Tampere University

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Evaluation of Expanded Gamut Printing in Flexography

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ACADEMIC DISSERTATION
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Responsible supervisor and Custos	Professor Jurkka Kuusipalo Tampere University Finland	
Supervisors	Associate Professor Mikko Hokka Tampere University Finland	Senior Research Fellow Johanna Lahti Tampere University Finland
Pre-examiners	Professor Abhay Sharma Ryerson University, Toronto Canada	Doctor Dieter Niederstadt Asahi Photoproducts Europe Germany
Opponents	Professor Jouko Peltonen Åbo Akademi University Finland	Doctor Kiran Deshpande Siegwerk Ltd United Kingdom

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PREFACE

This thesis is based on research carried out in cooperation with Marvaco Ltd. under the supervision of Professor Jurkka Kuusipalo, Associate Professor Mikko Hokka, and Senior Research Fellow Johanna Lahti from the unit of Materials Science and Environmental Engineering at Tampere University during the period 2005-2020. I would like to express my gratitude to the people who contributed to my work.

Thank you to my previous and current employers, colleagues, and packaging printing friends around the world for inspiring me with this subject and for helping and supporting me to get this accomplished. It has been a long and great learning journey over the years. Our company Marvaco has patiently supported and motivated me throughout this time. Broby Grafiska School, SOMA and Flint Group also played an important role in conducting the tests. I would also like to thank the brand owner companies for making their designs available for use.

I wish to thank my supervisors and the inspectors; it has been a pleasure to work with you and I have received valuable comments from you. I want especially to thank my colleagues Marko Valkamo and Mika Isohanni for providing the repro and color profiling data for the tests and sharing their deep knowledge in the art of prepress and color management. You have been very patient and helpful with several theoretical questions.

Above all I want to thank my wife Riikka for all the love, support, and motivation that made this possible; without your endless support and sacrifices I could not have done this. Our kids have already grown a lot during this time, but I will now enjoy my increased free time to play and spend time with our fantastic family and kids. I hope I have inspired you by showing that anything is possible – thank you for your love, support, and understanding Karl-Oskar, Silvia, and Hugo.

June 2021, Dresden, Germany

Kai Lankinen

ABSTRACT

There is a great need in the packaging industry to produce increasingly smaller lots in a more cost-effective and sustainable way, where the spot color accuracy of the brand elements is critical. Traditional flexography is spot color printing or four-color process printing supported by spot colors that consume a lot of time, effort, and materials. This study evaluates the transition from spot color printing to Expanded Gamut Printing, EGP, i.e., a multicolor process in solvent-based wide web flexography, which reduces the complexity of the printing process and produces spot color simulations in a simpler, more effective, and more sustainable way.

The packaging printing industry has traditionally been a conservative one and new methods are usually trialled without a deep systematic and scientific approach. Therefore, there has not been a comprehensive and scientific investigation of the multicolor process in flexography and it is relatively unknown in detail; thus EGP is considered a niche process. Printers and brand owners lack concrete evidence to support its implementation. This thesis aims to fill the scientific gap and provide data and test results to facilitate the transition to EGP in flexography.

Currently, there is very little scientific peer-reviewed literature or PhD studies on multicolor printing in flexography. The materials available are mainly proprietary marketing materials, various articles, user manuals, college-level studies, and seminar presentations. The available test results typically only apply to narrow web printing, while the availability of empirical production data is almost non-existent.

This study provides examples and data to show the potential of multicolor printing. The main questions are whether and how multicolor process printing can replace conventional spot color printing. The purpose is to describe and calculate the achievable benefits of EGP in figures, since economy and ecology are also significant market drivers.

The study collects and supplements materials from various sources. A novel EGP calculator is developed to describe and evaluate the potential of the method. The

study investigates and evaluates the possibilities of color gamut expansion in wide web flexography and describes and calculates the potential of the gang-run printing. Finally, a legacy job printed with spot colors is converted into EGP and the results evaluated.

Several key findings are made in the study and the calculations show great potential for efficiency and cost savings in various areas. The improvement in the press setup is clear, but one of the most interesting findings is the effect of cleaning solvent distillation. In addition, the influence of the amount of stock ink is low and the savings potential on the substrate high. It is also a novelty to link these calculations with Overall Equipment Effectiveness (OEE) and CO_2 values.

The EGP calculator estimate in this study shows an improvement in the OEE of 42% to 85% and a total cost savings of around 0,6 to 1,3 million euros per printing press per year, while the CO_2 equivalent is reduced by 34% to 51% compared to spot color printing, the results will be different case by case. The studied tests show the capability to expand the color gamut with additional process colors, up to 91% of the Pantone Color Matching System (PMS) colors for the studied 7-color system of less than 3,0 ΔE_{2000}, as expected. However, against expectations, high-pigmented inks also expands the color gamut by 14% for the studied 4-color inks. The Total Area Coverage (TAC) calculations of the tests show that EGP can save ink.

The benefit of gang-run printing is generally mentioned by many sources. This study also defines the increased efficiency in numbers as the test showed the ability to eliminate 30% of the total number of inks. The calculated individual ink consumption based on TAC is reduced by 15% to 69%, while the number of printing plates is also reduced by 9%. The legacy job test proves the possibility of a real-world EGP implementation with improved efficiency, quality, and sustainability. The total number of colors is reduced by 33% and ink consumption is reduced while the quality was acceptable to the brand owner.

The results show that the use of EGP enables accurate spot color simulations in a simplified way. Therefore, the proposed method offers the basis for the industrial transition from spot colors to multicolor designs for greater flexibility, efficiency, and better sustainability.

AUTHOR'S CONTRIBUTIONS

This study evaluates and examines the usability of Expanded Gamut Printing in replacing spot color printing with simulated multicolor process printing in flexography. Since the research area is a very specific part of packaging printing and this doctoral thesis is the first of a kind, and there is hardly any previous scientific reference material available about this topic in flexographic printing, the author has carried out work to develop this area. This work included the following:

Scattered data were collected and completed to combine theories, and previous work and to illustrate the differences between various systems.

New methods of increasing color intensity and contrast were investigated in order to achieve an expanded color gamut.

CMYK and CMYKOGV multicolor process print profiles were printed and measured, analyzed, and compared, and a color transformation lookup table was created to examine the accuracy of simulated EGP spot colors. The calculations revealed also the potential for ink savings with this method.

Information was collected to describe the average production values of modern multicolor process printing compared to traditional spot color printing.

A great effort was invested in developing the EGP eco-efficiency calculator to model the printing results to derive novel ROI and sustainability calculations.

Since very limited information was available on the Global Warming Potential of flexography, a literature search of CO_2 equivalents was conducted and a calculation model was created to describe the sustainability in flexography.

Since there were very few reference implementations of expanded gamut printing for flexography in Europe, a consumer-level test was conducted with a brand owner to determine and prove the usability and acceptance of simulated spot colors printed using multicolor process printing on flexible packaging.

This research has proven that the EGP system works in practice, and the analysis shows that the proposed method can be successfully used to convert brand spot colors into simulated spot colors with improved eco-efficiency.

The author's investigations about the potential of increased sustainability in flexography has raised sustainability as a global topic in packaging printing.

CONTENTS

LIST OF ABBREVIATIONS AND SYMBOLS

a*	Red/green component in CIELab color space
AM	Amplitude modulation
b*	Yellow/blue component in CIELab color space
C*	Chroma in CIELab color space
CAGR	Compound Annual Growth Rate
CI	Central Impression (printing press)
CIE	International Commission on Illumination
CMS	Color Management System
CMYK	Cyan, Magenta, Yellow and Black (Key) color
CtP	Computer-to-Plate
ΔE*ab	Color deviation calculation, ΔE*, ΔE, dE, delta E
DMS	Digitally Modulated Screening
DTP	Desktop publishing
EB	Electron beam
ECG	Extended Color Gamut
EG	Expanded / Extended Gamut
EGP	Expanded Gamut Printing
FCP	Fixed Color Palette
FIRST	Flexographic Image Reproduction Specifications & Tolerances
FM	Frequency modulation
FMCG	Fast-moving consumer goods
FTA	The Foundation of Flexographic Technical Association,
FTD	Flat-Top-Dot
GHG	Greenhouse Gas
GRACoL	General Requirements for Applications in Commercial Offset Lithography
GWP	Global Warming Potential
h°	Hue in CIELab color space
HD	High Definition

ICC	International Color Consortium
IFT	Ink Film Thickness
JND	Just Noticeable Difference
K	Kelvin
LCA	Life Cycle Assessment
LUT	Lookup table
L*	Lightness component in CIELab and CIELch color space
L*a*b*	Values that define a color in CIELab color space
L*C*h°	Values that define a color in CIELch color space
mpm	Meters per minute
OEE	Overall Equipment Effectiveness
OGV	Orange, Green and Violet colors
PCS	Profile Connection Space
PMS	Pantone® Color Matching System
RGB	Red, Green and Blue colors or inks
RIP	Raster Image Processor
SD	Saturation density
SID	Solid ink density
TAC	Total Area Coverage
TVI	Tonal value increase
UV	Ultraviolet
XG	Expanded Gamut

TERMINOLOGY

Chroma	(C), distance from neutral gray to "brilliant" color, used in L*C*h°
Dichroism	Change of hue due to the ink film thickness
Gamut	Range of reproducible colors
Gang-run	Combining multiple print jobs into a one print run
Hue	(h), color tone, color shade, used in L*C*h°
Moiré	A visible interference patterning in the print
Saturation	Intensity and purity of the color hue, correlates with the Chroma
Shore A	Hardness measurement index for elastomers and polymers
Vignette	A gradual fade out of a color tone

1 INTRODUCTION

1.1 Background and aims of the study

The trend in the printing industry is that the order length of a printing job is decreasing and there is a strong common need to reduce setup time and costs. Moreover, brand owners are actively looking for greener processes for packaging production, as consumers and retailers seek to use more ecological products.

The preparation and matching of traditional spot colors take time, occupy printing machine capacity, cause makeready waste, and also result in growing ink storage inventory and ink waste. The application of multicolor process printing to flexographic printing could result in a substantial efficiency increase and cost reduction due to a decrease in setup times, makeready waste and ink logistics. Furthermore, the expanded gamut printing system is also more ecological overall in comparison with traditional flexographic printing with spot colors.

The possibility and importance of industrial implementation

The main factors for the transition from traditional printing to expanded gamut printing are to make the printing process more effective, flexible, and even more sustainable, while the order lengths become shorter with more product variants. Although multicolor process printing is traditionally marketed on its efficiency and cost saving, the sustainability aspect has been missing. Since making this study, the author has been able to raise the sustainability of packaging printing in public debate as an added value of expanded gamut printing.

Expanded gamut printing (EGP) is a challenging system to implement as an industrial process at first. However, once done successfully, well-accepted print quality can be achieved with a remarkably shorter setup time and better sustainability compared to spot color printing. Therefore, the author has carried out pioneering work by collecting the data presented in this study, compiling, proving facts and making novel calculations to expand knowledge, creating examples of color accuracy

and production possibilities including gang-run printing. Further, a consumer-level study was performed with a brand owner using EGP. All of this contributes to encouraging and helping printers and brand owners to start implementing multicolor process printing for the packaging printing supply chain, providing a more efficient and sustainable process compared to traditional spot color printing.

While writing this thesis from 2004 to 2019, it has been interesting to note how sustainability in packaging has become a very hot topic in recent years, even though it has not yet affected printing itself to any great extent. Sustainability in packaging has been focused on first in downgauging the materials and then replacing substrates with degradable and bio-based materials, but printing itself has seen only a few approaches regarding sustainability.

N.B. The author uses the abbreviation EGP in this study as a synonym for the Marvaco EGP™ product and other abbreviations on other occasions that are not related to Marvaco's product.

Aims of the study

The flexographic (flexo) printing industry has an overall general need to offer cost-effective, high quality printing in smaller and smaller lot sizes and, in addition, preferably in a more sustainable way. Therefore, the application of a multicolor process printing is considered the main objective of this research.

The specific objectives in the utilization of the high-quality Expanded Gamut Printing process were the following:

Can the EGP multicolor process method be used to eliminate spot colors in flexo printing? Spot colors have traditionally been used in flexographic printing, and the question examined in this study is how well the multicolor composition of a color can replace a single spot color.

Does EGP methodology offer improved capacity and cost benefits compared to traditional flexo printing? The use of expanded gamut printing has been limited, while the majority of flexographic printing has traditionally been done with spot colors. This study evaluates the capacity and cost advantages that can be achieved by switching from spot color printing to multicolor process printing.

Does the switch from spot color printing to EGP method offer the possibility for higher quality in flexography? One of the expectations when implementing a new printing method is to maintain or even increase the previous quality level. The study compares different color and element aspects between spot and process colors in order to determine the potential for maintaining and increasing the quality when changing from spot colors to multicolor process printing.

What kind of effect does the EGP method have on sustainability, productivity, and lot size in flexography? Multicolor printing has been claimed to be more cost efficient than traditional spot color printing, but it has not been defined in concrete figures. While the earlier focus was limited to cost efficiency, the sustainability aspect was completely ignored. Hence, this study focuses on providing concrete figures, taking into account various aspects of eco-efficiency and lot size.

What are the problem areas of EGP methodology? To get a thorough evaluation of the multicolor printing process, the study also analyzes the potential conflict areas of the method that limit its implementation.

1.2 Thesis overview

The method used in this thesis is flexography for flexible packaging printing. The focus was on replacing spot colors with the use of simulated spot colors in process printing. This methodology is known as expanded gamut printing, which is theoretically old, but only a few practical implementations are made.

The literature review revealed a lack of published scientific research on this subject. Expanded gamut packaging printing has been examined to some extent in institutional and M.Sc. studies, but it has rarely been scientifically examined in doctoral theses or peer reviewed studies. There are 239 references in this study with 46 peer-reviewed articles or PhD studies, but only five of them were on multicolor printing and none dealt with multicolor printing in flexography.

Based on the literature research, this study appears to be one of the first, if not *the* first, on expanded gamut printing in flexography at PhD level. Hence, it was difficult to cite peer-reviewed publications. Therefore, in this thesis, as much valid and concrete data as possible was collected from many sources such as articles, theses,

books and seminar presentations and is listed in the bibliography to help other researchers delve into the subject more in depth.

This thesis is a monograph that was written between 2005 and 2020. During this time, the technology has developed to such an extent that machines, processes, software and knowledge finally enable the successful use of expanded gamut printing in flexography. Since the theory of multicolor process printing is not new, but earlier experimental implementations of the method have been unsuccessful, it is important to review and understand the principles in detail.

The beginning of the first part of the study contains the introduction and aims of the study. Here the traditional flexographic printing, color theory, different color systems and screenings are collected and presented. After these chapters, the principles and previous work to color separation and expand the color gamut are reviewed. Since sustainability is currently the main topic in the packaging industry, this is included as the last chapter in the theoretical part.

The second part of the study presents the materials and methods used in this research.

The third part presents the collected data, brings new aspects into consideration and creates novel analyses that lead to concrete figures and values in order to evaluate the eco-efficiency of the method. It opens up new perspectives for evaluating the advantages of the EGP system and provides data to describe the results. In addition, the created EGP print profile is used for test simulations and analyses. The knowledge gathered is then implemented in a pioneering consumer-level study with a brand owner and a flexo printer. Finally, the chapter provides a summary of what EGP can contribute to sustainability in flexographic printing.

In the last part, the thesis and contributions are summarized and suggested guidelines are given for future research.

1.3 Packaging printing

All major printing technologies are used for print packaging (Kipphan, 2001). The main methods are flexography, offset, gravure, screen, and digital printing (Kipphan,

2001; Leach & Pierce et al., 2002). For several years flexographic printing has been one of the most important processes for packaging printing (Meyer et al., 2000).

In comparison to the other packaging printing methods, flexography has many advantages (Malmirchegini & Rahmani, 2011) and as a result it is currently one of the most commonly used printing processes for packaging printing in North America, Latin America, and Europe (HP Inc., 2016). According to an article by Henry (Henry, 2017), the flexible packaging market is a high-volume market, where flexographic printing dominates, with about 75%, and digital printing accounts for about 1%.

According to Bates et al. in 2015 (Bates, Zjakic, & Budimir, 2015), flexographic and digital printing are the fastest growing printing techniques. Typically, digital printing is used in packaging printing to produce small production lots, and production is usually transferred to flexographic printing as the production lot size increases. According to an article by Hohmann (Hohmann, 2016), the United States is the leading country in the use of extended color gamut (ECG) printing. However, the number of practical ECG implementations is very low.

1.3.1 Flexographic printing

Flexography is a relief printing process in which an elastic printing plate transfers the print motif to the substrate using solvent-based, water-based, or UV/EB curable inks (Kamp & White et al., 2004; Thorman, 2018; Tryznowski, Żołek-Tryznowska, & Izdebska-Podsiadły, 2018). Flexographic printing tools have seen tremendous development since the 1970s and the printing machine itself went through a rapid and radical evolution in the first decade of the 21st century as gear driven flexo presses were replaced with gearless direct servo motor driven presses. Digitally controlled servos without traditional mechanical linkage make printing machines more suitable for quick changeovers and short production runs (Dorscheid, 2005).

Flexography is widely used in packaging printing due to its ability to print on almost any type of substrate, for example, folding cartons, corrugated boxes, labels, and flexible packaging (Narakornpijit, 2018). The flexographic process is the most common printing method (Dorscheid, 2005). Solvent-based and water-based inks have low viscosity (Tryznowski, Żołek-Tryznowska, & Izdebska-Podsiadły, 2018; Żołek-Tryznowska;Izdebska;& Tryznowski, 2015).

The printing is typically done with cyan (C), magenta (M), yellow (Y) and black, (K, as "key" color) and spot colors. According to Klein in 2014 (Klein, 2014), flexo printers have experimented with extended gamut printing to avoid the use of spot colors. Expanded gamut printing can use traditional printing like flexographic and offset (Sharma & Seymour, 2019). According to Hohmann (Hohmann, 2016), flexographic printing with a fixed color palette is still a niche in Germany but is expanding in other major markets such as the USA.

The printing machine is the key to product quality and productivity. To print high quality at high speeds requires a very stable press. During the last decades printing speeds have commonly been raised from 300-350 mpm to 400-600 mpm and even higher, for the most advanced machines.

1.3.2 Rotogravure printing

Rotogravure is a printing process in which the image is sunk into the printing cylinder surface to transfer the print motif to the substrate (Kipphan, 2001; Leach & Pierce et al., 2002). Gravure printing uses low viscosity inks (Narakornpijit, 2018) and is typically done with CMYK and spot colors, but according to Sharma and Seymour (Sharma & Seymour, 2019), expanded gamut printing is also applicable to gravure printing. In general, ECG is hardly used in gravure printing.

1.3.3 Offset printing

Offset printing, also known as lithographic printing, uses a flat printing plate to transfer the ink. The printing system is called offset as the plate does not print directly on the substrate, but to a rubber blanket that transfers the print motif to the substrate using thin layers of high viscous inks (Kipphan, 2001; Leach & Pierce et al., 2002; Abbot, 2018; Narakornpijit, 2018).

Offset printing for packaging is typically done with CMYK and spot colors, but according to Sharma and Seymour (Sharma & Seymour, 2019), expanded gamut printing can use traditional printing like flexographic and offset. In general, ECG is used only to a limited extent in offset printing.

1.3.4 Digital printing

Digital printing for packaging is typically done with fixed process colors (Chung & Hsu, 2006). According to various sources (Borenstain, Bar-Haim, Goldshtein, & Cohen-Taguri, 2020; Ryynänen, Sirviö, Tanninen, & Lindell, 2012), one challenge in digital printing is the limitation of the color gamut compared to traditional packaging printing, but according to Sharma and Seymour (Sharma & Seymour, 2019), digital printing can produce totally acceptable spot colors with an expanded gamut. This means that even more demanding packaging prints are possible in digital printing. Consequently, a fixed color process and ECG printing are commonly used in digital printing.

1.4 Color basics and color management

Color is an appearance of the stimulus based on the visual response to light (X-Rite Inc., 2000). In order to see and view a color, a light source is necessary. Light itself is radiated electromagnetic energy that is visible to the normal human eye. Light can be seen in different colors depending on the wavelength of the photon (radiated energy), as illustrated in Figure 1. The light spectrum visible to the normal human eye ranges from about 400 nm to 700 nm (Field, 1999; Vrhel & Trussell, 1999) or about 380 nm to 780 nm (Nussbaum, 2010).

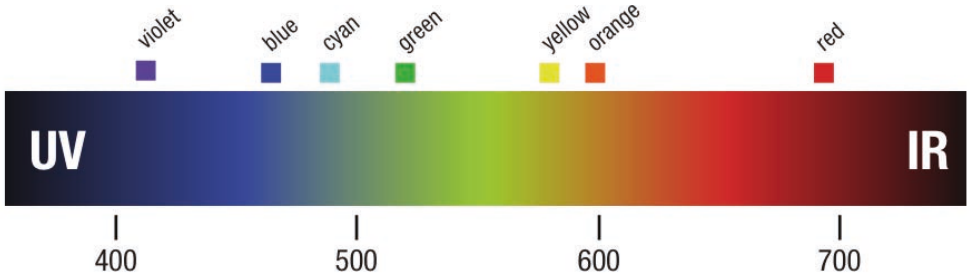


Figure 1 Spectrum of visible light (Weeks-Atkin, 2015)

To create a color stimulus there are two ways of producing a color from primary colors. These are additive and subtractive color mixing. The primary colors are colors that cannot be produced from other colors, but other colors can be derived from them (The Foundation of Flexographic Technical Association Inc., 1999).

Additive color mixing is the adding of different primary light sources in different proportions to produce colors. The theoretical primary light sources are red, green, and blue. Superimposing red and green light will produce yellow, green and blue produces cyan, while blue and red produces magenta (Huo & Yin, 2013; Digital Dots Ltd, 2005), as shown in Figure 2. The red, green, and blue all together will in theory produce white light, but as in practice these differ from ideal primaries the result will be grayish (Leach & Pierce et al., 2002).

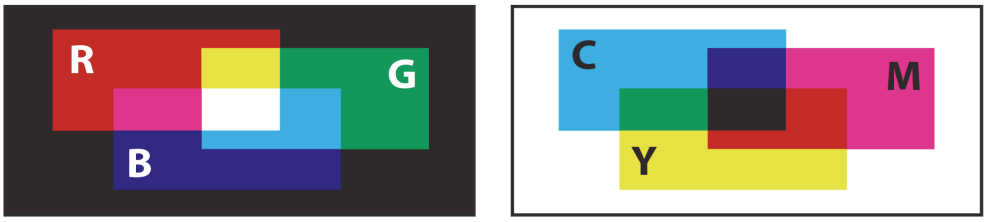


Figure 2 Additive and subtractive color mixing (K. Lankinen)

Subtractive color mixing is printing of different primary pigmented inks (cyan, magenta, and yellow) in different proportions to produce colors through selected light absorption into pigments magenta (Huo & Yin, 2013; Digital Dots Ltd, 2005), as shown in Figure 2. Cyan, magenta, and yellow inks all together will in theory produce the color black, but as in practice these inks differ from ideal subtractive primaries the result will not be a perfect black (Leach & Pierce et al., 2002).

According to Dharavath & Kokil (Dharavath & Kokil, 2014) color can be viewed as a quantitatively analyzed and measured science, although it is a subjective phenomenon for the human eye, which is sometimes a challenge for print and image reproduction. Visual judgement of a color is a subjective opinion where different factors influence simultaneously. The light source has a major influence on the perceived color tone of the image. Also, the surroundings affect color perception (The Foundation of Flexographic Technical Association Inc., 1999).

Color management

One of the most important goals of the printing industry is to produce colors accurately and consistently for the customer (Sharma, Leung, & Adams, 2017), even if different packages are printed on different places, with different printing methods, or on different substrates. Color management is a way of controlling color when

images are reproduced on different devices and substrates (Sharma A. , 2018), by utilizing process calibration and color separation with the help of profiles (Hoffstadt, 2019) to convert color data from one color space to another in a reliable and controlled way.

All imaging systems use some form of color management to preview, control, and adjust color throughout the image-production process, while color conversion is essential in successful color management (Giorgianni & Madden, 2008; Hu, Deng, & Zou, 2010; Nussbaum, 2010).

Device-dependent and -independent color models

Basically, the numeric values of red (R), green (G), blue (B), and CMYK color systems are ambiguous and do not specify the color. Each device or system that displays colors (e.g., RGB) or produces color prints (e.g., CMYK) has its own color reproduction. The RGB and CMYK systems are "device-dependent" color systems, and there is no simple conversion formula between RGB and CMY because the output of a predefined color input depends on the device producing the color (The Foundation of Flexographic Technical Association, Inc., 2013; Yin & Huo, 2013).

The device gamut is defined as a limited set of colors that a device can produce (Sharma A. , 2018; Vrhel & Trussell, 1999; Forrester, 2019). If there is no color management between different devices, a color input value (RGB or CMYK) produces different color results from different devices, or with different substrates. "Device-independent" color models are systems that aim to produce colors by simulating human vision numerically (Choi, Orsborn, & Boatwright, 2016). These include the International Commission on Illumination (CIE) color spaces, for example, CIE XYZ (1931) and CIE LAB (1976), CIE LCh, CIELUV, CIExyY (Vrhel & Trussell, 1999) – all of which are mathematical variations of CIE XYZ (Deshpande K. , 2015). The CIELAB color space is presented in more detail later in this study.

International Color Consortium profiles and Color Management Systems

To ensure precise color transformations from device to another, eight industry vendors established the International Color Consortium (ICC) in 1993 (ICC, 2020). The ICC profile specification ICC.1:2004-08 was used to make the ISO standard,

whereby the ISO 15076-1:2010 – Color Management standard is technically identical with ICC.1:2010 (ICC, 2020; ISO, 2010; ICC, 2010).

The ICC Profile Format Specification determines the open-format ICC color profile to convert color data between different devices and color spaces with the help of device-independent reference color space as a target for gamut mapping (Green, Holm, Li, & Hardeberg, 2008; ICC, 2020; ISO, 2010). The color transformation (T) is described in Figure 3.

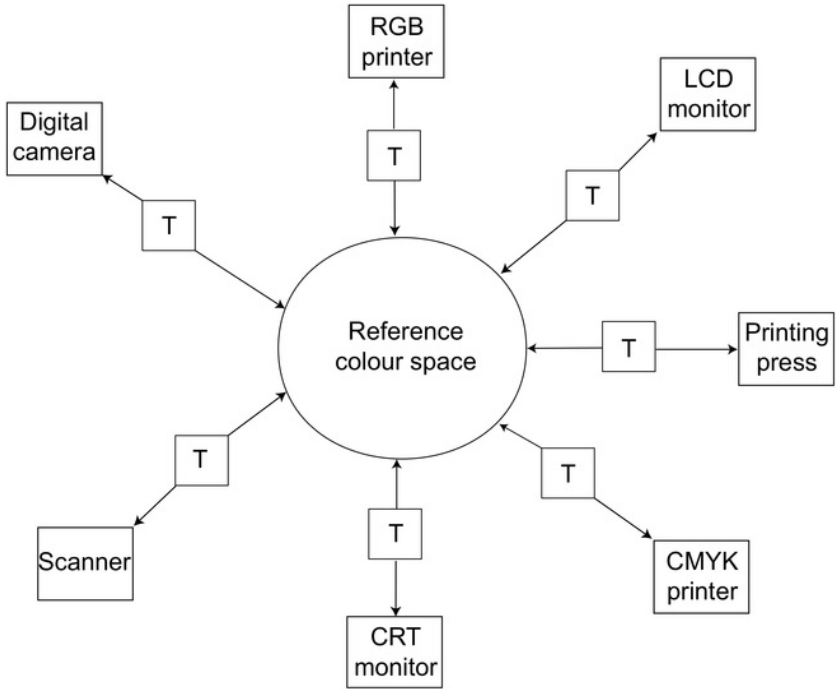


Figure 3 Color transformation between different color spaces (ISO, 2010)

Figure 3 shows how the source data is first transformed (T = input, transform, conversion, gamut mapping) to the intermediate reference color space and then converted (T = output, re-rendered, reproduced) for the destination device. The use of the intermediate reference color space allows each single device to be linked with it in a way that each gamut mapping (T) or re-rendering (T) can be done independently (ICC, 2020).

According to Sharma (Sharma G. , 2003), a color management system (CMS) interprets the device profiles and carries out the corresponding transformations to and from the device-independent space. In order for a CMS to be able to carry out the data transformation between the target device and reference color space, each device must be characterized (profiled) according to the ICC specification.

According to various sources (Nussbaum, 2010; Green, Holm, Li, & Hardeberg, 2008; ICC, 2010; Kipphan, 2001; Dharavath & Kokil, 2014), a CMS based on ICC architecture (profiles) has four basic parts:

PCS (Profile Connection Space), a device-independent CIE XYZ or CIE LAB color space, that defines colors as humans normally perceive them.

ICC Profile, defining especially the PCS values for device-dependent RGB or CMYK values.

CMM (Color Management Module), a "motor" or "calculator" used to perform all RGB or CMYK value transformations based on profile data.

Rendering Intents, based on four different color transformation algorithms (perceptual, saturation, relative colorimetric, and absolute colorimetric) to define how the out-of-gamut color value data is handled in color space transformations.

The problem in ICC profiling is that the set gives recommendations, but the characterization and color management can be done in many different ways, for example, default or gray component replacement (GCR) (Deshpande K. , 2015). Another problem with ICC profiles is that the method of gamut mapping (i.e., rendering intent or color projection) of an out-of-gamut color to the device color space is not specified and can be carried out in many different ways, giving different end results (ICC, 2010).

While CMYK profiling has developed over the years into standardized ICC profiling test charts such as ECI2002, IT8.7/3, and IT8.7/4, the expanded gamut charts have remained proprietary without a standardized method (Sharma & Seymour, 2019). Different software solutions are used to produce multicolor gamut profiles. These include software solutions from AGFA, Alwan, Bodoni, CGS ORIS, ColorLogic, Esko, GMG Color, Heidelberg, Kodak, and X-Rite (Sharma & Seymour, 2019; Plautz, 2018; Kraushaar, 2018). However, Idealliance has recently announced that it is working on creating an industry-standard test chart, methods, and procedures for multicolor printing calibration and profiling, which is a positive step (Idealliance, 2020).

The ICC profile can be created for a printing device by printing a profile target, for example, the IT8.7/4 test chart, and measuring it with the help of a spectrophotometer and color management software (Deshpande K. , 2015). According to Hoffstadt (Hoffstadt, 2019):"*To get representative data from a test print, it is therefore advisable to use a small chart multiple times, and not to use a single test chart with many pages*" Measuring a characterization chart as presented in Figure 4 will result in a profile to describe a color space.

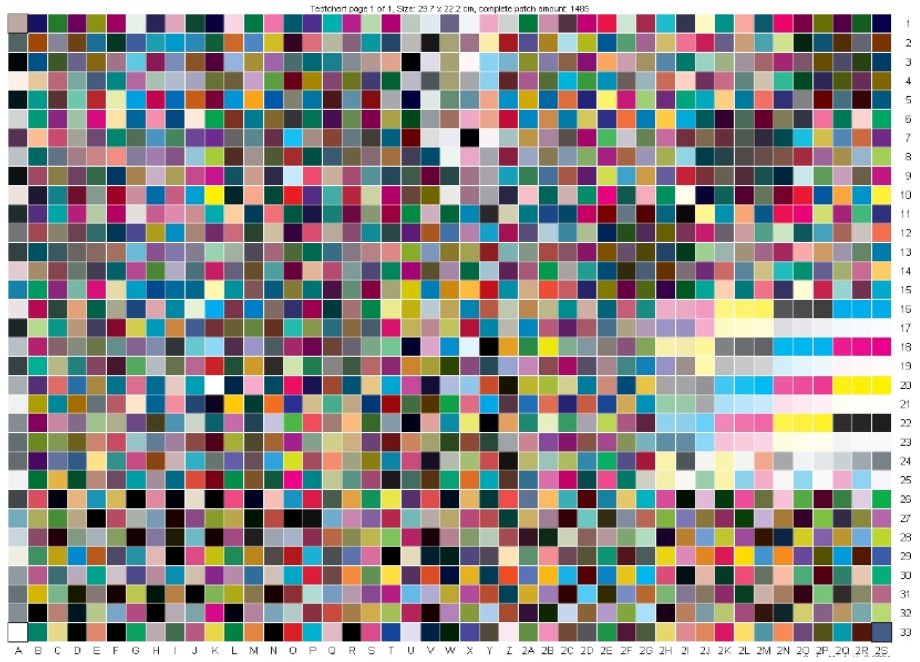


Figure 4 ECI2002R test chart in CMYK (Image: Marvaco)

For CMYK process color printing the above is still rather "easy", but multicolor process profiling (characterization) is more demanding, as it requires color combinations not only between the CMYK inks, but also with additional inks. A n-color gamut mapping becomes even more challenging when the process colors are printed in combination with spot colors on top of each other (Deshpande K. , 2015). However, if all the color conversions and color corrections are based on the LAB space in color management, the color loss or color deviation can be minimized (Hu, Deng, & Zou, 2010).

According to studies by Deshpande et al. (Deshpande K. , 2015; Tang & Xiu, 2012; Žitinski ElÍas, 2017), a "one-to-many" color management problem occurs when a source color can be generated over more than three color hues (for example CMY primary inks) in the target color space, as is common for CMY+K and multicolor orange (O), green (O), and violet (V) process printing. This means that a source color value can result in different ink combinations in the target color space depending on the user-specific color separation conditions to define the ratio and priority of using CMYK and OGV in the tint recipe.

According to Sharma & Seymour (Sharma & Seymour, 2019), the above results in redundancy in device-dependent color formulation even in one CMS system with more than three primary colors, and the "one-to-many" problem becomes even worse when color value data is processed with color management systems from different vendors.

In-gamut and out-of-gamut color values

The color is referred to as "in-gamut" if the output color value data of the destination color space exactly represents the input color value data of the source color space. If the source color space input color value data cannot be reproduced by the destination device (color output), the color is referred to as "out-of-gamut" (Deshpande, Green, & Pointer, 2015-10).

According to Vrhel and Trussell (Vrhel & Trussell, 1999): "*if* Ω_{cie} *is in the range of numerical values in the selected CIE color space and* Ω_{print} *is the numerical range of the device control values, then the set*

$$G = \left\{ \mathrm{t} \in \Omega_{cie} \mid \exists\, \mathbf{c} \in \Omega_{print} \text{ where } \mathcal{F}_{device}(\mathbf{c}) = \mathbf{t} \right\} \qquad (1)$$

defines the gamut of the color output device. Similarly, the complement set

$$G^c = \left\{ \mathrm{t} \in \Omega_{cie} \mid \nexists \mathbf{c} \in \Omega_{print} \text{ where } \mathcal{F}_{device}(\mathbf{c}) = \mathbf{t} \right\} \qquad (2)$$

defines colors outside the device gamut."

The RGB gamut of a color monitor is shown in on the left of Figure 5. In the middle, the gamut of a CMYK printer is mapped to the closest gamut value, whereby the hue angle and the lightness in the CIELab space are retained. On the right, the black area presents the out-of-gamut values of a CMYK printer.

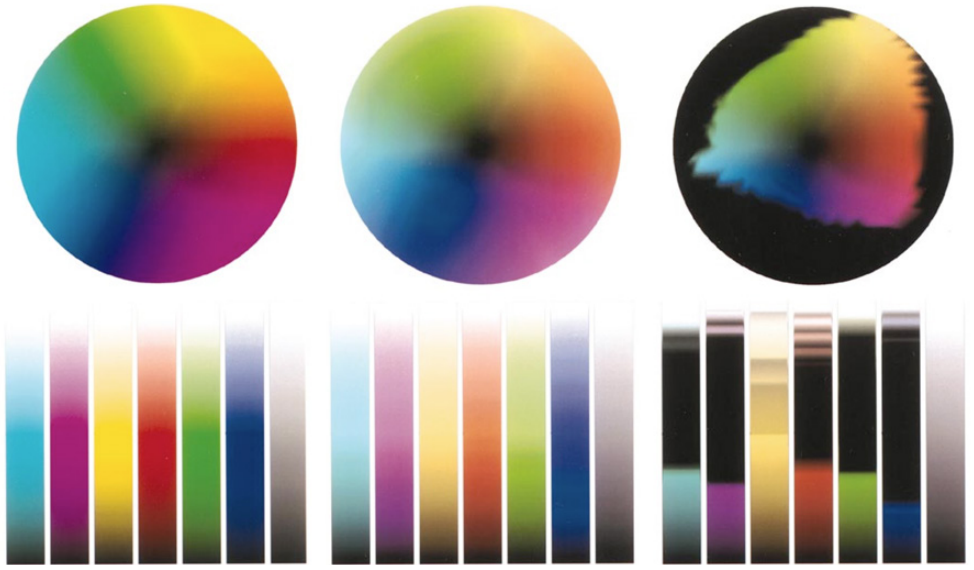


Figure 5 Colors in RGB, CMYK, and out-of-gamut (Vrhel & Trussell, 1999)

CIELAB color system and color gamut

Isaac Newton was an early pioneer of light and since circa 1665 when he identified the seven colors of the rainbow: red, orange, yellow, green, blue, indigo and violet (ROYGBIV), of white light passing through a prism (Taylor, 2017), there have been many attempts to describe color in an organized way and to create color management systems (CMSs). Over the years many kinds of color systems have been created for better color communication and currently numerous diverse systems are in use.

The foundation of the modern color management was established in 1931 when the International Commission on Illumination standardized a system by specifying the light source (illuminant), the observer, and the methodology to describe the color with XYZ chromaticity coordinates (Luo & Pointer, 2018).

CIELAB, also known as CIE (L*a*b*), is a color space system defined by the International Commission on Illumination in 1976 (Mirjalili, Luo, Cui, & Morovic, 2019; X-Rite Inc., 2000) to express any color in nature (Hu, Deng, & Zou, 2010).

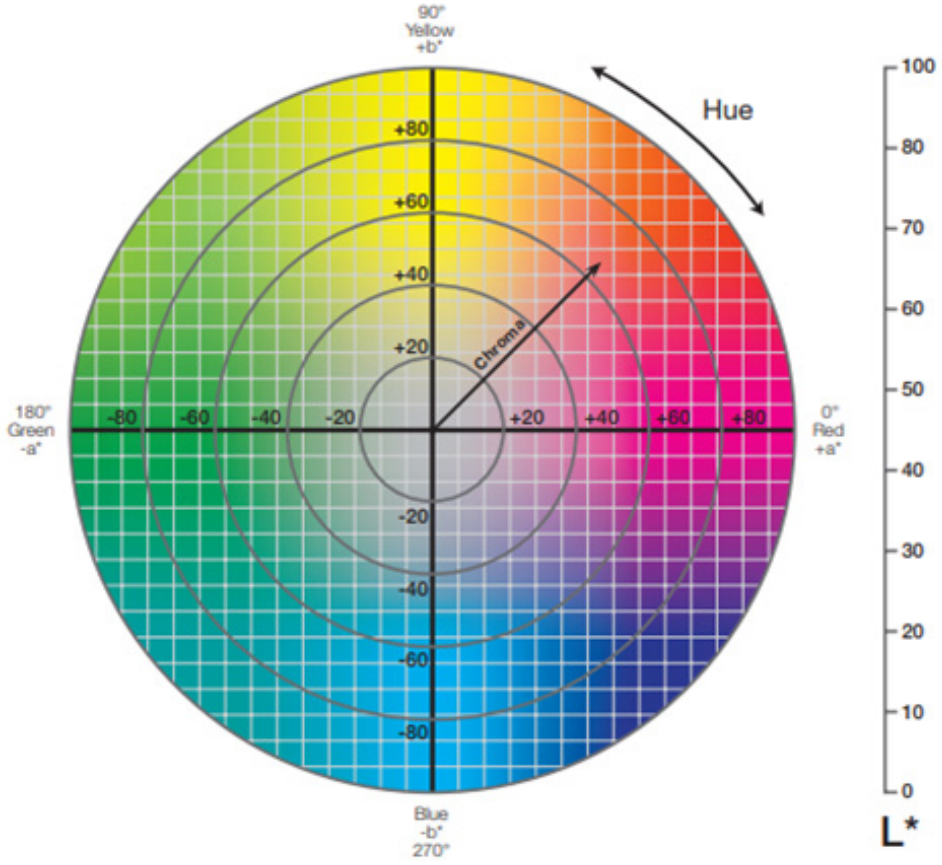


Figure 6 CIELab color space (X-Rite Inc., 2019)

As shown in Figure 6, the L* value is the degree of lightness from 0 to 100 (Mahajan & Bandyopadhyay, 2019), where a low number (0-50) indicates a dark color and a high number (51-100) indicates light color. The a* value is the red/green axis from negative to positive values, where an increasing positive number indicates more saturated red and a decreasing negative number more saturated green color. The b* value is the blue/yellow axis where an increasing positive number indicates more saturated yellow and a decreasing negative number more saturated blue (Nussbaum, 2010; Hasting & Rubin, 2012).

Like every model, the CIELAB has also some deficits. According to Deshpande (Deshpande K. , 2015), the CIELAB has equally spaced color distances, even if the natural color perception of humans is not so equidistant. Second, it assumes that every color in the same hue angle produces a continuous tone in which only the saturation changes. However, particularly in the blue area the colors shift towards purple and in the red areas towards orange when the saturation increases (Sharma G. , 2003; Fraser, Murphy, & Bunting, 2004).

The CIELAB color space is device-independent (Heidelberger Druckmaschinen AG, 2009) and the size of the colors in-gamut depend on the characteristics of the device. A device can be for example a RGB monitor, CMYK printer, or a flexo printing press with process and spot colors.

Color equivalence

In flexographic printing the colors are device-dependent, which means that each printing press results typically in a somewhat different result, even with the same ink. For example, a specific CMYK value can result in different colors on different printers (Vrhel & Trussell, 1999).

According to Kipphan, the human eye is very sensitive to noticing anomalies in the printing of constant tonal value areas; a small density value change of even $\Delta D = 0{,}02$ can be perceived and seen as mottling or a streak (Kipphan, 2001). It is important to have control over the print parameters and ensure constant ink transfer, as it affects the perceived color tone. The effect of ink film thickness (IFT) on hue is also known as dichroism (Leach & Pierce et al., 2002).

The printing and reproduction process must be profiled so that the proof is calibrated to match the print (The Foundation of Flexographic Technical Association, Inc., 2017). Each print setup typically needs to be profiled. According to Sharma (Sharma A. , 2006), the problems with the ICC workflow are that it is not regulated and the profile result varies according to the characterization method. An average user is unable to assess the quality of the ICC profile. It is recommended to do proofing for example according to ISO 12647-7:2016 (Finnish Packaging Association, 2016; The Foundation of Flexographic Technical Association, Inc., 2017). According to Niederstadt (Niederstadt, 2016), process color is even easier to control than a printing with spot colors.

Profiling multicolor printing is similar to profiling CMYK, but the additional OGV colors also need profiling, and the software allows many different ways to create custom color separations, for example to improve print stability (Sharma & Seymour, 2019). Instead of making a profile run only with CMYK, the same chart (e.g., ECI2002, IT8.7/3, or IT8.7/4) needs to be printed and measured also with OMYK, CGYK, and CMVK combinations, for example as presented in Figure 7.

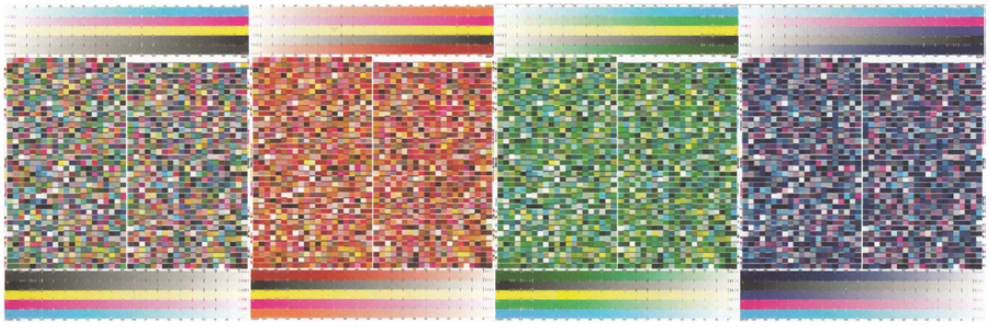


Figure 7 Profiling of multicolor printing (The Foundation of Flexographic Technical Association, Inc., 2017)

Color proofing with multicolor print profiles is more accurate than with CMYK profiles due to the fact that multicolor proofing contains more colors such as purer pastels and semi-saturated colors (The Foundation of Flexographic Technical Association, Inc., 2017).

About standards in color communication

ISO standards for viewing and measuring the graphic arts include the following:

ISO 3664:2009 – Viewing Conditions

ISO 13655:2017 – Measuring Conditions

ISO 15076-1:2010 – Color Management based on ICC

ISO 12647-7:2016 – Contract Proofing from digital data

ISO 3664:2009 determines that light tubes produced for the viewing of graphic arts contain more UV light than former versions of light tubes so as to be closer to typical daylight and D50/2° reference viewing conditions, and thus close to the typical M1

measuring devices to get a better match between visual evaluation and measurement (GMG GmbH & Co. KG, 2015).

ISO 13655:2017 defines the total color difference as ΔE_{2000} (ISO, 2013) and introduces M0, M1, M2, and M3 measuring conditions where the illumination conditions are standardized as shown in Table 1. M1 is recommended as it matches more closely with the D50 viewing conditions (Sharma, Leung, & Adams, 2017). The categorization of measuring conditions is intended to reduce illumination variations and the effect of optical brighteners. For substrates without optical brighteners M0 = M1 = M2 (GMG GmbH & Co. KG, 2015).

Table 1 ISO 13655:2009 measuring conditions (GMG GmbH & Co. KG, 2015)

M0	Formerly: No filter	Legacy mode, no defined UV tolerance
M1	**D50**	**Defined UV tolerance close to D50**
M2	Formerly: UV-cut filter	Without UV content
M3	Formerly: Polarization filter	Polarization filter (with UV-cut filter)

ISO 15076-1:2010 specifies a color profile format based on ICC specification and describes the architecture that specifies the information exchange of digital data from color image processing (ISO, 2010; ICC, 2020).

ISO 12647-7:2016 specifies the contract proofing requirements from digital data and determines the color differences (ΔE) of the proofing according to CIE ΔE_{2000} (ISO, 2016; Benz, 2017).

It is worth keeping in mind that the measured density values also depend on the status setting of a reflection densitometer, which typically differs in different geographical areas. According to X-Rite (X-Rite, 2003), these are:

Status T: Is the accepted standard in the United States

Status E: Is the accepted standard in Europe

Color difference – ΔE

To determine the color difference of two colors in a specific way, the ΔE^*_{ab} (also known as ΔE*, ΔE, ΔE_{76}, dE, or delta E) is used to describe the color difference with a single numeric value. The basic formula (CIE76) for calculating the color

difference ΔEab as shown in equation (3) calculates the Euclidian distance of two colors (Žitinski ElÍas, 2017).

$$\Delta E^*_{ab} = \sqrt{(L^*_2 - L^*_1)^2 + (a^*_2 - a^*_1)^2 + (b^*_2 - b^*_1)^2} \quad (3)$$

The problem with the original CIE76 calculation is that it follows the simple Euclidian metric calculation and does not take into account the differences in human color perception depending on color tone (Sharma G. , 2003). As a result, better calculation models such as ΔE_{94} and later ΔE_{2000} (CIEDE2000 or ΔE_{00}) have been developed (Žitinski ElÍas, 2017). The method for calculating ΔE is described in many ISO standards. The ΔE_{2000} is the most commonly used and most accurate way to describe color difference (Sharma, Wu, & Dalal, 2005).

According to Techkon company (Lakacha, 2018), usually the smallest just noticeable difference (JND) of ΔE is expressed as 1, i.e., a color difference smaller than 1 is not perceivable and a difference greater than 1 is perceivable. According to Mokrzycki and Tatol (Mokrzycki & Tatol, 2011), the JND of a ΔE_{Lab} is about 2,3. However, as human color perception is not equal for all colors as the eyes are more sensitive to changes in chroma than lightness, it means that the same ΔE between two yellows and two greens will look most obviously different to the eye (Lakacha, 2018).

According to Pantone® (Pantone LLC, 2018), human vision is so sensitive to a change in some colors, such as neutrals, that even a ΔE of 1 will be visibly apparent. According to Mokrzycki and Tatol (Mokrzycki & Tatol, 2011), the ΔE_{Lab} difference between the perceived colors by a standard observer has been determined as:

$0 < \Delta E < 1$	the observer does not notice the difference,
$1 < \Delta E < 2$	only an experienced observer can notice the difference,
$2 < \Delta E < 3{,}5$	an inexperienced observer also notices the difference,
$3{,}5 < \Delta E < 5$	a clear difference in color is noticed,
$5 > \Delta E$	the observer notices two different colors.

It is worth bearing in mind that the ΔE does not represent the whole truth of the color difference because spectrophotometers also have tolerances that affect the measurement result. According to Eddy Hagen's blog post (Hagen, 2018), even two similar devices of the same brand can have an inter-instrument deviation as follows:

X-Rite i1 Pro v2: an average of 0,4 ΔE_{94} and a max of 1,0 ΔE_{94}

X-Rite eXact: an average of 0,25 ΔE_{ab} and max of 0,45 ΔE_{ab}

Techkon Spectrodens: 0,3 ΔE_{ab}

Konica-Minolta FD-7: an average of 0,3 ΔE_{00}

It should also be noted that different color references can also lead to confusion and errors, since even the digital color libraries from different system providers use different versions of Pantone color targets, depending on which source and which update of the source they are using (Sharma & Seymour, 2019). Another problem is that the Pantone Color Manager only contains M2 data, while the measurements are usually made with the M1 setting (Sharma & Seymour, 2019). Additionally, some products, such as Adobe Photoshop, do not display the L*a*b* values accurately, since no decimal points are shown for the color values.

Acceptable color difference

The color of the packaging print is critical (Mahajan & Bandyopadhyay, 2019) and brand owners wish to have uniform colors through all their product families. This means that various printers and printing processes should have as close a match between the colors as possible. The contact proofs should also represent the final print as closely as possible. Hence, the ISO 12647-7:2016 has specified the maximum tolerance of 2,5 ΔE_{2000} for simulated spot colors in contract proofs (ISO, 2016; Benz, 2017). The deviations in printing must be taken into account, as a typical print variation average of ΔE_{2000} is above 2 (Hoffstadt, 2019).

Consequently, brand owners have defined their own color tolerances for their brand colors. According to the author's experience, the maximum color tolerances from 2,5 to 3,0 ΔE_{2000} are currently the most common color tolerances required by the brand owners. A typical tolerance for the spot color reproduction in labels and packaging set by the printers themselves is below 2 of ΔE_{2000} (Sharma & Seymour, 2019; Ryerson University, 2019).

Printing contrast and tonal range

An offset study (Dharavath & Hahn, 2009) found that most of the information in the halftone images is in the tonal and tinted areas and the measurement of dot gain

at 25%, 50%, and 75% dot area for each CMYK color gives an indication of the reproduction quality of the tone.

Print contrast, i.e., tonal range is measured as a density difference between the highlights and shadows of an image and it describes the ability to hold image detail in a shadow region (The Foundation of Flexographic Technical Association Inc., 1999; The Foundation of Flexographic Technical Association, Inc., 2017).

Print contrast is traditionally measured in flexo printing as the density difference between the printed 70% tint area and the solid area (The Foundation of Flexographic Technical Association Inc., 1999; The Foundation of Flexographic Technical Association, Inc., 2017). Print contrast is calculated as shown in equation (4) (X-Rite, 2003). N.B. In some sources the print contrast is measured in the 75% tint area, but this often refers to offset printing.

$$\text{Print contrast: } \frac{D_s - D_t}{D_s}\ x\ 100 \qquad \begin{matrix} \mathrm{D_s} = \text{Density of solid} \\ \mathrm{D_t} = \text{Density of tint (typially 70\%)} \end{matrix} \tag{4}$$

Print contrast is used to describe how well the printer is able to keep the screened area open in the upper tonal range and it is closely related to the ink transfer and condition of the printing machine (Meyer et al., 2000). The tonal range of a printed image depends very much on several process factors. These include the substrate, reproduction, printing plates and plate making, mounting tapes, aniloxes, inks, printing machine, and printing machine settings (The Foundation of Flexographic Technical Association, Inc., 2013).

According to Kodak, the ideal print contrast range is from 40% to 60%. Below that the image is too dark due to the lack of details and above that range the tonal scale is too open, the image is too light, and graphic details are lost (Kodak, 2018). To obtain the largest tonal range, a high solid print density together with the lowest dot gain is required (The Foundation of Flexographic Technical Association, Inc., 2013).

Dot gain compensation

According to Žitinski (Žitinski ElÍas, 2017), the increase in dot gain or tone value results from the interaction between the ink and the substrate. Dot gain is the measured growth of a dot area percentage between a dot area on the plate and dot

area of the print (Meyer et al., 2000). It is a physical and/or optical measurement and a theoretical calculation that is also termed Tonal Value Increase (TVI), normally expressed as the difference of the mid-tone (50%) dot area to describe the change from one medium to another e.g. between the digital file or plate and the printed dot area (The Foundation of Flexographic Technical Association, Inc., 2017). Dot gain is dependent on the substrate, printing press, plates, inks, backing materials, and other factors. It is a normal part of print production and must be controlled and compensated in the prepress for printing.

In halftone process printing the interpreted dot size is affected not only by the mechanical dot gain, but also by the so-called optical dot gain, which is caused as the light is scattered and entrapped in the material under the printed dots (Deshpande K. , 2015; Prof Steven Abbott, 2019; Pritchard, AM and FM gamuts compared, 2009; Kipphan, 2001; Žitinski ElÍas, 2017; Gustavson, 1997), as presented in Figure 8. The phenomenon is also known as the Yule–Nielsen effect where printed dots appear to be darker than the size of the dot would suggest (Sharma G. , 2003; Abbot, 2018).

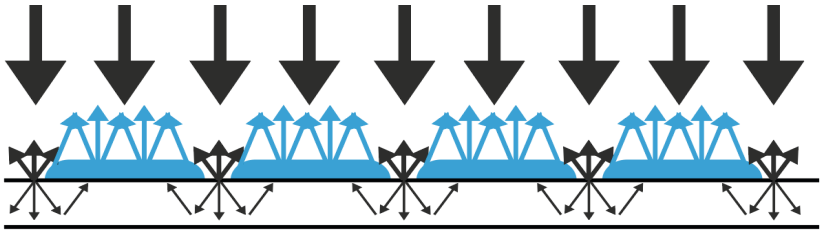


Figure 8 Optical dot gain (K. Lankinen)

Dot gain measured with the densitometer includes both mechanical and optical dot gain, whereas mechanical dot gain is measured with the microscope alone (X-Rite, 2003).

1.5 Influencing factors in flexography

1.5.1 Different color systems in flexographic printing

Traditionally, flexo printing can be divided into two categories, where linework designs have been printed with spot colors and screened halftone images with process colors.

Spot colors

Spot color (also known as line color or solid color) is any color that is printed on a separate print unit in a single run that is not part of the process color image (Kamp & White et al., 2004). Spot colors are typical for brand logos and brand recognition (O'Hara;Congdon;& Gasque, 2016). They have a full ink coverage over the area and are typically printed with a larger ink volume than process colors (The Foundation of Flexographic Technical Association, Inc., 2017).

Spot colors are widely used in flexography and the most recognized commercial system is the Pantone Color Matching System (PMS). There are also other color references such as HKS®, Toyo Ink Color Finder™, DIC Color Guide, ANPA color palette, GCMI Color Guide system, and RAL from other manufacturers.

Pantone Matching System®

The Pantone Matching System® is a proprietary color space (Sharma & Seymour, 2019) and a common way to communicate and match custom spot color tones in the graphics industry. The Pantone Formula Guide swatch currently illustrates 1867 Pantone spot colors with their corresponding ink formulations. Pantone states that 90% of the printed colors in the Formula Guide Coated set are within a tolerance of 2 ΔE2000 aligned to the 2010 Pantone Master Standards (Pantone LLC, 2018). The PMS color tones are referred to with codes such as for example Pantone Red 032 C, Pantone 186 C, and Pantone 485 C.

The challenge in using the PMS color references in flexography is that PMS books are primarily suited for offset printing on coated and uncoated papers only and do not take into account other printing methods and the wide material selection used in packaging. It is also worth noting that the PMS colors in the Pantone books vary

in some degree from one print lot to another and that substrates have also changed during the years. Additionally, it needs to be kept in mind that the color tones change when the book is altered and used (Finnish Packaging Association, 2016).

The colors of the PMS Solid Coated Book are mixed from 18 basic color inks, which are presented in Table 2. Pantone® does not publish the L*a*b* values for its colors, although the values in X-rite spectrophotometers are licensed by Pantone (Pantone, 2017). Due to the afore-mentioned, the LabCh values of the colors presented in Table 2 are measured from a PMS book with an X-Rite eXact spectrophotometer (an average result of three measurements per color).

Table 2 Measured LabCh values of basic PMS ink components (K. Lankinen)

PMS BASIC COLOR INKS	L*	a*	b*	C	h°
PMS YELLOW C	89	-1	115	115	90
PMS YELLOW 012 C	87	5	116	116	88
PMS ORANGE 021 C	58	68	81	106	50
PMS BRIGHT RED C	58	72	59	93	39
PMS WARM RED C	59	71	50	86	35
PMS RED 032 C	55	75	42	85	29
PMS RUBINE RED C	45	79	11	80	8
PMS RHODAMINE RED C	52	83	-20	85	346
PMS PINK C	51	75	-17	77	347
PMS PURPLE C	49	73	-42	84	330
PMS MEDIUM PURPLE C	23	50	-60	78	310
PMS VIOLET C	21	57	-75	94	308
PMS BLUE 072 C	18	43	-80	91	299
PMS DARK BLUE C	23	28	-68	73	292
PMS REFLEX BLUE C	15	28	-65	71	294
PMS PROCESS BLUE C	48	-34	-55	65	239
PMS GREEN C	58	-76	1	76	179
PMS BLACK C	18	2	3	4	62

The above PMS basic ink components are illustrated in Figure 9 according to their hue angle.

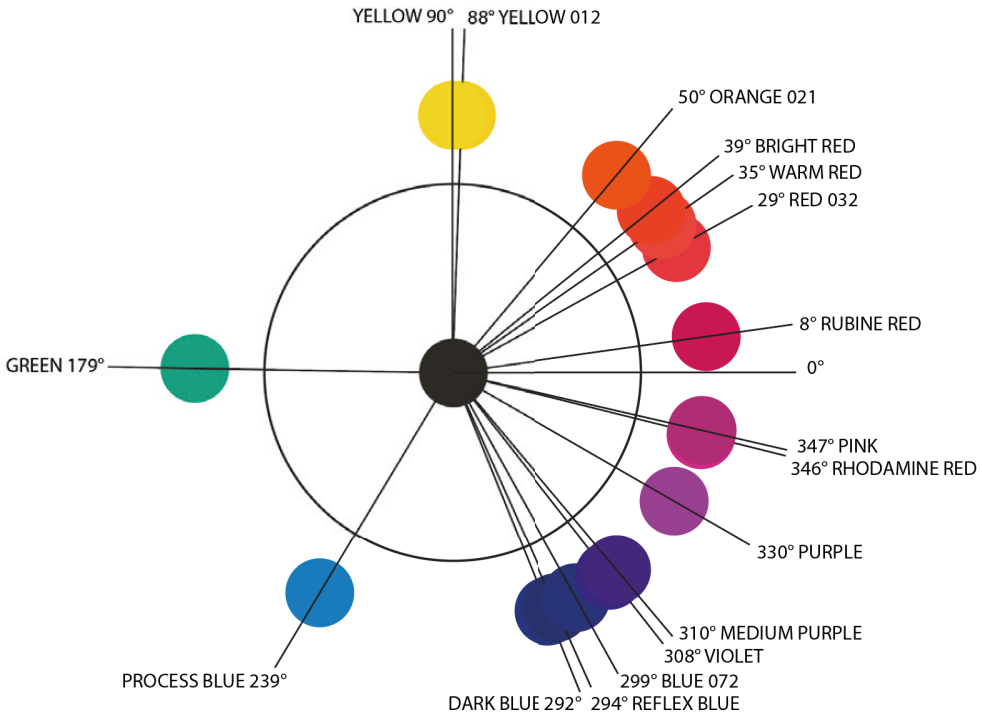


Figure 9 PMS basic color ink components on a color wheel (K. Lankinen)

The illustration gives a good overview of how the colors on the right side of this color wheel are closely and rather evenly distributed from dark blue to orange, but how few basic color shades are available from yellow to dark blue.

Common benefits and challenges of spot color printing

Even though there are color matching systems like PANTONE©, there are still no common standards for spot colors. This means that each printer has their own recipes for making each color tone and in a typical medium-size print house there are hundreds of recipes for different colors. The preparation, changing, color matching, storing, and waste management of spot colors require a lot of effort and storage space, which creates work and inventory costs (Klein, 2014).

Matching printed spot colors is a rather accurate method to produce desired color tones, when the print result is controlled for example with a spectrophotometer. A single spot color consistency is easier to control than the corresponding CMYK

process color, and with spot colors the printer can achieve colors outside the traditional CMYK gamut. (Sharma & Seymour, 2019)

A spot color matching on the press is normally the most time-consuming phase in the printing press startup including the wash-off of the previously used colors and matching the ink to the target. According to Niederstadt (Niederstadt, 2016), a typical ink change uses an average of 15 liters of solvent per wash-off. In addition, there are always some leftovers of each spot color ink after the run.

Spot colors have two typical print-related challenges. One is that, as the ink is typically dosed with higher volume aniloxes, the spreading of ink to the edges of the print motif often causes the so-called "halo effect" and lowers the quality delivered. The other is that the rasterized color tones are not typically profiled, and the screened result of a spot color tone is difficult to predict. In addition, it typically requires a lower plate screen ruling than screened process colors.

Process colors

Process colors are typically used in the printing of halftone images, but even lines, solid areas, and texts can be printed with them. Process color printing typically uses four process inks: cyan (C), magenta (M), yellow (Y) color inks, and black (K) to generate a picture image of flat color tones with halftone tint combinations (Field, 1999). The process inks are transparent in the sense that they can be overprinted on each other where necessary to create new color builds (Sangmule, Lovell, Pekarovicova, & Fleming, 2012). The black color (K, key color) is used to extend the gamut to neutral black and print the darkest shadows (Leach & Pierce et al., 2002). A CMYK color separation is shown in Figure 10.

Figure 10 CMYK color separation of an image (K. Lankinen)

Four-color process printing can reproduce a large number of PMS spot color tones and it can cover from 45% to 60% of the PMS shades (Ward, 2014; Sweeney, 2010). The drawback of the use of standard 4-color process printing in all printing is that the color gamut is restricted and many pure color tones cannot be achieved with this system. Deficiencies as impure colorants and undesirable secondary absorptions of dyes and pigments in a CMYK process produce a smaller color gamut than ideal (Sharma A. , 2019).

Conventional halftone images are made with AM (amplitude modulation) screening, where the dot size varies based on tonal values (AGFA, 2005), but nowadays FM (frequency modulation) and hybrid screenings are also used in halftone printing. In shadow areas the AM dots are bigger and in light areas they are smaller, as shown in Figure 11. The centers of the AM dots are fixed into grids that are set at different angles depending on the color.

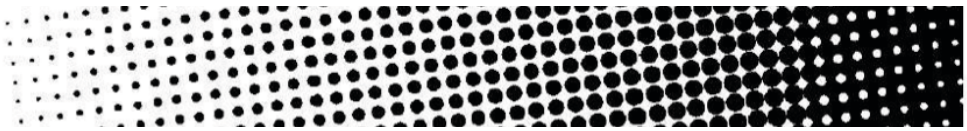


Figure 11 Tonal range of AM dot shape raster (DuPont, 2006)

Images can be printed with different AM dot line densities (screen ruling). Line density describes how many dots or lines there are per linear centimeter (The Foundation of Flexographic Technical Association Inc., 1999; Mahajan & Bandyopadhyay, 2019). Coarse line screenings are below 38 lpcm (96 lpi), while fine screenings are 59 lpcm (150 lpi) and over (The Foundation of Flexographic Technical Association Inc., 1999). According to the FTA (The Foundation of Flexographic Technical Association Inc., 1999), screenings between 38 lpcm (96 lpi) and 59 lpcm (150 lpi) are the most commonly used in flexo printing.

As mentioned, flexo printing lacks standardization. Even though there are some flexo printing standards and recommendations, it is typical that each flexo printer prints according to "house standards". Hence, the fingerprint of the process colors must be performed for each process, screening, and various materials.

Standardization of the four-color process

There are basic standards for the L*a*b* values of CMYK colors, such as for example ISO 12647-6, but in reality the CMYK series from different ink suppliers typically may vary, even considerably. This is due to the type of pigment, pigment source, grade of pigment grinding, and the pigment concentration of the ink.

The two guidelines usually followed in flexo printing are the ISO12647-6 standard and the Flexographic Image Reproduction Specifications & Tolerances (FIRST) recommendation by The Foundation of Flexographic Technical Association (FTA). It must also be noted that although these assign CIELAB values to solid CMYK colors, the target values for solvent-based inks for film and foil differ from each other, as presented in Table 3.

Table 3 CIELAB values for CMYK according to ISO and FIRST

CIELAB	ISO 12647-6 (foil and film)				FIRST 6.0 (solvent-based inks)			
Value	C	M	Y	K	C	M	Y	K
L*	50	43	73	26	56	46	90	21
a*	-33	54	-10	-1	-41	72	-4	1
b*	-36	-8	63	-2	-47	9	111	3

Table 4 shows how considerable the CIELAB ΔE* deviations are between these two standards when the results have been calculated with the ΔE_{2000} formula.

Table 4 DE2000 differences of CMYK between the ISO and FIRST targets

CIELAB	ISO 12647-6 vs FIRST 6,0			
Difference	C	M	Y	K
ΔE2000	7,0	9,3	16,0	6,6

The biggest deviation ΔE00 = 16,0 is in the yellow, although the magenta ΔE00 = 9,3, cyan ΔE00 = 7,0, and black ΔE00 = 6,6 also show big deviations. All these differences are easy to perceive visually as the difference is much bigger than the common tolerance of visually perceivable color difference ΔE00 = 3,0.

The US market often refers to GRACoL® as a "standard" or recommendation for flexography, although it is actually a specification of the General Requirements for Applications in Commercial Offset Lithography (Idealliance, 2020).

Common benefits and challenges of process color printing

Process color print quality is often perceived to be higher than that of spot color printing because the process colors are applied with thin ink films on top of each other (Niederstadt, 2016), which often results in smoother solids without pinholes. Also, the possibility for higher screen ruling increases the quality experienced with process colors in comparison to spot color printing.

When the process ink set is kept unchanged in the printing press from one job to another it saves time and waste in wash-ups and color matching as well as minimizing the size of the ink storage and ink logistics (Baldwin, 2016). This entails paying more attention to control of the machine settings.

Print quality has many different categories: for example color accuracy, halftone screen line density, quality of solids, and sharpness of details etc. A study on the visually influencing parameters (Bates, Zjakic, & Budimir, 2015) concluded that nine variables out of 17 tested printing parameters had a significant influence on the subjective perception of the total print quality of a high-quality flexo printed product with CMYK process colors. These were:

Dot gain of cyan at 50%

Dot gain of black at 50%

Trapping of yellow-magenta

Trapping of magenta-cyan

Trapping of yellow-magenta-cyan

Mottling of yellow

Optical density of magenta

Optical density of yellow

Optical density of black

The dot gain is usually highest at a 50% halftone dot because it has the largest dot circumference and more edges that can grow (Nathe, 2013). Similarly, smaller dots have a smaller circumference, resulting in less growth. Beyond 50%, the halftone dots have merged into their neighbors on at least two sides, so that the circumference available for dot gain decreases.

Typical instability problems in flexography are that sometimes the highlights do not print and sometimes they print too heavily or the shadows tend to fill in, which depends among other things on the ink and anilox characteristics as well as nipping pressures (Dewitte & Van Dooren, 1998). Also "dot bridging" has been a problem for many flexo printers for many years (Galton D. , 2005). The "kiss impression", i.e., the lightest possible printing pressure is ideal for printing (Miljković, Valdec, & Matijević, 2018; Holmvall, 2010; Hamblyn, 2015).

Expanding the gamut of process printing

During this thesis the author noticed that it was difficult to find a large number of scientific peer-reviewed flexographic studies as a reference. Extended gamut printing is not a new concept, but the process is largely proprietary and lacks deeper public information, making it very difficult for non-print industry members to obtain and use (Bogan, 2016; Sheth, Lovell, & Pekarovicova, 2013).

Printing with expanded gamut uses additional colorants such as Orange, Green, and Violet inks to expand the gamut beyond the conventional CMYK printing (Sharma & Seymour, 2019). The printing condition is considered expanded if the color gamut exceeds GRACoL or other ISO 12647-2 color spaces (Ellis, 2017).

Typically, expanded gamut printing is referred to as a 7-color system, but in fact it does not refer to the number of colors but rather the expansion of the gamut. A print gamut is considered to have been expanded when the result exceeds for example the standard GRACoL or ISO 12647-2 gamut (Ellis, 2017).

One way of optimizing the color gamut is to attempt to create the largest gamut as defined by cubic ΔE, while the other is to determine the number of Pantone colors that can be rendered from a gamut (O'Hara, Congdon, & Kariahlyn, 2019). A color can be made with many different colorant combinations in expanded gamut printing (Sharma & Seymour, 2019).

According to Hiremath, expanding the process color printing gamut is generally done in three ways: adding a supplementary color, increasing the ink film thickness of the color, and/or increasing the purity (chroma) of the color. Additionally, the gamut can also be expanded by using a brighter substrate (or better white ink) and choice of screening method (Hiremath, 2018).

According to Andersson's study with sheet-fed offset inks (Andersson M. , 1997), the ways of achieving gamut expansion with a 4-color set are:

Process inks with more ideal reflection and absorption of light

Increased solid ink density (SID)

Choice of screening method

Use of fluorescence in printing inks

Increased transparency of the ink

Better wet trapping

Higher paper quality

Higher pigment concentration in the ink

It is worth remembering that being able to expand the printing from CMYK to a bigger color gamut also requires that the original data supports this. Hence, it is essential to use RGB input data images, as CMYK input data files would restrict the color space to a smaller gamut (Digital Dots Ltd, 2005).

This study focuses on the use of CMYK+OGV primary colors together with the other possibilities to expand the gamut. Some of the different ways to expand the gamut will be briefly discussed in the following sections.

Multicolor process printing

Multicolor process printing sets can be called by many names such as, for example, expanded gamut printing, extended/expanded color gamut, and fixed color palette. Typical common abbreviations and names include:

ECG – Extended Color Gamut

EG – Expanded Gamut / Extended Gamut

EGP – Expanded Gamut Printing

FCP – Fixed Color Palette

Hi-Fi color – High Fidelity color printing

MCPP – Multicolor Process Printing

N-color – N color gamut, where n>1 number of color separation channels

Over time, there have been different variations of expanded gamut systems (Seymour, 2018). In principle, process color set that has more than four chromatic process colors can be termed a multicolor process printing set (Heidelberger Druckmaschinen AG, 2009). A typical way to expand the color gamut is to use additional process inks (Sharma & Seymour, 2019; Hoffstadt, 2019; Furr, The Effect of Press Variation on Color Stability with 7-color and 4-color Process Color Tint Builds, 2015; Strickler, 2019). Traditionally, this is done, for example, by adding complementary single pigmented orange, green, and violet (OGV) (Sharma & Seymour, 2019; Dreher, 2017; Forrester, 2019) or red, green, and blue (RGB) inks as additional colors between the conventional process CMYK inks, as shown in Figure 12.

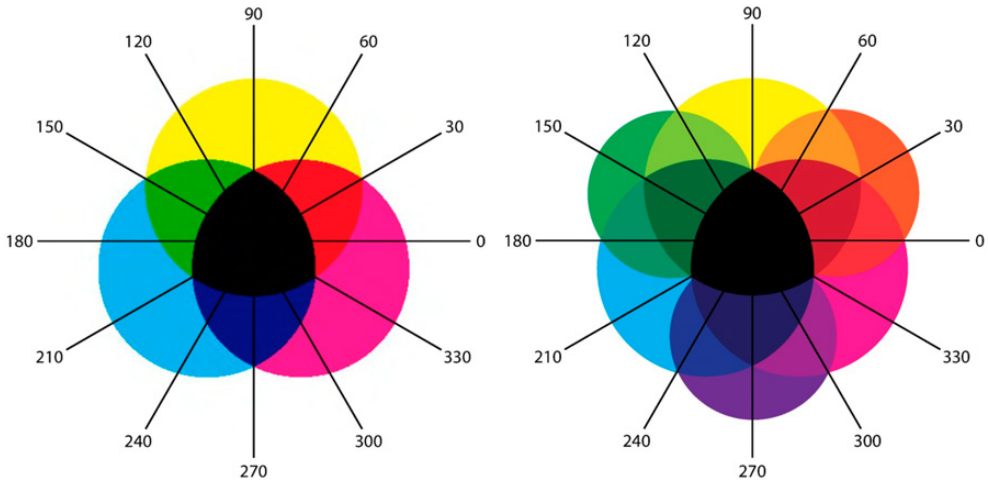


Figure 12 CMY and CMY+OGV hue illustration (Zerfass, 2016)

In principle, multicolor process printing is as easy as 4-color process printing, but of course many aspects, such as process control, needs to be taken into account to secure a successful multicolor printing result (Forrester, 2019).

The use of multicolor printing has increased a lot during the last years (O'Hara & Congdon, 2016; Deshpande;Green;& Pointer, 2014). The purpose of multicolor process printing is to use one ink set to replace many spot colors and to make print production more efficient and simpler. Printing with ECG can increase the gamut

even 70% beyond the CMYK process (Furr, 2014), and around 90% of all Pantone spot color can be reproduced within 3ΔE (Samworth, 2016). According to CSW, Inc. (Roberts, 2015), designers have the ability to create more complex color blends and cleaner color transitions with expanded gamut printing.

Expanded gamut ink sets have been in use for long and Hallmark Cards has been an early user of the system since 1962 (Reed Business Information, 2006), but according to O'Hara et al. (O'Hara;Congdon;& Gasque, 2016), it has only recently gained momentum due to the movement towards standardized ECG processes. In the nineties and the early 21st century there was a boom in multicolor printing, especially in offset printing and also in flexo, but it did not break through to larger scale use (Eller, 2010). Recently, multicolor printing has again become a hot topic in industry seminars and its use in flexo printing has been growing steadily, particularly during the last five years.

In principle, the idea of multicolor process printing could be extended to as many colors (n-color process printing) as there are printing stations available. As long ago as in 1993, Ostromoukhov (Ostromoukhov, 1993) stated that multicolor printing could be done, for example, with seven or nine colors.

According to the FTA FQC group study with Clemson University (Rich, 2012), additional orange resulted in an average of 23% gamut expansion, whereas green resulted in an average of 22% gamut expansion, and violet resulted in an average of 16% gamut expansion in comparison to the studied CMYK gamut. Typically, CMYK+OGV is a good start and, when necessary, the orange can be changed to red or warm red and the violet can also be changed to blue if needed (Plautz, 2018).

In the area of reds there are many options for selecting the single pigmented ink according to requirements, but in the area of blues and greens, the selection is very limited, as presented in Figure 13 (Esko Software BVBA, 2016).

Figure 13 Example of basic color options for an expanded color set (Image: Modified from Esko material by K. Lankinen)

The selection of color is not only a question of the pigment shade, but also the process printing properties, level of required expansion, color resistance, cost of ink, and compatibility with the proofing system need to be taken into account when selecting suitable process inks (Esko Software BVBA, 2016).

Sometimes a better press stability may be created by appropriate choice of colorants (Sharma & Seymour, 2019). As shown on the left of Figure 14, red ink offers less gamut expansion than orange, but sometimes red offers better color stability, especially in red color tones (Esko Software BVBA, 2016).

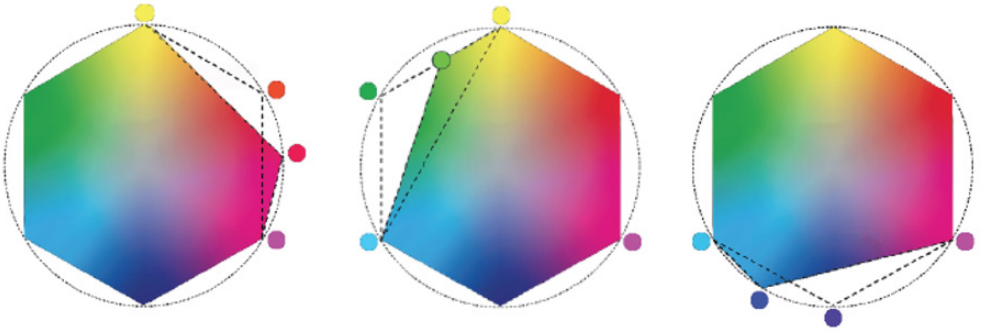


Figure 14 Basic ink components in expanded gamut (Esko Software BVBA, 2016)

Choosing the green ink also depends on the targeted purposes. To match proofing greens, it might be beneficial to use a similar bright green ink but by selecting a single pigmented green the gamut expansion can be maximized, as shown in the middle of Figure 14 (Esko Software BVBA, 2016).

Choosing the violet/blue ink also depends on the targeted purposes. Blue may be practical to use as a single color in texts for example and it may be less expensive than violet. However, by selecting a single pigmented violet, the gamut expansion can be maximized as shown on the right of Figure 14 (Esko Software BVBA, 2016).

Multicolor process printing pigment recommendations

The CMYK+OGV pigments and hue angles recommended by FIRST (The Foundation of Flexographic Technical Association, Inc., 2013) are shown in Figure 15, where the hue angle tolerance is ±2°.

Color	C	M	Y	K	O	G	V
Pigment	B15:3 or B15:4	R57:1 or R52.1	Y14	K7	O16 or O34	G7	V23
Hue angle	233°	357°	92°	-	54°	181°	307°

Figure 15 FIRST 6.0 CMYKOGV recommendations (The Foundation of Flexographic Technical Association, Inc., 2013)

Idealliance has initiated a global project to standardize the ECG dataset for offset and flexo printing (Idealliance, 2020). The targets for an ECG color set according to the project specification are shown in Figure 16. According to it: "*ECG is compatible with any ISO 12647-2 CMYK compatible ink set currently used for commercial (e.g., GRACoL®) printing. High-chroma inks may help improve gamut at lower ink film but are not recommended for this test.*"

Color	C	M	Y	K	O	G	V
Pigment	B15:3	R57:1	Y14	K7	O16 or O34	G7	V23
Hue angle	233,5°	356,9°	92,5°	0°	56,1°	180,8°	308,9°

Figure 16 Idealliance ECG project recommendations (Idealliance, 2019b)

Benefits of the multicolor process printing system

The benefits of multicolor process printing are less ink mixing and ink inventory, reduced press wash-ups, accelerated job preparation, facilitated production planning, simplified proofing, and lower costs (Strickler, 2019). The potential material savings alone are one reason to consider expanded gamut (EG) printing (Baldwin, 2016). An important point of the fixed color palette is also the possibility to reduce waste (Niederstadt, 2016). Also, Samworth has stated that EG allows conventional printing to compete with digital printing for short to medium runs, and that its implementation is the biggest step a packaging printer can take to increase profitability (Samworth, 2016).

According to Furr's tests, multicolor printing offers the possibility to use less ink, as 2-component color builds lead to an 18,8% reduction in total area coverage (TAC) and 3-component color builds lead to a 12,3% reduction in TAC when comparing a 7-color system with a 4-color system (Furr, 2015).

The drivers for the ECG according to Skrzynski (Skrzynski, 2018) are:

- Reduction of production cost
- Improved color engines/software
- Standardized ink set
- Improved gearless press systems
- Improved digital proofing
- Shorter press runs
- Brand demanding more colors
- Improved quality / print consistency
- Improved plate making
- Improved screening
- Improved white ink laydown
- Improved and less expensive measurement devices

According to Tolliver-Nigro (Tolliver-Nigro, 2007), the benefits of EG are:

- Deeper, more saturated colors than with the 4-color process
- Better and more consistent brand color simulations than with the 4-color process
- Elimination or reduction of inventory from spot colors
- Reduced makeready
- Possibility to print multiple jobs in the same pass using the same ink set

According to Sharma & Seymour (Sharma & Seymour, 2019), expanded gamut printing can offer remarkable savings and benefits, especially in label and package printing, by replacing cumbersome spot color printing. By adding the favorably selected complementary process inks to the traditionally used CMYK process printing, the use of spot color inks becomes unnecessary in many cases.

The addition of complementary primary inks can increase the gamut size and stabilize the multicolor process in order to be more robust against color shifts compared to the CMYK process color system (Sharma & Seymour, 2019; Hoffstadt, 2019). This is because the complementary colors can be closer to the simulated spot

color and the variation in ink hue on the press is less noticeable, which leads to more accurate color tones and easier process control (Furr, 2015; Forrester, 2019).

According to Dreher (Dreher, 2017), the use of additional primary colors (OGV) can replace small dots with more stable bigger dots in many spot color simulations and increase the printing stability. For example, an imaginary spot color simulation consisting of 80% magenta and 3% cyan could be replaced by a combination of 75% magenta and 6% violet to make the printing more stable.

According to Sharma (Sharma A. , 2019), the colors in the EG system can be made from the nearest colorants, enabling more stable spot color simulations. For example, a shift in any colorants for yellow made of green, yellow, and orange should not make a big difference because these colorants naturally constitute yellow.

Also according to tests by Furr (Furr, 2015), colors built from two or three components with a 4- or 7-color strategy showed that the ΔE variation was reduced by 28% and the 7-color printing was more stable than a 4-color model.

According to tests by Wilhelm (Wilhelm, 2015), in which 32 selected spot color tones were flexo printed with water-based inks on paper on a 70 lpcm plate screen ruling, 2 colors out of 32 (6%) printed with CMYK and 23 colors out of 32 (72%) printed with CMYK+OGB were within 3 of ΔE. The results showed that multicolor printing expanded the color gamut and a large part of the simulated spot colors were within acceptable tolerances.

Many sources have reported that expanded gamut printing offers great benefits when jobs can be ganged and printed (O'Hara & Congdon, 2016; O'Hara;Congdon;& Gasque, Optimizing Print Sequence for Expanded Color Gamut, 2016; Forrester, 2019; Furr, The Effect of Press Variation on Color Stability with 7-color and 4-color Process Color Tint Builds, 2015; Furr, EXPANDED-GAMUT PRINTING AND ITS IMPACT ON EFFICIENT BRAND COLOR REPRODUCTION, 2014; Sweeney, 2010; Hiremath, 2018), although the benefits are not specified in detail.

Increase in density, ink saturation, and chroma

According to FIRST 6.0 (The Foundation of Flexographic Technical Association, Inc., 2013), the goal in optimizing the color gamut is "*to increase chroma (C) while*

maintaining hue angle (h°) and lightness (L)." One way to expand the color gamut is to increase density or use high pigment strength inks (Andersson M. , 1997; Sweeney, 2010; Strickler, 2019; Hiremath, 2018; Chung & Hsu, 2006; Idealliance, 2016). N.B. It is worth noting that the previous studies have been related to offset or gravure printing but not to flexography.

An Idealliance XCMYK project study in offset printing showed that the CMYK gamut can be expanded not only with additional primaries, but also with higher density inks with a higher ink film thickness and, for example, with 20-micron FM screening (Idealliance, 2019). The XCMYK color gamut is presented in Figure 17.

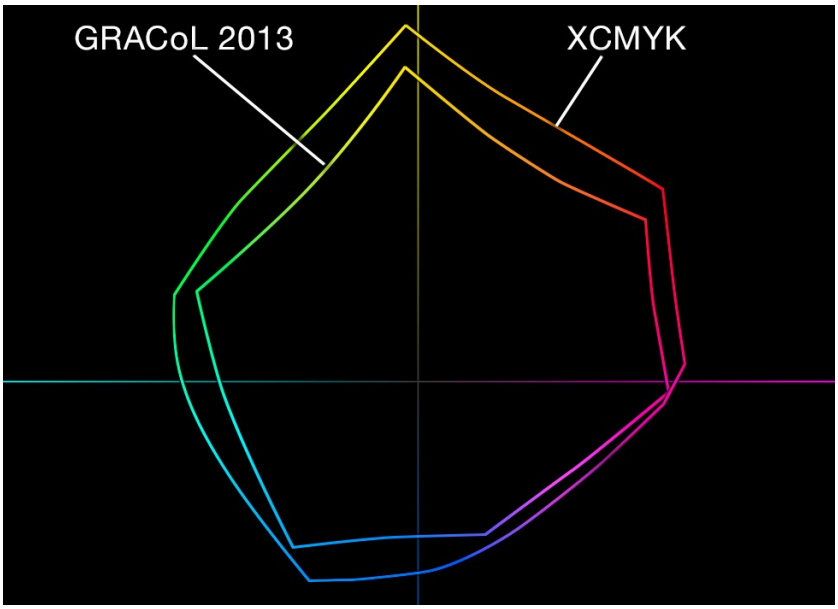


Figure 17 XCMYK vs. GRACol (Idealliance, 2019)

The target XCMYK values printed with normally commercially available inks are presented in Table 5 as provided by Idealliance (Idealliance, 2016). It also presents the target values of overprints for red, green, and blue.

Table 5 Idealliance XCMYK CIELab values (Idealliance, 2016)

CIELAB	Idealliance XCMYK							
Value	W	C	M	Y	K	R	G	B
L*	95	49	46	90	8	46	42	19
a*	1	-32	80	-3	0	73	-72	19
b*	-4	-61	5	105	0	56	24	-51

Although the previous example is for offset printing, the principle should also be applicable to other printing methods, as demonstrated in this study. As Table 5 shows, the XCMYK L*a*b* values for CMYK are considerably higher than the corresponding standard values in ISO 12647-6 shown in Table 6. On the other hand, the XCMYK values of magenta and yellow are surprisingly close to the FIRST 6.0 values although the cyan value is higher, as presented in Table 7.

Table 6 CIELAB of ISO 12647-6 vs. Idealliance XCMYK

CIELAB	ISO 12647-6 (foil and film)			
Value	C	M	Y	K
L*	50	43	73	26
a*	-33	54	-10	-1
b*	-36	-8	63	-2

CIELAB	ISO 12647-6 vs Idealliance XCMYK			
Difference	C	M	Y	K
ΔL*	1	-3	-17	18
Δa*	-1	-26	-7	-1
Δb*	25	-13	-42	-2

The above CIELAB values show that XCMYK cyan is a significantly more saturated blue, while the magenta is also a more saturated red and somewhat more yellow. Additionally, the yellow is lighter and more saturated than the corresponding ISO standard colors. Moreover, the black is also considerably darker than the ISO standard color.

Table 7 CIELAB of FIRST 6.0 vs. Idealliance XCMYK

CIELAB	FIRST 6.0 (solvent-based inks)			
Value	C	M	Y	K
L*	56	46	90	21
a*	-41	72	-4	1
b*	-47	9	111	3

CIELAB	FIRST 6.0 vs Idealliance XCMYK			
Difference	C	M	Y	K
ΔL*	7	0	0	13
Δa*	-9	-8	-1	1
Δb*	14	4	6	3

The above CIELAB values show that XMYCK cyan is a significantly more saturated blue, but the magenta and yellow are identical to the corresponding FIRST 6.0 standard colors. Moreover, the black is also darker than the FIRST 6.0 recommendation color.

The ΔE2000 difference of the XCMYK inks compared to ISO 12647-6 and FIRST 6.0 recommendations are presented in Table 8.

Table 8 dE2000 difference of ISO and XCMYK process colors

CIELAB	ISO 12647-6 vs Idealliance XCMYK			
Difference	C	M	Y	K
ΔE2000	8,1	9,1	15,5	12,3

CIELAB	FIRST 6.0 vs Idealliance XCMYK			
Difference	C	M	Y	K
ΔE2000	9,2	2,6	1,1	9,1

It can be seen from the above ΔE2000 values that ISO CMYK differs enormously from XCMYK, but the FIRST 6.0 target magenta and yellow are surprisingly identical to the XCMYK although the cyan and black differ a lot.

By looking at the solid ink densities in Table 9 it can be seen that the XMYCK target solid ink densities (Idealliance, 2016) have been boosted from typical flexo ink densities (FIRST 6.0 solid ink target densities for film products). It is very interesting that although the FIRST 6.0 and XCMYK magenta and yellow L*a*b* values are close to each other the densities are quite different from each other.

Table 9 Idealliance XCMYK and FIRST 6.0 target densities

Density	Idealliance XCMYK densities			
Status T	C	M	Y	K
Value	1,85	1,85	1,20	2,00

Density	FIRST 6.0 (Film Products)			
Status (?)	C	M	Y	K
Value	1,30	1,20	1,00	1,40

An additional interesting point about the XCMYK project is that, according to Idealliance (Idealliance, 2016), the result of overprinted CMY colors (300%) should remain as neutral as possible, i.e., as close to zero a* and b* as possible.

According to the research on using high-chroma inks for expanding the CMYK color gamut in waterless offset printing (Hiremath, 2018), high-chroma inks produce more vivid and saturated colors, deliver higher solid ink densities (SID) and provide a larger gamut than standard ink. A higher SID was achieved with high-chroma inks with an identical ink film thickness to standard inks. The research also demonstrated that the saturation density is a limiting factor when expanding the gamut by increasing the SID.

According to Idealliance (Idealliance, 2016), high-chroma inks may help improve the gamut at a lower IFT. Based on the above, this should offer the potential to save ink when printing the standard gamut with high-chroma inks.

Surface screens on printing plates

During the last decade, flexo plate surface screenings have seen great improvement. There have been various earlier attempts to boost the ink laydown by attaching a patterning on the plate, but with the development of CtP and plate exposing technology the results have improved, as discussed in other sections.

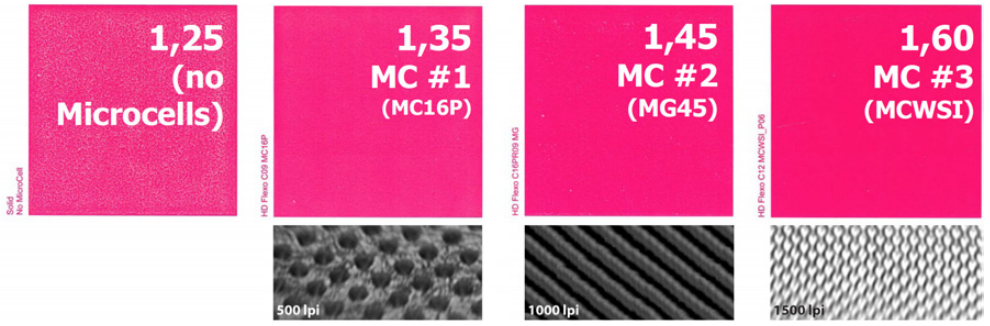


Figure 18 Solid ink density and flexo plate microcell (Esko, 2014)

Where an unscreened flexo plate delivers a solid ink density of 1,25, the same plate with plate surface screenings (microcell structure) can improve the ink density for example to 1,60, as illustrated in Figure 18. Typically, this also reduces ink consumption as the porosity of the original ink layer is decreased with the help of the plate microcell and a smoother ink layer can be applied with a finer and lower volume anilox without noticeable pinholing and loss of density (Klein, 2014).

Aniloxes with elongated cells

According to anilox suppliers, an elongated cell anilox allows a higher screen line count without a loss in cell volume. This in turn allows a smoother ink laydown to be transferred to the plate and substrate, which means less ink use in comparison to conventional hexagonal aniloxes (Anilox Laser Technology Ltd, 2018).

Traditionally, the anilox used is selected to fulfill the requirement either for fine details or solid areas. Hence, conventionally two different aniloxes are necessary or the result will be a compromise. With an elongated cell anilox, one anilox can fulfill both needs: it will reduce the dot gain, whereas it will also deliver higher ink density and a smooth layer for the solid areas (INOMETA GmbH, 2017).

Optical dot gain

Besides the properties of the ink or pigment itself, the color saturation is affected by the optical dot gain and the trapping of the ink in multicolor process printing. In halftone process printing, the interpreted dot size is affected not only by the mechanical dot gain, but also by the so-called optical dot gain, which is caused as the light is scattered and entrapped in the material under the printed dots (Deshpande K. , 2015; Prof Steven Abbott, 2019; Pritchard, AM and FM gamuts compared, 2009), as presented in Figure 19.

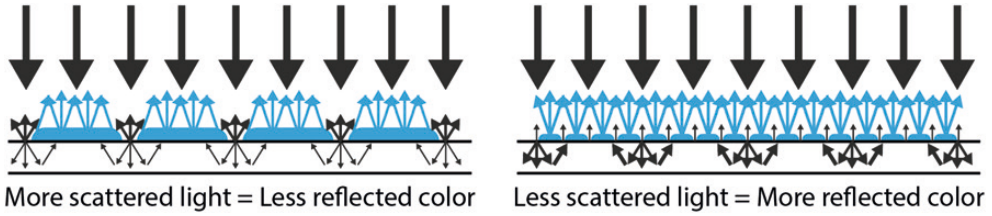


Figure 19 Optical dot gain (K. Lankinen)

This phenomenon is also known as the Yule-Nielsen effect where the printed dots appear to be darker than the size of the dot would suggest (Sharma G. , 2003).

According to Pritchard (Pritchard, 2009), optical dot gain will extend the color gamut due to the finer dots in the higher line screen count in comparison to the bigger dots printed in the coarser screen count. Moreover, the printed color of finer screening (AM or FM) is more saturated than the result with lower screening.

Ink sequence and trapping

Although inks are transparent to a great extent, the printing sequence has an effect on ink trapping and color appearance (Chung & Hsu, 2006). This is due to the fact that one ink on top of another has an optical effect on reflecting the light from the

ink layers below, in addition to which the opacities of the ink layers have a great influence (Seth, 2013).

For 4-process colors in surface printing, the sequence is typically Y, M, C, K (The Foundation of Flexographic Technical Association Inc., 1999) and the higher the ink trap the better (The Foundation of Flexographic Technical Association, Inc., 2013). However, in practice, printers have several reasons for using different kinds of ink sequences. By optimizing the ink sequence in multicolor process printing, a change can be seen both in chroma and hue (Chung & Hsu, 2006).

O'Hara et al. (O'Hara;Congdon;& Gasque, 2016) have stated that the research on ECG flexo printing sequences has been sparse and the numerous ink sequence studies that have been performed in offset lithography are not applicable to flexography because offset is a wet-on-wet and flexography is a dry trap method. Their study showed that some overprinting pair sequences of primary colors yield much larger color changes than the others.

A study in gravure printing (Chung & Hsu, 2006) has shown that inks printed on top of one another have a predominant influence on the result of overprinting colors. This is illustrated in Figure 20 where the yellow on top of the magenta makes the printing result more orange than the opposite sequence.

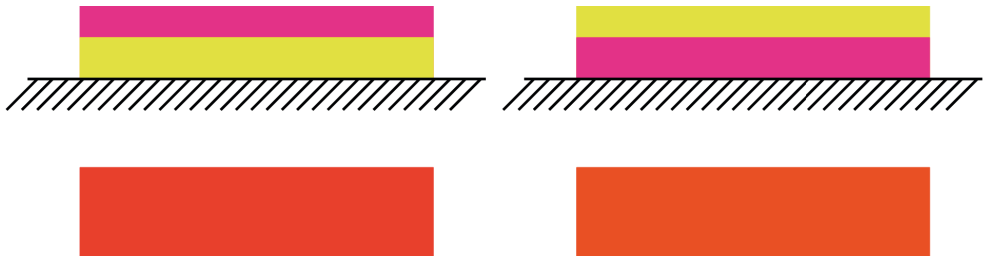


Figure 20 Ink sequence and trapping of colors (K. Lankinen)

A study made at Clemson University (Davis, 2017) presents the effect of different ink sequences on the extended color gamut, as illustrated in Figure 21.

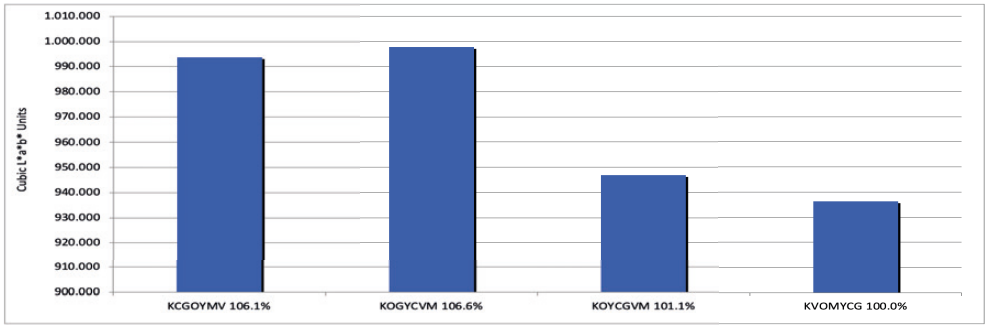


Figure 21 ECG gamut depending on the color sequence (Davis, 2017)

The Clemson test with different color sequences was surface printed with UV inks on white PET on a narrow web machine and the results were derived from the prints. The results showed that different ink sequences gave different overprinting results. Where the KVOMYCG sequence was set as reference, KOYCGVM enlarged the color gamut by 1,1% and KCGOYMV by 6,1%, while KOGYCVM resulted in the biggest expansion of 6,6% in comparison to the reference.

Another study, a thesis made by Gaurav Seth (Seth, 2013) presents the effect of different ink sequences on the extended color gamut, as illustrated in Figure 21.

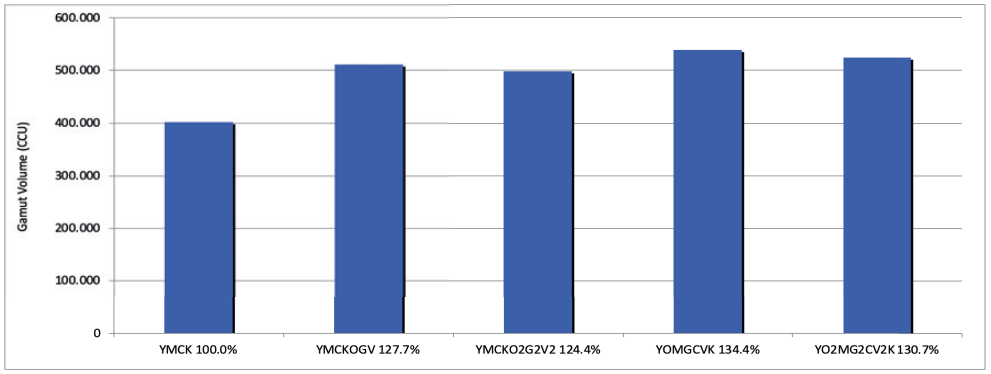


Figure 22 ECG gamut depending on the color sequence (Seth, 2013)

The test with different color sequences was surface printed with water-based mono and dual pigmented ink sets on white PE on a narrow web machine and the results were derived from the prints. The results showed that different ink sequences gave different overprinting results. Where the YMCK sequence was set as reference,

YMCKOGV (mono pigmented) enlarged the color gamut by 27,7% and YOMGCVK (mono pigmented) resulted the biggest expansion of 34,4% in comparison to the reference. The YMCKO2G2V2 (dual pigmented) enlarged the color gamut by 24,4% and YO2MG2CV2K (dual pigmented) resulted in the expansion of 30,7% in comparison to the YMCK reference.

Seth was also investigating the effect of opacity to the gamut and according to his study the dual pigmented OGV inks had higher opacity in comparison to the mono pigmented OGV inks. According to him, it is important to print inks in sequence to achieve highest transparency (or lowest opacity) for the composite ink film, as this will also result a higher chroma.

A study by O'Hara et al. (O'Hara, Congdon, & Kariahlyn, 2019) has shown that higher chroma may not result in a larger gamut. Also, a previous study by O'Hara et al. (O'Hara;Congdon;& Gasque, 2016) has found that the ink sequence based on the opacities does not produce the optimal color gamut.

It should be noted that even similar color tones from different ink suppliers have different opacities and overprinting properties and different inks lead to different overprints. There are also many factors other than the color sequence that affect the ink transfer and overprinting result, such as for example the substrate, plate material, plate making, screenings, and aniloxes (Hamblyn, 2015).

Typical concerns and challenges with EG

Although there are many reasons to implement the EG process, several arguments have also been raised to express concerns over the implementation and use of EG. The Graphics Arts Magazine summarizes the challenges of expanded gamut printing (Graphic Arts Magazine, 2017) as follows:

A reverse type that traditionally would have been run as a single color may require two or three screened colors.

Moiré can be one problem, but raising the line screening to 175 lpi (approx. 70 lpcm) or using violet for example as FM raster may help.

Repeatability can be an issue as solids made of three colors have many variables (screens, inks, dots, with overprinting, trapping, and registration).

It may be challenging to repeat legacy jobs that have earlier been run with spot colors identically with multicolor process printing.

Lack of skills of prepress operators, as the ECG prepress work requires special know-how and experience to succeed.

One of the challenges to be solved in multicolor process printing is the limitation of usable screen angles of dark colors, especially when MVCK are used to overprint the colors, as cyan (C) and black (K) can use the same screen angle and may result in Moiré (Hoffstadt, 2019). According to Forrester (Forrester, 2019), expanded gamut printing requires better process control than traditional printing.

1.5.2 Different screens in flexographic printing

The shape of the dot affects dot gain / Tonal Value Increase (The Foundation of Flexographic Technical Association, Inc., 2017). The selection of the halftone dot shape used to make the printed image has an impact on the visual esthetics of the final package and the performance of the printing press (Pritchard, 2009).

The Esko Company classifies screens into different categories (Esko, 2018):

screens with standard dot shapes

screens with advanced dot shapes

stochastic (FM) screens

FIRST 6.0 classifies screens into the following categories (The Foundation of Flexographic Technical Association, Inc., 2017):

traditional dot shape screens

hybrid screens

Traditional AM screenings

Traditional screenings are made of amplitude-modulated (AM) dots that are lined up to an array of dots, where the frequency of the dots remains constant but the size of the dots grows as the tonal value increases (The Foundation of Flexographic Technical Association, Inc., 2017). According to d'Andrea (d'Andrea, 2018) the best dot shape for screening is a circular dot, where the "touching" point of the dot edges comes as high to the shadow area as possible over the 60% tonal value to avoid loss of contrast, i.e., loss of detail in the images.

Screen angles and screen ruling

When different halftone colors are printed on top of each other, AM dots should result in a rosette pattern (The Foundation of Flexographic Technical Association Inc., 1999), which is about twice the size of the screen ruling (Gustavson, 1997). The two traditional forms of rosette patterns are known as a dot-centered and open-centered rosette (Pritchard, 2009), as shown in Figure 23.

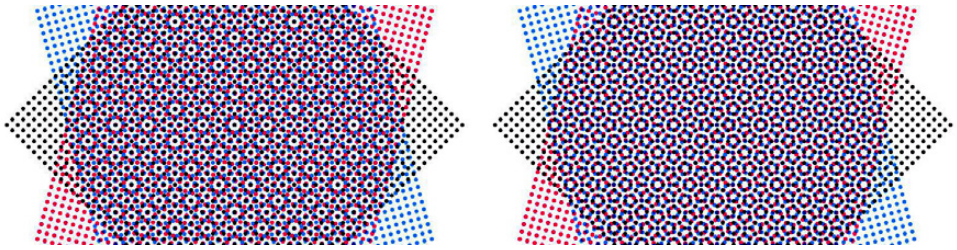


Figure 23 Dot-centered and open-centered rosette (Pritchard, 2009)

The superimposing of screens at a 30° angle from each other leads to an esthetically pleasing rosette pattern image (Esko-Graphics, 2004; The Foundation of Flexographic Technical Association, Inc., 2017). If the angle between any two screens is less than 30°, a visible interscreen patterning (Moiré) can occur (Pritchard, 2009; Esko, 2018). To avoid interference patterns like Moiré, it is common practice to separate the three darker process colors by 30° and one (e.g., yellow) by 15° from each other (ISO, 2006; Qu, 2013).

Conventionally in offset printing, the four process color angles are 45°, 75°, 105°, and 90° and to avoid a clash with the anilox screen angle in flexo printing the screen angles are additionally rotated by +7,5° or –7,5° from the conventional offset angles (The Foundation of Flexographic Technical Association Inc., 1999), although according to FIRST (The Foundation of Flexographic Technical Association, Inc., 2017) some Moiré is normally inevitable in flexography. There are several ways to set color angles as, for example, those listed in Table 10.

Table 10 Different screening angles in offset and flexo (K. Lankinen)

Method	C	M	Y	K	O	G	V
Offset[1]	15°	75°	90°	45°			
Offset[2] (-7,5°)	7,5°	67,5°	82,5°	37,5°			
FIRST[3]	7,5°	67,5°	22,5°	37,5°			
Esko-1[4]	22,5°	52,5°	7,5°	82,5°			
Esko-2[5]	7,5°	37,5°	82,5°	67,5°			
Multicolor[6]	7,5°	67,5°	82,5° or 22,5°	37,5°	7,5°	67,5°	82,5° or 37,5°

Traditional offset angles ([1]) put the least noticeable color at a 90° angle and the most noticeable color at a 45° angle, while the two other colors should be put at ±30° to 45° (Kipphan, 2001). Typical flexo angles ([2], [3], [4], and [5]) are derived from the traditional offset angles by rotating the angles by 7,5° to avoid Moiré with the traditional anilox roller screenings (d'Andrea, Screen angles in flexography, 2018; The Foundation of Flexographic Technical Association, Inc., 2017; Esko, 2018).

When more than four process colors are used, some of the screen angles ([6]) should be used twice (Kipphan, 2001) and chosen intentionally to avoid the Moiré effect (Sheth, Lovell, & Pekarovicova, 2013). The additional process colors in multicolor printing should use the angles of complementary colors like orange/red-cyan, green-magenta, and violet/blue-yellow/black (Pritchard, 2009). This is due to the fact that complementary colors will seldom be printed on top of each other (Kamp, 2002). This is illustrated in Figure 24.

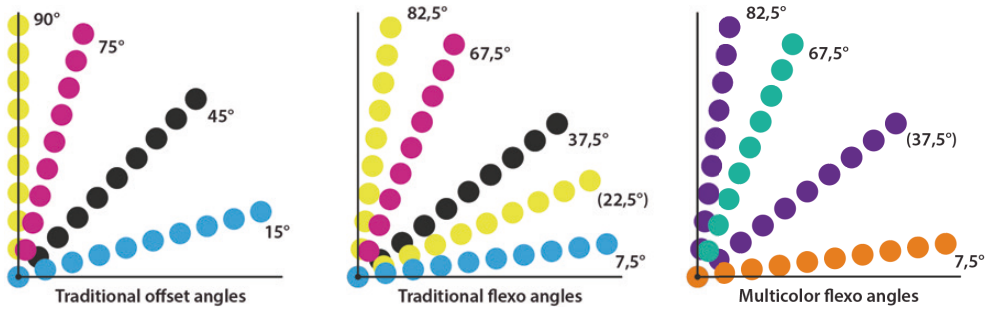


Figure 24 Traditional screen angles for offset, flexo, and multicolor flexo (K. Lankinen)

Screen ruling is affected by several factors such as substrate, inks, plate material, and printing conditions. A higher screen ruling usually result in greater image detail but may decrease the contrast (The Foundation of Flexographic Technical Association, Inc., 2017; Verso Corporation, 2019). It is also worth noting that Moiré is a low

frequency patterning and the higher the screen ruling, the less visible the Moiré phenomenon will be (Web Offset Champion Group, 2008).

Stochastic FM screenings and hybrid screenings

Stochastic screening is made with a computer algorithm that disperses halftone information in semi-random form across the area. Stochastic screening is also known as FM (frequency-modulated) or first-order FM screening, where the size of the FM dot remains the same but the frequency of the dots that appear varies across the tonal range (Kamp & White et al., 2004; Fraser, Murphy, & Bunting, 2004; Web Offset Champion Group, 2008), as presented in Figure 25.

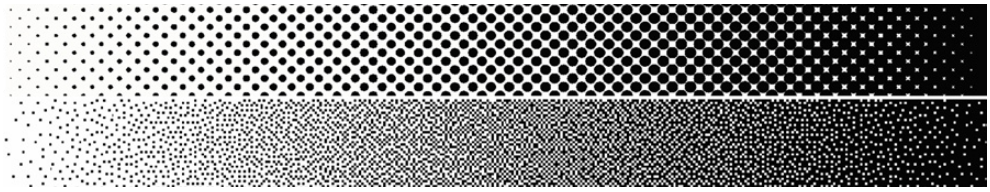


Figure 25 Traditional AM and FM screenings (Esko, 2018)

Stochastic screen tends not to generate Moiré or interference (M.Y. PrintTech, 2005; Hoffstadt, 2019; Forrester, 2019; Politis, et al., 2015; Gustavson, 1997; Idealliance, 2019b; Qu, 2013) because the dots are placed randomly.

FM screenings would be of great interest in flexo printing if they solved the typical AM dot print issues without making the repro and printing work more challenging or lowering the print quality in other ways (The Foundation of Flexographic Technical Association, Inc., 2017; Web Offset Champion Group, 2008; AGFA, 2003; Chen, 2018; Global Graphics, 2006; Esko, 2018; Verso Corporation, 2019).

Since traditional AM and FM screenings have limitations, hybrid screenings also known as XM (cross-modulated) or second-order FM screens have been developed (Web Offset Champion Group, 2008). Hybrid screens mix the AM and FM rasters to deliver improved print results where their predecessors have failed.

A hybrid screening is typically used in highlight areas to avoid the hard edge of the AM dot raster stopping at 0%, as the FM raster is less sensitive to impression variations in the highlight areas (Boonprasit, 2006). Replacing the AM highlight

raster with a transition to an FM raster will appear to the eye as a smoother fade out to 0% as a sudden hard break in the AM raster will be avoided (Kodak, 2015). There are several different FM and hybrid screenings available from different Raster Image Processor (RIP) vendors (The Foundation of Flexographic Technical Association, Inc., 2017).

An XCMYK study (Idealliance, 2016) states that the use of AM screening tends to produce a smaller gamut improvement in light pastel, tinted colors than, for example, 20-micron FM screening. According to Idealliance (Idealliance, 2019b): "*very small ink-receptive sites (e.g., 20 micron) can help expand color gamut in quarter-to mid-tone tinted areas on most offset and flexo presses.*"

Higher line screen and smaller dots use less ink

The higher resolution of the screening and smaller dots are said to reduce ink consumption as the dot size gets smaller (Cave, 2019; Web Offset Champion Group, 2008; Verso Corporation, 2019) and the amount of ink required is also reduced when printing is made with smaller dots (Braden Sutphin, 2007). According to the GATF study in 2004 (Web Offset Champion Group, 2008), the results showed that the conventional AM raster in a 69 lpcm (175 lpi) and 25-micron stochastic screen both consumed 15% less ink than the conventional AM 52 lpcm (133 lpi) screen in offset printing. The principle derived from earlier statements for flexographic printing is shown in Figure 26.

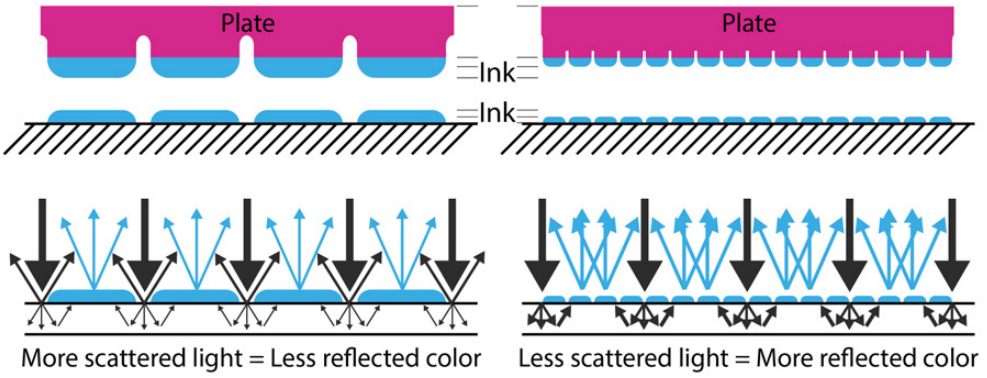


Figure 26 Ink transfer and reflected light depending on screening (K. Lankinen)

The picture on the left shows larger dots with more ink and larger gaps between dots, and that on the right higher resolution, smaller dots, and less ink. This is due to the fact that the smaller dots carry a smaller amount of ink on one dot, while the larger dots are supposed to transfer a larger volume of ink.

1.5.3 Flexo printing image carrier

The printing image carrier in flexography can be a plate or a roller. The plate is typically mounted onto a printing sleeve, whereas the printing roller is typically a sleeve. In flexography the conventional cylinders have been replaced with sleeves due to easier handling and lower prices. An illustration of a flexo plate cross section is shown in Figure 27.

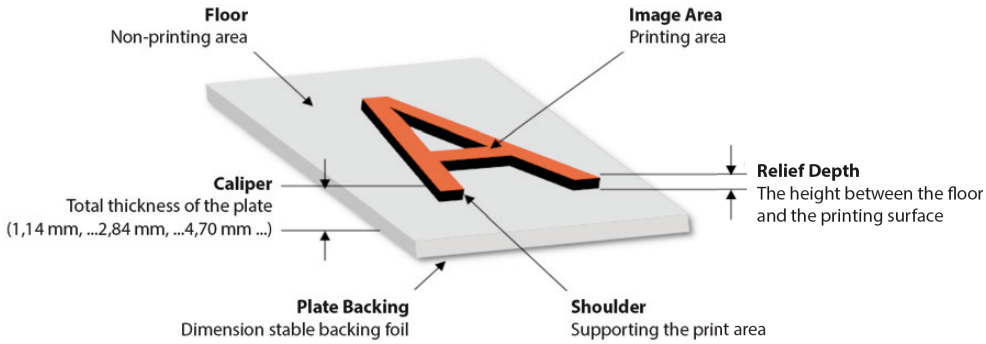


Figure 27 Illustration of a cross section of a flexo plate (K. Lankinen)

Good printing plate performance is important for a good result in the flexographic printing process (Andersson, Johnson, & Järnström, 2009). There are several types of printing plates available from different suppliers. Mostly photopolymer plates are in use, but to some extent other polymers (rubbers) are also in use. The properties of different printing plates vary depending on the manufacturer, plate thickness, plate hardness, polymer type used, additives, and of course finally in the way of manufacturing the finished printing plate.

The most common thickness for printing a high quality image on flexible material is from 1,14 to 1,70 mm. The thickness variation within a flexo plate is from ±0,010 to ±0,015 mm and the variation between two production lots is about ±0,025 mm (Deshpande & Deshpande, 2013).

Plate hardness varies from soft plates to hard plates between about 26 and 62 Shore A (DIN 53505) in a finished plate. The Shore A itself also depends on the plate thickness and the DIN 53505 standardized measurement is made for materials with a minimum thickness of 6 mm (Polymer Service GmbH, 2020).

The plate thickness and plate hardness have a direct effect on the screened image quality. The properties of the printing plate influence the amount of ink transfer (Johnson, et al., 2009). To achieve a clean high-quality print it is essential to have correct line ruling, dot geometry and obtain the correct nip pressure between the anilox roller and plate as well as between the plate and central impression cylinder (Valdec, Miljković, & Čerepinko, 2018). The finer the dots, the tighter the printing machine impression setting tolerances also need to be. The microscopic dot structure of a digital 3% and 50% dot is shown in Figure 28.

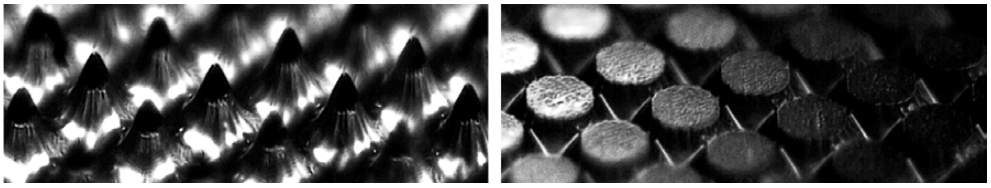


Figure 28 Microscope picture of 3% and 50% dot of CtP photopolymer plate (K. Lankinen)

One of the most important elements in plate making is determining the bump-up (Gençoglu & Kurt, 2015; Esko-Graphics, 2004; Valdec, Miljković, & Čerepinko, 2018; Poljacek;Cigula;Tomasegovic;& Brajnović, 2013; Bould, Claypole, & Bohan, 2005): This determines the minimum dot size in the making of a photopolymer printing plate to give an optimal print result, i.e., the smallest stable dot. To get the first printable stable dot between 1% and 10%, a bump-up curve needs to be determined and adjusted (Gençoglu & Kurt, 2015). For example, the dots below the minimum size are not held on the plate or over-large and unstable dots are printed, whereas over-large dots are stable but result in over-large printed dots. The bump-up adjustment between the "round top" and "flat top dot" is shown in Figure 29.

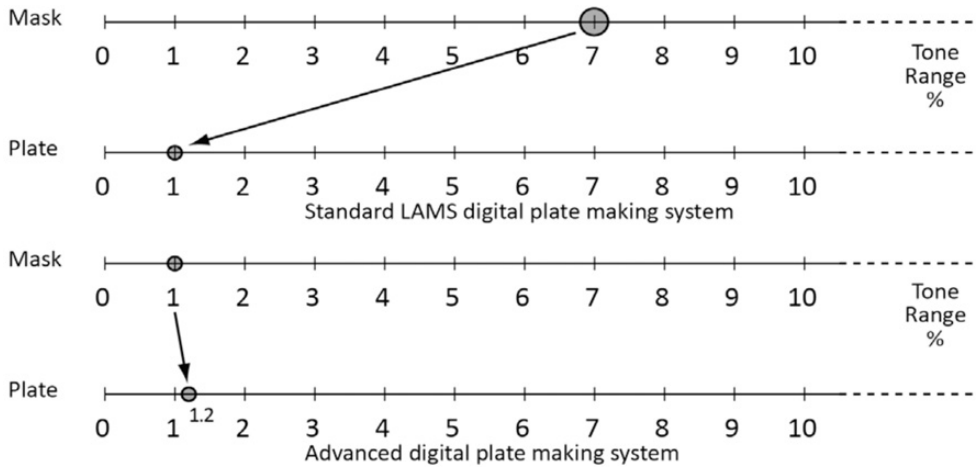


Figure 29 Minimum dot size on the plate (Valdec, Miljković, & Čerepinko, 2018)

The "bump-up" adjustment depends on many factors like plate type, line screen, exposure, imagesetter, and printing press (Valdec, Miljković, & Čerepinko, 2018).

Evolution in plate making (processing)

The improvement in flexo print quality has been continuous during the past 20 years, as shown in Figure 30, according to the Esko workflow (Esko, 2014). A significant technological leap was taken when plate making was changed from analog film plotting plate making to integrated laser ablation masks (LAMS). Furthermore, when HD Flexo, flat-top-dot flexo, and Full HD Flexo developed it was possible to increase the print quality and print contrast.

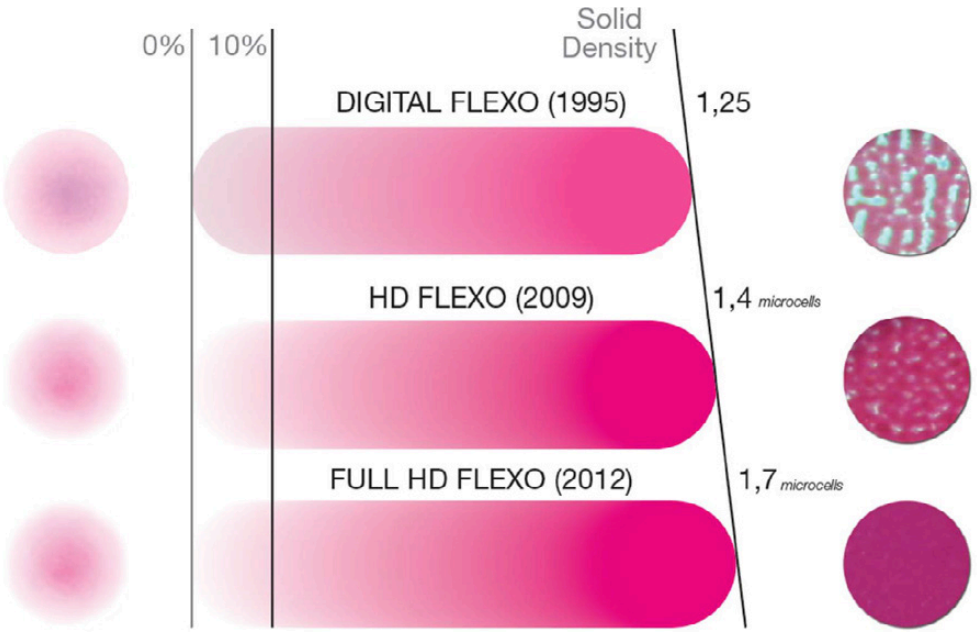


Figure 30 Development of the digital imaging of flexo plates (Esko, 2014)

As shown in Figure 30, the first generation of digital flexo plate making (1995) was able to increase the contrast, as it generated smaller dots than those made earlier with analog plate, and led to lighter highlights.

The second generation of digital flexo plate making (2009) raised the quality level further as the laser imaging resolution was increased from 2540 dpi to 4000 dpi. This enabled even smaller and more stable dots, sharper details, and also micro screening on the plate surface to deliver a smoother ink layer and higher density.

In the third generation of digital flexo plate making (2012), the LED exposure of the 4000 dpi laser imaged plates enabled even more stable dots than earlier while the micro screening on the plate surface was also further enhanced to deliver an even more stable ink layer and higher density than earlier. In addition, vignettes became smoother and better during the plate processing evolution.

Flexo plate evolution such as Full HD Flexo and Kodak FLEXCEL have enabled better surface screening on the plate, as presented in Figure 31. Plate surface screening helps to improve the smoothness and ink density of printed solid areas, even with less ink volume (Weiss, 2017; Klein, White paper: Full HD Flexo, 2014).

Figure 31 Plate surface screening on digital file (Esko, 2012)

Figure 32 presents a microscope image of a 75% dot without and with surface screening. It can be seen that the use of the LED exposure enables a desired kind of surface screening to be applied on the top of the plate. This has an effect on improving ink transfer and results in smoother solids.

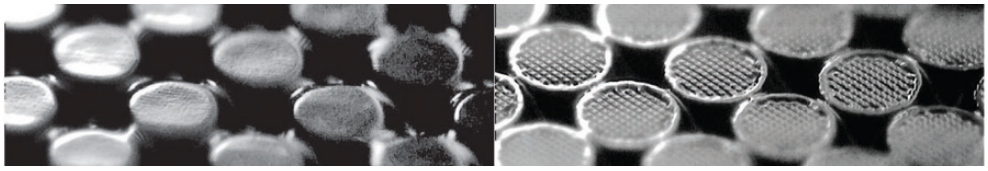


Figure 32 Standard 75% CtP dot vs. Full HD dot with micro screening (K. Lankinen)

1.5.4 Inks and ink transfer

The basic components of an ink are typically a colorant (pigment), a resin system, and a solvent for thinning (Leach & Pierce et al., 2002). According to FIRST (The Foundation of Flexographic Technical Association, Inc., 2017), flexo ink typically contains the following components as presented in Table 11.

Table 11 Normal ink formulation according to FTA

Ink Formulation	Conventional Ink	High Strength Ink
Pigment	10%	20%
Resin	20%	30%
Solvents	60%	40%
Additives	10%	10%

Pigment is the colorant, resins are for binding the pigments to the substrate, water or alcohol solvent is as a vehicle to transfer the components to the substrate, and the additives provide the necessary additional properties for the ink (Rentzhog, 2006). According to Gross (United States Patent No. US20030084803A1, 2003), flexography can use fast-drying inks, which allows to print on surfaces that would otherwise be difficult for a conventional printing such as offset lithography.

The wet ink film thickness on the substrate is typically 2-15 microns (Leach & Pierce et al., 2002) and the pigment concentration affects both color intensity and IFT. Flexo ink is somewhat more concentrated, leading to a lower average film thickness in comparison to gravure printing (Leach & Pierce et al., 2002).

To cover a large number of different substrates and needs for different properties, there are different ink series with different pigment and resin systems (Leach & Pierce et al., 2002; Rentzhog, 2006). Typical inks used in flexo printing are alcohol solvent-based inks with nitrocellulose (NC) resins, water-based inks with acrylic resins, and UV inks with acrylic-based oligomers (The Foundation of Flexographic Technical Association, Inc., 2017). Water-based inks are mainly used to print fiber-based materials like paper and corrugated board in flexography (Malmirchegini & Rahmani, 2011). Solvent-based inks are mainly used for plastic films and non-absorbent materials. UV inks are mainly used in label printing.

Ink transfer

Ink transfer depends on several factors such as the ink dosing system, plate properties and ink properties as well as the substrate. Moreover, ink transfer depends on for example ink viscosity, temperature, and printing speed (Hamblyn, 2015). The inking system determines how the ink is metered onto the flexo plate.

Chambered doctor blade systems are typical for inking systems in high quality flexography, as the principle presented in Figure 33. The ink is pumped to the ink chamber and from there it is dosed by an anilox roller forward onto the printing plate, which transfers the ink to the substrate.

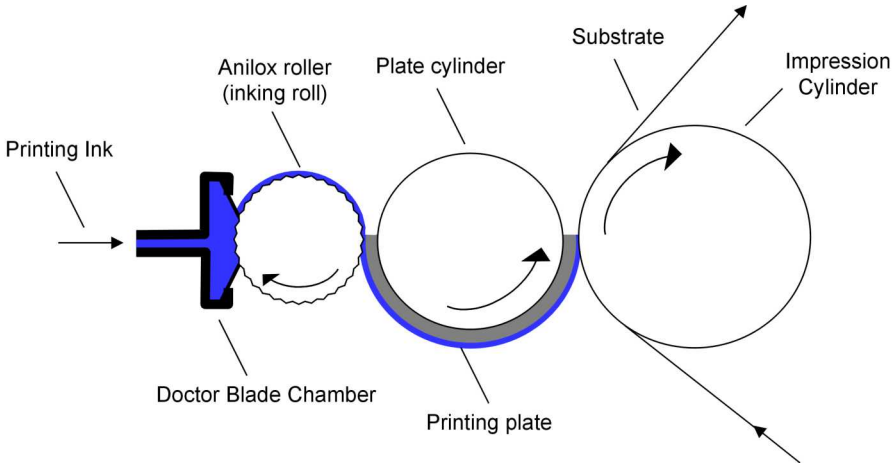


Figure 33 Ink system based on chambered doctor blade system (K. Lankinen)

To achieve good ink coverage for solids, suitable ink transfer and wetting are required. According to Kipphan (Kipphan, 2001), the rule of thumb in flexography ink transfer is that for a 2 µm ink film (wet) on a substrate (corresponding to an anilox cell volume of 2 cm^3/m^2) an anilox cell volume of 4 cm^3/m^2 should be used. According to Kipphan (Kipphan, 2001), the ink transfer from plate to substrate can be calculated with the Walke-Fetzko formula as follows:

$$p = (1 - e^{-(am)^x}) \left\{ w_0 \left(1 - e^{\frac{-m}{w_0}} \right) + \alpha \left[m - w_0 \left(1 - e^{\frac{-m}{w_0}} \right) \right] \right\} \qquad (5)$$

A detailed explanation is shown in Figure 34.

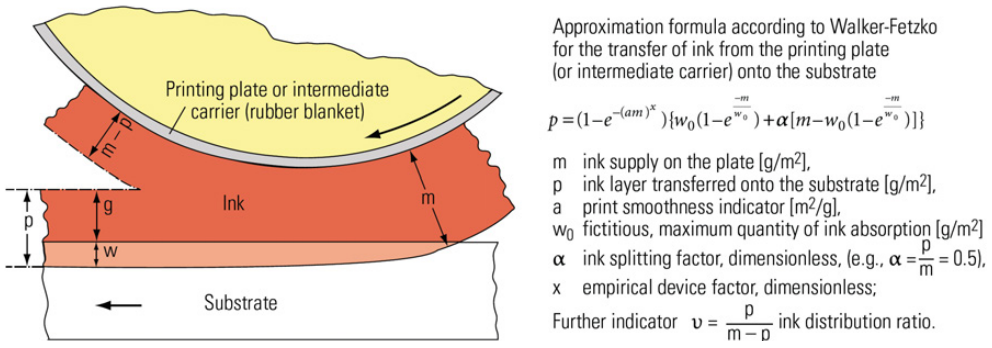


Figure 34 Walker-Fetzko calculation formula for ink transfer (Kipphan, 2001)

According to DFTA (DFTA-TZ, 2002), only about 40% of the theoretical ink volume of anilox cells is transferred to the substrate, as illustrated in Figure 35.

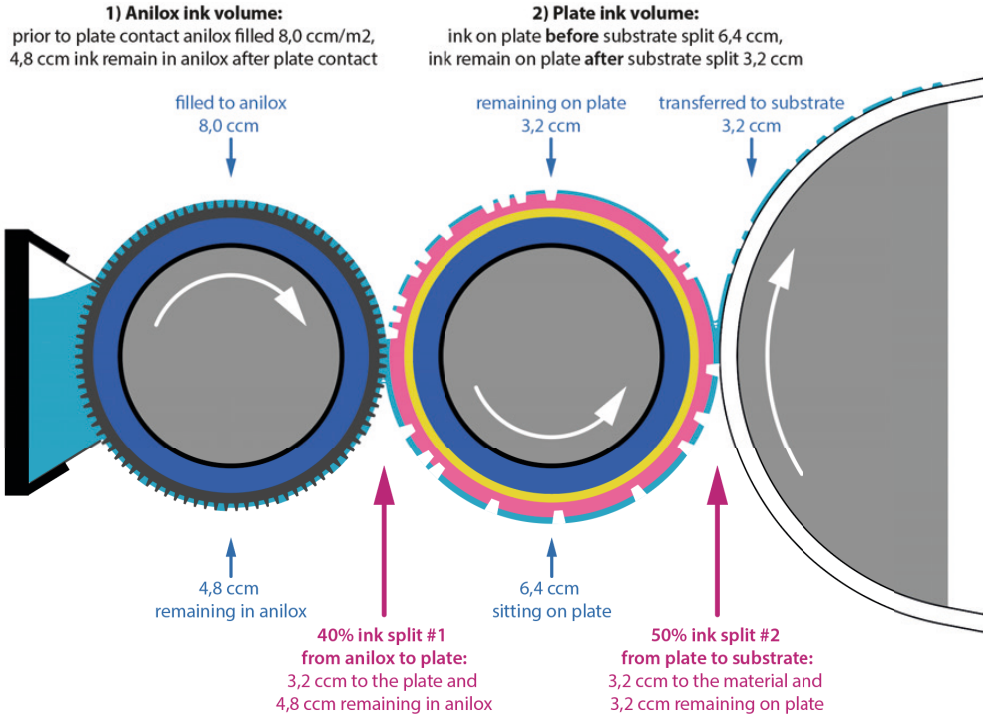


Figure 35 Ink transfer from anilox to substrate (Image: Derived from DFTA-TZ material by K. Lankinen)

Figure 35 presents how the anilox and plate transfer ink from the ink chamber to the substrate according to DFTA (DFTA-TZ, 2002). The original anilox volume is expected in this case to be 8,0 cm^3/m^2 and the ink transfer from the anilox is expected to be 40%, meaning that 3,2 cm^3/m^2 of the ink will be transferred to the plate and 60% of the ink, i.e., 4,8 cm^3/m^2, will remain in the anilox cells after ink splitting from the anilox to the plate. The next assumption is that the ink splitting between the plate and substrate is 50%, meaning that half of the ink is transferred to the substrate and the other half will remain on the plate. It has to be noted that, during the first rotations of the anilox and plate, the ink transfer at the start of the printing press is not 40% of the anilox volume, i.e., 3,2 cm^3/m^2, until the flow has stabilized after the first inking rotations of the plate. After the ink flow has stabilized the ink split from the plate to the substrate is 3,2 cm^3/m^2 and the other 3,2 cm^3/m^2 will remain on the plate.

It is worth mentioning here that a common way of thinking is that the amount of transferred and splitting ink is 50% from anilox to plate and then again 50% from plate to substrate, resulting in 25% total ink transfer (Lankinen, 2019). N.B. The problem with this thinking is that it assumes that 4,0 cm^3/m^2 of the 8,0 cm^3/m^2 from anilox will transfer to the plate and only 2,0 $cm^3/m2$ from there to the substrate. This would lead to a situation where 4,0 cm^3/m^2 of ink leaves the anilox and only 2,0 cm^3/m^2 is put on the substrate, meaning that 2,0 cm^3/m^2 will disappear in the process.

In public discussions with print specialists, the total ink transfer rate has been evaluated to be from 18% to 50%, depending on the tools and materials used (Lankinen, 2019). It is also noteworthy that a flexographic printing plate has been claimed to accomplish a 100% ink transfer from the plate to the substrate. According to Niederstadt (Niederstadt, 2015), this is due to the fact that "Pinning Top Dot" plate technology has been engineered to have lower surface energy than conventional solvent plates, enabling improved ink transfer to the substrate.

Galton (Galton D. , 2004) states that the surface energy of the plate affects the ink transfer volume, but according to Hamblyn (Hamblyn, 2015), determining the surface energy is problematic because there is generally no basic understanding of it. The effect of plate surface energy and the roughness of the plate surface on ink transfer are not fully understood, and the plate properties can be altered if the plate is not chemically resistant to solvents and ink components (Hamblyn, 2015).

Anilox as the “heart of the machine”

A modern anilox roll is a laser engraved ceramic ink metering roll consisting of a micro-cell structure according to customer-specific needs. The development of anilox rolls is one significant factor that has revolutionized flexo printing quality along with the development of the plate making process.

The target of ink transfer should be to achieve a sufficient amount of ink delivery onto the substrate to build color densities and coverage as needed. Too low an amount of ink transfer will lead to a porous and pale print result. Too high an amount of ink transfer will result in dark color tones and may also result in print problems like bridging of dots, the halo effect, and inadequate drying.

The cell shape of an anilox is related to the engraving process and cell array angle. There are different cell shapes, as presented in Figure 36, but traditionally ceramic rollers with cells at a 60° angle are the most common aniloxes.

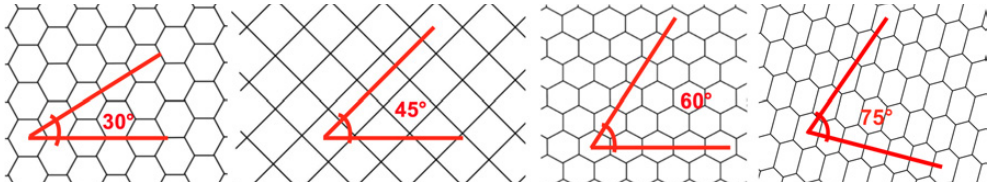


Figure 36 Cell shapes of 30°, 45°, 60°, and 75° aniloxes (K. Lankinen)

The cell depth and geometry depend on the laser engraving process, which also determines the cell/wall ratio. During the 21st century, different kinds of open cell or elongated cell anilox structures have become more common, such as the 75° angle anilox format shown in Figure 36. The claimed benefits of these aniloxes are that they are capable of delivering optimized ink transfer to cover a wider range of needs for more or less ink with a smooth ink layer (INOMETA GmbH, 2017; Anilox Laser Technology Ltd, 2019).

Screen line ruling and the volume of an anilox roller are in relation to each other, where the anilox ink volume has an effect on color saturation and density. Typically, the higher the line screen line ruling, the lower the volume. In general, anilox cell line screen counts are from 100 to 360 lpcm and the volumes from 16,0 to 3,5

cm^3/m^2. Lately the use of aniloxes with higher screen line densities at over 400 and 500 lpcm have been increasing for high quality process printing.

The study by Bould et al. (Bould, Hamblyn, Gethin, & Claypole, 2011) showed that the anilox cell volume has the greatest influence on the solid density and halftone dot formation, although the anilox cell geometry also seems to have an effect. According to Abbott (Abbot, 2018), there is no rational theory that describes the ink transfer on the plate in terms of the shape and size of the anilox cell with the ink rheology.

1.5.5 Substrate

The substrate has an effect on image quality. Substrates can be divided into absorbing and non-absorbing materials, where non-absorbing materials can have a glossy or rough surface. The smoother the substrate, the glossier the result. If the substrate has a rough surface it will also decrease the gloss level of the print. A porous material absorbs wet ink, which will have a major influence on lowering the gloss, changing the ink color and density.

Typical plastic packaging materials include polyethylene (PE) and oriented or cast polypropylene (PP), and also polyethylene terephthalate (PET) or polyamide (PA) (Marsh & Bugusu, 2007; Poovarodom, Ponnak, & Manatphrom, 2015). PE and PP films have a naturally lower surface energy than needed for suitable wetting and adhesion of printing ink (Żołek-Tryznowska;Izdebska;& Tryznowski, 2015). Hence, the printed surface must be pre-treated with corona, plasma, or primer before printing to raise the surface energy to the required level (Lindner, Rodler, Jesdinszki, Schmid, & Sängerlaub, 2018). Typically the minimum surface energy of plastic films for printing is 38 mN/m (dyn/m). The surface treatment of the substrate should be 8-10 mN/m higher than the surface tension of the ink (The Foundation of Flexographic Technical Association, Inc., 2017; Mesic, Lestelius, & Engström, 2006).

1.5.6 Registration accuracy and misalignment tolerances

Registration (aligning the colors relatively to each other) is a clearly visible part of quality. Printers always aim to obtain a perfect register, but due to several

simultaneously affecting factors a 100% perfect register is nearly impossible in flexo printing. According to Dorscheid (Dorscheid, 2005), the best achievable registration in printing is within 0,0005 inches (0,0127 mm).

There can be several reasons for misregistration (Rentzhog, 2006). These include mounting of the plates, incorrect machine settings, profile variations or stretching of the substrate, web guidance problems, and tolerance differences in print cylinders or plates. A text misregistration is presented in Figure 37.

Figure 37 Sample of correct and incorrect registration of a two-color print (K. Lankinen)

According to ISO 12647-6 (ISO, 2012), the register tolerance depends on the printed screen line: *"the image centers of any two printed colours shall not be more than 2/(screen ruling) and should be not more than 1/(screen ruling)."* Figure 38 shows an example in which the tolerance for a 48 lpcm screen ruling should not be more than 0,417 mm and 0,208 mm.

Screen ruling		2/ruling	1/ruling
36 lpcm	91 lpi	0,556 mm	**0,278 mm**
48 lpcm	122 lpi	0,417 mm	**0,208 mm**
60 lpcm	152 lpi	0,333 mm	**0,167 mm**
72 lpcm	183 lpi	0,278 mm	**0,139 mm**

Figure 38 Register tolerance according to ISO 12647-6 (ISO, 2012)

According to the Italian flexo association (ATIF), a register tolerance below 50 microns is good, below 100 microns is sufficient, and over 100 microns is insufficient (ATIF - Italian flexo association, 2013).

According to Forrester (Forrester, 2019), a slight misregistration of the printing press is not as critical when printing with three adjacent colors with an expanded gamut, as it is when printing with CMYK.

1.6 Standardization problem in flexographic printing

Standardized tooling and production are normally the key to efficiency, but despite flexo standards like ISO 12647-6, their use in flexographic printing is limited. According to the bvdm, (the German Federal Association of Printing and Media), the flexo standard is largely irrelevant for data exchange (Bundesverband Druck und Medien e. V., 2016).

According to Nussbaum (Nussbaum, 2010), optimized and standardized printing press methods are two ways to manage a printing press, where "*A fully optimized press aims at maximizing its capability in terms of lowest possible dot gain, highest ink densities, and best contrast that the individual printing press can achieve, without considerations of any external specifications or standards*" and "*Another approach is to make the presses conform to a certain reference or standard such as e.g., ISO 12647-2, and applying predefined parameters.*"

The reason that there are no universally utilizable standards in flexography is due to the fact that there are multiple factors influencing the print result simultaneously and combinations of them give very different results from one printer to another. Consequently, so-called "house standards" are a common practice, where each printer has its own specifications for print production. Therefore the usefulness of the ISO 12647-6 as the flexographic printing standard is very limited.

There is a whole raft of different standards, methods, guidelines, and practices to be used in the graphics industry such as those from ANSI, ASTM, CIE, CGATS, DIN, INCITS, ISO, NPES, TAPPI, and USPS (The Foundation of Flexographic Technical Association, Inc., 2017). One of the most comprehensive guidelines to be utilized as a "standard" is the Flexographic Image Reproduction Specifications & Tolerances (FIRST) published since 1997 by the Foundation of Flexographic Technical Association, Inc. The latest version, 6.0, was published in 2017.

To communicate the color, the most widely used color reference system in packaging printing is the Pantone Matching System® (PMS) from Pantone LLC. Pantone has different color swatch books where for example the Extended Gamut (XG) color swatch is a rather new and very helpful tool also in communicating the spot color tones for multicolor printing. According to Pantone, the XG Coated book aims to conform to ISO 2846-1 and ISO 12647-2:2-2004/Amd 1:2007 in CMYK colors,

whereas the additional OGV colors are set to align with research by the leading industry associations (Pantone LLC, 2017).

1.7 Sustainability in flexographic printing

Minimizing the use of resources is important, but also minimizing and eliminating waste is also an important part of sustainability. According to Kiurski et al. (Kiurski, Marić, Aksentijević, Oros, & Kecić, 2016), the printing industry generates solid (packaging, plates, film, substrate, and spoilage materials, etc.), liquid (inks, solvents, resins, varnishes, etc.), and gaseous waste while printing inks are the largest sources of organic and inorganic water pollution.

Kodak have stated (Kodak, 2010) that the packaging printing process should be evaluated as a total process in the bigger picture to identify the potential elements impacting on sustainability. Figure 39 is derived from Kodak's white paper (Kodak, 2010) and illustrates approximated values for the use of non-renewable energy and greenhouse gas (GHG) emissions of the printing process and plate process. According to Kodak, the printing process figure is based on DuPont's Life Cycle Assessment (LCA) study from 2008.

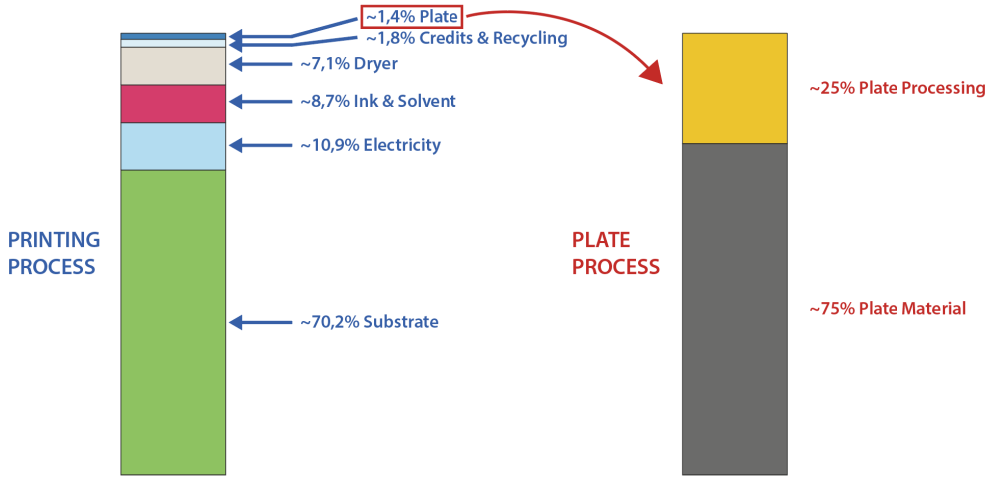


Figure 39 Approximated non-renewable energy and GHG values of a print job (Image: Derived from Kodak's source material by K. Lankinen)

The use of inks, solvents, and energy are the main sources of the environmental burden in printing and vary depending on the area of the printed image (Poovarodom, Ponnak, & Manatphrom, 2015). On the other hand, as can be seen from Figure 39, the printing substrate has the biggest influence on energy consumption and greenhouse gas emissions in printing (Kodak, 2010). Hence, material waste reduction has a huge impact on sustainability. Additionally, the other parts used such as electricity, ink and solvent, dryer, heat crediting, and recycling as well as plate consumption can also be affected by making multicolor separation as investigated and discussed later in this thesis.

Various gases and volatile organic compounds (VOC) from process chemicals and cleaning solutions are the most typical exhaust emissions (Guo, Lee, Chan, & Li, 2004; Caselli, de Gennaro, Saracino, & Tutino, 2009; Andrade, Míguez, Gomez, & Bugallo, 2012; Kiurski, Marić, Aksentijević, Oros, & Kecić, 2016; Kliopova-Galickaja & Kliaugaite, 2018). Eliminating ink wash-off with a fixed color palette reduces VOCs significantly and improves the sustainability of a printer (Niederstadt, 2016).

One way to evaluate sustainability in packaging printing is to use ISO 14067:2018, which defines the principles for a product's carbon footprint in a way that complies with international standards for life cycle assessment (ISO, 2018).

Ink consumption in process printing

The study conducted by FTA (Flexo Technical Association) in 2012 showed that there is no difference in ink consumption between spot and process color printing (Rich, 2012). On the other hand, recent studies and experience over a long period of time have shown that there is in fact a difference in ink consumption between spot and process color printing. Here are some examples:

Braden Sutphin Ink Company's comments on stochastic screenings (Braden Sutphin, 2007): *"The "Pay Offs" for the printer are: Use less ink, use weaker inks (less cost), less waste due to misregister and / or color variance, higher productivity, more flexibility in scheduling, reduced inventory costs."*

According to PackagePrinting (Bauer, 2013): *"Accredo Packaging is able to: Use less substrate at startup; Reduce ink waste by up to 95 percent; Reduce ink consumption by up to 35 percent; Have less ink inventory; Eliminate clean-ups between jobs; Significantly reduce hazardous*

return waste; Reduce solvent waste by not having to wash-up between color changes; Reduce production and cycle time; and Reduce solvent emissions."

Experiences from Esko regarding Full HD process printing (Klein, White paper: Full HD Flexo, 2014): *"Printing with a pinhole-free ink laydown and the correct SID also reduces ink consumption and solvents on the press to a minimum, and guarantees brilliant overprint colors without any blackening effect. From our experience talking with printers, the ink savings can be as much as 25%."*

According to a flexographic printing study by Furr comparing 4-color and 7-color printing processes (Furr, 2015): "*As well, there was an 18,8% difference in total area coverage with two component builds, and a 12,2% difference in three component builds. With extended color printing, it is possible to use less ink to get to final color.*"

According to Marvaco's customer experiences of EGP™ (Marvaco Ltd, 2017): *"Printing efficiency has increased by over 30%, ink consumption has decreased by 33%, and solvent usage has decreased by 50%."*

Comexi's experiences of expanded gamut printing (Comexi, 2018): *"As a summary, the more relevant data were a reduction of 60% changeover time, a reduction of 50% of waste material and decrease of 20% in ink cost."*

Project Blue's experiences (Reproflex 3, 2019): *"Ink imposition technology and customized anilox rollers allow for smaller halftone details, and pick and transfer less ink, which provides up to 12% ink savings over printing in conventional AM screenings. Ink reduction means better recyclability, a smaller carbon footprint, and more green money for the printer."*

Uniflex's experiences with ECG according to Sun Chemical (Sun Chemical, 2019): *"It is a major innovation being able to print Pantone™ colors with just seven inks. We can now offer higher quality, more saleable print with less color differentiation. We have now boosted our color space and regularly use extended gamut printing. We are also saving an average of 25% in inks."*

2 MATERIALS AND METHODS

This second part of the study describes the methods and materials that were used to create the calculator, make the print tests, and evaluate the results.

2.1 EGP efficiency and EGP calculator

During the long duration of this study, the author gathered production experiences and developed a unique EGP efficiency calculator for this study to model printing production and visualize the potential for eco-efficiency. The accuracy of the calculation values was checked using reference verifications, which included:

1. Testing the ink transfer
2. Survey of production cost split
3. Survey of printing press setup values
4. Collecting empirical process values and piloting the calculations

Testing the ink transfer

In order to verify a general wet ink transfer from anilox to substrate for the calculations, an ink transfer printing test was carried out at SOMA spol. s.r.o. and the printed plastic film samples were weighed before and after the dried ink was removed in the Flint Group's ink laboratory.

The test run parameters were as follows:

Printing press: SOMA Optima2 8-color flexo press of 1280 mm in width.

Printing: Solid areas printed on 20-micron transparent BOPP substrate.

Printing plates: 1,14 mm (045) high durometer Flint Group nyloflex® solvent-washable flexo plate 60 Shore A (DIN 53505) with 4000 dpi Full HD and surface screening, produced by Marvaco Ltd.

Mounting: 0,5 mm Lohmann DuploFLEX® soft cushion tape on the sleeves.

Identical Flint Group standard type solvent-based process ink in all ink stations: Viscosity (DIN 4) 19 seconds, density 0,95084 g/cm^3, solid content 26,10%.

Two "elongated cell" process color aniloxes: 524 lpcm and 3,3 cm^3/m^2.

One "elongated cell" spot color anilox: 280 lpcm and 7,5 cm^3/m^2.

Printing speed: 300 mpm.

The results and summarized calculations are presented in Chapter 3.

Survey of production cost split

In order to verify the production cost split, empirical production costs were obtained from two participants in 2019. The participants, representing the management of a printing house, were randomly selected from among Western European wide web flexographic printers that use solvent-based inks and are known as high print quality suppliers using both process and spot color printing in their production. Due to the confidentiality of the data, the material is stored electronically.

The survey was a semi-structured questionnaire including the following questions regarding print-related costs:

1. Material cost of a typical plastic film (€/kg), which was used to calculate the value of an average 1000 mm wide and 40-micron plastic film.
2. Labor and auxiliary personnel costs (€/year) for two operators in three shifts for five days a week, including administrative costs.
3. Combined ink and solvent cost (€/kg), which was used to calculate values for a Total Area Coverage (TAC) of both 75% and 150%, with a consumption of 3 g/m2.
4. Machine and auxiliary costs (€) for running a flexographic printing press for 10 years, including servicing and repairs.
5. Flexographic plates and reproduction costs (€/m2) for a job in six colors with an area of 0,5 m2 per color used in six production runs.

The collected, averaged, and anonymized answers were calculated for an annual production volume of 30, 50, and 70 million printed meters, averaging 15.000, 30.000, and 60.000 printed meters per job. The results are presented later in the following chapter.

Survey of printing press setup values

In order to verify the functionality of the calculator and the accuracy of the printing press setup values used, empirical production values were collected in 2019 from seven participants in a survey, where one respondent delivered two responses, one for an automated printing press and the other for a non-automated printing press.

The participants were randomly selected from among wide web printers and printing press manufacturers using solvent-based inks that were known to use the most typical flexographic printing presses and to utilize both process and spot color printing in their production. Due to the confidentiality of the data, the material is stored electronically.

This survey was a structured questionnaire including the following questions regarding the printing press setup:

1. The start-up material waste and other waste and time (incl. color matching) per job in meters and minutes, where the time included washing, anilox change, ink change, plate sleeve change, and color adjustment.
2. The average start-up wash-up in minutes and per color in liters and kilograms, where the washing time was total washing time in minutes, the amount of total consumed solvent was in liters per color, and the washed and wasted ink in kilograms per color.

Each participant gave average values for the following:

Setup time and material waste per CMYK job

Setup time and material waste per CMYK+OGV job

Setup time and material waste per CMYK+1x spot color job

Setup time and material waste per CMYK+2x spot color job

Setup time and material waste per CMYK+3x spot color job

Wash-up time, solvent use, and ink waste between CMYK color jobs

Wash-up time, solvent use, and ink waste between spot color jobs

The anonymized answers included three responses from two European flexographic press manufacturers, four responses from European printers (North Europe, Central Europe, and Eastern Europe) and one response from a Latin American

printer. The answers included new and old wide web flexo printing presses from the past 10 years and the values were given as best estimates describing an average printing setup based on the experience of each participant.

The answers were summarized, averaged, and the CMYK+1xEG and CMYK+2xEG values were interpolated from the previous answers. The anonymized results are presented later in Chapter 3.

Collecting the empirical process values and piloting the calculations

The EGP calculator was developed and tested by the author based on iterated simulations with the actual production values of the printing houses. The calculation model was developed to correspond to the empirical data that was piloted with a large number of European wide web flexo printers over the years. The calculator was adapted with the averaged setup time data received from the survey sent to printers and press manufacturers, as described earlier.

The input values required for the EGP calculator functions were:

Time to empty the ink chambers, minutes

Time to wash the ink chambers, minutes

Time to change the print sleeves, minutes

Time to change the anilox sleeves, minutes

Time to change the ink, minutes

Time to change the job on the computer, minutes

Amount of similar spot inks run consecutively, %

Time to make the impression settings, minutes

Time to make the register settings, minutes

Time needed for color adjustment, minutes/color

Time needed for quality assurance and job acceptance, minutes

Run speed of the press, mpm

Average job length, meters

Start-up waste, meters

Number of working shifts per day, pcs

Number of working days per week, pcs

Number of working weeks per year, pcs

Mechanical maximum speed of the printing press, mpm

Production target per year, meters

Machine operation cost, €/h

Width of the printed substrate, cm

Weight of the printed substrate, g/sqm

Printed material sales price, €/kg

Anilox volume for spot and process colors, g/sqm

Ink transfer of spot color and process color, %

Printed area of spot color and process color, %

TAC of spot and process color of the printed area, %

Cost of spot and process ink, €/kg

Number of print unit washes per week, pcs

Amount of washing solvent used per wash, L/color

Amount of washed ink per wash, kg/color

Number of spot color return ink bins in stock, pcs

Substitution of spot colors by EGP colors, %

Amount of returned ink from the press, kg/color

Amount of non-marketable inks per year in stock, %

Energy used for solvent regeneration, kWh/L

Cost of energy for regenerating solvent, €/kWh

Lost solvent in regeneration, %

Cost of fresh solvent, €/L

Cost of solvent regeneration waste handling, €/L

Raw material price of the printing substrate, €/kg

The exact values for the previous functions used in the calculations are presented in Chapter 3. The values for the Global Warming Potential (GWP) functions of the calculator were based on literature references, as described later.

The GWP functions used in the calculations were:

GWP equivalent of ink, CO_2 kg/kg

GWP equivalent of electricity production, CO_2 kg/kWh

GWP equivalent of washing solvent, CO_2 kg/L

GWP equivalent of plastics primary production, CO_2 kg/kg

The developed EGP calculator computed the essential parts of print production: makeready, productivity, Overall Equipment Effectiveness (OEE), production time, increase in sales, ink savings, value of solvent regeneration, value of wasted material, CO_2 reduction, and CO_2 equivalents. The results are presented below in Chapter 3.

2.2 EGP reference profile

The EGP profile test chart was printed in 2018 at SOMA in Lanskroun, Czech Republic on an Optima2 flexo press. It was measured by Marvaco and the data was collected for the CMYK and CMYKOGV lookup table (LUT) to match the profiled Pantone colors, and to calculate the color gamut sizes and the simulated spot color accuracy. The color profiles were used to create CMYKOGV and CMYK builds for each spot color in the Pantone library as shown at the end of this study as appendices.

Materials

The Marvaco EGP™ used in this study was a CMYK ink set expanded with orange, green, and violet process inks. It was beyond the scope of this thesis to go into ink sequences in depth and therefore the profile runs of this study were made with the color sequence from the darkest to the lightest color, i.e., KVCMGOY, with white as the last ink on reverse printed 20-micron BOPP.

The inks used to print the examples for this study were normal, commercially available solvent-based inks on plastic films but boosted with higher pigmentation

in comparison to the traditional pigmentation grades. The printed samples were prepared using hard 1,14 mm thick flexographic photopolymer plates of 60 Shore A (DIN 53505), where 4000 dpi Full HD and surface screening technologies to expand the color gamut were used. The plates were mounted with 0,5 mm soft cushion tapes.

Instead of using the traditional 60° hexagonal anilox, the profiles in this study were made with so-called "elongated cell" high line screen aniloxes (524 lpcm, 3,3 cm^3) where the cell was extended in the longitudinal direction to deliver optimal ink release for solids and highlights. The printing speed was 300 mpm.

Methods

The profiles based on the ECI2002 random test charts contained 1873 Pantone spot colors. The profile printing was performed by printing the test charts in CMYK, OMYK, CGYK, and CMVK. The printed color charts were measured, color builds created and gamut value comparisons were made with a commercial 3rd party proprietary industrial color management software program. The calibration of the printing press was not done according to any standard, as the target was to reach high color densities in printing.

Based on the color characterization of the 7-color printing process, the recipes for the color builds were created with proprietary software, in which the maximum number of overlapping colors was set to three colors with 300% TAC. Based on these color profiles, the proprietary software predicted the reproduction accuracy for the simulated PMS colors as shown in the appendices. The 3-D CIELAB color gamut presentations were based on these profile calculations.

The estimation of the color gamut and the ΔE accuracy are directly available in this software product and were used in the thesis to arrive at the conclusions described in Section 3.2. The software provided these results based on its internal color model of the color characteristics of the printing system.

Regarding optical dot gain, in theory, using higher plate line screening at a certain level, a lower ink consumption should produce the same color effect as coarser screened dots with higher ink consumption. This was not investigated in the study; however, a 70 lpcm (178 lpi) high plate screen using hybrid screenings was chosen for the test print to potentially improve the gamut extension.

The color profile values were measured with an X-rite i1 PRO spectrophotometer and measuring condition M0 (D50/2°). Otherwise, eXact and measuring condition M1 (D50/2°) was used and the color difference was measured according to the CIE ΔE_{2000} formula unless otherwise mentioned. Based on several customer cases and experience, the author decided to use the ΔE_{2000} value in this study as follows:

< 0,5	Very excellent quality, normally not visible color difference
0,5-1,0	Excellent quality, extremely small color difference
1,0-2,0	Very good quality, very small color difference
2,0-3,0	Good quality, small color difference
> 3,0	Medium and low quality, noticeable color difference

The color gamut size of the 7-color profile and 4-color profiles were compared in a spider web against each other and the ISO-coated v2 standard color space. The gamut volumes of previous profiles were calculated with Esko Equinox software and compared to each other. Additionally, the different color gamut spaces for CMYK and CMYKOGV were analyzed and the color gamut size for different ΔE_{2000} values determined, as well as the total area coverages of the simulated spot colors.

2.3 OATIS - differences in spot and EGP color printing

The OATIS co-printing test was printed at SOMA in Lanskroun, Czech Republic on an Optima² flexo press to demonstrate the eco-efficiency of gang-run printing. A combination sheet of OATIS products was collected and evaluated to see how the co-printing of multiple designs on the same print sheet could be done in EGP.

Materials

In this test six different jobs were gathered onto a single sheet and co-printed in a 70 lpcm plate screen line with water-based CMYKOGV inks on coated UPM UniquePack 80 g/m² paper, while the original designs were made with CMYK and one to two spot colors plus one white as reverse printing on OPP. Because the original jobs and test products were printed on different materials (plastics vs. paper), this test was only simulated with theoretical calculations and the earlier created ICC profile for this study was not compared to the final print on paper.

The samples were printed using hard 1,14 mm thick flexographic photopolymer plates 60 Shore A (DIN 53505), where 4000 dpi Full HD and surface screening technologies to expand the color gamut were used. The plates were mounted with 0,5 mm soft cushion tapes.

Instead of using the traditional 60° hexagonal anilox, the print was made with so-called "elongated cell" high line screen aniloxes where the cell is extended in the longitudinal direction to deliver optimal ink release for solids and highlights.

Methods

The original spot colors used for the OATIS designs (PMS 2736, PMS 2925, PMS 354, PMS 485, PMS 201, and PMS 7549) were compared to the reference EGP color profile values in CMYK and CMYKOGV.

The CIE ΔE_{2000} color differences and the total area coverage were retrieved for each spot color simulation. The ink consumption was calculated on a theoretical level based on the ink transfer assumptions as described. The efficiency potential of different gang-run printing combinations was evaluated by calculating the number of plates required for different combinations.

2.4 Fazer Puikula legacy job pilot project

The final test, a legacy job with spot colors changed to multicolor process printing, was conducted on a large scale to investigate the feasibility of using EGP in the supply chain with a Finnish printer and brand owner (Fazer). Due to the confidentiality of the industrial process, the exact production details and parameters are not published.

Materials

The test job was printed with solvent-based highly pigmented inks on 25-micron CPP using hard 1,14 mm thick flexographic photopolymer plates of 60 Shore A (DIN 53505), where 4000 dpi Full HD and surface screening technologies to expand the color gamut were used. The plates were mounted with 0,5 mm soft cushion tapes.

Methods

The spot colors were checked against the EGP reference profile and the theoretical ΔE_{2000} color difference and the TAC were calculated for each original spot color. In this test, the EGP reference profile values had to be used because the actual production recipes and values could not be published due to the confidentiality of a live product. In addition, it was not allowed to share the exact original PMS codes of the brand product either.

Although the CMYKOGV inks gave better ΔE_{2000} values, the brand owner decided to accept the greater variation to reduce the number of colors, and the job was printed in only cyan and magenta. These colors were still EGP colors as they were highly pigmented process color inks.

Theoretical eco-efficiency calculations were made and presented based on the ink transfer assumptions as described. These values were then projected into annual savings with similar print jobs.

The colors of the printed bread bag were also measured with an eXact spectrophotometer and compared to the digital PMS color library of the device, the measured color from the Pantone XG book, and the spot color of the previously printed bag. These values are reported and illustrated in Chapter 3.

Registration and print quality were evaluated, and microscopic images were taken with a Dino-Lite handheld microscope calibrated to 50x and 218x magnification. Additionally, some of the images were scanned with a CanoScan LiDE 210 scanner.

Finally, comments on the improved sustainability due to EGP printing were listed and discussed with the printer and the brand owner.

3 RESULTS AND DISCUSSION

This third part of the study collected real production data for multicolor process printing and a unique new calculator was developed to model printing production and visualize the potential for eco-efficiency.

Over the years reproduction tools have developed. Color separation, raster image processing, profiling, and proofing have improved significantly and modern tools are advancing all the time. All of this has resulted in overall improved process printing with halftones. The quality of images and solid areas nowadays allows printing with expanded gamut in ways that were not possible earlier.

In the early stages of the study in 2005, the technologies did not yet provide sufficiently accurate and stable printing to implement the expanded gamut printing method on a larger, practical scale. Hence, due to earlier unsuccessful experiences with multicolor printing tools, expanded gamut printing is still unnecessarily regarded with doubt by many printers and repro specialists. Fortunately, the technologies have evolved significantly over the years and the conclusions of the study today provide significantly more precise and stable results than what would have been achievable 10 or 15 years ago. In the author's time at Marvaco Ltd, these technologies have been combined and developed in order to perform multicolor process printing in a personalized way. On this basis Marvaco has developed the Marvaco EGP™ – Expanded Gamut Printing system. In this study, the name "EGP" refers to the Marvaco "EGP™" system, but is referred to only as EGP for better readability and simplicity.

The following pages describe the implementation of expanded gamut printing. The economics of expanded gamut printing were thoroughly reviewed and used for the EGP efficiency calculations. The theoretical calculations were carried out using the developed EGP calculator and the test profile.

An EGP profile was created, analyzed in detail, and used for theoretical calculations and analyses of the sample test. Moreover, a real production test and analysis of a legacy job were performed.

Finally, the standardization possibilities of flexographic printing, as well as its sustainability are discussed briefly.

3.1 EGP efficiency

Expanded gamut printing is traditionally marketed as more efficient than spot color printing, but it has been challenging to obtain data from production cases. During the long duration of this study, the author has gathered production data and developed an EGP efficiency calculator, which has been shown to correlate fairly well with actual printing practices. The data was collected as described in chapter 2.1 and the calculations are presented in the following pages.

The economics of printing depends on many factors, such as the fixed and variable costs, as well as the uptime and downtime of the press and, of course, the printing speed. The studied flexographic printing process is described briefly in the following subchapters and the data for the EGP calculator is presented.

Setting up the machine for printing

Regardless of the length of the print job, the setup cost and effort required to start the printing are the same. In a long production run, a difference of one hour or an additional waste of 200 meters of substrate in makeready does not greatly affect the price per unit, but the shorter the job length, the greater the relative impact on the economics and the environment.

Setting up a flexo printing job includes the following steps:

1. Emptying the ink chambers
2. Washing the ink chambers
3. Changing the substrate
4. Changing the plate sleeves
5. Changing the anilox sleeves

6. Possibly changing of doctor blades and end seals if needed
7. Changing the ink
8. Job changes on the computer
9. Impression setting of the anilox and plate cylinder (or automatic)
10. Impression setting of the plate cylinder and substrate (or automatic)
11. Register setting
12. Color adjustment of the ink if needed
13. Job start acceptance

Production planning attempts to minimize the wash-ups by placing similar jobs one after the other. When the same, similar, or darker color is printed on the next run from the same printing unit, the ink change may be possible without washing the print unit or with a minimal wash-up. In the worst case, dark colors are replaced with a light color and the excessive washing takes time, requires a large amount of solvent, and causes some amount of wastage of ink.

The use of spot colors increases the number of press return inks and the size of the ink stock in contrast to process colors. The more unusual color tones or ink recipes are included in the job, the greater the risk that non-usable ink will remain after the print job.

The more ink changes over the year, the more washing solvent is used and every time a small amount of ink is washed away. Dirty solvent must be regenerated to be reusable. All of this takes effort, costs, and is a burden on the environment. By using process inks, color changes are avoided, improving overall efficiency and sustainability.

During the color setup, a certain amount of material is printed that is not marketable. This leads to a waste of ink, material, and time. In addition, toning a color requires good experience; otherwise it can also lead to additional waste.

The impact of machine setup on process economy, productivity, and sustainability was calculated and is shown in more detail below.

Ink consumption of spot and process colors

On the whole, ink consumption and cost are important, although ink usage on a single job is rather insignificant. Where a quick change and small number of colors are more important for small production lots, ink consumption also plays a greater role in large production lots.

There are two main reasons for the lower ink consumption of process colors. First, the ink film thickness of higher-concentration process inks is lower than the less concentrated spot colors because of the different aniloxes. Second, the total area coverage of process colors is lower because the colors are screened (rasterized) whereas spot colors are printed with full 100% coverage.

Solvent-based process ink is more concentrated than spot color ink and, due to this process color, is typically transferred at 3,0-4,5 cm^3/m^2 anilox, with the spot colors typically applied at 6,0-10,0 cm^3/m^2 anilox rolls for good and smooth coverage. For this reason, the ink consumption of spot color ink is higher than that of process ink.

Please note that spot color simulations often require more than just single process colors, thus a spot color simulation can be built from one or more process colors, as shown in Figure 40 for CMYK.

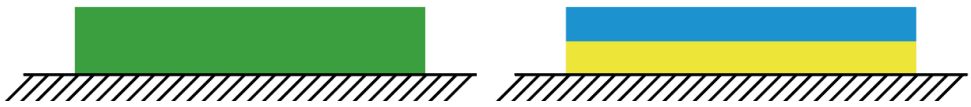


Figure 40 Ink film thickness of spot color green vs. 4c process color green (K. Lankinen)

However, multicolor separation uses additional primary process colors, such as OGV, to replace and save ink whenever possible, as shown in Figure 41.

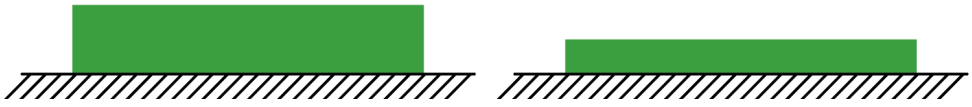


Figure 41 Ink film thickness of spot color green vs. 7c process color green (K. Lankinen)

Although the literature references have indicated ink transfer rates of 40% to 50% from the ink chamber to the substrate (DFTA-TZ, 2002; Kipphan, 2001), the values mentioned in public discussions have been between 15% and 50%, whereas many print professionals have estimated it to be around 25% to 30% (Lankinen, 2019).

Based on the above and the author's own experience, this study used an average estimation of ink transfer of 1/3, i.e., approx. 33%, to calculate the total wet ink transfer from the original anilox volume to the substrate. In addition, the relationship between the process color and the spot color was also rated at 50% in this study, whereby two process aniloxes with 3,5 cm^3/m^2 ink transfer correspond to an ink amount with a 7,0 cm^3/m^2 spot color anilox.

To validate previous expectations, an ink transfer test was performed with a SOMA flexo printing machine, as described in 2.1. In the test a solid area was printed on BOPP at 300 mpm using two similar process aniloxes (3,3 cm^3/m^2) and one spot color anilox (7,5 cm^3/m^2) to determine the ink transfer. Ink weight measurements were made in the Flint Group's ink laboratory, and the results of the comparative calculation made by the author are shown in Table 12.

Table 12 Ink transfer comparison between process and spot color printing (K. Lankinen)

INK TRANSFER MCO/SOMA/FLINT	**Plate 01**	**Plate 02**	**Plate 01 + Plate 02**	**Plate 03**
Anilox, lpcm / ccm/m2	**Anilox 1: 524 / 3,3**	**Anilox 2: 524 / 3,3**	**Anilox 1+2: 2x 524 / 3,3**	**Anilox 3: 280 / 7,5**
Ink viscosity (DIN 4), sec	**19**	**19**	**19**	**19**
Ink density, g/ccm	**0,95084**	**0,95084**	**0,95084**	**0,95084**
Solid content, %	**26,10%**	**26,10%**	**26,10%**	**26,10%**
Measurement	**Dry ink weight, g/m²**	**Dry ink weight, g/m²**	**Dry ink weight, g/m²**	**Dry ink weight, g/m²**
1	0,40	0,35	0,65	0,65
2	0,50	0,35	0,65	0,55
2	0,40	0,30	0,60	0,60
4	0,40	0,30	0,55	0,50
5	0,40	0,40	0,50	0,70
6	0,30	0,40	0,55	0,70
7	0,35	0,45	0,60	0,60
8	0,40	0,30	0,60	0,65
9	0,35	0,45	0,60	0,65
10	0,40	0,40	0,55	0,55
11	0,40	0,40	0,55	0,55
Average	**0,39**	**0,37**	**0,58**	**0,61**
Maximum, g/m2	0,50	0,45	0,65	0,70
Minimum, g/m2	0,30	0,30	0,50	0,50
Median, g/m2	0,40	0,40	0,60	0,60
Standard deviation, g/m2	0,05	0,06	0,05	0,07
Samples, (n)	11	11	11	11
Average dry ink weight, g/m2	**0,39**	**0,37**	**0,58**	**0,61**
Wet ink weight, g/m2	0,41	0,39	0,61	0,64
Wet ink volume, ccm/m2	1,58	1,50	2,34	2,45
Nominal anilox volume, ccm/m2	3,3	3,3	6,6	7,5
Dry content vs. Nominal anilox volume, %	11,8%	11,3%	8,8%	8,1%
Nominal wet ink transfer, %	**47,7%**	**45,5%**	**35,5%**	**32,7%**

As Table 12 shows, the 3,3 cm^3/m^2 process aniloxes alone transferred 47,7% and 45,5% ink, while overprinting the color twice with those aniloxes resulted in a

combined ink transfer of 35,5%. The ink transfer result of 32,7% with the 7,5 cm^3/m^2 spot color anilox confirmed the expectation that a typical spot color anilox would transfer around 33% of the nominal anilox volume. Based on the above calculation, it was expected that two process aniloxes with a nominal volume of 3,5 cm^3/m^2 would overprint a result comparable to a spot color anilox with a nominal volume of 7,0 cm^3/m^2.

The above is, of course, a generalization and real cases depend on many parameters such as anilox engraving, ink properties, printing plate, mounting tape, and substrate, which can affect ink transfer.

The ink transfer volume of an anilox roller is one factor, but the ink consumption is also affected by the surface coverage of the printed ink. Whereas spot colors are printed with full coverage of the printed area, process colors are printed with halftone screens, as shown in Figure 42. Hence, the unprinted gaps in halftone screen printing result in additional ink savings.

Figure 42 Full coverage spot color vs. halftone screening of process colors (K. Lankinen)

An interesting point, which is not always clear, is that the lighter colors in the process print consume less ink than the darker shades. The lighter the color, the greater the difference in the amount of ink consumed. Among other things, this will increase the effect of cost savings and ecology, as shown in Figure 43.

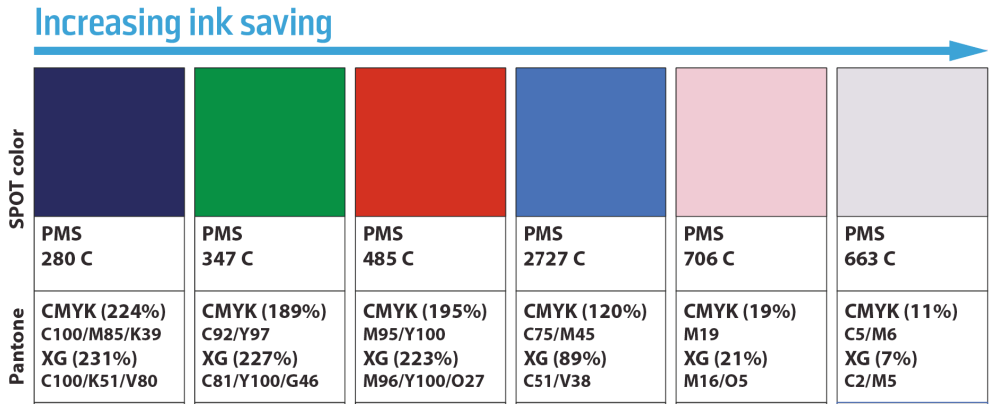


Figure 43 Ink consumption of process colors according to color lightness (K. Lankinen)

Similar results with ink savings have been confirmed in the majority of the previous studies and examples presented earlier (Braden Sutphin, 2007; Bauer, 2013; Klein, White paper: Full HD Flexo, 2014; Furr, The Effect of Press Variation on Color Stability with 7-color and 4-color Process Color Tint Builds, 2015; Marvaco Ltd, 2017; Comexi, 2018; Reproflex 3, 2019; Sun Chemical, 2019) with the exception of the study by Rich (Rich, 2012), who stated that there was no difference in ink consumption between spot and process color printing. So far, the author has not encountered any study that has led to increased ink consumption when comparing process printing with spot color printing.

Uptime, downtime, and lot size

To be able to work economically, the press must remain in operation. To increase productivity, downtime must be minimized and uptime maximized. A significant improvement in uptime is the minimization of makeready time and the avoidance of downtime, such as the cleaning of dirty printing plates. However, the main factor that influences the ratio of uptime and downtime is lot size.

The smaller the lot size, the more frequently job changes are made. As the proportion of setup time increases, keeping process colors fixed or using similar colors from job to job in the printing machine will shorten the setup time, i.e., reduce the downtime. Using fixed process colors in the machine can totally eliminate ink changes and increase productivity, as shown in Figure 44. Hence, more production jobs can be printed within the same time.

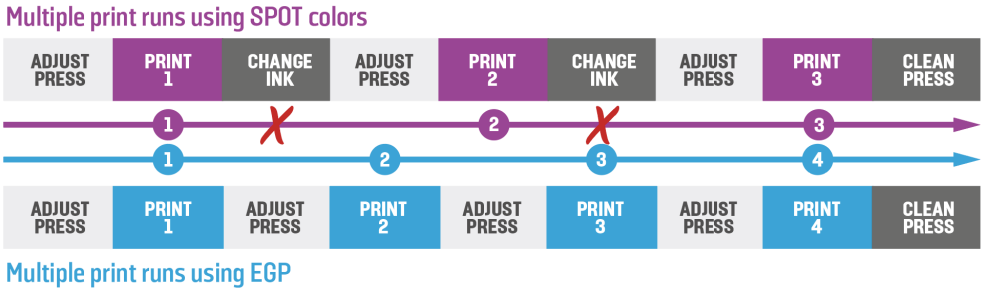


Figure 44 Shorter makeready increases productivity (Image: Derived from Esko's materials by K. Lankinen)

The shorter the job, the more important the number of colors and color changes per makeready. In order to make the printing costs per unit as efficient as possible, a small series should contain as few colors as possible and, if possible, be printed with process inks. With multicolor process printing, there is also often the possibility to reduce the number of plates used.

Production cost split

Overall, the annual production of a flexo machine is typically between 30 and 70 million meters with an average lot size of 15 to 60 km per order, with most orders having an average lot size of 15 to 35 km. According to the author's survey, as described in Chapter 2.1, the estimated cost split of a flexo printed job for printers according to the Western European cost structure was as follows:

Material cost of a typical plastic film was 1,75 €/kg, which was used to calculate the average value for a 1000 mm wide 40-micron plastic film.

Labor and auxiliary personnel costs were 825.000 €/year for two operators in three shifts for five days a week, including administrative costs.

Combined ink and solvent cost was 5,00 €/kg, which was used to calculate values both for a TAC of 75% and 150%, with a consumption of 3 g/m2.

Machine and auxiliary costs were 4.000.000 € for running a flexographic printing press for 10 years, including servicing and repairs.

Flexographic plates and reproduction costs were 500 €/m2 for a job in six colors with an area of 0,5 m2 per color used in six production runs.

The previous values resulted in the following production cost split:

Material costs	47%-68%
Labor & total personnel costs	9%-22%
Ink and solvent costs	8%-20%
Machine & auxiliary costs	5%-11%
Plates & repro	3%-14%

The previous summary was based on calculations using the printer survey results, as shown in Table 13. Annual output, job length, and ink coverage have a tremendous impact on the cost structure of a job. The personnel costs are a rough estimate, including printers, mounters, supervisors, QA, production planners, sales, administration, and development personnel, etc. The machine cost is also a rough estimate, including amortization, interests, energy, service, spare parts, tools, buildings, etc. In Table 13, the TAC in the left column is 75% and in the right column 150% (e.g., including white ink).

Table 13 Printing cost split estimation (K. Lankinen)

Per year	30 million meters	Job 15.000 m 2.000 pcs	Job 30.000 m 1.000 pcs	Job 60.000 m 500 pcs		Job 15.000 m 2.000 pcs	Job 30.000 m 1.000 pcs	Job 60.000 m 500 pcs
Material cost	1m width; 0,04g/m2; 1,75 €/kg	50%	54%	55%		47%	49%	51%
Labor & aux. pers. costs	3x2 operators + aux. & admins; 825.000 €/yr	20%	21%	22%		18%	19%	20%
Ink & solvent cost	TAC 75% and 150%; 3 g/m2; 5,00 €/kg	8%	9%	9%	or	15%	16%	16%
Machine & aux. costs	In 10 years; 4.000.000 €	10%	10%	11%		9%	9%	10%
Plates & repro	6x 0,5m2; x6 runs; 500 €/m2	12%	6%	3%		11%	6%	3%

Per year	50 million meters	Job 15.000 m 3.333 pcs	Job 30.000 m 1.667 pcs	Job 60.000 m 833 pcs		Job 15.000 m 3.333 pcs	Job 30.000 m 1.667 pcs	Job 60.000 m 833 pcs
Material cost	1m width; 0,04g/m2; 1,75 €/kg	57%	61%	64%		52%	56%	58%
Labor & aux. pers. costs	3x2 operators + admins; 825.000 €/yr	13%	14%	15%		12%	13%	14%
Ink & solvent cost	TAC 75% and 150%; 3 g/m2; 5,00 €/kg	9%	10%	10%	or	17%	18%	19%
Machine & aux. costs	In 10 years; 4.000.000 €	7%	7%	7%		6%	6%	7%
Plates & repro	6x 0,5m2; x6 runs; 500 €/m2	14%	7%	4%		12%	7%	3%

Per year	70 million meters	Job 15.000 m 4.667 pcs	Job 30.000 m 2.333 pcs	Job 60.000 m 1.167 pcs		Job 15.000 m 4.667 pcs	Job 30.000 m 2.333 pcs	Job 60.000 m 1.167 pcs
Material cost	1m width; 0,04g/m2; 1,75 €/kg	61%	65%	68%		55%	59%	61%
Labor & aux. pers. costs	3x2 operators + admins; 825.000 €/yr	10%	11%	11%		9%	10%	10%
Ink & solvent cost	TAC 75% and 150%; 3 g/m2; 5,00 €/kg	10%	11%	11%	or	18%	19%	20%
Machine & aux. costs	In 10 years; 4.000.000 €	5%	5%	6%		5%	5%	5%
Plates & repro	6x 0,5m2; x6 runs; 500 €/m2	14%	8%	4%		13%	7%	4%

The cost split based on Table 13 is visualized in Figure 45.

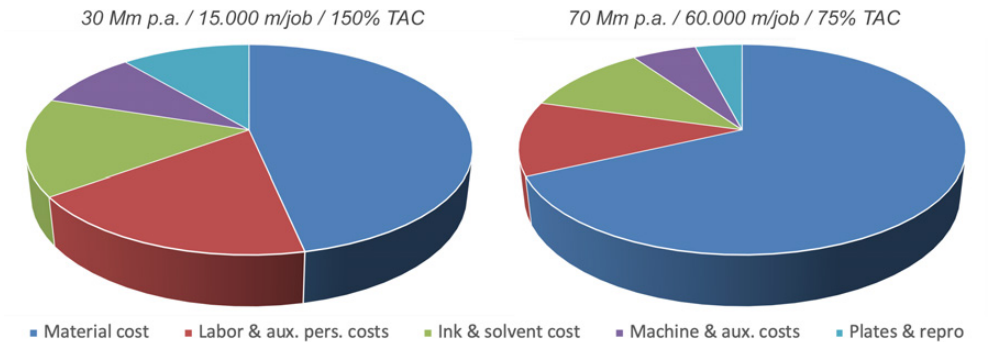


Figure 45 Cost split of a flexible packaging printing job

Printing press setup values

In order to verify the functionality of the calculator and the accuracy of the values used, data on the empirical makeready time and setup waste, as well as process wash time, solvent consumption, and ink waste was obtained from the survey of printers and printing machine manufacturers and summarized by the author.

Eight responses from seven participants were collected, interpolated, and summarized in Table 14 and Table 15. These values were used to calculate the OEE results, which are presented below.

Table 14 Setup material waste and time of a print job (K. Lankinen)

SETUP	SETUP METERS				SETUP TIME				
Sampling: 8	Minimum	Maximum	Average	Median	Minimum	Maximum	Average	Median	
CMYK	20 m	500 m	**234 m**	160 m	5 min	30 min	**19 min**	20 min	
CMYK+1EG*	20 m	533 m	**252 m**	182 m	6 min	33 min	**21 min**	22 min	* *Interpolated figure*
CMYK+2EG*	20 m	567 m	**270 m**	203 m	6 min	37 min	**23 min**	23 min	* *Interpolated figure*
CMYK+OGV	20 m	600 m	**288 m**	225 m	7 min	40 min	**25 min**	25 min	
CMYK + 1x spot	200 m	800 m	**475 m**	415 m	17 min	75 min	**51 min**	52 min	
CMYK + 2x spot	300 m	1.000 m	**569 m**	440 m	27 min	120 min	**74 min**	81 min	
CMYK + 3x spot	350 m	1.500 m	**694 m**	465 m	30 min	160 min	**94 min**	102 min	

Concerning the makeready waste for multicolor process printing, a minimum wastage of 20 meters and for spot color printing a minimum waste of 200 to 350 meters was reported. Likewise, a maximum of 500 to 600 meters was reported for multicolor process printing and 800 to 1500 meters for spot color printing. These answers averaged 234 to 288 meters of setup waste for multicolor process printing and 475 to 694 meters for spot color printing.

Regarding the makeready time for multicolor process printing, a minimum job changeover time of 5 to 7 minutes and for spot color printing a minimum time of 17 to 30 minutes was reported. Also, a maximum of 30 to 40 minutes was reported for multicolor process printing and 75 to 160 minutes for spot color printing. These answers averaged 19 to 25 minutes of setup time for multicolor process printing and 51 to 94 minutes for spot color printing. The average setup waste and time are shown in Figure 46.

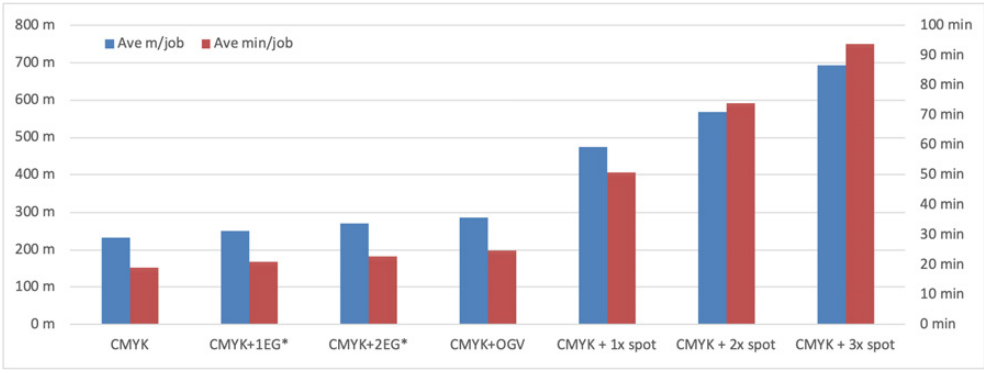


Figure 46 Average setup waste and time per job

Each time the ink or anilox is changed, the previous ink must be washed out of the ink chamber. All the printing units can be washed at the same time, but the amount of solvent used and ink washed off per printing unit was determined, as shown in Table 15.

Table 15 Wash-up time, solvent use, and ink waste (K. Lankinen)

WASH PER COLOR	WASH-UP TIME				USED WASHING SOLVENT				WASHED INK WASTE			
Sampling: 8	Minimum	Maximum	Average	Median	Minimum	Maximum	Average	Median	Minimum	Maximum	Average	Median
Between CMYK jobs	0 min	0 min	0 min	0 min	0,0 L	0,0 L	0,0 L	0,0 L	0,0 kg	0,0 kg	0,0 kg	0,0 kg
Between SPOT jobs	4 min	20 min	12 min	13 min	8,0 L	24,0 L	14,1 L	12,5 L	0,5 kg	1,5 kg	0,9 kg	0,8 kg

Because multicolor process printing eliminates the need to change colors from job to job, the ink chambers do not need to be washed, and neither solvent nor ink is wasted. According to the survey sent to printers and printing machine manufacturers, washing off a spot color took at least 4 minutes, with a maximum of 20 minutes and an average of 12 minutes. The consumption of washing solvent was at least 8,0 liters, with a maximum of 24,0 liters and an average of 14,1 liters of solvent, washing at least 0,5 kg, at most 1,5 kg, and an average of 0,9 kg of ink.

3.1.1 Introduction to the EGP efficiency calculator

The unique EGP calculator developed by the author during this study included inputting the basic data, as described in Chapter 2.1, and obtaining the output data presented in the following pages. The development over the years required a large number of simulations with real data from the printers to confirm that the calculations matched real production closely. In addition, the calculator has unique functions for describing OEE and sustainability factors in print production.

The basic functions of the EGP calculator are as follows:

The basic data was entered as shown in Table 16 and Table 17, where job setup times were used together with production data such as operating hours and days in order to obtain the total makeready time per job, annual print capacity, and average hourly printing press productivity.

To achieve the above, Table 16 required input values such as the time needed to empty the ink chambers, washing the ink chambers, changing the printing sleeves, changing the aniloxes, changing the ink, job change on the computer, impression settings, register settings, color adjustment, and quality assurance including job acceptance. Good production planning to reduce setup time as a result of printing consecutive jobs with similar colors was also taken into account.

In addition to the above, Table 17 required input values such as the time of press availability and downtime, as well as the printing speed, job length, and start-up waste. Additionally, production time was entered as the number of shifts per day, working days per week, and working months per year. All other parts of the table were calculated from these and the data mentioned above.

Based on the previous entries, Table 18 only required input of the maximum mechanical printing press speed in order to display the values for the overall equipment effectiveness according to Equation 6.

Table 19 required input of the targeted annual printing production and printing press operation cost per hour in order to calculate and display the values for the required production time, the production time saved, and the cost savings based on the saved time.

Table 20 required input of the substrate width, substrate weight, and selling price of the printed material in order to calculate and display the amount of production in kilograms and the values for the potential increase in sales per year, based on the annual capacity according to Table 17.

Table 21 required input of the spot and process color anilox volumes, the ink transfer rate of the aniloxes, the printed areas of the spot and process colors of the design, the TACs of the spot and process colors as well as the price of the colored spot and process inks, in order to calculate and display the values for the estimated

total ink consumption and price, leading to the savings of colored inks in kilograms and euros in accordance with the targeted annual production. It is important to note that the printed area has a major impact on total ink consumption.

Table 22 required input of the number of process washes per week, consumed washing solvent per wash, and estimated waste of ink per wash in order to obtain the amount of annually washed spot colors, washing solvent used, and wasted ink due to process washes. The value of the washed ink was calculated and displayed according to the prices shown in Table 21 and according to the targeted annual production volume shown in Table 19. The calculation assumed that, with good production planning, the number of process washes would be reduced, as listed in Table 16.

Table 23 required input of the total number of stored ink bins in the stock, the percentage of spot color gamut covered by the multicolor gamut, the amount of returned ink from the press per color, and the estimated amount of non-marketable stored inks per year in order to present the size and value of the ink stock as well as the amount and value of the annually wasted ink. The calculated value of the ink stock was based on the spot color ink price shown in Table 21. The calculation assumed that the amount of inks to be stored for EGP printing was 1:1 in relation to the EGP color gamut size.

Table 24 required input of the amount and cost of the energy used for solvent regeneration, the level of distilling process yield and the cost of fresh solvent, as well as the cost of distillation waste handling in order to present the annual cost of the cleaning solvent regeneration according to the targeted annual production volume, as shown in Table 19. The table shows the number of annual spot and process color washes, the annual amount of solvent used, the quantity and value of the lost solvent, the cost of waste handling, and the energy consumption and cost of distilling.

Table 25 required input of the cost of printing substrate in order to present the annual setup waste material savings according to the targeted annual production volume, as listed in Table 19.

Table 26 required input of the Global Warming Potential CO_2 equivalent per ink kilogram used in order to present the annual ink consumption CO_2 equivalent for the colored inks, according to Table 21.

Table 27 used the above entered data in order to present the annual CO_2 equivalence for the ink washed off during the cleaning of the ink station, according to the targeted annual production volume, as shown in Table 19.

Table 28 required input of the Global Warming Potential CO_2 equivalent of solvent regeneration energy and washing solvent used in order to present the annual CO_2 equivalent for the regenerated washing solvent, according to the targeted annual production volume, as listed in Table 19.

Table 29 required entering the greenhouse gas CO_2 equivalent per kilogram of primary production of substrate used in order to present the annual CO_2 equivalent for the primary production of the substrate wasted during the setup, according to the targeted annual production volume as given in Table 19.

Table 31 summarized the previous values to present the CO_2 equivalent of ink consumption, washed ink, stock ink waste, regenerated washing solvent, and loss of solvent as well as setup substrate waste.

3.1.2 EGP efficiency calculations

The empirical data described above were used as the basis for the calculations of the different color strategies presented in the following pages.

Makeready

The figures in Table 16 were derived from discussions and data received from multiple printers over the years and adapted with the averaged setup time information received from the survey sent to printers and press manufacturers.

Table 16 Basic data comparing machine setup of spot and EGP job (K. Lankinen)

Gearless machine:	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Used process colors	*4 pcs*	*5 pcs*	*6 pcs*	*7 pcs*	*4 pcs*	*4 pcs*	*4 pcs*
Used spot colors	*0 pcs*	*0 pcs*	*0 pcs*	*0 pcs*	*1 pcs*	*2 pcs*	*3 pcs*
Emptying ink chambers	0 min	0 min	0 min	0 min	3 min	3 min	3 min
Washing of ink chambers	0 min	0 min	0 min	0 min	11 min	11 min	11 min
Change of print sleeves	4 min	5 min	6 min	7 min	5 min	6 min	7 min
Change of anilox sleeves	0 min	0 min	0 min	0 min	1 min	2 min	3 min
Change of ink	0 min	0 min	0 min	0 min	3 min	6 min	9 min
Job change on computer	3 min	3 min	3 min	3 min	3 min	3 min	3 min
Similar spot inks run consecutively	0 min	0 min	0 min	0 min	-3 min	-5 min	-7 min
Impression settings	4 min	4 min	4 min	4 min	4 min	4 min	4 min
Register settings	4 min	4 min	4 min	4 min	4 min	4 min	4 min
Color adjustment (total time)	0 min	0 min	0 min	0 min	16 min	31 min	44 min
QA & job acceptance	5 min	6 min	6 min	6 min	6 min	6 min	6 min
Total Makeready Time per job	**20 min**	**22 min**	**23 min**	**24 min**	**53 min**	**71 min**	**87 min**

Table 16 has been arranged to display the process printing setups from 4-color process printing (CMYK) to 7-color process printing (OGV colors of EGP) on the left side, and CMYK process printing with additional 1 to 3 spot colors on the right side. The basic assumption was that a machine uses the same type of color setup, e.g., CMYK+1c EGP for the entire calculation period (one year, for instance).

Second, it was assumed that the process colors remain fixed in the press throughout the week and the process ink aniloxes in the press were washed only once a week. Regarding the spot colors, it was assumed that the CMYK inks remain unchanged in the press and only the spot colors were changed during a job change, with the exception that 10% of the jobs were run sequentially without the spot color being changed due to good production planning ("Similar spot colors run consecutively"). In addition, it was assumed that any possible substrate reel change was done during the other preparations without affecting the overall setup time.

The parameters of the calculation setup as shown in Table 16 were as follows:

Emptying ink chambers: 0 min for process colors and 3 min per spot color

Washing of ink chambers: 0 min for process colors and total 11 min for spot colors

Change of print sleeves: 1 min per color (common for all colors)

Change of anilox sleeves: 1 min per changed spot color

Change of ink: 3 min per changed spot color

Job change on computer: 3 min total (common for all jobs)

Similar spot inks run consecutively: 10% reduction of affected spot color setup time

Impression settings: 4 min for all colors

Register settings: 4 min for all colors

Color adjustment (total time): 0 min for process colors and approx. 15 min per spot color

QA & job acceptance: 5-6 min per job

The previous setup parameters gave a calculated total makeready time of 20 to 24 minutes for process printing and 53 to 87 minutes for spot color printing, as shown in Figure 47. These times corresponded to the averaged results obtained from the survey of printers and press manufacturers, as described in Chapter 2.1.

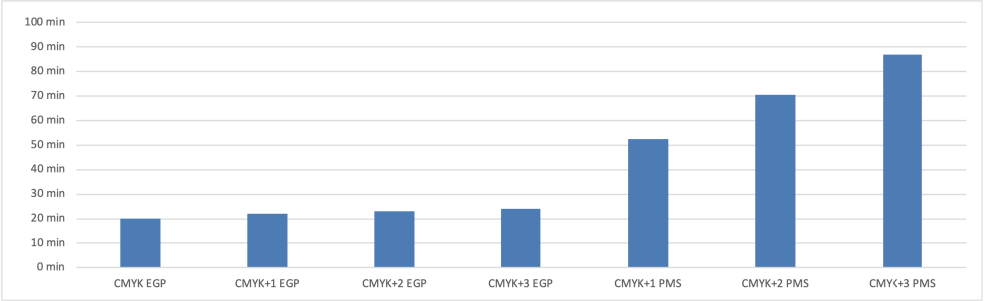


Figure 47 Total makeready per job for different color strategies

Productivity calculations

Based on the previous figures and adapted setup waste feedback from printers and press manufacturers, the productivity calculations are listed in Table 17.

Table 17 EGP and spot color productivity of printing machine (K. Lankinen)

Gearless machine:	**CMYK EGP**	**CMYK+1 EGP**	**CMYK+2 EGP**	**CMYK+3 EGP**	**CMYK+1 PMS**	**CMYK+2 PMS**	**CMYK+3 PMS**
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Total time per shift	*7,50 h*	*7,50 h*	*7,50 h*	*7,50 h*	*7,50 h*	*7,50 h*	*7,50 h*
Run Speed	275 mpm	275 mpm	275 mpm	275 mpm	275 mpm	275 mpm	275 mpm
Job length	15.000 m	15.000 m	15.000 m	15.000 m	15.000 m	15.000 m	15.000 m
Start-up waste	212 m	222 m	232 m	242 m	434 m	517 m	643 m
Start-up waste - %	*1,4%*	*1,5%*	*1,5%*	*1,6%*	*2,8%*	*3,3%*	*4,1%*
Setup time per job	0,33 h	0,37 h	0,38 h	0,40 h	0,88 h	1,18 h	1,45 h
Run time per job	0,91 h	0,91 h	0,91 h	0,91 h	0,91 h	0,91 h	0,91 h
Total production time per job	*1,24 h*	*1,28 h*	*1,29 h*	*1,31 h*	*1,79 h*	*2,09 h*	*2,36 h*
Run time - % (vs. Setup time)	*73%*	*71%*	*70%*	*69%*	*51%*	*44%*	*39%*
Process color washes per week	1,0 pcs	1,0 pcs	1,0 pcs	1,0 pcs	0,0 pcs	0,0 pcs	0,0 pcs
Jobs per shift	6,0 pcs	5,9 pcs	5,8 pcs	5,7 pcs	4,2 pcs	3,6 pcs	3,2 pcs
Jobs per 3 shifts a day	18,1 pcs	17,6 pcs	17,4 pcs	17,2 pcs	12,6 pcs	10,8 pcs	9,5 pcs
Jobs per 5 days a week	90,5 pcs	88,2 pcs	87,0 pcs	85,9 pcs	63,0 pcs	53,9 pcs	47,7 pcs
Jobs per 48-week year	**4.346 pcs**	**4.233 pcs**	**4.178 pcs**	**4.125 pcs**	**3.024 pcs**	**2.587 pcs**	**2.289 pcs**
Capacity meters per week	1.358.232 m	1.322.743 m	1.305.686 m	1.289.063 m	944.977 m	808.413 m	715.318 m
Capacity meters per year	**65.195.122 m**	**63.491.686 m**	**62.672.919 m**	**61.875.000 m**	**45.358.900 m**	**38.803.803 m**	**34.335.260 m**
Average productivity /hour	*12.073 m*	*11.758 m*	*11.606 m*	*11.458 m*	*8.400 m*	*7.186 m*	*6.358 m*

In the calculations, manned machine availability corresponded to a total production time of 8 hours per day minus lunch break and coffee break (0,5 h). The running speed averaged 275 mpm and the order length was rather short (15.000 meters), which is very typical for many printers today. The setup waste per printing process type were derived from the answers of the printers (see Table 14) and the setup time from the calculations in Table 16. Process anilox washing only took place once a week and this was omitted in the calculations because the time was so short.

Production results were calculated based on 3 shifts per day, 5 days per week, 48 weeks per year.

The results showed that pure process color printing yielded about 62 to 65 million meters per year, whereas spot color printing only yielded about 34 to 45 million meters per year, as shown in Figure 48. This means that, compared to CMYK + 3c spot color printing, efficiency was increased by up to 32% with CMYK + 1c spot color printing, while switching to process-only printing (4c- to 7c- EGP) yielded an increase in productivity of up to 80 - 90%. This resulted in an increase from about 2.300 - 3.000 jobs to about 4.100 - 4.300 jobs printed each year.

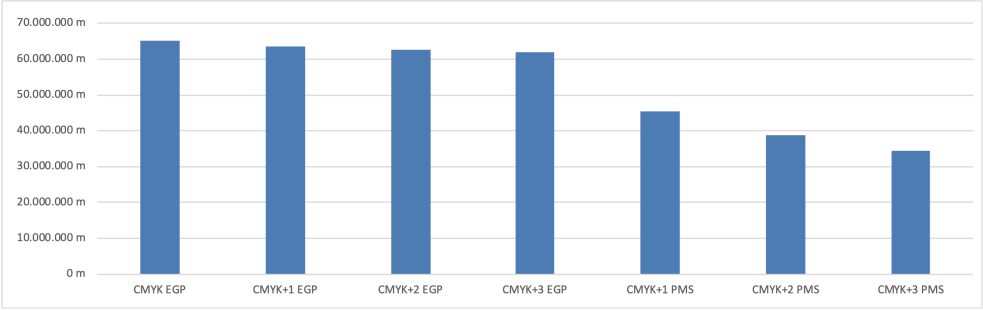


Figure 48 Capacity meters per year for different color strategies

Printing efficiency can be approached from a variety of perspectives, and there are many factors that affect the total efficiency of a job. One way to describe the printing efficiency is to calculate the Overall Equipment Effectiveness of the printing process.

OEE – Overall Equipment Effectiveness

OEE describes how effectively a manufacturing process is used. OEE is a calculation formula in which the performance of the manufacturing process is divided into three measurable components (availability, performance and quality), as shown in Equation 6.

$$\text{OEE} = \text{Availability} \times \text{Performance} \times \text{Quality} \quad (6)$$

The maximum score of OEE is 100%. This means that the process produces only good units (100% Quality) as fast as possible (100% Performance) with no stoppage time (100% Availability) (Vorne Industries Inc., 2019).

It is unlikely that a manufacturing process can operate at 100% OEE, but manufacturers set the World-Class benchmark at 85% (Availability 90,0%, Performance 95,0%, Quality 99,9%) (Vorne Industries Inc., 2008), which is challenging but not an unusual target.

On the basis of the example efficiency calculations made with the EGP calculator and discussions with numerous printers, the author concluded that the traditional flexo printing process had a typical OEE of between 25% and 45%. According to the responses from printers (see Table 17), the waste in spot color printing in the example case was from 2,8% to 4,1% for a job length of 15.000 meters and the EGP waste from 1,4% to 1,6%, due to its more efficient job makeready. The performance was calculated at a mechanical machine speed of 400 mpm, with the press speeds for spot color and EGP printing being 275 mpm. Availability was calculated at 94% of manned hours per shift. The calculations showed a noticeable difference between the makeready time of a traditional spot color job and an EGP job, as shown in Table 18.

Table 18 Spot vs. EGP printing: OEE calculation (K. Lankinen)

OEE CALCULATION 1 – OVERALL EQUIPMENT EFFECTIVENESS* – 3 shifts per day, 5 days per week, 48 weeks per year

Gearless machine:	**CMYK EGP**	**CMYK+1 EGP**	**CMYK+2 EGP**	**CMYK+3 EGP**	**CMYK+1 PMS**	**CMYK+2 PMS**	**CMYK+3 PMS**
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Quality (incl. setup waste)	98,6%	98,5%	98,5%	98,4%	97,2%	96,7%	95,9%
Performance	68,8%	68,8%	68,8%	68,8%	68,8%	68,8%	68,8%
Availability	78,0%	76,0%	75,0%	74,1%	54,3%	46,5%	41,1%
OEE	**52,9%**	**51,5%**	**50,8%**	**50,1%**	**36,3%**	**30,9%**	**27,1%**
Relative productivity	100%	97%	96%	95%	69%	58%	51%

The previous example shows how the production efficiency of a 7-color job increased from 27% to 50% (increase of +85%) and a 5-color job from 36% to 52% (increase of +42%). The OEE of different color strategies is shown in Figure 49. It should be noted that 4-color printing was the most effective way to print a colorful image.

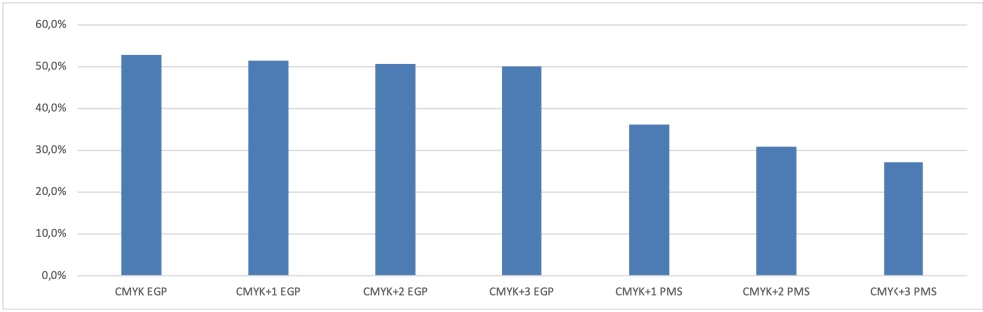


Figure 49 OEE of different color strategies

Increasing efficiency will free up capacities that can be utilized in many ways, but in all cases offers potential for improving profitability. If it is not possible to produce more, the working time can be shortened and savings will then be mainly the saved working time and additional shifts. If it is possible to do more jobs, this can be used to increase sales with better profitability.

Value of saved production time

The above-mentioned makeready times with an average order length of 15.000 meters would yield a capacity of 34 to 65 million meters per year in 3 shifts and 5 days for 48 weeks. On average, this would result in an annual production of 50 million meters and 3.333 jobs.

Based on the makeready times for each printing setup and the parameters in the example case, an annual production of 50 million meters would require about 4.100 to 7.900 hours, as shown in Table 19. This means that CMYK+3PMS would require twice the number of hours to execute the same print jobs as CMYK or CMYK+3EGP colors.

Table 19 Spot vs. EGP printing: saved production time calculation (K. Lankinen)

ROI CALCULATION 2 – SAVED PRODUCTION TIME* – 3 shifts per day, 5 days per week, 48 weeks per year

Gearless machine:	**CMYK EGP**	**CMYK+1 EGP**	**CMYK+2 EGP**	**CMYK+3 EGP**	**CMYK+1 PMS**	**CMYK+2 PMS**	**CMYK+3 PMS**
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Production target per year	50.000.000 m	50.000.000 m	50.000.000 m	50.000.000 m	50.000.000 m	50.000.000 m	50.000.000 m
Production time need	4.141 h	4.253 h	4.308 h	4.364 h	5.953 h	6.958 h	7.864 h
Difference to CMYK	0 h	111 h	167 h	222 h	1.811 h	2.817 h	3.722 h
Machine operation cost per hour	300 €/h	300 €/h	300 €/h	300 €/h	300 €/h	300 €/h	300 €/h
Extra cost per machine	0 €	33.333 €	50.000 €	66.667 €	543.333 €	845.000 €	1.116.667 €
Capacity	100%	97%	96%	95%	70%	60%	53%

The difference between CMYK and CMYK+3EGP colors is minimal (223 hours), whereas the difference between CMYK+1PMS and CMYK+3PMS is greater (1.911 hours). Moreover, the difference between CMYK+3EGP and CMYK+3PMS is huge (3.500 hours).

According to this example, for an average total machine costing 300 €/hour, the difference of running the same jobs with CMYK and spot colors instead of EGP would result in an additional cost of about 500.000 to 1.000.000 euros per machine per year, as shown in Figure 50.

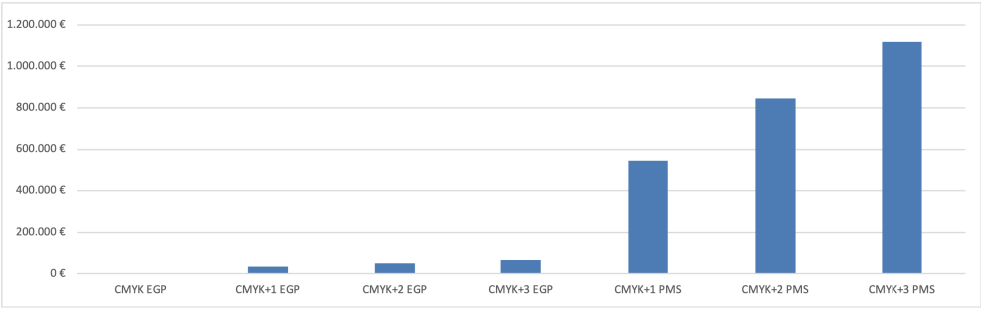


Figure 50 Extra cost per machine for different color strategies

Value potential of increase in sales

Using the additional production time to produce more orders increases sales and also improves sales margins, since the fixed costs are already covered and the additional sales only generate variable costs. The increase in sales on the basis of the example figures and a substrate of 100 cm width with a weight of 40 g/m² and an imaginary product sales price of 3 €/kg resulted in the calculation shown in Table 20.

Table 20 Spot vs. EGP printing: increased sales calculation (K. Lankinen)

ROI CALCULATION 3 – INCREASED PRODUCTION SALES – 3 shifts per day, 5 days per week, 48 weeks per year

Gearless machine:	**CMYK EGP**	**CMYK+1 EGP**	**CMYK+2 EGP**	**CMYK+3 EGP**	**CMYK+1 PMS**	**CMYK+2 PMS**	**CMYK+3 PMS**
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Capacity meters per year	65.195.122 m	63.491.686 m	62.672.919 m	61.875.000 m	45.358.900 m	38.803.803 m	34.335.260 m
Capacity kg per year	2.607.805 kg	2.539.667 kg	2.506.917 kg	2.475.000 kg	1.814.356 kg	1.552.152 kg	1.373.410 kg
Sales € per year	7.823.415 €	7.619.002 €	7.520.750 €	7.425.000 €	5.443.068 €	4.656.456 €	4.120.231 €
Increased sales per machine	3.703.183 €	3.498.771 €	3.400.519 €	3.304.769 €	1.322.837 €	536.225 €	0 €
Jobs per year	4.346 pcs	4.233 pcs	4.178 pcs	4.125 pcs	3.024 pcs	2.587 pcs	2.289 pcs
Capacity	190%	185%	183%	180%	132%	113%	100%

According to this example, producing more jobs with fewer spot colors would increase sales of these imaginary products by about 500.000 to 3.700.000 euros per machine per year as capacity was released, as shown in Figure 51. This means that a machine fleet can generate more turnover with EGP than with spot color printing.

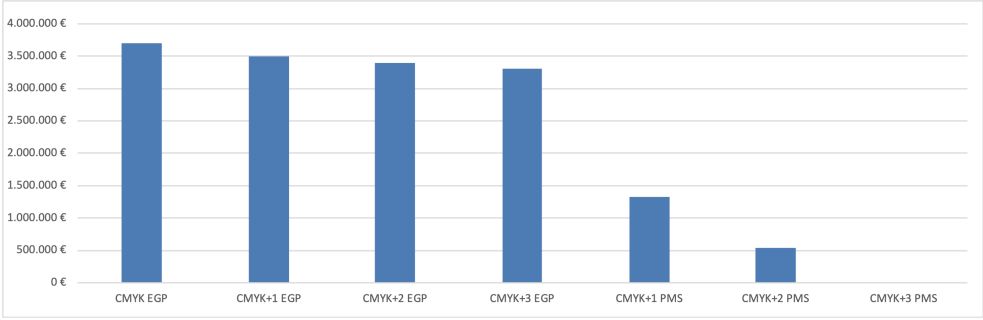


Figure 51 Increased sales per machine for different color strategies

It should be noted that the numbers in the example calculations are hypothetical and assume that a single machine would be restricted to a certain type of printing. Even though the real values would be below the values given in the example, the magnitude of the increase in production gives an indication of the development direction in the transition from spot color printing to EGP.

Value of ink savings

As stated earlier, the typical ink savings in the transition from spot color printing to expanded gamut printing have been on average around 20%. This is due to the aforementioned reasons, i.e., a smaller volume of ink used to create the colors and images.

The example calculation in Table 21 used the following assumptions:

An 8,0 cm^3/m^2 anilox used for spot color printing and a 3,5 cm^3/m^2 anilox for multicolor process printing.

Both of the above aniloxes had a total ink transfer of 33% per color.

An imaginary product with a process printed area of 33% and spot color printed area of 33%.

A TAC for spot colors of 100% and for process colors 150%.

The ink price evaluated as 4,5 €/kg for spot colors and 5,5 €/kg for process colors.

Table 21 Spot vs. EGP printing: ink saving calculation (K. Lankinen)

ROI CALCULATION 4 – INK SAVINGS (COLORED INKS) – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK Image	Spot simulation (EGP)		CMYK Image	Spot color (Spot)
Printed area of the product	33%	33%		33%	33%
Anilox volume	3,5 ccm/m2	3,5 ccm/m2		3,5 ccm/m2	8,0 ccm/m2
TAC (Total Area Coverage)	150%	150%		150%	100%
Production target per year	50.000.000 m	50.000.000 m		50.000.000 m	50.000.000 m
Ink consumption kg per year	28.875 kg	28.875 kg		28.875 kg	44.000 kg
Ink cost € per year	158.813 €	158.813 €		158.813 €	198.000 €
Total kg and euros	**57.750 kg**	**317.625 €**		**72.875 kg**	**356.813 €**
Difference in kg and euros	-15.125 kg	-39.188 €			
Difference-% of kg and euros	-21%	-11%			

As the previous example calculation showed, the ink consumption for producing 50 million meters of a 100 cm wide product would be about 58.000 to 73.000 kilograms and the ink price about 318.000 to 357.000 euros. This shows that creating the spot colors by simulating EGP printing in this case offers the potential benefit of savings in ink of about 15.000 kg (21%) and 39.000 euros (11%).

The importance of ink reduction in kilograms and sustainability is greater than the cost savings. This is because the price of higher-concentration inks is higher for process colors than for spot colors.

The savings in ink consumption are one aspect, but the other aspect is to save ink every time the ink is changed. Each time a spot color is washed off the printing unit, a certain amount of ink is also washed off, as shown in the calculations in Table 22.

Table 22 Spot vs. EGP printing ink wash-off calculation (K. Lankinen)

ROI CALCULATION 5 – WASHING OF INK – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Washing of ink	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Process color washes per year	192 pcs	240 pcs	288 pcs	336 pcs	192 pcs	192 pcs	192 pcs
Number of spot washes per year	0 pcs	0 pcs	0 pcs	0 pcs	3.000 pcs	6.000 pcs	9.000 pcs
Washing solvent used per year	2.707 L	3.384 L	4.061 L	4.738 L	45.007 L	87.307 L	129.607 L
Washed ink per year, kg	173 kg	216 kg	259 kg	302 kg	2.873 kg	5.573 kg	8.273 kg
Value of washed ink per year, €	**950 €**	**1.188 €**	**1.426 €**	**1.663 €**	**14.450 €**	**27.950 €**	**41.450 €**
Reduction of ink consumption	98%	97%	97%	96%	65%	33%	0%

Process inks can be kept for a long time in the printing unit and only one wash per week is required. In contrast, spot colors must be washed off with each color change. The example calculation was based on the approximation that 3.333 jobs (equivalent to 50 million meters at 15.000 meters per job) would be changed annually, unless

the production planning was able to arrange the jobs consecutively so that some ink would not have to be changed (10% of the cases in the calculation).

The example calculations used 14,1 l/wash of solvent per color and the washed ink was 0,9 kg/wash of ink per color. The calculation showed that process color printing would consume about 3.000 to 5.000 liters of wash solvent and wash about 170 to 300 kg of ink, while the spot color printing would consume about 45.000 to 130.000 liters of wash solvent and wash about 2.900 to 8.300 kg of ink.

The cost of washed ink was calculated at an estimate of 4,5 €/kg for spot color ink and 5,5 €/kg for process color ink. The value of wasted process ink per year was several hundreds of euros, while the value of wasted spot color ink was tens of thousands of euros, as shown in Figure 52.

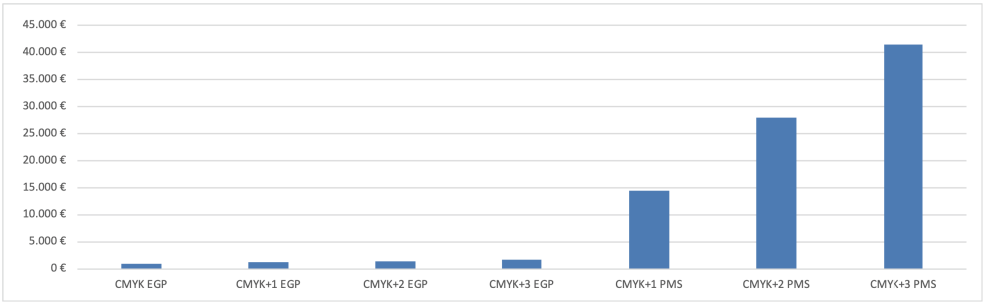


Figure 52 Cost of washed ink per year for different color strategies

In addition to ink savings, capital is also tied up in ink storage, which according to the calculations performed can be minimized by moving from spot color printing to EGP, as shown in Table 23.

Table 23 Spot vs. EGP printing: ink stock calculation (K. Lankinen)

ROI CALCULATION 6 – INK STOCK SIZE (COLORED INKS) – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	Spot color stock with EGP system			Spot color stock with spot color system	
Number of return ink bins in stock	45 pcs			450 pcs	
Stock size, kg	675 kg			6.750 kg	
Stock value, €	3.038 €			30.375 €	
Annual non-marketable inks	20%			20%	
Annual wasted ink kg and CO2 kg	135 kg	CO2: 445 kg		1.350 kg	CO2: 4.446 kg
Annual wasted €	608 €			6.075 €	

In the previous calculation it was assumed that, when printing with spot colors, an average of 450 return ink bins would be needed in stock. Since multicolor process printing covers up to 90% of spot colors, the ink stock was calculated to be 45 return ink bins for process colors. It was assumed that the return ink would be 15 kg per ink at a price of 4,5 €/kg (spot color), and the annual non-reusable waste ink was estimated at 20% of the ink stock size. This resulted in an inventory value of approx. 3.000 euros for the process color system and approx. 30.000 euros for spot color ink stock. The annual waste for the process ink system was 135 kg (608 €) compared to 1.350 kg (6.075 €) for the spot color system. These values were not very high, but each saving affects the overall savings, and process printing was shown to be more advantageous in this case also compared to the spot color system.

Value of washing solvent regeneration

The more ink is washed, the more washing solvent needs to be regenerated (distilled). Table 24 shows the amount of solvent needed for the process wash and the solvent wasted during solvent regeneration in the example calculations.

Table 24 Spot vs. EGP printing: washing solvent regeneration calculation (K. Lankinen)

ROI CALCULATION 7 – CLEANING SOLVENT REGENERATION– 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	**CMYK EGP**	**CMYK+1 EGP**	**CMYK+2 EGP**	**CMYK+3 EGP**	**CMYK+1 PMS**	**CMYK+2 PMS**	**CMYK+3 PMS**
Cleaning solvent regeneration	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Process color washes per year	192 pcs	240 pcs	288 pcs	336 pcs	192 pcs	192 pcs	192 pcs
Number of spot washes per year	0 pcs	0 pcs	0 pcs	0 pcs	3.000 pcs	6.000 pcs	9.000 pcs
Washing solvent used per year	2.707 L	3.384 L	4.061 L	4.738 L	45.007 L	87.307 L	129.607 L
Lost solvent in regeneration, L	541 L	677 L	812 L	948 L	9.001 L	17.461 L	25.921 L
Value of lost solvent, €	812 €	1.015 €	1.218 €	1.421 €	13.502 €	26.192 €	38.882 €
Value of solvent waste handling, €	541 €	677 €	812 €	948 €	9.001 €	17.461 €	25.921 €
Energy used in distillation, kWh	1.083 kWh	1.354 kWh	1.624 kWh	1.895 kWh	18.003 kWh	34.923 kWh	51.843 kWh
Cost of energy of distillation, €	271 €	338 €	406 €	474 €	4.501 €	8.731 €	12.961 €
Cost of solvent regeneration, €	**1.624 €**	**2.030 €**	**2.436 €**	**2.843 €**	**27.004 €**	**52.384 €**	**77.764 €**
Reduction of energy consumption	98%	97%	97%	96%	65%	33%	0%

The basis for the previous calculations was that 14,1 liters of solvent were used for each process wash and that the regeneration of the contaminated solvent gave an average yield of 80% (i.e., 20% of the solvent is lost during distillation). As a result, the waste solvent must be handled in waste management and replaced with fresh solvent. The energy consumed in distillation was estimated at 0,4 kWh per liter, and the total electricity cost at 0,25 euro per kWh, resulting in a total cost of 0,1 €/liter for solvent regeneration (excluding the cost of the capital investment in a distilling unit). The cost of fresh solvent was estimated at 1,5 €/liter and waste management for dirty solvent-ink waste at 1,0 €/liter.

According to the calculations, process printing washes would cause 541 to 812 liters of lost solvent, whereby 9.001 to 25.921 liters would be lost in process printing. The energy required to regenerate the process printing washing solvent would be approximately 1.100 to 1.900 kWh, whereby approx. 18.000 to 52.000 kWh would be required for spot color printing. This means that spot color printing would consume about 10 to 48 times more energy for solvent regeneration than process color printing would. In addition, the total value of solvent recovery, waste management, and replenishment of process colors would be about 1.600 to 2.800 euros, whereas for spot colors this cost would be from 27.000 to 77.800 euros, as shown in Figure 53.

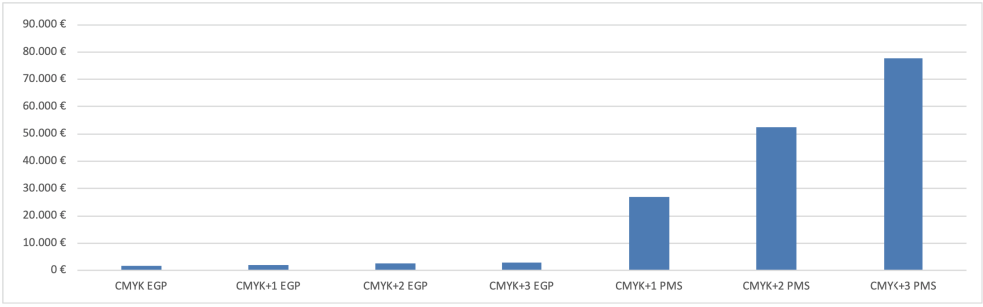


Figure 53 Cost of solvent regeneration for different color strategies

All in all, according to the above, the amount of wash ink solvent, washed and wasted ink, and regeneration energy would be reduced by about 90% and even more when switching from spot color printing to the process color system. All this is not only a cost saving, but also results in more sustainable production.

Value of waste material

The makeready generates waste material, as previously calculated. The value of materials can vary widely, from rather simple and cheap materials to complex and expensive materials. The higher the material costs and the shorter the order length, the greater the importance of setup waste. In the calculations, the setup waste was valued in comparison with saleable production, as shown in Table 25.

Table 25 Spot vs. EGP printing: waste material calculation (K. Lankinen)

ROI CALCULATION 8 – WASTE MATERIAL SAVINGS (SETUP) – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Printing decks used:	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Setup meters per Job	212 m	222 m	232 m	242 m	434 m	517 m	643 m
Setup waste per year (m)	706.667 m	740.052 m	773.438 m	806.824 m	1.446.719 m	1.724.934 m	2.142.257 m
Setup waste per year (kg)	28.267 kg	29.602 kg	30.938 kg	32.273 kg	57.869 kg	68.997 kg	85.690 kg
Setup material cost / machine	49.467 €	51.804 €	54.141 €	56.478 €	101.270 €	120.745 €	149.958 €
Reduction of setup material	67%	65%	64%	62%	32%	19%	0%

As before, this calculation was based on an annual production of 50 million meters (3.333 jobs) with a material width of 100 cm, a weight of 40 g/m², and a raw material price of 1,75 €/kg.

Based on Table 25, the annual setup waste for process colors would be about 707.000 to 807.000 meters and for spot colors about 1.447.000 to 2.142.000 meters, which equates to 28 to 32 metric tons of setup waste for process printing and 58 to 86 metric tons for the spot color system. The setup waste would be two to three times higher with spot colors than with process colors. The value of waste is high, even if it is only calculated at a potential raw material price of 1,75 €/kg, which would result in savings in the amount of setup waste of tens of thousands of euros. The annual cost of the setup material per color strategy is shown in Figure 54.

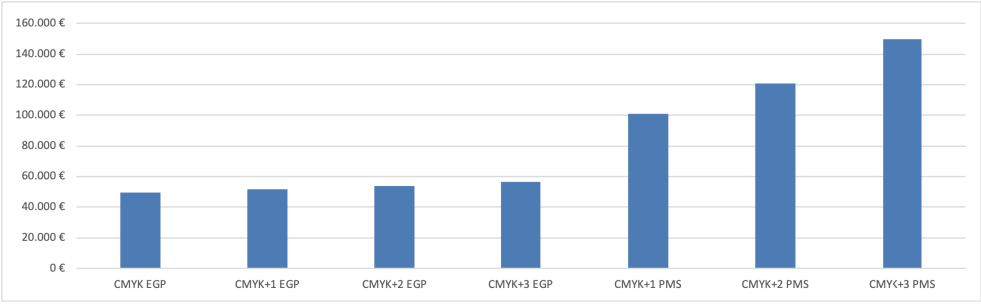


Figure 54 Annual setup material cost per machine for different color strategies

As usual, this is not just a waste of money, but also an additional burden on the environment. This example calculation demonstrates the potential of process printing for more sustainable printing production.

CO_2 reduction through ink, solvents, and substrate

A 'greener' product today has a big advantage in the marketplace when consumers and brand owners are looking for more sustainable alternatives. Fortunately, cost savings often mean more sustainable production when it comes to reducing consumption and saving material, while replacing the process with greener alternatives can increase costs, thereby saving the environment.

The scope of this study was the overall efficiency of EGP, and as sustainability has become an important issue in recent years, the author performed additional calculations related to this. As a result of expanding this study, the author has identified the sustainability benefits and been able to raise the sustainability issue as a topic in public discussions since 2018. It has been a pleasure to see that the sustainability issue has been widely debated in process printing since 2019.

The CO_2 equivalent was calculated and is shown on the following pages for ink consumption, distillation, ink waste, solvents, and substrates. It was difficult to find exact CO_2 equivalents because different sources gave different values and in some parts only the value "cradle-to-gate" was determined, although it would have made sense to use the value "end-of-life". Nevertheless, the author has tried to find values that are as sound as possible and at least not to overestimate them. It is also good to note that process color jobs can usually be run with fewer printing plates than CMYK plus spot color jobs, especially when several jobs are combined in one run.

Because this study was one of the first to address the sustainability comparison of process and spot color printing in flexographic printing, sustainability was treated only briefly, without going too deeply into sustainability itself. Sustainability deserves more in-depth analysis and is recommended as a topic for further investigation as this is a very new perspective in evaluating the impact of printing. However, at least it was worth including this topic in passing to introduce some primary calculations of the sustainability potential of process color printing, although many aspects such as drying energy, energy used for washing, setup energy, plates, mounting tapes, transport, etc. were not included in these calculations.

CO_2 equivalent of saved ink

The European Printing Ink Association (EuPIA) has conducted a Life Cycle Assessment (LCA) to calculate the generic reference for a virtual product that

represents the process of manufacturing average market inks from cradle-to-gate in Europe (EuPIA, 2017). The study concluded that the Global Warming Potential or carbon footprint value of 1,000 kg of printing ink equals 3,293 kg of CO_2, which means that this value can be used as a base value, although the actual value could be higher, as the further handling, transport, and use of inks cause an additional CO_2 load.

Using the EuPIA CO_2 equivalent of ink with the calculations shown in Table 21, the amount of CO_2 equivalence saved with the transition from spot color printing to process color printing is shown in Table 26.

Table 26 Spot vs. EGP printing: ink usage CO_2 reduction calculation (K. Lankinen)

ROI CALCULATION 9 – INK CONSUMPTION CO2 EQUIVALENCE (COLORED INKS) – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK Image	Spot simulation (EGP)		CMYK Image	Spot color (Spot)
Printed area of the product	33%	33%		33%	33%
Anilox volume	3,5 ccm/m2	3,5 ccm/m2		3,5 ccm/m2	8,0 ccm/m2
TAC (Total Area Coverage)	150%	150%		150%	100%
Production target per year	50.000.000 m	50.000.000 m		50.000.000 m	50.000.000 m
Ink consumption kg per year	28.875 kg	28.875 kg		28.875 kg	44.000 kg
Total ink kg and CO2 kg	**57.750 kg**	**CO2: 190.171 kg**		**72.875 kg**	**CO2: 239.977 kg**
Difference in ink kg and CO2 kg	-15.125 kg	-49.807 kg			
Difference-% of kg and CO2 kg	-21%	-21%			

With these parameters it can be seen that, with an annual production of 50 million meters, the amount of saved ink of 15.125 kg corresponds to a saving of 49.807 kg CO_2 equivalent, which would result in a 21% reduction in the carbon footprint.

CO_2 equivalent of washed inks

Using the previous EuPIA CO_2 equivalent, the results of the calculation of annually washed inks according to Table 22 are shown in Table 27.

Table 27 Spot vs. EGP printing: ink wash-off and CO_2 reduction calculation (K. Lankinen)

ROI CALCULATION 10 – WASHING OF INK CO2 EQUIVALENCE – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Washing of ink	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Process color washes per year	192 pcs	240 pcs	288 pcs	336 pcs	192 pcs	192 pcs	192 pcs
Number of spot washes per year	0 pcs	0 pcs	0 pcs	0 pcs	3.000 pcs	6.000 pcs	9.000 pcs
Used washing solvent per year	2.707 L	3.384 L	4.061 L	4.738 L	45.007 L	87.307 L	129.607 L
Washed ink per year, kg	173 kg	216 kg	259 kg	302 kg	2.873 kg	5.573 kg	8.273 kg
GWP CO2 equivalent of ink	**569 kg**	**711 kg**	**854 kg**	**996 kg**	**9.460 kg**	**18.351 kg**	**27.242 kg**
Reduction of CO2 footprint, kg	-26.673 kg	-26.531 kg	-26.389 kg	-26.247 kg	-17.782 kg	-8.891 kg	0 kg
Reduction of CO2 footprint, %	-98%	-97%	-97%	-96%	-65%	-33%	0%

According to the previous calculation, the ink loss during the washing of spot color inks would result in an annual CO_2 equivalent of 9.460 to 27.242 kg, while process color printing would result in only 569 to 996 kg of CO_2 equivalent, as shown in Figure 55. This means that by switching from spot color to process color printing the carbon footprint in these calculations would be reduced by 89% - 98%.

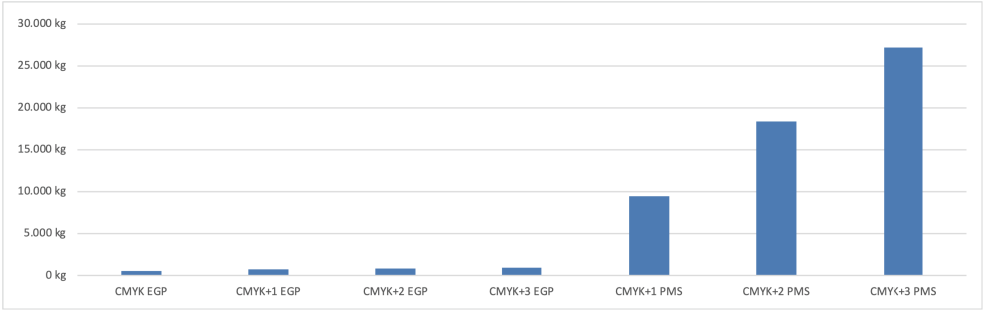


Figure 55 GWP CO_2 equivalent of ink for different color strategies

CO_2 equivalent of regeneration of solvents

The washing of printing units consumes washing solvent (mix of ethanol and ethyl acetate), which must be recovered (distilled). This distillation consumes energy and also some of the solvent is lost during distillation. In addition, the distillation waste has to be handled somehow, which also costs time and effort. As shown in the previous calculations, the transition from spot color printing to process color printing would minimize the need for distillation.

The electricity for the industry is generated in different ways depending on the country, which is why the CO_2 equivalent for the production of 1 kWh varies so much. The general trend is that the GWP burden of electricity generation is decreasing from year to year as production shifts to methods producing less greenhouse gas. The electricity generation of the European Union (European Environment Agency, 2018) in 2016 corresponded to 0,2958 kg CO_2 per 1 kWh, while the US 2018 figure (EPA, 2018) was 0,707 kg CO_2 per 1 kWh. The following calculations used the value of 0,2958 kg CO_2 per kWh.

Ethanol production varies considerably from country to country and method by method, so that the CO_2 equivalent for 1 liter of ethanol also differs a lot.

According to a study (Muñoz, et al., 2019) *"GHG emissions per kilogram bio-based ethanol range from 0.7 to 1.5 kg CO_2 eq per kg ethanol and from 1.3 to 2 kg per kg if emissions at end-of-life are included. Fossil-based ethanol involves GHG emissions of 1.3 kg CO_2 eq per kg from cradle-to-gate and 3.7 kg CO_2 eq per kg if end-of-life is included."*

In one of the latest case studies (Pacheco & Silva, 2019), the authors have calculated ethanol equivalent values from 0,31 to 5,55 kg CO_2 per liter and concluded that an emission value of 1,51 kg CO_2 per liter represents the GWP value of biomass-to-ethanol.

Wash solvent has a typical mixture of about 80% ethanol and 20% ethyl acetate although some other components may also be present, typically 5% or less. It appears that ethyl acetate has a higher GWP equivalent of CO_2 than ethanol. According to Budsberg et al. (Budsberg, Morales-Vera, Crawford, Bura, & & Gustafson, 2020), ethyl acetate extraction results in 1,0 to 2,5 kg CO_2 eq per kg. However, as it has been difficult to find an average value for ethyl acetate, the author decided to use the 2,00 kg CO_2 equivalent for calculating the GWP emission of 1,00 liter of wash solvent.

Combining the CO_2 values for electricity (0,2958 kgCO_2/kWh) and ethanol (2,00 kgCO_2/L) with 80% yield (20% loss of solvent) resulted in the calculations shown in Table 28.

Table 28 Spot vs. EGP printing: solvent regeneration CO_2 calculation (K. Lankinen)

ROI CALCULATION 11 – REGENERATING SOLVENT AND CO2 EQUIVALENCE – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Regeneration of washing solvent	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Used washing solvent per year	2.707 L	3.384 L	4.061 L	4.738 L	45.007 L	87.307 L	129.607 L
Energy used for regeneration	1.083 kWh	1.354 kWh	1.624 kWh	1.895 kWh	18.003 kWh	34.923 kWh	51.843 kWh
CO2 eqv. of reg. Energy *EU*	320 kg	400 kg	480 kg	561 kg	5.325 kg	10.330 kg	15.335 kg
Lost solvent in regeneration p.a.	541 L	677 L	812 L	948 L	9.001 L	17.461 L	25.921 L
CO2 eqv. of lost solvent	1.083 kg	1.354 kg	1.624 kg	1.895 kg	18.003 kg	34.923 kg	51.843 kg
GWP CO2 equivalent of regener.	**1.403 kg**	**1.754 kg**	**2.105 kg**	**2.456 kg**	**23.328 kg**	**45.253 kg**	**67.178 kg**
Reduction of CO2 footprint, kg	-65.775 kg	-65.424 kg	-65.073 kg	-64.722 kg	-43.850 kg	-21.925 kg	0 kg
Reduction of CO2 footprint, %	-98%	-97%	-97%	-96%	-65%	-33%	0%

The calculations in Table 28 assumed that 50 million meters were produced and jobs were changed according to the previous calculations. The 20% lost solvent corresponds to a CO_2 equivalent of 1.083 to 51.843 kg, while the energy consumption of distillation corresponds to a CO_2 equivalent of 320 to 15.335 kg. The total GWP of solvent regeneration corresponds to a CO_2 equivalent of 1.403 to

67.178 kg, as shown in Figure 56. The calculations showed that process printing would require only a fraction of the washing needed in spot color printing. This means that switching from spot color to process color printing would reduce CO_2 emissions by 89% - 98% in solvent regeneration.

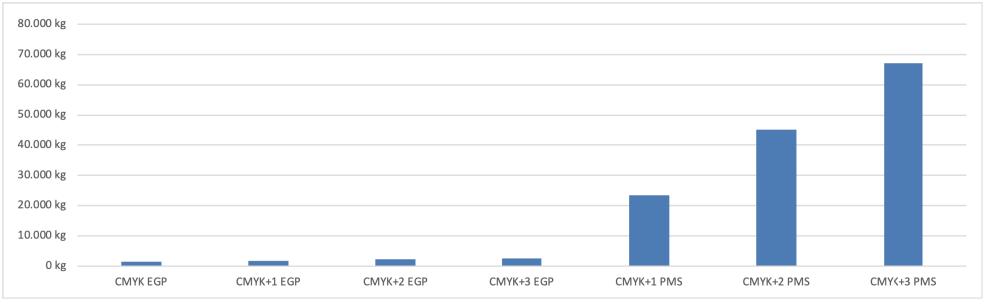


Figure 56 GWP CO_2 equivalent of regeneration for different color strategies

CO_2 equivalent of recycling waste material

As the previous calculations in Table 25 showed, job changes waste material. The following calculations assumed that the plastics substrate has an equivalent of 2,1 kg of CO_2 per kilogram of primary production plastics, as shown in the study for Nordic Council of Ministers (Damgaard, Eriksson, Fluck, Hillman, & Jonsson, 2015). The same source also indicates that if there is a possibility to use recycled plastics, an equivalent of 1,3 kg of CO_2 per kilogram of recycled plastic can be used. The CO_2 calculated for setup waste, according to the example calculation, is shown in Table 29.

Table 29 Spot vs. EGP printing: setup waste material CO_2 calculation (K. Lankinen)

ROI CALCULATION 12 – CO2 REDUCTION VIA WASTE MATERIAL SAVINGS (SETUP) – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Seutp material waste	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Setup meters per Job	212 m	222 m	232 m	242 m	434 m	517 m	643 m
Setup waste per year (m)	706.667 m	740.052 m	773.438 m	806.824 m	1.446.719 m	1.724.934 m	2.142.257 m
Setup waste per year (kg)	28.267 kg	29.602 kg	30.938 kg	32.273 kg	57.869 kg	68.997 kg	85.690 kg
GHG primary production CO2 eq.	59.360 kg	62.164 kg	64.969 kg	67.773 kg	121.524 kg	144.894 kg	179.950 kg
GHG recycling CO2 equivalent	36.747 kg	38.483 kg	40.219 kg	41.955 kg	75.229 kg	89.697 kg	111.397 kg
Reduction of CO2 footprint, %	-67%	-65%	-64%	-62%	-32%	-19%	0%

Based on the calculations, the switch from spot color printing to process color printing would save tens of thousands of kilograms of waste plastic and result in a

44% - 67% reduction of the CO_2 footprint. The annual CO_2 equivalent of the wasted primary production setup material is shown in Figure 57.

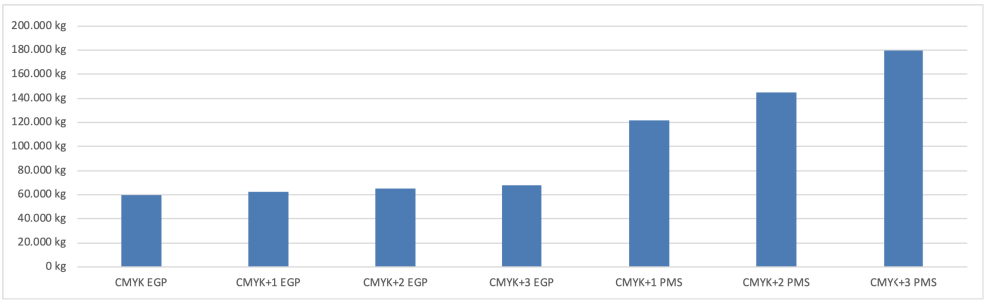


Figure 57 GHG primary production CO_2 equivalent of wasted substrate for different color strategies

3.1.3 Summary of EGP eco-efficiency

As previously presented, expanded gamut printing offers remarkable benefits. According to the calculations, the system can be used to improve the efficiency and sustainability of printing.

Summary of potential savings and improvements

The results of the calculations show that it is always more efficient to print with CMYK than with CMYK + EGP or CMYK + spot color printing, as stated earlier. Summarizing the previous additional costs from Table 19, Table 21, Table 22, Table 23, Table 24, and Table 25, the combined additional production costs compared to CMYK printing are listed in Table 30.

Table 30 Spot vs. EGP additional printing cost summary (K. Lankinen)

ROI SUMMARY – ADDITIONAL COST BUILD UP THROUGH PRODUCTION – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
Cust summary / 50 M meters p.a.	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Excessive production time cost	0 €	33.333 €	50.000 €	66.667 €	543.333 €	845.000 €	1.116.667 €
Excessive ink consumption	0 €	0 €	0 €	0 €	39.188 €	39.188 €	39.188 €
Excessive ink washed off	0 €	238 €	475 €	713 €	13.500 €	27.000 €	40.500 €
Excessive stock ink waste	0 €	0 €	0 €	0 €	5.468 €	5.468 €	5.468 €
Excessive cleaning solvent use	0 €	406 €	812 €	1.218 €	25.380 €	50.760 €	76.140 €
Excessive setup substrate waste	0 €	2.337 €	4.674 €	7.011 €	51.804 €	71.279 €	100.491 €
Total excess cost per year	0 €	36.314 €	55.961 €	75.609 €	678.672 €	1.038.694 €	1.378.453 €

As shown in Table 30, the additional cost associated with CMYK plus 1 to 3 EGP process colors for the 50 million meter annual print quantity was about 36.000 to 76.000 euros, while for CMYK plus 1 to 3 spot colors it was about 679.000 to 1.378.000 euros. The former shows that switching from spot color to process color printing in this calculation would reduce costs by several hundred thousands of euros per year.

Comparing the values of the various additional cost sources, as shown in Figure 58, it can be seen that, in the example, excessive production time costs were the largest costs due to longer makeready times, with setup waste being the second largest source, and the regeneration of the washing solvent the third largest source. Excessive ink consumption and washed-off inks were also notable costs, especially for spot color printing. However, the size of the ink stock played a minor role in this comparison.

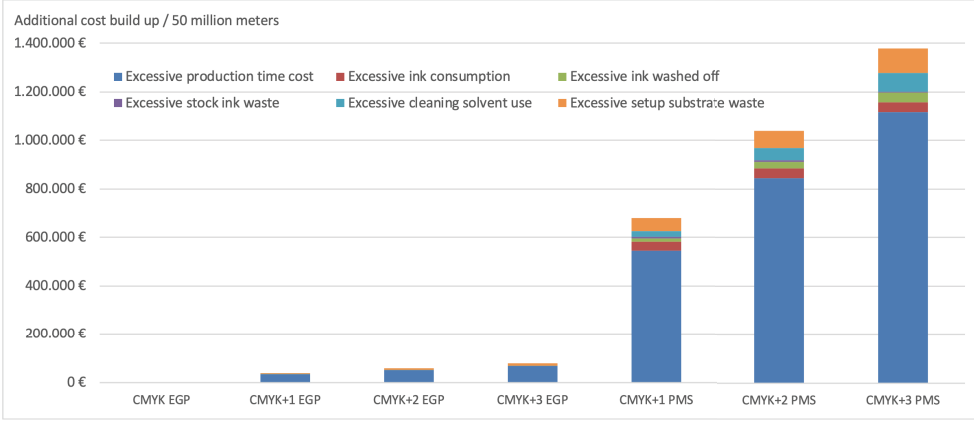


Figure 58 Comparison of Spot vs. EGP: additional printing costs

In addition to the previous costs, it should be noted that the other perspectives such as increased quality, higher production flexibility, lower print stock, and plate cost reduction can also be achieved when switching from spot color printing to process printing. Furthermore, fewer anilox rolls, and fewer doctor blade and end seal changes are needed, which means not only eliminating the cost of the product, but also the time and effort required to change and organize the tools. In fact, the cost of downtime and machine downtime usually increases, as any break can easily lead to longer break times. Moreover, as the machines get faster and orders shorter, there

will be even more job changes per week and higher cost savings potential in the future.

Summary of CO_2 reduction

As a summary of the previous results from Table 26, Table 27, Table 23, Table 28, and Table 29, the CO_2 equivalent values were collected and are presented in Table 31.

Table 31 Spot vs. EGP printing: CO_2 summary (K. Lankinen)

ROI SUMMARY – CO2 EQUIVALENT THROUGH PRODUCTION – 3 shifts per day, 5 days per week, 48 weeks per year

Process vs. Spot color printing	CMYK EGP	CMYK+1 EGP	CMYK+2 EGP	CMYK+3 EGP	CMYK+1 PMS	CMYK+2 PMS	CMYK+3 PMS
CO2 summary / 50 M meters p.a.	4 colors	5 colors	6 colors	7 colors	5 colors	6 colors	7 colors
Ink consumption	190.171 kg	190.171 kg	190.171 kg	190.171 kg	239.977 kg	239.977 kg	239.977 kg
Washed ink	569 kg	711 kg	854 kg	996 kg	9.460 kg	18.351 kg	27.242 kg
Stock ink waste	445 kg	445 kg	445 kg	445 kg	4.446 kg	4.446 kg	4.446 kg
Regeneration and loss of solvent	1.403 kg	1.754 kg	2.105 kg	2.456 kg	23.328 kg	45.253 kg	67.178 kg
Setup waste substrate	59.360 kg	62.164 kg	64.969 kg	67.773 kg	121.524 kg	144.894 kg	179.950 kg
Total CO2 equivalent per year	**251.948 kg**	**255.245 kg**	**258.542 kg**	**261.840 kg**	**398.736 kg**	**452.922 kg**	**518.793 kg**
CO2 reduction / 50.000.000 m	-51%	-51%	-50%	-50%	-23%	-13%	0%
CO2 corresponding to driving car	*1.679.650 km*	*1.701.633 km*	*1.723.616 km*	*1.745.600 km*	*2.658.237 km*	*3.019.478 km*	*3.458.619 km*
Around the Globe 40.075 km	*41,9x*	*42,5x*	*43,0x*	*43,6x*	*66,3x*	*75,3x*	*86,3x*

As shown in Table 31, for an annual printed quantity of 50 million meters the corresponding CO_2 equivalent for process color printing was 252 to 262 metric tons, while spot color printing values were 399 to 519 metric tons of CO_2 equivalent. The result means that process color printing in this case would reduce the CO_2 equivalent by 34% - 51% compared to spot color printing.

The conversion of the previous CO_2 values to the corresponding car driving with an estimate of 0,150 CO_2 kg per driven kilometer showed that the CO_2 emissions corresponded to 1,68 to 3,46 million kilometers. This corresponds to a calculated value for a journey of about 42 to 86 times around the globe.

Comparing the values of the different CO_2 sources, as shown in Figure 59, showed that ink consumption represents the largest source of CO_2, with setup waste being the second largest. The regeneration of washing solvent and the washed-off inks were also notable as a source of CO_2, especially for spot color printing, but the effect of stock ink waste was quite minimal.

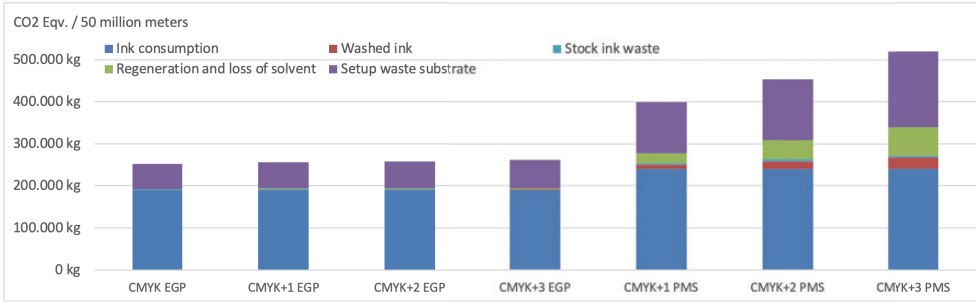


Figure 59 Comparison of Spot vs. EGP printing: CO_2 source

Other improvements

In addition to the benefits previously calculated, co-printing orders and reducing lead times can also accelerate time-to-market, which can give the brand owner a significant competitive advantage. Further, test production and print acceptance can be made more effective through co-printing.

Moreover, well-profiled and consistent production allows accurate prediction of a product with proofs. Also, conformability with digital printing offers additional product benefits without much difference in colors and quality perception between different printing technologies. Furthermore, designers and brand owners are no longer restricted to the number of color tones as the color shades are created by digitally mixing screened EGP primary colors. To achieve these benefits, designers should consider ways to use more and more process printing in designs. This would mean closer cooperation with the repro house and the printer.

All in all, process color printing is more efficient than spot color printing, but of course, it must be noted that multicolor process printing does not cover 100% of all requirements, and there are cases where the transfer from spot color printing to process color printing is not recommended.

3.2 Test designs

The study included three different tests. The first profile printing was performed on the SOMA Optima² flexographic press and the profile was used to calculate the OATIS sample test as shown on the following pages. The third test, the actual

production of Fazer Puikula bread bags was performed as a real-life test and analyzed, as also shown on the following pages.

The profile printing was performed by printing the ECI2002 random test charts and profiling them in CMYK, OMYK, CGYK, and CMVK as shown in Figure 60.

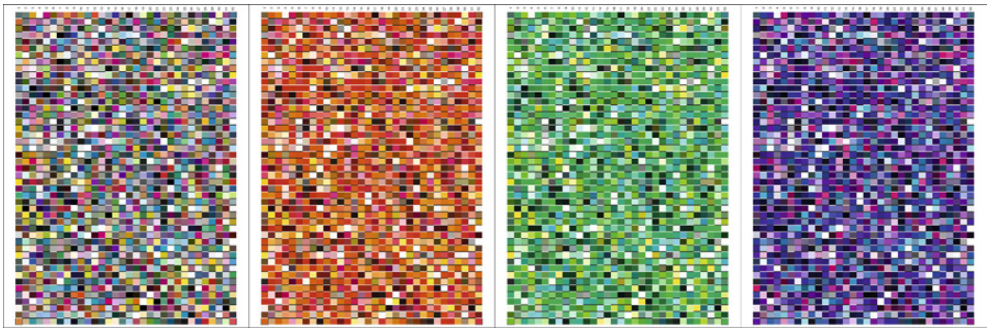


Figure 60 ECI2002 profile chart in CMYK, OMYK, CGYK, and CMVK (Image: Marvaco)

After measuring the ECI2002 charts and making the ICC profile, a combination sheet of OATIS products was collected and evaluated to see how a co-printing of multiple OATIS designs on the same print sheet could be done in EGP. The OATIS design collection is shown in Figure 61.

Figure 61 OATIS co-print EGP test design (Image: Marvaco)

In order to gain experience with a multicolor process job, a Fazer Puikula Pehmeämpi bread bag design was selected for a real-life test and produced as a real product for the market; the results of switching the design from spot colors to EGP printing were then analyzed. The design of the Fazer Puikula Pehmeämpi bread bag is shown in Figure 62.

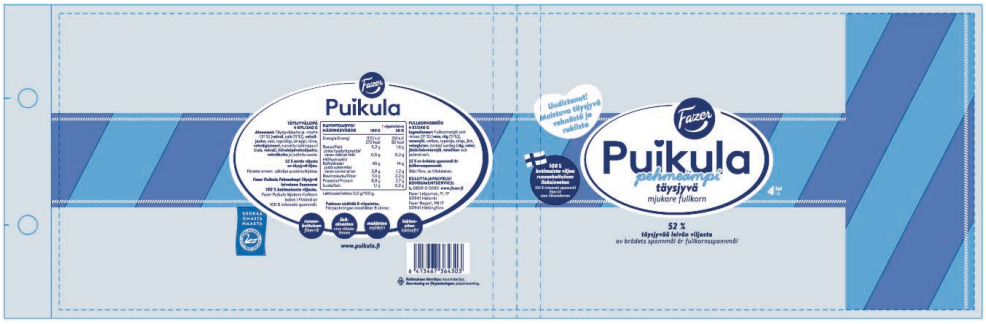


Figure 62 Fazer Puikula test design (Image: Marvaco)

These tests and designs are evaluated and discussed in the following subchapters.

3.2.1 Test-1: EGP reference profile

The reference profile created for this project was printed on a SOMA Optima² flexo printing press at SOMA Globe in Lanskroun, Czech Republic. The printing setup was the following:

Printing press: 1280 mm wide SOMA Optima² 8-color flexo press.

Substrate: Reverse printed 20-micron transparent BOPP.

Printing plates: 1,14 mm (045) high durometer Flint Group nyloflex® solvent-washable flexo plate in 70 lpcm (178 lpi) plate line screen with 4000 dpi Full HD flat top dot structure, produced by Marvaco Ltd.

Mounting tape: 0,5 mm thick Lohmann DuploFLEX® soft cushion tape on the sleeves.

Motif: ECI2002 random chart with color sequence black, violet, cyan, magenta, green, orange, yellow and white (KVCMGOYW) combining the information of maximum number of three overprints of inks from CMYK, OMYK, CGYK, and CMVK profiles.

Inks: Flint Group FlexiPrint MV standard type solvent-based high-pigmented process inks.

Aniloxes: 524 lpcm (206 lpi) elongated cell anilox of 3,3 cm^3/m^2 (2,1 bcm).

Printing speed: 300 meters per minute (984 fpm).

The test charts were measured at Marvaco Ltd with an X-Rite i1 PRO spectrophotometer on an iO table using the M0 setting. The profile data was used to collect a lookup table (LUT) with color combinations and their L*a*b values to match 1873 Pantone colors of the software used (N.B. it is not allowed to publish the name of the software here). The lookup tables are attached as APPENDIX 2: 7c EGP reference profile SOMA Optima2 2018 and APPENDIX 3: 4c EGP reference profile SOMA Optima2 2018. The lookup table contains 1873 Pantone colors with deltaE-2000 calculation.

It should be noted that even the references (M.Y. PrintTech, 2005; Hoffstadt, 2019; Forrester, 2019; Politis, et al., 2015; Gustavson, 1997; Idealliance, 2019b; Qu, 2013) consider Moiré to be inevitable, the jobs and samples printed in this thesis did not suffer from Moiré even though they were printed with CMYKOGV colors using traditional screens. The screen angles used in this study are shown in Table 32.

Table 32 Raster screen angles used in the studied profiles

Method	C	M	Y	K	O	G	V
Marvaco SOMA ICC (178 lpi)	67,5°	37,5°	82,5°	7,5°	67,5°	37,5°	7,5°

The CMYKOGV primary color values are presented in Table 33 and the gamut is analyzed and discussed in more detail in the following chapters.

Table 33 L*a*b*C*h° and density values of profiled EGP primary colors

EGP	C	M	Y	K	O (Y)	G (C)	V (M)
L*	48,71	45,14	90,53	12,78	69,92	66,16	26,90
a*	-32,56	78,73	-7,50	2,10	50,19	-70,56	51,50
b*	-58,23	1,88	100,39	5,04	88,27	-3,05	-59,49
C*	66,71	78,75	100,67	5,46	101,54	70,63	78,69
h°	240,79	1,36	94,27	67,34	60,38	182,48	310,88
Density	1,90	1,73	1,50	1,74	1,50	1,92	1,77

Comparison of spider web sizes of the color systems

The color gamut size of the 7-color profile and different 4-color profiles were compared in spider web and gamut volume, as shown in Figure 63. The spider web illustration presents a projection of all profiled colors along the L axis in the a-b plane. A colored spider web of the profiled CMYK and CMYKOGV L*a*b* gamuts compared to the ISO-coated v2 profile is shown in Figure 63.

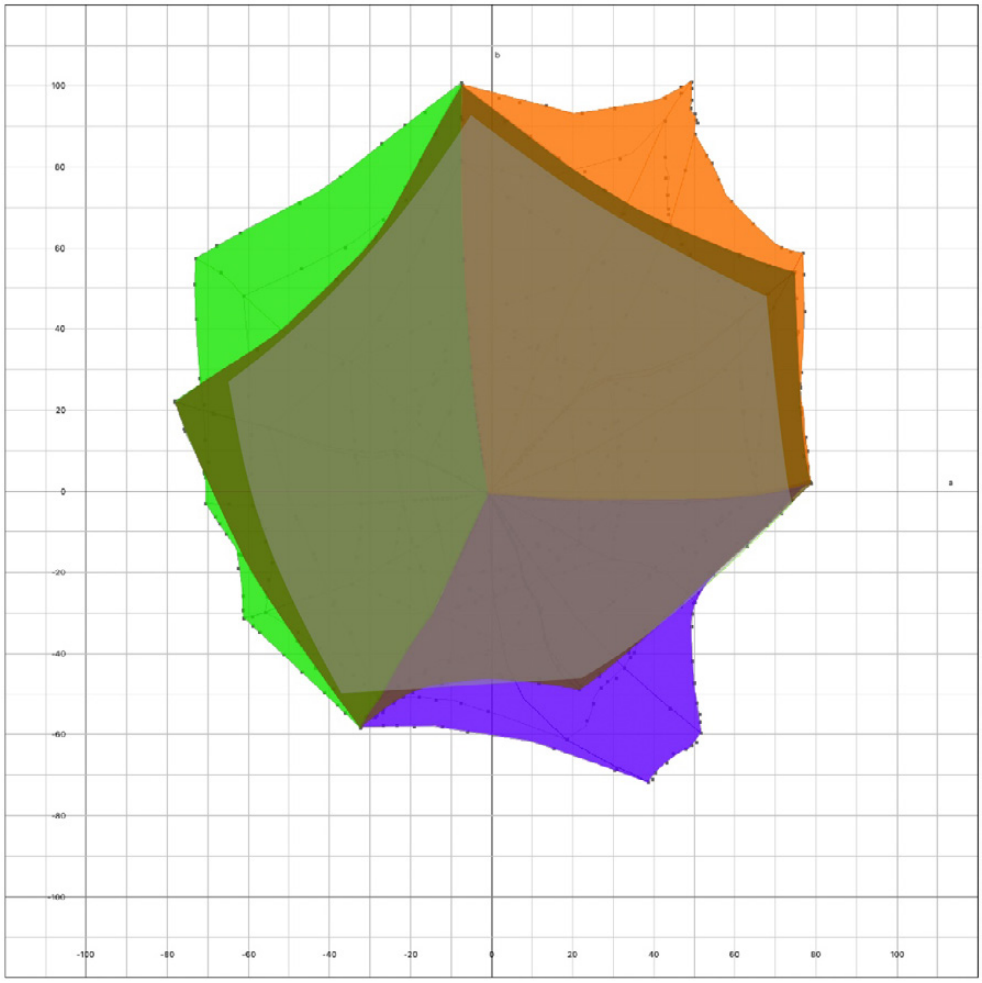


Figure 63. EGP color space based on the fingerprint of the SOMA press (K. Lankinen)

It can be seen that the printed area of the CIELAB a-axis reached from almost -80 to almost +80 and the b-axis from about -70 to about +100. The illustration shows

the ISO-coated v2 (FOGRA39) color space spider web in the middle as a gray area, which is surrounded by the expanded gamut CMYK spider web color space (brown area) of the profiled printing. The additional primary colors expanded the color gamut with orange, green, and violet colors, as illustrated. The profiled CMYK color gamut spider web included almost all of the ISO-coated v2 areas very well, except for a very small area of the violet.

As can be seen in Figure 63, the OMYK, CGYK, and CMVK EGP triads expanded the gamut even further than the EGP-CMYK, although in the green area the CYK triad had a peak exceeding the CGYK triad.

Comparison of color gamut sizes

In order to evaluate the color gamut sizes more precisely, a comparison was made between the high-pigmented and normal-pigmented inks and the ISO-coated v2 profile. A normally pigmented CMYK profile was also run at the same time as the highly pigmented CMYK inks, although the normally pigmented ink was not used or presented in detail in the study. In this case, the normally pigmented ink was the same as the highly pigmented ink, but with lower pigmentation. The L*a*b*C*h° values and densities of the previous color strategies are shown in Table 34.

Table 34 L*a*b*C*h° and density values of different CMYK profiles

ISO-coated v2 CMYK profile**					Normal density CMYK profile (MCO)***					High density CMYK profile (MCO)***				
ISO-C v2	C	M	Y	K	Normal	C	M	Y	K	EGP	C	M	Y	K
L*	55,00	48,00	89,00	16,00	L*	55,00	48,86	90,76	16,56	L*	48,71	45,14	90,53	12,78
a*	-37,00	74,00	-5,00	0,00	a*	-36,47	75,29	-8,09	2,64	a*	-32,56	78,73	-7,50	2,10
b*	-50,00	-3,00	93,00	0,00	b*	-52,44	-5,72	93,41	6,52	b*	-58,23	1,88	100,39	5,04
C*	62,20	74,06	93,13	0,00	C*	63,87	75,51	93,76	7,04	C*	66,71	78,75	100,67	5,46
h°	233,50	357,68	93,08	0,00	h°	235,18	355,66	94,95	67,98	h°	240,79	1,36	94,27	67,34
Density	1,40	1,40	1,00	1,70	Density	1,45	1,35	1,31	1,57	Density	1,90	1,73	1,50	1,74
**Density according to G7 (Status T)					***Density according to Status E					***Density according to Status E				

N.B. The L*a*b*C*h° values of the ISO-coated v2 and normally pigmented CMY-colors were very close to each other and the yellow densities were in practice almost identical; the difference in the yellow density values (T = 1,00 vs. E = 1,31) was a result of different measurement status strategies.

The color gamut volume and in-gamut of the previous profiles were calculated with Esko Equinox software and are shown in Table 35, Figure 64 and Figure 65.

Table 35 Profile comparison for color gamut volume and in-gamut values

Profile	Gamut Volume	Volume vs. ISO-coated	In-gamut	In-gamut vs. ISO-coated
ISO-coated v2 CMYK	**470.177 ccu**	100%	**55%**	100%
CMYK Normal-pigmented	**571.734 ccu**	122%	**45%**	82%
CMYK High-pigmented	**652.536 ccu**	139%	**49%**	89%
CMYK+OGV High-pigmented	**1.029.366 ccu**	219%	**76%**	138%

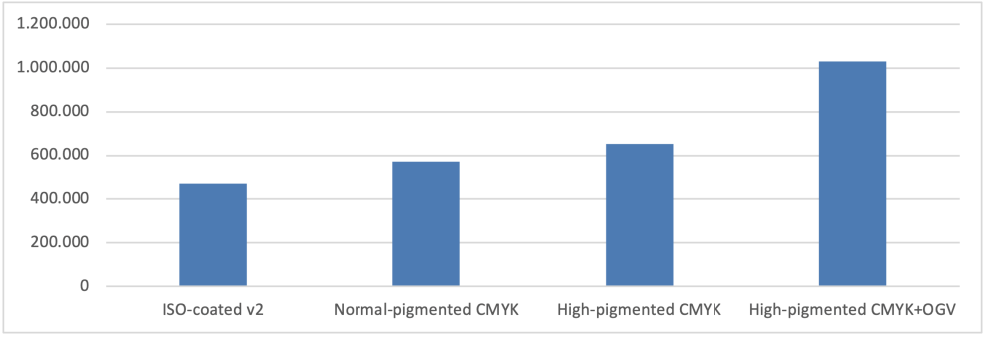


Figure 64 Cubic color unit comparison of different color gamut profiles

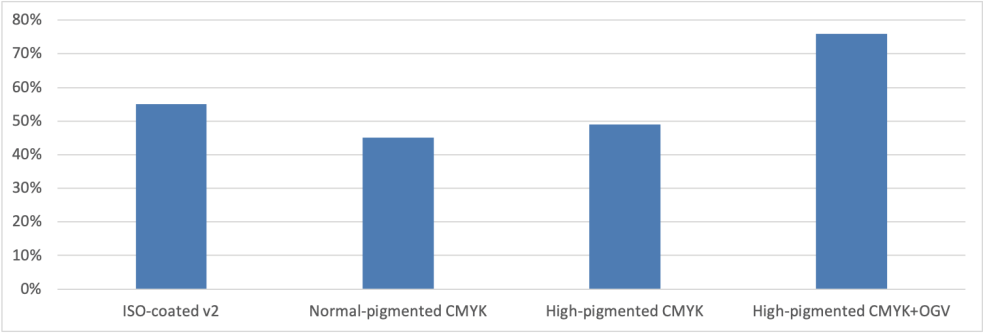


Figure 65 In-gamut comparison of different color gamut profiles

The color gamut of the normally pigmented CMYK flexo profile was 22% larger than the ISO-coated v2 profile value, but the in-gamut value of PMS colors was 18% smaller, as shown in Figure 64 and Figure 65. As expected, the in-gamut value of flexographic process printing was lower than that of offset printing. An interesting result, however, was that the color gamut volume of the flexographic profile was larger than that in offset printed.

The comparison mentioned above showed that the high-pigmented CMYK flexo profile color gamut was 39% larger than the ISO-coated v2 profile value, but the in-gamut value of PMS colors was still 11% smaller. The increase in the total color gamut was remarkable and higher than expected, although, as expected, the in-gamut value of high-pigmented flexographic process inks was lower than in offset printing.

An interesting result, however, was that both the color gamut volume and the in-gamut size of the PMS colors of the high-pigmented flexographic profile were 14% and 9% larger respectively than those of the normal-pigmented flexographic printing profile. Consequently, the high-pigmented CMYK used in this study is termed EGP-CMYK.

The results corresponded with results from earlier studies and reports from offset and gravure printing (Andersson M. , 1997; Sweeney, 2010; Strickler, 2019; Hiremath, 2018; Chung & Hsu, 2006; Idealliance, 2016), although it is worth noting that the previous studies were related to offset or gravure printing, not to flexography.

On the one hand, the result that the ISO-coated gamut was smaller, but had more PMS colors in the color gamut than both flexo printed CMYK ones, corresponded to the study by O'Hara et al. (O'Hara, Congdon, & Kariahlyn, 2019) in that the size of the gamut had no direct correlation with the number of PMS colors in the gamut, at least not between different printing strategies. On the other hand, in this study, the size of the gamut was reflected in a bigger number of PMS colors.

The comparison above also showed that the high-pigmented CMYK+OGV flexo profile color gamut was 119% larger than the ISO-coated v2 profile value and the in-gamut value of PMS colors was also 38% larger. The results were as expected. An interesting result was that the color gamut volume of the high-pigmented CMYK+OGV flexographic profile was 80% larger than the comparable normal-pigmented CMYK gamut. The in-gamut size of the PMS colors was 69% larger than that of the normal-pigmented flexographic printing profile. This also corresponded with the results from an earlier study by Seth (Seth, 2013).

Comparison of the high-pigmented CMYK+OGV with the ISO-coated profile

Comparison of the highly pigmented CMYK+OGV profile with the ISO-coated v2 profile in Esko Equinox software resulted in a color gamut of 1.029.366 cubic color

units for highly pigmented CMYK+OGV and 470.177 cubic color units for ISO-coated v2. In other words, the highly pigmented ink had a 119% larger color gamut in this case. The gamut comparison is shown in Figure 66, which is cut at different lightness levels (L) from 10 to 90.

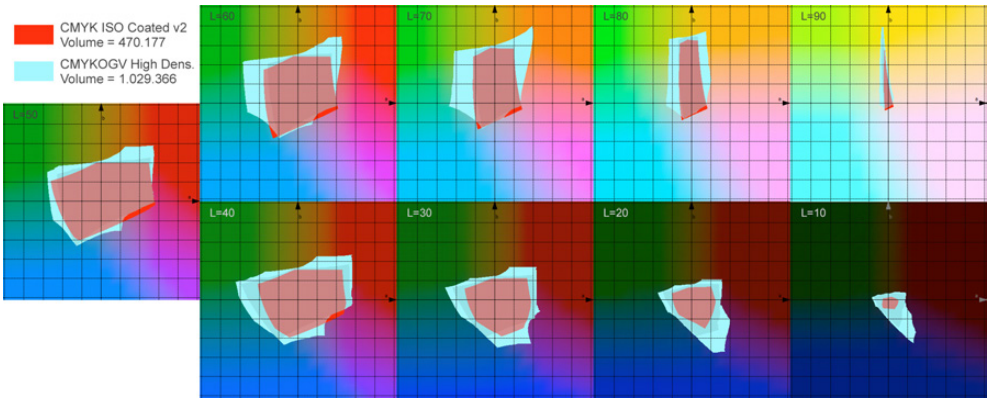


Figure 66 Comparison of ISO-coated v2 and high-pigmented CMYKOGV color gamut (K. Lankinen)

As can be seen in Figure 66, the highly pigmented CMYK+OGV ink profile almost completely covered the ISO-coated v2 printing profile and offered a significantly larger color gamut in all areas from L = 10 to L = 90. The only exceptions were visible starting from L = 40 to L = 50, where the purple hue area of the ISO-coated v2 magenta color slightly exceeded the highly pigmented CMYK+OGV gamut. From L = 60 to L = 90, the area of the ISO-coated v2 cyan color also slightly exceeded the highly pigmented CMYK+OGV gamut.

Comparison of the high-pigmented CMYK with the ISO-coated profile

Comparing the highly pigmented CMYK profile with the ISO-coated v2 profile in Esko Equinox software resulted in a color gamut of 652.536 cubic color units for highly pigmented CMYK and 470.177 cubic color units for ISO-coated v2, i.e., the highly pigmented ink had a 39% larger color gamut in this case. The gamut comparison is shown in Figure 67, which is cut at different lightness levels (L) from 10 to 90.

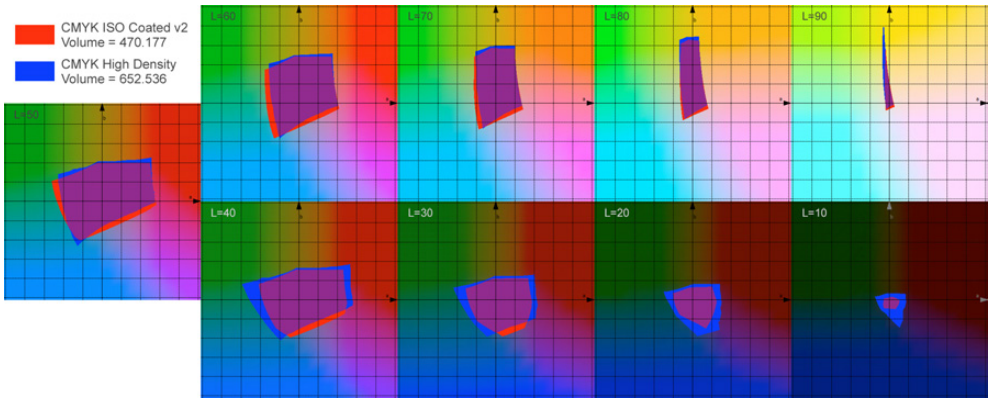


Figure 67 Comparison of ISO-coated v2 and high-pigmented CMYK color gamut (K. Lankinen)

The highly pigmented ink in dark shades at L = 10 and L = 20 offered a significantly larger color gamut in all areas, as shown in Figure 67. At L = 30 and L = 40, the color gamut was larger in all other areas except for the purple hue. At L = 50, the highly pigmented ink had a larger color gamut in all areas except for the purple and turquoise hues. At L = 60, the highly pigmented ink had a larger color gamut only for the yellow hue area. From L = 70 to L = 90, the turquoise, cyan, and purple areas of the ISO-coated v2 were nearly identical to the highly pigmented ink profile and only the highly pigmented yellow hue was noticeably expanded.

Comparison of the normal-pigmented CMYK with the ISO-coated profile

Comparing the normally pigmented ink with the ISO-coated v2 profile in Esko Equinox software resulted in a color gamut of 571.734 cubic color units for normally pigmented CMYK and 470.177 cubic color units for ISO-coated v2. This means that the normally pigmented ink had a 22% larger color gamut in this case. The gamut comparison is shown in Figure 68, which is cut at different lightness levels (L) from 10 to 90.

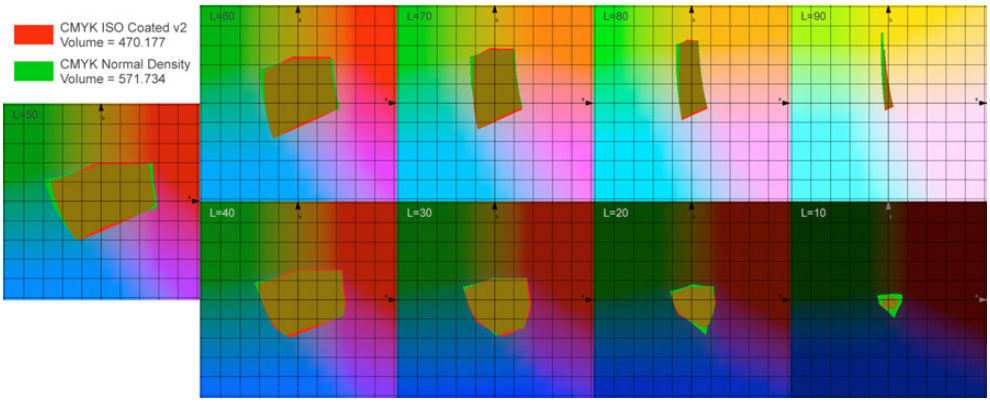


Figure 68 Comparison of ISO-coated v2 and normal-density CMYK color gamut (K. Lankinen)

As Figure 68 shows, the normally pigmented ink was almost identical to the ISO-coated v2 profile from L = 10 to L = 90.

Comparison of the high-pigmented CMYK with the normal-pigmented CMYK profile

Comparing the normally pigmented ink with the highly pigmented ink in Esko Equinox software resulted in a color gamut of 571.734 cubic color units for normally pigmented CMYK and 652.536 cubic color units for highly pigmented ink. In other words, the highly pigmented ink had a 14% larger color gamut in this case. The gamut comparison is shown in Figure 69, which is cut at different lightness levels (L) from 10 to 90.

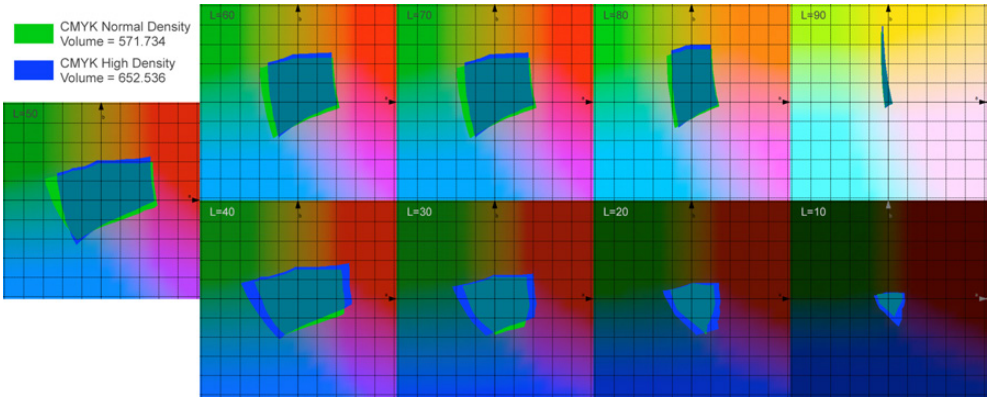


Figure 69 Comparison of normal-density and high-density CMYK color gamut (K. Lankinen)

As can be seen in Figure 69, the high-pigmented ink in dark shades at L = 10 and L = 20 offered a significantly larger color gamut in all areas. At L = 30 and L = 40, the color gamut was larger in all other areas except for the purple hue. At L = 50, the high-pigmented ink had a larger color gamut in areas apart from the magenta-purple and turquoise hues. From L = 60 to L = 80, the high-pigmented ink had a larger color gamut only for the yellow hue area. At L = 90, the area of the normal-pigmented ink was nearly identical to the high-pigmented ink profile.

7c and 4c reference profile ΔE color values

The evaluations of the examined profiles, which are also shown in APPENDIX 2: 7c EGP reference profile SOMA Optima2 2018 and APPENDIX 3: 4c EGP reference profile SOMA Optima2 2018, resulted in an average ΔE of 0,73 compared to the PMS colors for the 7-color profile (CMYKOGV) and 1,83 for the 4-color (CMYK) profile, as shown in Table 36.

Table 36 DeltaE of EGP 7c vs. 4c profiles compared to PMS colors

Profile, dE00	C	M	Y	K	O	G	V	dE<0,5	dE<1,0	dE<1,5	dE<2,0	dE<2,5	dE<3,0	InGamut	Ave dE
CMYK+OGV	X	X	X	X	X	X	X	74%	79%	83%	86%	89%	91%	76%	0,73
CMYK	X	X	X	X				59%	62%	66%	70%	72%	75%	49%	1,83

The 7-color profile showed a much larger color gamut than the 4-color profile, where 76% of the CMYKOGV colors and 49% of the CMYK colors were in gamut.

The 7-color profile showed a much better PMS color match than the 4-color profile. According to the profiles, the calculated color match of less than 0,50 ΔE was 74% for 7c and 59% for the 4c. The very low variation of less than 1,00 ΔE was as high as 79% for 7c and 62% for 4c, meaning that majority of the colors could be matched to the target color without a perceivable color difference.

The profiled value with low color variation, i.e., less than 2,00 ΔE, was 86% for 7c and 70% for 4c. The value for a generally acceptable color variation below 3,00 ΔE was 91% for 7c and 75% for 4c of the profiled colors.

As mentioned earlier, all the processes have variation, which builds up the tolerances to presenting and measuring color. Tolerances are included in the processes, such as for example:

Making the profiled plates: calibrations of the process.

Printing of original profile: process calibration and stability.

Measuring printed profile: device calibration and settings.

Profiling software: calculation models used for color profiling.

Profile creation: settings and calculations.

Color reference targets used in the software: color target values.

Color recipe: calculation criteria, rounding, or adjustment in color execution.

Color proofs: calibration, capability, and stability.

Making the printing plates: process repeatability.

Printing the products: process repeatability.

Measuring the final product colors: device calibration and tolerances.

The previous tolerance list shows that there is no 100% match to meet the original color reference, since the profile creation and color reproduction comprise many steps, all of which include tolerances. Even if the calculation shows a 0,00 ΔE match with a color, there is definitely always some deviation. The smaller the original ΔE match with the target color, the more variation it allows for the printing without a noticeable color difference.

7c and 4c total area coverage of reference profile

Simulated spot colors usually consist of one to three primary process colors. From the examined profile, it can be seen that the 7-color process had an average of 98% of the total area coverage and the 4-color process had an average of 101% TAC, as shown in Table 37.

Table 37 7c and 4c EGP colors and total area coverage

TAC, %	C	M	Y	K	O	G	V	<100%	100<200%	>200%	Average	Maximum
CMYK+OGV	X	X	X	X	X	X	X	52%	46%	2%	98%	265%
CMYK	X	X	X	X				49%	49%	2%	101%	243%

In approximately 98% of cases where simulated Pantone spot colors were printed, both 7c and 4c had a TAC of less than 200% and in about half of the cases the TAC was less than 100%.

As shown in Table 12, two overprinting process aniloxes result in comparable ink transfer volume as one spot color anilox. Hence, it can be said that most simulated Pantone colors saved ink when the switch was made from spot color to process color printing. According to the profile studied, only about 2% of the profiled colors had a larger total area coverage than 200%, meaning that only a small number of Pantone spot colors consumed more ink when printed with process colors compared to spot color printing.

The color tones and their coverage are listed in APPENDIX 2: 7c EGP reference profile SOMA Optima2 2018 and APPENDIX 3: 4c EGP reference profile SOMA Optima2 2018. These color profiles were used in the following test examples.

Conclusions from the reference profile test

The purpose of the reference profile test was to examine how the level of ink pigmentation and additional primary inks influence the color gamut, and how well the literature references deal with these results. The high-pigmented CMYK+OGV profile was compared to high-pigmented CMYK, normal-pigmented CMYK, and ISO-coated v2 profiles.

The significant findings of the study showed that the CMYK color gamut was expanded with high-pigmented process inks compared to a traditional print setup, as has been indicated by different studies and reports on offset and gravure printing (Andersson M. , 1997; Sweeney, 2010; Strickler, 2019; Hiremath, 2018; Chung & Hsu, 2006; Idealliance, 2016). On the other hand, as expected and as many studies and reports have noted (Furr, 2015; Hoffstadt, 2019; Strickler, 2019; Dreher, 2017; Forrester, 2019; Sharma & Seymour, Evaluation of expanded gamut software solutions for spot color reproduction, 2019; Ryerson University, 2019), the additional primary inks also expanded the gamut beyond the CMYK color gamut.

As shown by the results of the study by O'Hara et al. (O'Hara, Congdon, & Kariahlyn, 2019), this profile test also showed that the color gamut expansion was greater for shadows below L = 50 than for highlights above L = 50. However, it was noteworthy that the results of this thesis proved that the higher pigmentation as well as the higher chroma (C) increased both the color gamut and the in-gamut value, which was not assumed in the study by O'Hara et al.

The result of this study also confirmed the results from the study by O'Hara et al. (O'Hara, Congdon, & Kariahlyn, 2019) that the size of the color gamut does not always correlate directly with the number of PMS colors in the gamut. Although the high-pigmented CMYK and normal-pigmented CMYK profiles had a larger gamut than the ISO-coated v2 profiles, they still had fewer PMS colors in the gamut.

The above results showed that PMS colors could be simulated below 3,00 ΔE with high-pigmented CMYK inks in 75% of cases and with high-pigmented CMYK+OGV inks in 91% of cases, which confirmed the general expectations for color gamut expansion, as many other results have shown (Sharma & Seymour, 2019; Ryerson University, 2019; Politis, et al., 2015). However, in the Ryerson University study, 90% of the Pantone spot color library has been reproduced within 2,00 ΔE00. It should be noted that the CMYK inks used in this study were also highly pigmented and therefore had a larger color gamut than the normal-pigmented inks.

The significant findings of the present study also showed that simulated PMS colors generally used less ink in process printing compared to PMS spot colors. This was a very significant outcome, confirming the indications of previous results, although the Ryerson University study did not summarize the ink savings in their digital printing test (Sharma & Seymour, 2019; Ryerson University, 2019). The comparison of the study showed that the 7-color strategy had slightly less TAC on average than the 4-color strategy, which confirmed the expectations according to the Furr study (Furr, 2015).

The results confirmed the expectations and provided the following answers to the original questions:

1. *Can the EGP multicolor process method be used to eliminate spot colors in flexo printing?* Yes, multicolor printing can be used to eliminate PMS spot colors. In this test, the number of acceptable simulated spot colors was higher for the high-pigmented inks in flexography than for normal-pigmented inks.

2. *Does EGP methodology offer improved capacity and cost benefits compared to traditional flexo printing?* This question was not fully addressed in this chapter and cannot be fully answered on this basis. Nevertheless, based on the TAC calculations, the ink consumption in process color printing was lower compared to spot color printing.

3. *Does the switch from spot color printing to the EGP method offer the possibility for higher quality in flexography?* This question was not fully addressed in this chapter and cannot be fully answered on this basis. Based on the resulted color accuracy of the spot color

simulation, the studied higher pigmented CMYK inks with additional OGV primaries expanded the spot color simulation accuracy, but not all PMS colors could be replaced by the EGP, as is known.

4. *What kind of effect does the EGP method have on sustainability, productivity, and lot size in flexography?* This question was not fully addressed in this chapter and cannot be fully answered on this basis. As in the previous question, the ink consumption in process color printing based on the TAC calculations was lower compared to spot color printing and is therefore more sustainable. In addition, process colors do not have to be changed like spot colors, so on that basis the sustainability and productivity are better.

5. *What are the problem areas of EGP methodology?* The problem is that not all PMS colors can be replaced by multicolor process printing. Therefore, some spot colors are required if critical color tones are used in the design. Process printing, like all processes, has deviations, and if process control is lacking, even the normally acceptable multicolour process print results may become unacceptable in some cases.

3.2.2 Test-2: OATIS - differences in spot and EGP color printing

The OATIS brand co-printing from the company Real Snacks was done at SOMA Flexo Challenges 2019 to demonstrate the eco-efficiency of expanded gamut printing. In the demo the six different jobs were gathered onto a single sheet and co-printed with water-based inks on paper, as presented in Figure 70.

Figure 70 Co-printing of six OATIS designs in a single run with EGP (Image: Marvaco)

Five of the OATIS designs were originally executed with six colors and one (the yellow version) with five colors. The original designs were made with CMYK and one to two spot colors plus one white as reverse printing on OPP. The red variant of the design (Arrabbiata Pesto) is shown in Figure 71.

Because the original and demo products were printed on different materials (plastics vs. paper), this test was only simulated with theoretical calculations in this study and the plastic profile was not compared to the final print on paper.

The original signal (spot) colors used for the OATIS design backgrounds were PMS 2736 (violet blue), PMS 2925 (light blue), PMS 354 (green), PMS 485 (red), PMS 201 (red brown), and PMS 7549 (yellow). The logo text was made with spot yellow (PMS 7549) in all of the designs.

Figure 71 OATIS Arrabbiata Pesto, a six-color job (Image: Marvaco)

The conversion from spot colors to EGP CMYKOGV process colors is shown in Table 38 and Table 40 shows the conversion from spot colors to EGP CMYK process colors. The reference profiles were reverse printed on OPP and are shown

in the attachments. In Table 38 the EGP recipe for PMS 7549 yellow originally contained 0,01% of primary green process color, but in this test it was ignored as it is impossible to print 0,01% of any color.

Table 38 Converting OATIS spot colors to EGP process colors

PANTONE to EGP	C	M	Y	K	O	G	V	ΔE00	TAC	INK
PMS 2736 (violet blue)	**65,00**	0,00	0,00	0,00	0,00	0,00	**83,61**	**1,95**	149%	-26%
PMS 2925 (light blue)	**58,12**	0,00	0,00	0,00	0,00	0,00	**4,23**	**0,99**	62%	-69%
PMS 354 (green)	**3,70**	0,00	**67,28**	0,00	0,00	**100,00**	0,00	**1,35**	171%	-15%
PMS 485 (red)	0,00	**65,89**	0,00	0,00	**82,71**	0,00	0,00	**0,07**	149%	-26%
PMS 201 (red brown)	0,00	**74,59**	0,00	**29,22**	**60,57**	0,00	0,00	**0,00**	164%	-18%
PMS 7549 (yellow)	0,00	0,00	**100,00**	0,00	**32,56**	0,00	0,00	**0,14**	133%	-34%

It could be seen from the EGP conversion that each profiled ink recipe for a simulated spot color was predicted to be within a ΔE2000 of 2,0 and four out of these six spot colors were even within a ΔE2000 of 1,0. This meant that the designs could easily be converted to EGP if desired, as there were no thin lines, small texts, nor were there other elements in the design that would have required special attention or solutions in multicolor reproduction.

The number of colors per product and the theoretical difference in ink consumption of spot color vs. process colors are presented in Table 39. The calculation of the spot vs. EGP ink consumption (ΔInk) was calculated based on the calculation model where spot colors were printed with two times higher volume anilox in comparison to multicolor process printing. For example, spot colors to be printed with 7,0 cm^3/m^2 anilox and process colors with 3,5 cm^3/m^2 anilox. The calculation included the simplification that the ink transfer between different aniloxes was linear and the theoretical ink consumption calculation used was thought to be ideally 2x100% of process color (3,5 cm^3/m^2 anilox) equals 1x100% of spot color (7,0 cm^3/m^2 anilox).

In the calculations EGP-1 corresponded to the EGP CMYKOGV inks and EGP-2 corresponded to the EGP CMYK ink set. ΔPlate describes the difference in plates required when a job was transferred from spot color printing to process color printing.

Table 39 Spot colors of OATIS products

Product - OATIS	PMS to EGP	ΔInk	PMS to EGP	ΔInk	CMYK+PMS	EGP-1	ΔPlates	EGP-2	ΔPlates
Blueberry Pie	PMS 2736 (violet blue)	-26%	PMS 7549 (yellow)	-34%	6 pcs	6 pcs	0 pcs	6 pcs	0 pcs
Sea Salt	PMS 2925 (light blue)	-69%	PMS 7549 (yellow)	-34%	6 pcs	6 pcs	0 pcs	5 pcs	-1 pcs
Rosemary	PMS 354 (green)	-15%	PMS 7549 (yellow)	-34%	6 pcs	6 pcs	0 pcs	6 pcs	0 pcs
Arrabbiata Pesto	PMS 485 (red)	-26%	PMS 7549 (yellow)	-34%	6 pcs	5 pcs	-1 pcs	5 pcs	-1 pcs
Cinnamon Apple	PMS 201 (red brown)	-18%	PMS 7549 (yellow)	-34%	6 pcs	5 pcs	-1 pcs	5 pcs	-1 pcs
Italian Cheese	PMS 7549 (yellow)	-34%	-	0%	5 pcs	5 pcs	0 pcs	5 pcs	0 pcs

In all of the cases the amount of consumed ink showed a remarkable reduction when a color was converted from spot color to EGP-1 CMYKOGV colors. In individual cases the calculated ink consumption reduction was from -15% to -69%. For the yellow text the reduction was -34%.

Making the original CMYK + spot color separation with CMYK + OGV separation helped to reduce the number of colors in printing. When the designs would have been printed individually (one design per run), the number of printing plates used could be reduced by one unit in two of the cases (Arrabbiata Pesto and Cinnamon Apple) by replacing the original spot colors with CMYKO colors (EGP-1 solution). Furthermore, one more additional plate could have been eliminated from the Sea Salt product if the conversion of the light blue color (PMS 2925) had been done with only CMYK colors (EGP-2 solution) instead of the EGP violet, as shown in Table 40. Please note that the number of printing plates would not have increased in any of the cases when replacing spot color separation with CMYKOGV multicolor separation.

The calculations, shown in Table 39, show what efficient and excellent results could have been achieved with the EGP process. One should bear in mind that there is no need to use additional OGV primary process colors when a good enough result can be achieved even with fewer inks, as in CMYK printing. The examination of the OATIS design colors in CMYK inks is shown in Table 40.

Table 40 OATIS spot colors in CMYK process colors

PANTONE to CMYK	C	M	Y	K	O	G	V	ΔE00	TAC	INK
PMS 2736 (violet blue)	78,70	88,45	0,00	0,00	-	-	-	9,40	167%	-17%
PMS 2925 (light blue)	59,09	3,90	0,00	0,00	-	-	-	1,70	63%	-69%
PMS 354 (green)	64,66	0,00	80,00	0,00	-	-	-	9,27	145%	-28%
PMS 485 (red)	0,00	79,58	91,94	0,00	-	-	-	1,04	172%	-14%
PMS 201 (red brown)	0,00	83,60	64,41	27,35	-	-	-	0,00	175%	-13%
PMS 7549 (yellow)	0,00	14,53	100,00	0,00	-	-	-	3,84	115%	-43%

The projection of OATIS designs with CMYK color predictions in Table 40 shows that the spot colors PMS 2925, PMS 485, and PMS 201 could have been printed within a ΔE2000 of 2,0 only in CMYK without using additional OGV primary inks. Keeping in mind that each design contained yellow text (PMS 7549) that was out of the normally acceptable tolerance of 3,0 ΔE2000, a minimum of five inks would have been required to print the designs. The color deviation of the CMYK profiled PMS 7549 was 3,8 ΔE2000, which is a noticeable difference. Furthermore, the calculated color deviation of CMYK printed PMS 2736 was 9,4 ΔE2000 and that of PMS 2736 was 9,3 ΔE2000. Hence, the colors made in CMYK were visually significantly different than the corresponding spot colors and it is therefore recommended to execute them not with CMYK but with CMYKOGV.

The optimization of the design in CMYK and CMYKOGV color separations is shown in Table 41.

Table 41 CMYK vs. EGP color separation comparison

CMYK vs. EGP	C	M	Y	K	O	G	V	ΔE00	TAC	INK
PMS 2925 (light blue) 4c	59,09	3,90	0,00	0,00	-	-	-	1,70	63%	-69%
PMS 2925 (light blue) 7c	58,12	0,00	0,00	0,00	0,00	0,00	4,23	0,99	62%	-69%
PMS 485 (red) 4c	0,00	79,58	91,94	0,00	-	-	-	1,04	172%	-14%
PMS 485 (red) 7c	0,00	65,89	0,00	0,00	82,71	0,00	0,00	0,07	149%	-26%
PMS 201 (red brown) 4c	0,00	83,60	64,41	27,35	-	-	-	0,00	175%	-13%
PMS 201 (red brown) 7c	0,00	74,59	0,00	29,22	60,57	0,00	0,00	0,00	164%	-18%
PMS 7549 (yellow) 4c	0,00	14,53	100,00	0,00	-	-	-	3,84	115%	-43%
PMS 7549 (yellow) 7c	0,00	0,00	100,00	0,00	32,56	0,00	0,00	0,14	133%	-34%

Comparing the above color recipes it can be seen that, on the one hand, the total area coverage of EGP printed PMS 485 and PMS 201 was slightly lower compared to the CMYK, but on the other hand the TAC difference was rather small (23% and 9%) for taking an additional primary color from OGV colors. In summary, it could be said that the OATIS designs with PMS 2925, PMS 485, and PMS 201 can be

printed with CMYK or EGP color separation depending on which is considered best for each case, but it would be beneficial to print the yellow PMS 7549 with EGP as it was significantly closer to the targeted color than the CMYK color separation.

Cost-wise the process color separation differences were investigated holistically and they were case-dependent. Please note that, in some cases, despite the lower ink consumption of EGP separation, the total cost of ink can be lower in CMYK color separation. For example, the cost of orange ink per kg is usually slightly higher than the price of process yellow. However, in general, the ink cost differences are so small that they do not need to be considered in calculations. Moreover, the number of plates must be taken into account.

Please note that the previous ΔE color matching calculations were theoretical and have not been verified in real printing. Nevertheless, the example gives a good and reliable insight into the conversion process from spot colors to the CMYKOGV process as they were based on the real printing press profile values.

Optimization of eco-efficiency in OATIS products

When there is a desire to optimize the printing process further, then co-printing (gang-run printing) should be considered. As the pack height of the OATIS jobs was identical (repeat length 265 mm), these jobs were very suitable for co-printing. A sample of the co-printing of two designs (Arrabbiata Pesto and Cinnamon Apple) is shown in Figure 72.

Figure 72 Co-printing of two different OATIS designs (Image: Marvaco)

In order to be able to use gang-run printing, the width of a single package must be narrow enough that the designs can be run together in two or more lanes in a single pass. In this case the printing width of a single package was 450 mm, allowing the job to be printed in two or even three lanes, depending on the printing machine web width.

Typical web widths of wide web printing presses are from 1220 mm to 1290 mm, which would make it possible to print these jobs in two lanes. There are also printing presses with a width of 1500 mm, which would allow printing in three lanes. The combinations of two designs and the required number of inks per co-printing run are shown in Table 42.

Table 42 Number of colors in different OATIS co-printing combinations

A: CMYK+spot colors	Blueberry Pie	Sea Salt	Rosemary	Arrabbiata Pesto	Cinnamon Apple	Italian Cheese
Blueberry Pie	6	7	7	7	7	6
Sea Salt	7	6	7	7	7	6
Rosemary	7	7	6	7	7	6
Arrabbiata Pesto	7	7	7	6	7	6
Cinnamon Apple	7	7	7	7	6	6
Italian Cheese	6	6	6	6	6	5

B: EGP-1 colors	Blueberry Pie	Sea Salt	Rosemary	Arrabbiata Pesto	Cinnamon Apple	Italian Cheese
Blueberry Pie	6	6 (-1)	7	6 (-1)	6 (-1)	6
Sea Salt	6 (-1)	6	7	6 (-1)	6 (-1)	6
Rosemary	7	7	6	6 (-1)	6 (-1)	6
Arrabbiata Pesto	6 (-1)	6 (-1)	6 (-1)	5 (-1)	5 (-2)	5 (-1)
Cinnamon Apple	6 (-1)	6 (-1)	6 (-1)	5 (-2)	5 (-1)	5 (-1)
Italian Cheese	6	6	6	5 (-1)	5 (-1)	5

C: EGP-2 colors	Blueberry Pie	Sea Salt	Rosemary	Arrabbiata Pesto	Cinnamon Apple	Italian Cheese
Blueberry Pie	6	6 (-1)	7	6 (-1)	6 (-1)	6
Sea Salt	6 (-1)	5 (-1)	7	5 (-2)	5 (-2)	5 (-1)
Rosemary	7	7	6	6 (-1)	6 (-1)	6
Arrabbiata Pesto	6 (-1)	5 (-2)	6 (-1)	5 (-1)	5 (-2)	5 (-1)
Cinnamon Apple	6 (-1)	5 (-2)	6 (-1)	5 (-2)	5 (-1)	5 (-1)
Italian Cheese	6	5 (-1)	6	5 (-1)	5 (-1)	5

As visualized in Table 42, pairing two OATIS designs into a single run can create 15 different combinations plus 6 identical combinations. 15 different combinations mean that instead of two separate setups and two print runs, two different jobs can be combined and the single combined print setup made and run. This is very beneficial as often a single job run length can be short and ganging of jobs makes printing more efficient.

If two identical designs with spot color separation would have been printed as a gang-run print in two lanes, CMYK and one to two spot colors would have been required, as shown in chart A. If two identical jobs with EGP or CMYK execution would have been printed together, in some cases the number of printing plates could have been reduced by one, as shown in charts B and C.

In the case of the red designs (PMS 485 red and PMS 201 red brown), these two designs could have been printed with EGP using only five process colors (CMYK+O), although with spot colors it would have needed seven colors (CMYK + PMS 485 red, PMS 201 red brown and PMS 7549 yellow). This would have meant the potential of eliminating three spot colors and saving two printing plates.

In cases where blue designs (PMS 2736 violet blue and PMS 2925 light blue) would have been EGP printed together or with red designs (PMS 485 red or PMS 201 red

brown), six process colors would have been required (CMYK+O+V). Printing with spot colors would have needed seven colors. This would have meant the potential of eliminating three spot colors and saving one printing plate.

If the green design (PMS 354 green) had been EGP printed together with red designs (PMS 485 red or PMS 201 red brown), six process colors would have been needed (CMYK+O+G), whereas printing with spot colors would have required seven colors. This would have meant the potential of eliminating three spot colors and saving one printing plate.

If the green design (PMS 354 green) had been EGP printed together with blue designs (PMS 2736 violet blue or PMS 2925 light blue), seven process colors would have been required (CMYK+O+G+V). Printing with spot colors would still have needed seven colors, but the job change would have been less effective and would have required more time as the three spot colors would have had to be prepared and matched, as well as washed off at the end of the run.

Printing the previously mentioned six OATIS jobs with EGP would have needed only CMYK plus three process colors, whereas spot color separation would have needed CMYK plus six additional spot colors. Hence, moving from spot color printing to EGP printing would have given the possibility to eliminate six spot colors and reduce the total number of colors (inks) by 30%, from ten colors to seven colors. In addition, the calculated reduction of ink consumption was from -15% to -69%. The reduction for the yellow OATIS text was -34%. The above means that, in printing all these jobs, the number of individual printing plates could have been reduced by 9% from 35 plates to 32 plates, which would have meant that the change from spot color printing to EGP would have resulted in a more efficient and more sustainable printing process.

Table 43 shows the theoretical ink saving calculation per piece of artwork when a spot color job is made with EGP color separation. The calculation was made with the assumption that the wet ink transfer from the anilox to the substrate was ideally 33%. The spot color printed area was 23% and the text spot color covered an area of 5% of the total artwork. In the evaluation the spot color anilox had a volume of 7,0 cm^3/m^2 and the process anilox a volume of 3,5 cm^3/m^2.

Table 43 OATIS spot to EGP ink saving calculation per piece

PANTONE SPOT to EGP	Spot area	Spot anilox	Ink transfer 33%	EGP anilox	Ink transfer 33%	EGP TAC	Print m2 per pcs	Spot m2 per pcs	Spot ink per pcs	EGP ink per pcs	ΔInk per pcs
PMS 2736 (violet blue)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	149%	0,12 m2	0,03 m2	0,064 g	0,048 g	-0,016 g
PMS 2925 (light blue)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	62%	0,12 m2	0,03 m2	0,064 g	0,020 g	-0,044 g
PMS 354 (green)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	171%	0,12 m2	0,03 m2	0,064 g	0,055 g	-0,009 g
PMS 485 (red)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	149%	0,12 m2	0,03 m2	0,064 g	0,048 g	-0,016 g
PMS 201 (red brown)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	164%	0,12 m2	0,03 m2	0,064 g	0,052 g	-0,012 g
PMS 7549 (yellow)	23%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	133%	0,12 m2	0,03 m2	0,064 g	0,042 g	-0,022 g
PMS 7549 text (yellow)	5%	7,00 g/m2	2,33 g/m2	3,50 g/m2	1,17 g/m2	133%	0,12 m2	0,01 m2	0,014 g	0,009 g	-0,005 g

The calculation in Table 43 shows that switching from spot color to process color printing gives the potential to save from 0,005 to 0,044 g of ink per package.

Table 44 shows the theoretical ink consumption and ink savings for 100.000 pcs of printed products. A print job of 100.000 pcs would have had a run length of 22.500 meters if one and the same design had been printed in two lanes or 45.000 meters when printed in one lane, for example in a gang-run print.

Table 44 OATIS spot to EGP ink saving calculation per 100.000 pcs

PANTONE SPOT to EGP	Spot ink per 100.000 pcs	EGP ink per 100.000 pcs	ΔInk per 100.000 pcs	% Ink save	Wash save	% Wash save	Total save	Total save-%
PMS 2736 (violet blue)	6,40 kg	4,77 kg	-1,63 kg	26%	0,90 kg	14%	-2,53 kg	40%
PMS 2925 (light blue)	6,40 kg	1,98 kg	-4,42 kg	69%	0,90 kg	14%	-5,32 kg	83%
PMS 354 (green)	6,40 kg	5,47 kg	-0,93 kg	15%	0,90 kg	14%	-1,83 kg	29%
PMS 485 (red)	6,40 kg	4,77 kg	-1,63 kg	26%	0,90 kg	14%	-2,53 kg	40%
PMS 201 (red brown)	6,40 kg	5,25 kg	-1,15 kg	18%	0,90 kg	14%	-2,05 kg	32%
PMS 7549 (yellow)	6,40 kg	4,24 kg	-2,16 kg	34%	0,90 kg	14%	-3,06 kg	48%
PMS 7549 text (yellow)	1,39 kg	0,92 kg	-0,47 kg	34%	0,90 kg	65%	-1,37 kg	98%

The calculated ink consumption was identical at 6,40 kg for all the signal colors when printed in spot colors and 1,39 kg for the text part. With EGP multicolor separation the calculated ink consumption was between 1,98 and 5,47 kg, depending on the signal color tone, and 0,92 kg for the text area. Darker colors consume more ink and lighter color shades consume less ink.

Each time a spot color is changed to another color the previous ink needs to be washed off from the printing machine. It has earlier been reported that a minimum of 0,9 kg of ink is wasted (in the case of a modern printing machine) each time that a color is washed off. With older machines the ink waste has earlier been reported to be as high as 2,0 kg of ink per wash. This means that the ink saved per signal color

including washes is calculated to be from 1,83 to 5,32 kg, corresponding to a total ink saving of 29 to 83%.

In addition to ink savings, the use of cleaning solvent for spot color changes (wash-off) could also be avoided. On average, modern equipment was reported earlier to consume approximately 15 liters of washing detergent (solvent or water) per color and generate waste that needs to be dealt with. In older machines it has earlier been reported that washing detergent consumption is as much as double . Moreover, the washing cycle increases the job changeover time and some additional energy is consumed.

Pairing different jobs into a single EPG gang-run print can reduce the material waste and preparation costs significantly. To enable the ganging of different jobs would require agreeing that the ordered job order size would be identical for the products that are printed together. This would require good communication between the customer and supplier, but would be eco-efficient.

Conclusions from the OATIS study

The purpose of the OATIS study was to use authentic designs and theoretical calculations to investigate how well a spot color design could have been executed in EGP and co-printing. The study showed that the design was very suitable for execution in this way. The calculations based on the examined profiles showed that all six spot colors could have been eliminated and replaced by process printing within acceptable tolerances of below 2,0 ΔE2000.

The design did not contain small text or lines and therefore all elements were suitable for multicolor process printing or could even have been made with only CMYK colors. The significant findings of the study were that the TAC of the colors indicated that each color would have offered noticeable ink savings of 15 to 69 percent. In addition, the number of plates showed the possibility of a 33% reduction with the CMYK+OGV color strategy and up to a 50% reduction with the CMYK color strategy compared to the original spot color version.

Another significant confirmatory finding of the study was that the efficiency could have been further optimized by ganging the designs. In this case, all six designs could have been printed in different combinations as necessary. This would have allowed

longer runs in combined webs, made production more flexible, and also had a positive impact on reducing substrate waste and the number of plates.

Although many sources have reported that expanded gamut printing offers great benefits when jobs can be ganged and printed together (O'Hara & Congdon, 2016; O'Hara;Congdon;& Gasque, Optimizing Print Sequence for Expanded Color Gamut, 2016; Forrester, 2019; Furr, The Effect of Press Variation on Color Stability with 7-color and 4-color Process Color Tint Builds, 2015; Sweeney, 2010; Hiremath, 2018), none of them have specified this in more detail, nor given a numeric evaluation of gang-run printing efficiency. This study was able to specify the benefits in more detail and the significance of gang-run printing in numbers.

Although many previous sources have reported that Moiré is an almost inevitable problem with multicolor designs, these designs did not show any Moiré effect.

The results confirmed expectations and provided the following answers to the original questions:

1. *Can the EGP multicolor process method be used to eliminate spot colors in flexo printing?* Yes, based on the calculations, all spot colors were able to be eliminated in this test and replaced by multicolor printing. The evaluations did not show any problems in the execution and co-printing of these designs in flexography.

2. *Does EGP methodology offer improved capacity and cost benefits compared to traditional flexo printing?* Yes, this example showed very good potential for improving capacity and cost efficiency with EGP compared to spot color printing.

3. *Does the switch from spot color printing to the EGP method offer the possibility for higher quality in flexography?* This question has not been fully addressed in this chapter and cannot be fully answered on this basis. With regard to the color accuracy calculations of the spot color simulations with EGP, all colors were well within the acceptable tolerances of below 2,0 ΔE2000. The design did not contain any texts or small elements that would have compromised the quality.

4. *What kind of effect does the EGP method have on sustainability, productivity, and lot size in flexography?* These designs were highly suitable for EGP printing. The evaluation showed that EGP would have made these jobs more sustainable, more efficient, made production and production planning more flexible, and offered the opportunity to save ink, plate, and substrate.

5. *What are the problem areas of EGP methodology?* This evaluation showed no problems with the transition to EGP printing.

3.2.3 Test-3: Fazer Puikula legacy job pilot project

Transferring a legacy job with spot colors to multicolor process printing can be challenging. This was also observed in the Fazer Puikula bread bag pilot project, which was conducted on a large scale and examined in practice in the supply chain. The design of the job is shown in Figure 73.

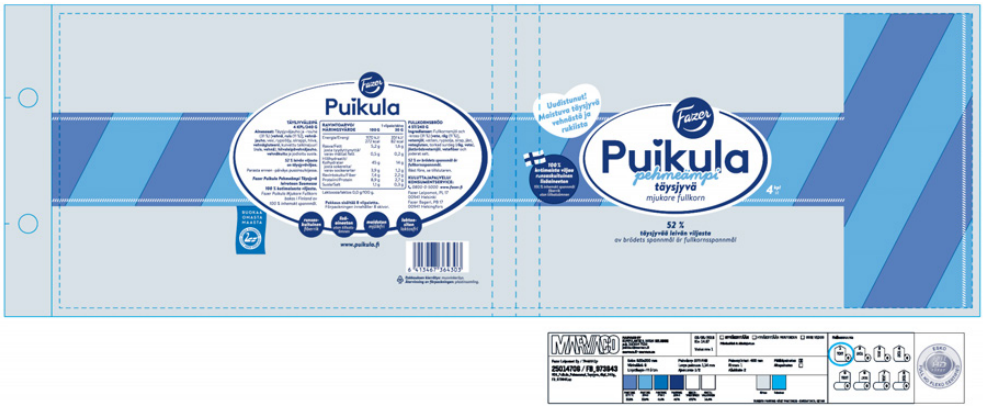


Figure 73 Original design of the Fazer Puikula legacy job (Image: Marvaco)

The original design was originally executed with four blue spot colors and two white ones. The spot colors were the Fazer logo and product texts with barcode in "Dark Blue X", dark blue "stripes" in "Blue C", light blue "stripes" in "Light Blue D," and the "Ruokaa omasta maasta" label in "Blue A".

The most critical element for color accuracy was the "Dark Blue X" logo. The "stripe" signal colors were also important, but their meaning played a minor role in the brand color, as the "Fazer" and "Puikula" brands and the shape of the elements are very well known on the Finnish market. The "Blue A" label had tertiary priority.

At first, the colors were checked in the EGP profile and the results are shown in Table 45.

Table 45 Fazer Puikula spot colors to CMYKOGV EGP colors

PANTONE to EGP™	C	M	Y	K	O	G	V	ΔE00	TAC	INK
Dark Blue X	82,99	0,00	0,00	48,82	0,00	0,00	75,65	0,00	207%	4%
Blue C	50,19	0,00	0,00	0,00	0,00	0,00	41,87	5,13	92%	-54%
Light Blue D	38,66	0,00	0,00	0,00	0,00	0,00	5,19	1,56	44%	-78%
Blue A	100,00	0,00	0,00	0,00	0,00	0,00	47,27	0,86	147%	-26%

As can be seen in Table 45, the "Dark Blue X" logo color with cyan, black, and violet process colors with 0,0 ΔE2000 perfectly matched the spot color target. The blue label color "Blue A" was also nicely within the target gamut tolerances of below 1,0 ΔE2000.

The light blue stripe color "Light Blue D" was also well within the target gamut tolerances at about 1,6 ΔE2000, but the dark blue stripe "Blue C" was outside the normally acceptable color variation with 5,1 ΔE2000 from the target color.

The positive aspect of the color conversion was that the colors were created nicely with only two process colors, with the exception of the blue "Dark Blue X" logo, which consisted of three inks. Moreover, all colors except the logo color resulted in remarkable ink savings of -26 to -78%, with the logo consuming only +4% more ink. This execution reduced the number of colors and ink consumption to result in a more sustainable product.

Second, the spot colors were also checked in the CMYK EGP profile and the results are shown in Table 46.

Table 46 Fazer Puikula spot colors to CMYK EGP colors

PANTONE to CMYK EGP™	C	M	Y	K	O	G	V	ΔE00	TAC	INK
Dark Blue X	100,00	91,86	0,00	2,91	-	-	-	0,20	195%	-3%
Blue C	56,93	35,00	0,00	0,00	-	-	-	6,23	92%	-54%
Light Blue D	42,38	4,22	0,00	0,00	-	-	-	2,30	47%	-77%
Blue A	83,14	50,12	0,00	0,00	-	-	-	4,00	133%	-33%

As can be seen in Table 46, the "Dark Blue X" logo color was now created from the process cyan, magenta, and black colors with a very good color accuracy of 0,2 ΔE2000 from the spot color target. The other colors in contrast were already in an area where the color deviation from the original color targets was perceivable.

The blue label color "Blue A" had a ΔE2000 of 4,0; the light blue stripe color "Light Blue D" was still within the tolerances at about 2,3 ΔE2000, but the dark blue stripe "Blue C" was even further outside the normally acceptable color deviation of 6,2 ΔE2000 from the target color.

The positive aspect of this color conversion was that it was possible to create all the colors with only two process colors, even if the small amount of process black (2,91%) was excluded from the blue "Dark Blue X" logo. Since the logo color was so close to 0,00 ΔE2000, a small deviation by removing the black was acceptable. Moreover, all colors, including the logo color, led to a considerable ink saving of -3 to -77%. This execution further reduced the number of colors and ink consumption in order to result in an even more sustainable product.

In discussions with the brand owner, it was decided to execute the spot colors only in cyan and magenta, as this allowed the elimination of two colors and use of the common cyan and magenta process colors. It was noted that the other simulated PMS colors, with the exception of the brand color "Dark Blue X", would deviate significantly from the previously printed bread bags. However, the brand owner was so determined to pursue sustainability that the presented color difference was accepted for the secondary "Light Blue D," "Blue C," and tertiary "Blue A" colors.

Due to the previous decision, the final spot color conversion was performed with cyan and magenta only, as shown in the CMYK EGP reference profile in Table 47.

Table 47 Optimized Fazer Puikula spot color simulation in CM EGP

PANTONE to CMYK EGP™	C	M	Y	K	O	G	V	ΔE00	TAC	INK
Dark Blue X	100,00	91,86	0,00	0,00	-	-	-	x,xx	192%	-4%
Blue C	56,93	35,00	0,00	0,00	-	-	-	6,23	92%	-54%
Light Blue D	42,38	4,22	0,00	0,00	-	-	-	2,30	47%	-77%
Blue A	83,14	50,12	0,00	0,00	-	-	-	4,00	133%	-33%

Although the ink savings in percentile form appear to be high, it is worth keeping in mind that the total ink savings in kilograms depend on the printed area and ink film thickness. The colors had the following coverage areas in the printed design:

4,70% Fazer logo and product texts with barcode in "Dark Blue X"

11,10% dark blue "stripes" "Blue C"

11,90% light blue "stripes" "Light Blue D"

0,40% blue label ”Ruokaa omasta maasta” ”Blue A”

Theoretical Fazer Puikula ink savings

The ink savings were calculated according to the studied profile, and the white color was not included in the calculations since it remained unchanged. Please note that the profile was not the one that the actual printer used, but the one that was used in this study. For this reason, these ink savings calculations are theoretical and actual percentages may vary in real-world execution. The ink calculations are shown in Table 48.

Table 48 Test Fazer Puikula ink saving calculation 1

PANTONE to CM-EGP™	Spot anilox	Ink transfer 33%	Spot ink per m2	Print area	Spot ink per print	EGP anilox	Ink transfer 33%	EGP TAC	EGP ink per m2	Print area	EGP ink per print	Δink per m2	Δink per print	Δink print-%
Dark Blue X	7,00 g/m2	2,33 g/m2	2,33 g/m2	4,70%	0,11 g/m2	3,50 g/m2	1,17 g/m2	192%	2,24 g/m2	4,70%	0,11 g/m2	-0,095 g	-0,004 g	-4%
Blue C	7,00 g/m2	2,33 g/m2	2,33 g/m2	11,10%	0,26 g/m2	3,50 g/m2	1,17 g/m2	92%	1,07 g/m2	11,10%	0,12 g/m2	-1,261 g	-0,140 g	-54%
Light Blue D	7,00 g/m2	2,33 g/m2	2,33 g/m2	11,90%	0,28 g/m2	3,50 g/m2	1,17 g/m2	47%	0,54 g/m2	11,90%	0,06 g/m2	-1,790 g	-0,213 g	-77%
Blue A	7,00 g/m2	2,33 g/m2	2,33 g/m2	0,40%	0,01 g/m2	3,50 g/m2	1,17 g/m2	133%	1,55 g/m2	0,40%	0,01 g/m2	-0,779 g	-0,003 g	-33%
White(s)														
TOTAL SUM				28,10%	0,66 g/m2					28,10%	0,30 g/m2		-0,36 g/m2	-55%

It was assumed in the calculation that the spot colors were printed with 7,0 cm^3/m^2 aniloxes and the process colors with 3,5 cm^3/m^2 aniloxes and that the ink transfer of different aniloxes is linear to the anilox volume. This means that the ink consumption of the spot color anilox is double that of the process color anilox. The value of 1 cm^3 was approximated to 1 g of ink.

It was also assumed that the total ink transfer from anilox to the substrate was 33%. In addition, the spot color area (0,40…11,90%) determined the total volume of ink transferred per design for spot colors, but for process colors, the total area coverage (47…192%) also affected the final amount of ink consumed.

As expected, the calculations resulted in the same ink consumption differences (-4…-77%) between the spot and process inks as found in the previous color recipes. On average, the consumption of colored ink was reduced by 55%. A further ink consumption calculation is shown in Table 49.

Table 49 Test Fazer Puikula ink saving calculation 2

PANTONE to CM-EGP™	Job m2 per pcs	Print area per pcs	Spot ink per pcs	EGP ink per pcs	ΔInk per pcs	Spot ink per 1.000.000 pcs	EGP ink per 1.000.000 pcs	Ink save per 1.000.000 pcs	Ink save-%	Washed ink	Spot ink total use	Wash save-%	Total ink save	Total ink save-%
Dark Blue X	0,123 m2	0,006 m2	0,013 g	0,013 g	-0,001 g	13,46 kg	12,91 kg	**0,55 kg**	**4%**	3,60 kg	17,06 kg	21%	**4,15 kg**	**24%**
Blue C	0,123 m2	0,014 m2	0,032 g	0,015 g	-0,017 g	31,79 kg	14,61 kg	**17,18 kg**	**54%**	3,60 kg	35,39 kg	10%	**20,78 kg**	**59%**
Light Blue D	0,123 m2	0,015 m2	0,034 g	0,008 g	-0,026 g	34,09 kg	7,94 kg	**26,14 kg**	**77%**	3,60 kg	37,69 kg	10%	**29,74 kg**	**79%**
Blue A	0,123 m2	0,000 m2	0,001 g	0,001 g	0,000 g	1,15 kg	0,76 kg	**0,38 kg**	**33%**	3,60 kg	4,75 kg	76%	**3,98 kg**	**84%**
White(s)														
TOTAL SUM	0,123 m2	0,034 m2	0,080 g	0,036 g	-0,044 g	80,5 kg	36,2 kg	**44,3 kg**	**55%**	14,4 kg	94,9 kg	15%	**58,7 kg**	**62%**

The total area of the bag surface was 0,123 m², with the majority was unprinted or white and only 28,10% was printed in color. The calculation also assumed that the annual volume was 1.000.000 bags, printed in four batches. This meant that this single product would have been printed four times a year, and in the case of spot color printing, 0,9 kg of ink would have been washed off per wash in each spot color print batch.

As calculated, the theoretical annual consumption would have been 80,5 kg of spot color ink or 36,2 kg of process color ink to print this product. The difference would have resulted in savings of 44,3 kg (55%). It is worth noting that changing the spot ink would also consume (wasted) inks and entail washing 14,4 kg of ink in four batches. This would have resulted in a total spot ink consumption of 94,9 kg and meant a total ink saving of 58,7 kg of colored ink per year, which corresponds to a total ink saving of 62%.

Please note that preparing a printing press requires about 15 kg of ink to start the press. As a result, the percentage of ink saved for colors that are used very little becomes very large. In this case, the printing of blue label "Blue A" would have consumed only 1,15 kg, while 3,60 kg of ink would have been washed off, which would have led to an annual ink saving of 84%.

The lighter the simulated spot color tone, the less total area covered with process ink and the less ink consumed. For example, "Light Blue D" had only 47% of the screened area covered with ink, which would have led to a 77% reduction of ink consumption and 79% total ink reduction when washes were also included.

Although the amount of spent and saved ink in kilograms for this product seemed small, it should be noted that each bag was approximately 0,2 m wide and a sample quantity of 1.000.000 bags corresponded to a total print run of 200.000 meters per year, i.e., 50.000 meters per run. At a print speed of 275 meters per minute, a print

run takes 3,0 hours and 0,5 hours of preparation time. This means that the ink saving of 58,7 kg in this case would correspond to a total production time of 14,1 hours.

With an annual production capacity of 6.000 hours, around 424 similar batches could have been performed each year. If each batch saved 58,7 kg of ink, this would have corresponded to an annual saving of 24.941 kg of ink, which would already be a significant improvement in sustainability. In addition, it should be noted that in this particular test, only 28,10% of the area was printed with colors and higher ink coverage would have resulted in even greater savings.

In addition, in this particular test, the order length was calculated to be quite long at 50.000 meters per job, but in many cases the typical average job length can be as much as 15.000 meters, and the trend is for shorter runs.

Fazer Puikula color accuracy

Since this was a legacy job, it was almost inevitable that there would be some color deviation. Not only does this multicolor printed simulated spot color deviate from the color target, but usually the fact that previous jobs were printed in a different location or with a different method also causes color variation, as was also the case in this project.

Please note that the difference between the printed spot color of the product and the original PMS color reference can also be caused by the print acceptance, where the advertising agency or the representative of the brand owner asks to adapt the color to a specific target. This often results in a deviation from the original PMS reference.

As already mentioned, the blue "Dark Blue X" logo was the primary color and had to be kept within the tolerances. The product signal colors dark blue "Blue C" and "Light Blue D" had secondary priority, and for this specific project, color adjustment was allowed as needed to match the CM-EGP process and meet sustainability expectations. The small blue information label "Blue A" had tertiary priority and larger color variations were allowed, as this has no influence on product recognition.

Based on the above requirements, the color profiling was done with cyan and magenta, and color tolerance adjustments of secondary and tertiary colors were

inevitable as the original Fazer Puikula blue color shades were difficult to achieve. The color differences are visualized in Figure 74 and Figure 75.

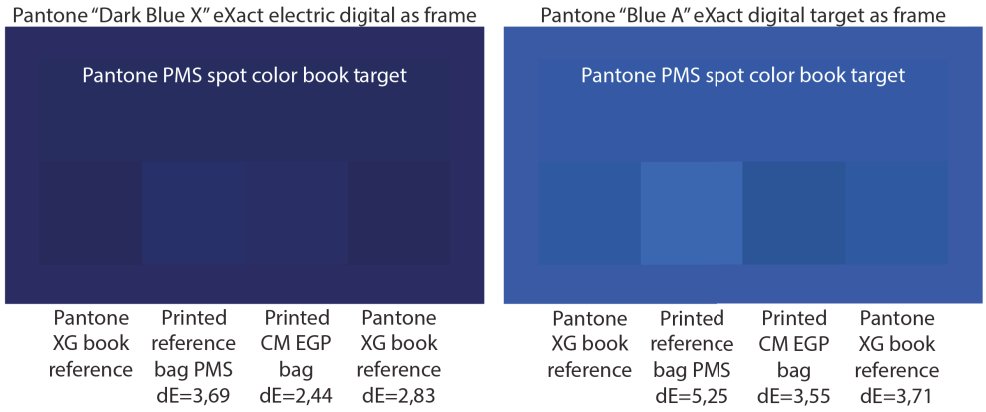


Figure 74 Comparison of Fazer Puikula "Dark Blue X" and "Blue A" color (K. Lankinen)

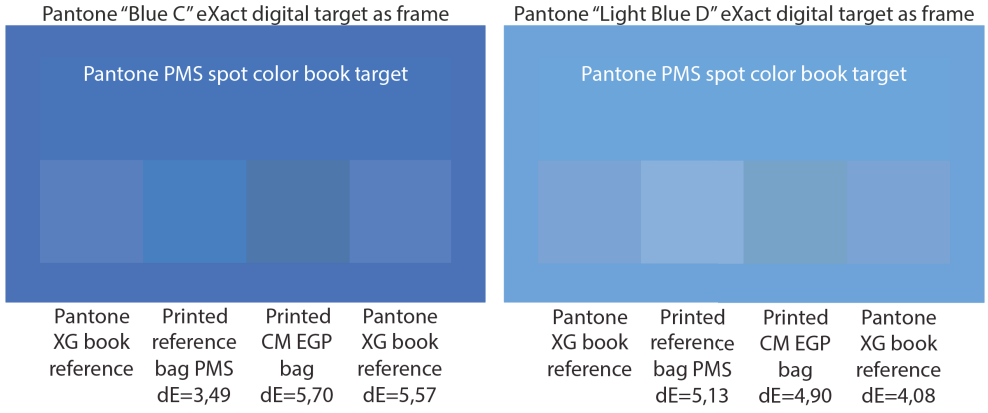


Figure 75 Comparison of Fazer Puikula "Blue C" and "Light Blue D" color (K. Lankinen)

As shown above, the digital PMS library of the spectrophotometer color is around the images, the color from the Pantone Solid Coated swatch is on the top row, and from left to right on the lower row there are color illustrations of the Pantone XG Coated swatch, an earlier produced spot color printing sample, the final CM-EGP printed bag, and again the Pantone XG Coated swatch reference.

The brand owner was informed of the color differences, who accepted the adjusted colors, although there were some visible color differences from the previously printed products as anticipated. In this test, it was noted that the color gamut for blue was limited for both CMYKOGV and cyan-magenta process printing.

As shown in Table 50, none of the reproduced CM-EGP colors had an exact match for the original PMS (X-Rite eXact digital value) as the ΔE of the printing varies between 2,44 and 5,70.

Table 50 Test Fazer Puikula colors dE2000

PANTONE to CM-EGP™	PMS book spot reference	CMYKOGV XG reference	CM-EGP™ print	Previous spot print
Dark Blue X	1,36	2,83	**2,44**	3,69
Blue C	1,48	5,57	**5,70**	3,49
Light Blue D	1,37	4,08	**4,90**	5,13
Blue A	2,50	3,71	**3,55**	5,25

The most important logo color "Dark Blue X" was within the tolerances of below 2,5 ΔE and there was a very minimal visual color deviation from the target color. Since the primary color was within the tolerances, it was accepted by the brand owner. The small texts and thin lines as well as the barcode were created with the same color separation.

The secondary signal colors "Blue C" and "Light Blue D" had a visible difference to their target colors of 5,70 ΔE and 4,90 ΔE, but the reason for this color deviation was understood and accepted by the brand owner for the purpose of this pilot project. It was interesting that the Pantone XG swatch also showed similar deviation (5,57 ΔE and 4,08 ΔE) from the color target for these colors, which meant that these particular colors were difficult to achieve with the CMYKOGV color system.

The tertiary blue label color "Blue A" also had a visible difference of 3,55 ΔE to its target color, but due to the tertiary importance of the element, the color deviation was not critical and it was close enough to the target to be accepted.

Fazer Puikula register accuracy and print quality

Like every brand owner, Fazer also wanted to have as high product quality as possible. With the transfer from spot color printing to EGP quality improvements were also targeted.

The registration between the colors is always important in process printing, as in this case. This design had printing plates with a very typical width of 0,6 meters and a repeat length of 0,4 meters (two designs were printed repeatedly), which helped to keep the register within the required tolerances. The print result in two colors (cyan and magenta) was very sharp and the small texts and lines were easy to read, as shown in Figure 76.

Figure 76 Fazer Puikula test: register accuracy of cyan and magenta (Image: Marvaco and K. Lankinen)

The EGP also offered higher quality through better readability of texts and sharper items, as shown in Figure 77. The sharper details were due to the fact that it was possible to preserve the details better with a thinner ink layer.

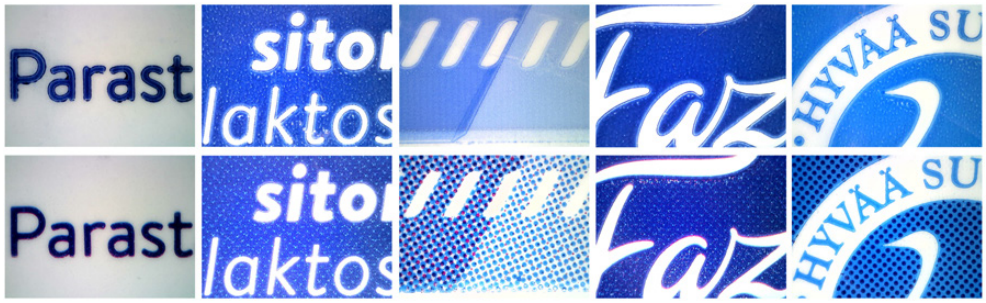


Figure 77 Fazer Puikula details (50x magnification) (K. Lankinen)

The top row shows details of a spot color printed bag and the bottom row the process printed detail of the same part. Please note that the 50x magnification shows dots that were not visible in the actual print.

Building text and lines in multiple colors

It is true that especially text or a barcode may become a problem when printed in multiple colors. This also applies to both small negative and positive text fonts or smaller barcodes. Where a spot color text can have almost any color one can imagine in a single color, there are only a few colors in multicolor printing that can be used as a single color alone. Colors such as black, cyan, violet, and green have enough contrast to be readable, but other colors such as yellow, magenta, and orange lack contrast and hence are not readable in texts or barcodes. Consequently, the higher-contrast RGB colors are very helpful additional primaries in multicolor printing.

Although one might think that multicolored text and barcodes are an issue, in the real world it does not need to be so. The register accuracy of modern machines is so good that it is entirely possible to print small multicolor texts and thin lines, as shown in Figure 78. The magnification of real production samples showed that printing of cyan and magenta created a very nice blue and no kind of misregistration was visible.

Figure 78 Small texts and lines in two colors (C+M) (K. Lankinen)

In Figure 78, the only difference from a normal blue text was that the printing consisted of two colors (100% cyan + 100% magenta). If the text needed to be changed, a remake of two plates instead of one would have had to be done. Blue text composed from C + M is a very useful combination as these colors are usually already present in the CMYK image and there is no need to add more colors to the job.

The previous text was a 7-point font, that had an x-height of about 1,4 mm. A 218x microscopic image of the text showed that in this test the C + M ink combination had better detail accuracy due to 30 micron less swelling of the ink in comparison to its original spot color equivalent, as well as the register accuracy of the C + M colors was very good (15 micron), as shown in Figure 79.

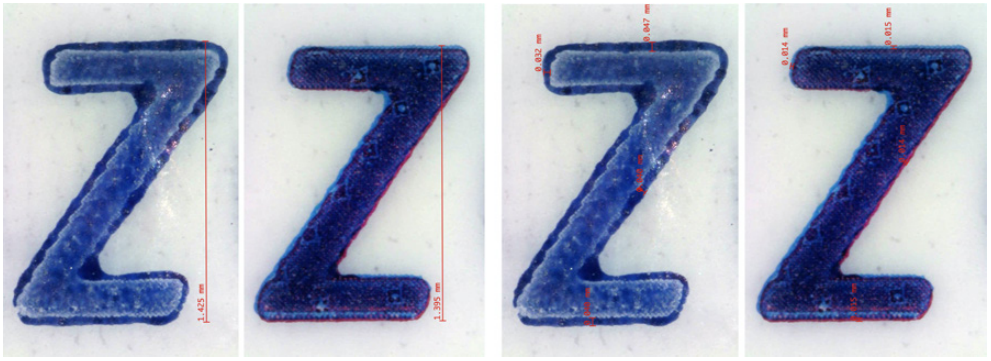


Figure 79 The x-height of the 7 pt text and the registration of spot and C + M color (K. Lankinen)

The previous result showed that a text and thin lines were also able to be printed with two primary colors, but this should only be used in cases where good register accuracy can be achieved.

The scanned Figure 80 shows more details of the spot and process color printed bags. In the upper part (spot color printed) the colors were more vivid as discussed earlier, but the trapping of colors was observed as a darker border line where the spot colors meet, but this was not visible in the lower part (process printed) of the image.

Figure 80 Scanned details of the Fazer Puikula bread bag (K. Lankinen)

In addition to the above, the sharpness of the process printed texts was also better due to the fact that less ink was squeezed to the edges of the letters to create a "halo" effect. Of course, a slightly darker text also gave a better contrast for readability in this case.

This can also be seen in Figure 81, where on the left side three spot colors were registered with each other and on the right side only two process colors were registered with each other. In this case registering of only two colors with each other was easier than registering more colors with each other. This also had an effect on the substrate wasted during the job setup.

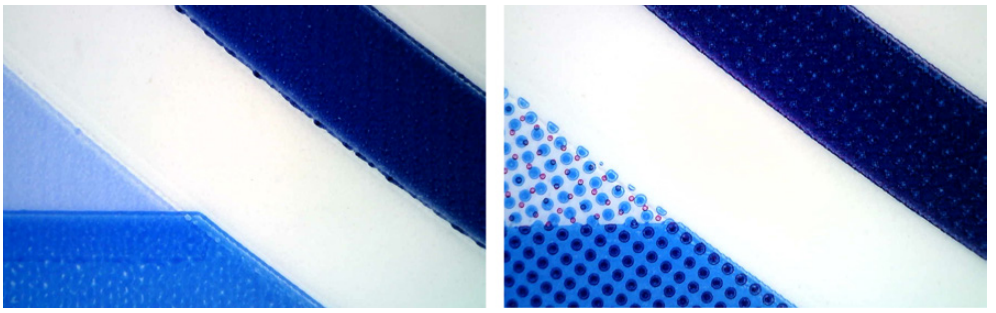


Figure 81 Fazer Puikula details: spot vs. process colors (50x) (K. Lankinen)

Although there was a noticeable color difference in this test, as expected, the brand owner liked the better sharpness of details achieved with process printing.

Fazer Puikula sustainability

This test was a pilot project on a large scale to test the feasibility of EGP™ in printed bread bags with the aims of reducing the number of colors, decreasing the ink consumption, and reducing spot ink washes and setup waste. The comments based on these experiences from the brand owner and the printer were positive.

One topic of discussion regarding changing to multicolor process printing was that in the case of text changes, the blue texts created in two colors (e.g., cyan and magenta) instead of one spot color, caused the replacement of two plates rather than one, but as the extra environmental load of one additional plate was estimated to correspond to about one avoided spot color wash, this had no effect on adding to the environmental load and was accepted as a good and sustainable solution as it allowed elimination of four spot color washes several times a year.

While this was a pioneer project, the brand owner also wanted to communicate this with consumers and hence a temporary "GreenerPrinting™" label with texts explaining the pilot was printed on the bag, as shown in Figure 82.

Figure 82 Fazer Puikula EGP™ bags with a GreenerPrinting™ label (K. Lankinen)

Please note that for the "GreenerPrinting™" label, only one additional temporary process yellow plate was made, because the green label needed a combination of cyan and yellow. The gray "GreenerPrinting" text was created from a combination of cyan, magenta, and yellow, so that there was no need to make an extra black plate for the logo. These logo colors were not taken into account in the consumption calculation as this was only a temporary label to inform the consumers of the pilot changes in the printing of the product.

The total ink calculation including the effect of white ink is presented in Table 51. The calculation showed that when the white ink was included, the decrease in ink consumption was 25% and when it included the washed ink, the total amount of saved ink with process printing was 31% compared to spot color printing. This also correlated very well with the previous industrial experiences that have been reported earlier in this thesis.

Table 51 Fazer Puikula test: total ink saving calculation 3

PANTONE to CM-EGP™	Spot ink per 1.000.000 pcs	EGP ink per 1.000.000 pcs	Ink save per 1.000.000 pcs	Ink save-%	Washed ink	Spot ink total use	Wash save-%	Total ink save	Total ink save-%
Dark Blue X	13,46 kg	12,91 kg	**0,55 kg**	**4%**	3,60 kg	17,06 kg	21%	**4,15 kg**	**24%**
Blue C	31,79 kg	14,61 kg	**17,18 kg**	**54%**	3,60 kg	35,39 kg	10%	**20,78 kg**	**59%**
Light Blue D	34,09 kg	7,94 kg	**26,14 kg**	**77%**	3,60 kg	37,69 kg	10%	**29,74 kg**	**79%**
Blue A	1,15 kg	0,76 kg	**0,38 kg**	**33%**	3,60 kg	4,75 kg	76%	**3,98 kg**	**84%**
White(s)	94,53 kg	94,53 kg	**0,00 kg**	**0%**	0,00 kg	94,53 kg	0%	**0,00 kg**	**0%**
TOTAL SUM	175,0 kg	130,8 kg	**44,3 kg**	**25%**	14,4 kg	189,4 kg	8%	**58,7 kg**	**31%**

In addition to theoretical ink saving, there were many other factors associated with the decreased amount of colors and use of process printing that had an impact on sustainability. These included, for example, the reduction in energy, solvents, substrate, time, and effort, as shown in Table 52.

Table 52 Fazer Puikula test: items where savings were made

Annual: 4x 50.000 m run	Annual	Save	Reduction	Saved item	Description
Reduction of no. of plates	6 => 4	0,5 m2	33%	Plate, energy, solvent, effort	Saved plate (à 0,25 m2), handling and washing of dirty plates from 6 to 4 pcs
Printing plate mounting	4*6 => 4*4	8 pcs	33%	Tape, time, effort	Saved time and mounting tape (2,0 m2) from 24 to 16 pcs (à 0,25 m2)
Reduction of manual ink mixing	4*4 => 0	16 pcs	100%	Time, effort	Saved manual ink mixing
Elimination of ink press makeready	4*4 => 0	16 pcs	100%	Time, effort	Process inks are ready in the machine, no setup time needed
Reduction of color adjustment	4*4 => 0	16 pcs	100%	Time, effort, substrate	Process inks are digitally profiled, no color adjustment needed
Reduced ink consumption		44,3 kg	25%	Ink, solvent	Process inks consume less ink
Eliminating spot ink waste in process washes	4*4 => 0	14,4 kg	100%	Ink, solvent, energy, time	0,9 kg waste ink per wash (16x wash p.a.), no ink wash needed for process colors
Eliminating spot ink washing solvent waste	4*4 => 0	45,1 kg	20%	Ink, solvent, energy, time	14,1 L solvent per wash (16x wash p.a.), 80% distillation yield (20% waste)
Eliminating press return spot ink	4*4 => 0	60,0 kg	100%	Time, effort	15 L of press return ink per color (ink stored and used again next time)
Reduction of setup material waste	4*1	1.340 m	59%	Time, substrate	4x per year 569m waste per spot job or 234m waste per CMYK job

The switch from spot color printing to process printing allowed the elimination of two printing plates from the original six plates. This reduced the number of total printing plates by 33% from six to four plates (cyan, magenta, and two whites). This reduced the plate raw material used by 0,5 m^2 and eliminated additional plate processing in plate making, logistics, and maintenance of the plates in the printing house.

The switch also made plate mounting more efficient, as there were now two plates less for mounting and setup of the printing press. When using tapes for plate mounting, the reduced mounting tape consumption was 33%, which meant a saving of 0,5 m^2 of tape per mounting. Furthermore, if an average plate mounting takes 10-15 minutes per sleeve, this results in 20-30 minutes saved in the mounting time used. Once again, the individual saving of time and material may seem small, but implementing comparable savings in each printed job a year would result in a huge impact on eco-efficiency.

The change also totally eliminated the need for preparation of spot color ink, setting it up in the press and color matching it, as well the wash and returning of the remaining ink to the ink stock, as presented in Table 52. All this not only eliminated a lot of time and logistics related to ink makeready, but also the need for spot color washes and the use of solvents, as well as the waste of ink due to color washing. Additionally, it also eliminated the possible non-reusable press return ink that would have been stored and possibly lost without reuse. Multiplying again all this effort by the number of annual jobs, the improvement in eco-efficiency is considerable.

Last but not least, the press setup was faster with two process colors compared to a press setup with four process colors. Using the same average values as calculated earlier in this study, the setup waste for a four-color process job (CMYK) was on average 234 meters, while for a six-color job (CMYK+2xPMS) it was 569 meters. This meant a saving of 335 meters (59%) per run, resulting in an annual saving of 1.340 meters for this job over four printing lots. Once again, if a similar change could be made for every annual job it would have a huge impact on eco-efficiency.

In summary, it can be stated that in this case the process printing was more sustainable than spot color printing and significant savings of waste and resources were linked to process printing, influencing sustainability. This test was a very good example of how cooperation with brand owners can turn many small efforts into great efforts regarding sustainability. Even if the annual savings may seem minor at first, scaling this to annual production will have a massive impact on eco-efficiency.

Conclusions from the Fazer Puikula legacy job pilot

The purpose of the Fazer Puikula test was to examine the possibility and the effects of transferring a legacy print job from spot color printing to EGP on a large scale.

The Fazer Puikula job was chosen based on previous experiences, whereby this job offered the possibility to replace four spot colors with just two process colors. The significant findings of the test showed that even spot color designs with small text and elements can be executed with multicolor process printing if there is good register accuracy and process control.

The significant findings of the study confirmed the expectation that a large quantity of spot colors can be executed in EGP, and depending on the design, there are possibilities to make the printing more eco-efficient. As expected, the study

confirmed that it was difficult to match some of the spot colors with ΔE2000 below 3,0 and therefore the color targets had to be adjusted. In this test, it was essential that the brand owner was ready to adjust the color targets. Therefore, all four spot colors were replaced by only two process colors, and the total number of colors including two whites was reduced by 33%.

As expected, the test showed that visual quality can be improved by reducing the overlap of colors when changing from spot color to process color printing. In addition, overall quality was improved by using process printing, since the swelling of spot color ink was reduced and the details and sharpness of the design were improved.

As seen earlier, the TAC of many colors indicated noticeable ink savings compared to spot color printing. Savings in ink and other production savings, which also had a positive impact on sustainability, were also confirmed in the production runs, as predicted for the test. However, for reasons of confidentiality, the amount of the different production savings cannot be disclosed in this study.

By using the process color strategy, spot color washes and many consumables between different process job changes were eliminated, makeready times reduced, and the total number of colors reduced. All of this made process printing of the product more eco-efficient compared to spot color printing.

These results confirmed the expectations and provided the following answers to the original questions:

1. *Can the EGP multicolor process method be used to eliminate spot colors in flexo printing?* Yes, the empirical production runs were carried out using only process printing with 33% fewer colors, with all spot colors being eliminated. There were no problems in executing and printing this design in flexography.

2. *Does EGP methodology offer improved capacity and cost benefits compared to traditional flexo printing?* Yes, it was seen in both calculations and empirical runs that EGP printing resulted in improved capacity and cost benefits in comparison to spot color printing in flexography.

3. *Does the switch from spot color printing to the EGP method offer the possibility for higher quality in flexography?* Yes, the sharpness of detail was better with process color printing compared to previous spot color printing. All of the original color tones were not achieved within acceptable tolerances, but after adjusting the color targets together with the brand owner, all of the colors were printed within acceptable tolerances.

4. *What kind of effect does the EGP method have on sustainability, productivity, and lot size in flexography?* The results were positive and convincing. Each different area offered improved efficiency and sustainability. Sustainability was improved by reducing the number of printing plates, mounting tapes, eliminating the ink mixing of spot colors, and reducing the press makeready times. No additional color adjustments on the press were needed, ink consumption was reduced, energy consumption was reduced, process washes were eliminated, there were no spot color return inks or storing of spot colors, and the amount of setup material was also decreased.

5. *What are the problem areas of EGP methodology?* In this test, there was no problem with registration because there were only two overprinting colors and the register accuracy and production tolerances were minimal. The problematic areas of the implementation were the original light blue color tones that were unachievable within an acceptable ΔE until the brand color targets were adjusted.

3.2.4 Key learning experiences from test jobs

As we have seen from the previous samples, there are jobs that are perfectly suitable for multicolor process without any problems. On the other hand, there are designs that will not suit the multicolor process or would need modifications to a greater of lesser extent in order to be suitable for process printing.

The key lessons learned from the test jobs were that, with the EGP system, printing can be done more efficiently and more sustainably. It also showed that, if a legacy job is switched from spot color printing to process color printing, some color adjustment may need to be done.

While the number of colors, amount of ink, and use of solvents can be decreased with process printing, the results also confirm that even though the system does not cover 100% of all PMS spot colors, it suits the great majority of cases. Where it makes no sense to transfer a job to process printing, spot colors are still an option to supplement the system as needed.

While sustainability, shorter runs, and more impactful designs are becoming increasingly important for packaging printing, EGP seems to offer a good way to achieve these goals. It also became very clear that gang-run printing is an excellent way to further increase the potential of eco-efficiency impacts. The results also showed that the quality level can also be increased and that register accuracy is not as big an issue as usually expected. Above all, the tests proved that increased

cooperation between brand owners, printers, and prepress leads to more eco-efficient production.

3.3 Opportunities for standardization

A common question among printing professionals has been whether flexo printing can be standardized. Although there is a standard, ISO 12647-6, it has never been found to suit real production and hardly anyone in the flexo industry has reported it as fully implementable for use in daily production, and no common standard has been found to be used across printers. This incompatibility with the common standard has been due to the broad offering of different tools and needs based on many different ink systems, which do not match the standard.

The production has been based on so-called house standards, where each printing house sets their own production standards and each printing machine is profiled separately. The use of "house standards" has been highly dependent on the use of different tools for process and spot colors and it has not offered much potential for further standardization. However, multicolor printing is opening up a new opportunity for standardization, since it allows simplification of the complexity of multiple inks, aniloxes, tapes, and setups used in spot color printing. Simplified tools could offer a better base for standardization.

Printing production based on multicolor printing and digitally simulated spot color execution facilitates the better control of a number of limited inks, enabling a larger color gamut than CMYK. Further standardization of the multicolor process printing of flexo could open up new opportunities for harmonizing the field of flexo printing.

3.4 Sustainability for flexographic printing

Packaging companies are looking for ways to have more sustainable production. Consumers are concerned about environmental impacts and responsibility is a major topic at fast-moving consumer goods (FMCG) companies. Packaging materials have been the object of focus for a long time, while printing itself has been overlooked. Expanded Gamut Printing offers interesting opportunities to implement a more

environment friendly printing system, and early adopters can take advantage of the market demand for more sustainable printing.

Expanded Gamut Printing, EGP, is not a system to replace 100% of traditional spot printing, as each printing system has some limitations, but it offers remarkable opportunities for more environmentally friendly printing to reduce the Global Warming Potential.

As discussed and calculated in this study, there are ways to reduce the environmental load in printing with EGP, even without substituting materials. These are, for example, reducing ink usage, solvent usage, use of washing solvents, ink waste, ink logistics, energy used in the process, printing substrate waste, logistics and transportation of raw materials, as well as the potential in printing plate reduction and additional effects related to the above.

The positive impacts of multicolor process printing include not only increased sustainability, but also the quality and efficiency of printing can be improved. This means getting more colorful designs with a reduced number of colors, improving ink densities and solid coverage, increasing the printed image resolution, and achieving sharper details, while also making short jobs cost-efficient. Further improvement can also be achieved through gang-print runs, which in many cases allow further optimization of printing eco-efficiency.

Environmental benefits are the biggest for solvent-based printing processes, but it can be stated that all multicolor process printing systems are more sustainable than traditional printing processes, when the number of additional printing plates is kept minimal. It should be noted that white, gold, and silver inks, as well as varnishes and unprinted areas remain unaffected by expanded gamut printing.

This study confirmed that expanded gamut printing can increase the eco-efficiency and quality of packaging printing.

4 SUMMARY AND CONCLUSIONS

The research consisted the study of the gamut expansion principles and simulation and implementation of a profiled four-color process and multicolor process printing. The research helped to develop a deeper understanding of the possibilities for multicolor process printing and its impact on the quality and eco-efficiency of packaging printing.

Since it was difficult to find appropriate scientific studies on multicolor process printing in flexography, the thesis work contained studies and scientific research results on the subject of flexographic printing that had not been thoroughly summarized and investigated before on a scientific level. For this reason, much of the work in this research was pioneering to test the existence of potential limits.

One of the main key novel achievements of the study was the development of the EGP calculator by the author. The development of this unique calculator required a large number of test simulations with empirical data of printers, which confirmed that the calculation results corresponded closely with the real production values. In addition, the calculator included unique and novel functions to describe the OEE and sustainability factors in print production.

4.1 Overview

The main objective of the study was to evaluate the eco-effectiveness of EGP in flexography and the possibilities to utilize the method in practice. These goals were achieved and the results exceeded expectations.

The first question was whether the EGP multicolor process method could eliminate spot colors in flexo printing. The simple answer is yes, it can replace the majority of PMS colors, although the system does not replace 100% of the spot colors in all cases within 3,0 ΔE2000.

Since many attempts were made at the beginning of the 21st century to implement multicolor process printing and eliminate the use of spot colors, without great success at that time, the equipment, production technologies, and software have now developed to the stage that production stability and process repeatability have been improved to enable successful implementation of EGP. This research work showed how the development of technologies and the improved experience of multicolor separation have enabled the practical implementation of the expanded gamut process.

The appearance of Moiré is often presented as a critical problem that prevents the use of multicolor process printing. This research and tests showed that the Moiré effect could be avoided by using one or more techniques such as: selecting screen angles so that identical angles were used in opposite colors, increased screen line density, or use of a stochastic raster for color separation. None of the performed printing tests showed any Moiré.

Another key problem with the implementation of multicolor process printing has been the potential register problem and its serious impact on the legibility of texts and barcodes. The significant result was that these concerns were also proven to be exaggerated, since the conducted tests showed excellent readability of multicolor texts and elements.

As expected and often heard, this research also confirmed that the replacement of spot colors with CMYKOGV multicolor separation covers up to 80-90% of the PMS color range, whereas CMYK covers more than 50% of PMS spot colors. In fact, in this thesis the color correspondence with the examined expanded CMYK resulted in 60 to 75% coverage of spot colors.

All in all, it is impossible to replace 100% of spot colors in all requirements of different graphics with the pure CMYKOGV expanded gamut printing method. Some of these typically problematic areas are single color blue, brown text, and thin lines, although this research work even yielded positive results and identified ways to replace spot color blue texts and barcodes with EGP in test. In addition, the research confirmed that some color tones cannot be achieved by CMYKOGV process color separations, for example some light blue tones.

The second question was whether the EGP method offers capacity and cost benefits compared to traditional flexo printing. The short answer is again yes, especially for short jobs with many colors.

Combining the above with questions about whether the switch from spot color printing to the EGP method offers the possibility of higher quality in flexography and what kind of effect the EGP method has on sustainability, productivity, and lot size in flexography, the result was also positive. It was calculated and shown that the EGP system had a positive impact on these items, i.e., significantly lowering the production cost, decreasing ink consumption, eliminating spot color washes, reducing ink stock levels, and saving a large amount of washing solvents as well printed substrate.

Additionally, as the research also showed, multicolor process printing is an eco-efficient solution for almost all jobs, excluding special cases, e.g., when the original design is made with so few colors that it would require multiple process colors in a very tight register over a large area. The switch from spot colors to process colors makes printing more productive, more flexible and even improves the image quality, especially with trapping of colors, vignettes, and fade-outs, while the packaging can also contain more colors.

Above all, this research was pioneering in that it estimated concrete Global Warming Potential figures and showed that this area can be positively affected, proving how printing can be made considerably more sustainable with process printing savings in energy, ink, and solvent and material waste, etc. Moreover, the study revealed the importance of gang-run printing, which offered additional potential to further increase eco-efficiency.

The last research question was about the problem areas of the EGP method. Indeed, like all processes, there are advantages and disadvantages when viewed from different angles. If the printing process is not kept stable and under control, implementation of the EGP system will be problematic. The expectations for the successful implementation of the EGP method are clear: The equipment must be in good condition, process stability maintained, and parameters controlled throughout the supply chain, and it is essential that the prepress operator has the knowledge and experience to perform multicolor separation correctly.

The printing press itself may be old or new, but the most important factor is that it is well maintained and that register accuracy is not an issue. The test proved that a multicolor register tolerance was very achievable. The other multicolor printing process parameters, such as aniloxes, were comparable to CMYK process aniloxes. Prepress required special software for multicolor separation.

The common complaints against multicolor implementation such as for example the Moiré effect, small text, thin lines, and barcodes were proven during the research to be controllable, but for the most demanding items the prepress operator and printer need to have good cooperation with the brand owners to solve the problem or agree on the necessary changes to the original artwork.

A clear problem is the replacement of legacy jobs by EGP. If the previous job was done with the spot colors, the EGP method may not match all previous colors. This can prevent the switch from spot color printing to simulated spot colors with multicolor process printing if the color is not adjusted in cooperation with the brand owner, as shown in the example in the study. The importance of acceptance by the brand owner of the research results was essential, and the cases examined proved that a modern EGP system can replace traditional spot color printing on a large scale.

With the move to ever shorter print jobs, the need for more efficient production is important. Due to developments in the past, use of expanded gamut printing is expected to increase every year as a continuous trend. The study demonstrated the meaning and importance of the eco-efficiency results of EGP and gang-run printing. The use of this potential should be expanded. As discussed in the study, brand owner activity is critical in order to unlock this potential on a large scale. To spread the technology faster and increase eco-efficiency, packaging designers should learn more about multicolor printing and exploit the advantages it offers.

Above all, wherever consumers and brand owners demand more sustainable products with higher efficiency, quality, and flexibility, expanded gamut process printing offers great opportunities for the packaging printing industry to meet these requirements.

4.2 Key scientific contributions of this work

The evaluation phase of the study identified many practical aspects of multicolor printing. The main novel scientific contributions of this work were as follows:

A lot of work was done in this study to acquire hidden data, make it available to the public, and convey fact-based insights to ease concerns about expanded gamut printing.

The results of this study proved that the higher pigmentation of solvent-based inks increased both the color gamut and the in-gamut value in flexography, as previously only reported for offset and gravure printing.

A significant and very interesting novel finding from the study revealed that the vast majority of PMS color tones led to ink savings when converted from spot color printing to multicolor process printing. This also increased the sustainability of flexographic printing.

The author expended a lot of effort on developing a novel, comprehensive and accurate EGP eco-efficiency calculator for this thesis, which modeled the printing process to derive the ROI and sustainability calculations presented in the study. The empirical values were collected from printers and printing press manufacturers in order to confirm the correctness of the calculated results.

The developed calculator also has a unique feature for estimating the achievable impacts when switching from spot color printing to multicolor process printing. The results included data on the potential OEE improvement, saved production time, increased production sales, achieved ink savings, amount of ink washed off, ink stock size, impact of cleaning solvent regeneration, waste substrate savings, GWP equivalent of ink consumption savings, GWP equivalent of washed ink savings, GWP equivalent of regenerating solvent savings, and GWP equivalent of waste substrate savings.

It was known that the savings in production time represented the biggest cost saving potential, but the extent of the calculated savings was surprisingly high, ranging from hundreds of thousands to a million euros per year.

Another surprising fact that emerged from the calculations was that the influence of the ink stock size was not as large as had been assumed based on previous public presentations and discussions.

One of the significant new results of the calculations and the study addressed the potential of more sustainable printing with EGP, which had not been pointed out in previous studies. It was difficult to conduct reliable measurements to present comprehensive GWP values for all the different aspects of printing, but at least this study provided very useful basic values and insights for the further implementation of sustainability calculations.

Another very interesting new finding based on the calculator results was the large amount of solvent used to wash inks and the large amount of solvents and inks wasted annually. This had not earlier been raised in discussions on the topic; the shorter the lot sizes become, the greater the sustainability impact will be.

The calculator also highlighted the cost and sustainability impact of the setup substrate waste. The potential for saving substrate was obvious, but the extent of the resulting GWP was a surprise.

This study was able to describe the benefits of gang-run printing in more detail and in more concrete numbers in comparison to previous studies and sources.

4.3 Conclusions

The thesis evaluated different ways of flexographic printing with solvent-based inks in packaging. The study confirmed many previous expectations and provided new views on the subject. The conclusions proved that expanded gamut printing, EGP, has a great potential to make the flexographic printing industry more cost-effective, as well as even more sustainable.

The investigated method offers the possibility to produce even short runs effectively with good color accuracy. The use of EGP simplifies spot color simulations, shortens press setup time, reduces makeready waste, decreases ink consumption, diminishes the multiplicity of anilox rollers and preparation of spot color inks, and reduces the size of ink storage. In addition, eco-efficiency can be further increased through gang-run printing.

The results of the study showed that the volume of the color gamut can be expanded beyond the CMYK color gamut with both high-pigmented process inks and additional primary inks, although the size of the gamut does not always correlate directly with the number of PMS colors in the gamut of different color systems.

The novel EGP calculator tool developed in this study offered the possibility to define the potential savings and sustainability advantages when transitioning from traditional flexographic printing with spot colors to EGP.

Although multicolor process printing is not currently widely used, based on this study, it can be proposed that EGP could replace spot color printing on a larger scale. While EGP technology is not a solution that can replace 100% of spot colors,

it can be used effectively to replace the vast majority of PMS colors to make current packaging printing more eco-efficient.

4.4 For further research

There is a lack of peer-reviewed scientific material on multicolor process printing in wide web flexography with solvent-based inks on plastic films. Hence, the author has an interest in doing further research and writing more publications on this subject in order to increase the availability of scientific data in this area. It is also hoped that this scientific research motivates others to examine this area in more detail in future studies, as the development of technologies has reached a level that enables the practical utilization of the EGP system.

Suggested avenues for future research:

This investigation focused on the CMYK+OGV method. Where the CMYK+OGV method sometimes causes problems in creating small elements such as texts and lines in multicolor, it would be interesting to extend the color gamut and usability evaluation to CMYK+RGB to complement the method in areas where especially red and blue colors are needed as a single color.

This study was done with hybrid AM screening. As technologies to support FM screenings have developed in recent years, it would be interesting to extend the tests to FM screening and different stochastic rasters for expanded gamut printing. FM screens have been a matter for public debate many times, but it has been difficult to obtain concrete data about the FM color gamut in flexography. Hence, a further investigation could show how the stochastic raster influences the color gamut in wide web flexographic printing.

There are only a few publicly available descriptions of the stability of long-term spot color simulation with process colors in flexography. Therefore, it would be interesting to investigate the stability of process printing more on a larger scale, to determine the expanded gamut process ink variation and color deviation over time.

Traditionally, it has been challenging to simulate flexographic spot color printing with an inkjet proof because the color strategies have been different. Hence, the color correspondence of the process color printed spot colors and contract proof would be worth examining. The evaluation would show how well proofing can correlate with modern EGP.

Digital printing is used in packaging printing to produce small production lots and when the job length increases, production is usually moved to flexo printing. In order to maintain packaging color unity during the job transfer from digital printing to

flexography, it would be ideal to maintain the process color strategy and use the expanded gamut technology. Hence, it would be interesting to examine the uniformity of spot color simulation builds using process colors in flexography and digital printing and to describe how well product printing can be switched between different printing processes.

It is a known fact is that the color saturation and ink sequence influence the size of the color gamut. Previous studies have mainly been done with UV inks on a narrow web press and therefore a further study of the color gamut expansion with solvent-based and water-based inks in wide web flexo would be beneficial with regard to the effect of ink saturation and other ink properties in relation to the print sequence. This would give an understanding of the possibilities to increase the color gamut with different ink properties and ink sequences.

Packaging substrates have been investigated for sustainability, but the packaging printing process itself has not been properly examined yet. Based on the results of this study, expanded gamut printing would lead to better sustainability compared to spot color printing in flexography. Hence, a more in-depth sustainability analysis and calculations would be helpful to determine a proper breakdown of the different parts of the packaging production that cause CO_2 emissions and what opportunities exist to improve the eco-efficiency of the packaging printing process.

Multicolor process printing may offer better opportunities for the standardizing of flexography, as additional primaries stabilize color variations compared to the traditional CMYK process printing. The possibilities for standardizing the expanded gamut color process could be investigated further since, although CMYK inks are somewhat standardized, there is less standardization of the process with additional primary inks. This would help printers to more easily implement the expanded gamut printing strategy according to the standardized set.

BIBLIOGRAPHY

3M. (2010, July). Citrine informatics page for 3M products. *3M™ Cushion-Mount™ Plus Plate Mounting Tapes*.

3M. (2016, May 12). Flexographic Mounting Systems Selection Guide. *Flexo Selection Guide_70-0709-4579-8_LR.pdf*, 8. 3M.

3M. (2019). *3M Flexographic Plate Mounting Tapes Poster*. Retrieved from 3M Multimedia: https://multimedia.3m.com/mws/media/61802O/3m-cushion-mount-plus-plate-mounting-tapes-poster-low-res.pdf

Abbot, S. (2018). *Printing Science: Principles and Practice.* Ipswich.

Adobe. (2017, February 10). *Adobe Illustrator user manual*. Retrieved February 09, 2019, from Printing: https://helpx.adobe.com/fi/illustrator/using/trapping.html

AGFA. (2003, August 22). XM Screening Technology. *White paper*.

AGFA. (2005). *Agfa Balanced Screening.* Retrieved January 5, 2005, from http://agfabeint01.net.agfa.com/bu/gs/dms/Marketing.nsf

Andersson, C., Johnson, J., & Järnström, L. (2009). Ultraviolet-induced aging of flexographic printing plates studied by thermal and structural analysis methods. *Journal of Applied Polymer Science, Vol.112(3)*, 1636-1646.

Andersson, M. (1997, January 5). Rochester Institute of Technology Scholar Works. *A study in how the ink set, solid ink density and screening method influence the color gamut in four color process printing.* http://scholarworks.rit.edu/theses/5031/.

Andrade, L., Míguez, C., Gomez, M., & Bugallo, P. (2012). Management strategy for hazardous waste from atomised SME: application to the printing industry. *Journal of Cleaner Production, Vol.35*, 214-229.

Anilox Laser Technology Ltd. (2018). *Nano Technology*. Retrieved September 5, 2019, from Anilox Laser Technology Ltd website: https://www.aniloxlt.co.uk/nano

Anilox Laser Technology Ltd. (2019). Nano Technology. *Alt product brochure*.

Anon. (2003). *Digital workflow management in the folding carton industry*. Retrieved July 28, 2006, from ECMA Technical Seminar: http://www.ecma.org/download/reportseminar2003.pdf

Anon. (2006, June 30). *http://www.digitmag.co.uk/features/index.cfm?FeatureID=1432*. Retrieved from http://www.digitmag.co.uk/features/index.cfm?FeatureID=1432

Anon. (2008). *04-huecirclemyc.jpg*. Retrieved March 27, 2016, from www.gzdesigns.net: http://www.gzdesigns.net/projects/colortech/04-huecirclemyc.jpg

Apex International. (2019, May 20). *Top causes of Dot Gain related to Anilox rolls*. Retrieved September 29, 2019, from Apex News Blog: https://blog.apex-groupofcompanies.com/apex-anilox-news/topcausesofdotgainrelatedtoanilox

Apex. (2006). Technische Schulung für die flexible Verpackung. *Technische Schulung für die flexible Verpackung.* Apex.

ATIF - Italian flexo association. (2013). *DOC 04 – Procedura e check up di stampa – Macchine flessografiche – Rev. 04 – 2013*. Milano, Italy: ATIF.

Baldwin, C. (2016, May). Nilpeter North America Artile. *Expanded gamut printing 101*. USA: https://www.nilpeter.com/ref.aspx?id=1279.

Bates, I., Zjakic, I., & Budimir, I. (2015). Assessment of the print quality parameters' impact on the high-quality flexographic print visual experience. *The Imaging Science Journal, Vol.63(2)*, 103-110.

Bauer, C. (2013). Flexing Sustainable Muscle. *PackagePrinting, Vol.60 (3)*, 20, 22-23.

Benz, M. (2017, September 25). *Proof. de offers proofs according to the latest tolerance criteria of ISO 12647-7:2016*. Retrieved from proofing.de website: http://proofing.de/proof-de-offers-proofs-according-to-the-latest-tolerance-criteria-of-iso-12647-72016/

Bogan, A. (2016, April 22). Honors Theses. *Extended Gamut Printing in Flexographic Packaging and the Impact of Brand Management*. USA.

Boonprasit, W. (2006, May). RIT Scholar Works. *A study of producing smoother gradients in the flexographic process on oriented polypropylene with UV ink by varying screening techniques, gradient lengths and the surrounding*. Rochester, NY, USA: Rochester Institute of Technology.

Borenstain, S., Bar-Haim, G., Goldshtein, K., & Cohen-Taguri, G. (2020). Optimization of quinacridone magenta, Cu-phthalocyanine cyan, and

arylide yellow ink films formulated for maximum color gamut. *Color research and application-12, Vol.45 (6)*, 1153-1169.

Bould, D. C., Claypole, T. C., & Bohan, M. F. (2005). An investigation into plate deformation in flexographic printing. *Proceedings of the Institution of Mechanical Engineers. Part B, Journal of engineering manufacture, Vol.218 (11)*, 1499-1511.

Bould, D. C., Hamblyn, S. M., Gethin, D. T., & Claypole, T. C. (2011). Effect of impression pressure and anilox specification on solid and halftone density. *Journal of Engineering Manufacture, Vol.225(5)*, 699-709.

Braden Sutphin. (2007, July 19). *Braden Sutphin - Ink company*. Retrieved September 3, 2019, from Stochastic screening – What is it and why is it a hot issue today: http://www.bsink.com/wp-content/uploads/2017/03/StochasticScreening.pdf

Brunner, Campbell, & Lindström. (2005, January 22). *The Digital Dots Guide to Color Management & Proofing*. Retrieved July 6, 2006, from http://www.graphicrepro.co.za/assets/2/pdf/18-CM%20Workflow.pdf

Budsberg, E., Morales-Vera, R., Crawford, J. T., Bura, R., & & Gustafson, R. (2020, September 3). *U.S. National Library of Medicine*. Retrieved from Production routes to bio-acetic acid: life cycle assessment: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7469289/

Bundesverband Druck und Medien e. V. (2016). MediaStandard Print 2016. *Technical Guidelines for Data, Proof and Production Run Printing*.

Caselli, M., de Gennaro, G., Saracino, M. R., & Tutino, M. (2009). Indoor contaminants from newspapers: VOCs emissions in newspaper stands. *Environmental Research, Vol.109(2)*, 149-157.

Cave, A. (2019, May 8). Transforming the image of flexo -presentation. *A Screening of Screening: Investigation into Prepress and Plate Advances*. New Orleans, USA: Flexo Technical Association.

Chen, D. (2018, August 30). *KYMC company web page*. Retrieved September 3, 2019, from AM Screening V.S FM Screening: https://www.kymc.com/webls-zh-tw/msg/msg63.html

Choi, P., Orsborn, S., & Boatwright, P. (2016). Bayesian analysis of color preferences: An application for product and product line design. *Color research and application; Vol.41 (5)*, 445-456.

Chung, R., & Hsu, F. H. (2006). *Gravure Process Color Gamut Optimization*.

Comexi. (2018, April 26). *Higher productivity, ink savings and better quality; the main benefits of expanded gamut printing system proven in practice*. Retrieved February 5, 2019, from Comexi company news: https://comexi.com/en/new-detail/higher-productivity-ink-savings-and-better-quality-the-main-benefits-of-expanded-gamut-printing-system-proven-in-practice

d'Andrea, S. (2018, July 28). *Screen angles in flexography*. Retrieved August 26, 2019, from flexo•expert: https://www.flexo.expert/screen-angles-in-flexography/

d'Andrea, S. (2018, November 8). *What's the best dot shape for flexo?* Retrieved August 22, 2019, from flexo•expert: https://www.flexo.expert/whats-the-best-dot-shape-for-flexo/

Damgaard, A., Eriksson, O., Fluck, L., Hillman, K., & Jonsson, D. (2015, November 02). Study for Nordic Council of Ministers. *Climate Benefits of Material Recycling – Inventory of Average Greenhouse Gas Emissions for Denmark, Norway and Sweden*, p. 75.

Davis, N. (2017, April 30). Ink Sequence of EG and Its Affect on Color Gamut. *FTA Conference papers FQC_Pre-Conference*. Phoenix, AZ, USA.

De Boever, T., De Proost, G., & Moore, L. (2003, December 10). *Esko-Graphics Screening Technology*. Retrieved February 05, 2005, from www.esko.com: http://www.esko.com/files/presentations/Esko-Graphics_Screening_2004.pdf

Deshpande, K. (2015, May). N-colour separation methods for accurate reproduction of spot colours. *Ph.D. Thesis*. London, Great Britain: University of the Arts, London.

Deshpande, K., Green, P., & Pointer, M. R. (2014). Color Separation of an n-Color Printing Process Using Inverse Printer Models. *Journal of Imaging Science & Technology, Vol. 58 Issue 5*, 505041–505048.

Deshpande, K., Green, P., & Pointer, M. R. (2015-10). Metrics for comparing and analyzing two colour gamuts. *Color research and application, Vol.40 (5)*, 465-471.

Deshpande, M. S., & Deshpande, S. S. (2013). ANALYSIS OF EXPOSURE PARAMETER OF FLEXOGRAPHY SHEET PHOTOPOLYMER PLATES. *International Journal of Advances in Engineering & Technology; Bareilly Vol. 5, Iss. 2*, 231-237.

Dewitte, H., & Van Dooren, F. (1998). *Barco's Samba Screens: AM, FM in same image* (http://www.seyboldreports.com/SRPS/subs/2719/PS271915.HTM ed., Vol. 27). The Seybold Report on Publishing Systems.

DFTA-TZ. (2000). Seminar Rasterflexodruck. *Seminar papers* (p. 147). DFTA-TZ.

DFTA-TZ. (2002). Seminar Farbübertragung. *Seminar papers* (p. 34). DFTA-TZ.

Dharavath, H. N., & Kokil, U. (2014). Effect of pre-defined Color Rendering Intents (CRI) on the Hue attributes in a Color Managed Workflow (CMW). *Journal of Technology Studies, Vol. 40 (1)*, pp. 12-25.

Dharavath, N., & Hahn, K. (2009). Green Printing: Colorimetric and Densitometric Analysis of Solvent-based and Vegetable Oil-based Inks of Multicolor Offset Printing. *Journal of Technology Studies, Vol.35(2)*, 36-46.

Digital Dots Ltd. (2005). The Guide to Colour Management & Proofing. *Technology Guides, 2nd*.

Dorscheid, S. (2005, September). Operation: PRINTING. *Motion System Design*, pp. 42-43,45.

Dreher, M. (2017, August 22). *Jetzt die Weichen richtig stellen!* Retrieved from Hochscule der Medien: https://www.hdm-stuttgart.de/science/science/scienceverzeichnis/380/DFTA-TZ_Dreher_Weichen_richtig_stellen_170822_final.pdf

DuPont. (2006). *Glossary*. Retrieved August 13, 2006, from www2.dupont.com: http://www2.dupont.com/Packaging_Graphics/en_US/tech_info/glossary/glossary_r.html

Eller, R. (2010, April 15). Rochester Institute of Technology – Gravure Day 2010. *Gravure In Flexible Packaging – Meeting the Challenge*.

Ellis, R. (2017, February). Techkon Guide. *THE PRINTER'S GUIDE TO EXPANDED GAMUT*.

EPA. (2018, October 15). *United States Environmental Protection Agency web site*. Retrieved from Greenhouse Gas Equivalencies Calculator: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

ERA - European Rotogravure Association. (2007).

Esko Software BVBA. (2016, June). User Guide. *Equinox Profile Creator*.

Esko-Graphics. (2003, October 10). Retrieved October 10, 2003, from Esko-Graphics Screening Technology: http://www.esko.com/files/presentations/Esko-Graphics_Screening_2004.pdf

Esko-Graphics. (2004, July 12). *Screening on the Esko-Graphics FlexRip , Version 1.0*. Gent, Belgium: Esko-Graphics.

Esko-Graphics. (2004, November 1). *Esko-Graphics and M.Y. PrinTech announce cooperation integrating InkWizard and FMsix technologies*. Retrieved from Svettisku web site: http://www.svettisku.cz/buxus/generate_page.php?page_id=812&buxus_svettisku=f3f3

Esko-Graphics. (2005, May 7). *Multi Color Process Printing (MCPP)*. Retrieved July 7, 2006, from Esko Graphics: http://www.esko-graphics.com/files/presentations/EG_MCPP.pdf

Esko. (2012). Flexo plate dot shapes. *FPPA 2012 Orlando FL*. Orlando, FLorida, USA.

Esko. (2014, March). *HD Flexo Technologies Seminar Presentation*. Retrieved from FPPA website: https://flexoplatemakers.com/wp-content/uploads/2018/08/ESKO_Technologies_IanHole.pdf

Esko. (2018, November). *Imaging Engine 18 - User Guide*. Retrieved August 21, 2019, from docs.esko.com: https://docs.esko.com/docs/en-us/imagingengine/18/userguide/pdf/ImagingEngine_18.pdf

EuPIA. (2017, February 03). *The European Printing Ink Association web page*. Retrieved from Eco Footprint of a generic reference: https://www.eupia.org/fileadmin/FilesAndTradExtx_edm/2017-02-03_Eco_Footprint_and_Screening_of_Virtual_reference_-_Web_leaflet.pdf

European Environment Agency. (2018, December 18). *European Environment Agency web page*. Retrieved from CO2 emission intensity: https://www.eea.europa.eu/data-and-maps/daviz/co2-emission-intensity-5#tab-googlechartid_chart_11_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(current%20composition)%22%5D%7D%7D

Field, G. (1999). *Color and Its Reproduction* (2nd Edition ed.). GATF Press.

Fine Line Graphics Inc. (2010, December 29). *ScreeningGuide.pdf*. Retrieved October 28, 2017, from Fine Line Graphics Inc.: http://www.flgcorp.com/files/ScreeningGuide.pdf

Finnish Packaging Association. (2016, April 20). Värinhallinnan suositukset eri toimijoille pakkausten tuotannossa. Tampere, Finland.

Flexica Oy. (2019). Dirty vs. Clean Anilox. Littoinen, Finland.

Forrester, J. (2019). The Colour Accuracy Of Expanded Gamut Printing. *2019 TAGA Proceedings* (pp. 280-305). Printing Industries of America.

Fraser, B., Murphy, C., & Bunting, F. (2004). *Värinhallinta.* IT Press.

Furr, M. (2014). EXPANDED-GAMUT PRINTING AND ITS IMPACT ON EFFICIENT BRAND COLOR REPRODUCTION. *Printing Industries of America, The Magazine, Vol.6(11)*, 14-15.

Furr, M. (2015). The Effect of Press Variation on Color Stability with 7-color and 4-color Process Color Tint Builds. *2015 TAGA Proceedings* (pp. 176-184). Printing Industries of America.

Galton, D. (2004). A study of the effects of the process parameters on the flexographic printing problem "dot bridging" - Part I: experimental design and linear run length. *Pigment & Resin Technology, 01 October, Vol.33(5)*, 293-301.

Galton, D. (2005). A study of the effects of the process parameters on the flexographic printing problem "dot bridging" – part II: experimental design and print contrast/density. *Pigment & Resin Technology, Vol.34(2)*, 94-100.

Gençoglu, E. N., & Kurt, M. B. (2015). THE EFFECTS OF PRINTING PLATE THICKNESS AND RELIEF DEPTH ON DOT GAIN IN FLEXO PRINTING. *Istanbul Ticaret Universitesi Fen Bilimleri Dergisi, 14(27)*, 1-21.

Giorgianni, E. J., & Madden, T. E. (2008). *Digital Color Management : Encoding Solutions.* John Wiley & Sons, Incorporated.

Global Graphics. (2006, October 5). Harlequin Screening white paper. *Harlequin disperset screening.*

GMG Academy. (2016). Fit for FOGRA51/52. *Fit for FOGRA51/52.*

GMG GmbH & Co. KG. (2015, April). *Home / FOGRA51/52*. Retrieved February 21, 2019, from FOGRA51/52 - Printing Standards: https://www.gmgcolor.com/fileadmin/user_upload/Images_Landing_Pages/2015_April_trueColors_ISO_Standards.pdf

Graphic Arts Magazine. (2017, March 27). *Expanded colour gamut.* (C. Smyth, Editor) Retrieved September 5, 2019, from Graphic Arts Magazine Articles: https://graphicartsmag.com/articles/2017/03/expanded-colour-gamut/

Green, P., Holm, J., Li, W., & Hardeberg, J. Y. (2008). Recent developments in ICC color management. *Color Research & Application, Vol.33(6)*, 444-448.

GreenDelta GmbH. (2019, December 12). *openLCA Nexus*. Retrieved from Your source for LCA data sets: https://nexus.openlca.org/database/Environmental%20Footprints

Gretag-Macbeth AG. (2001, April). Managing Color in a Global Workflow. USA.

Gross, L. (2003). *United States Patent No. US20030084803A1*.

Guo, H., Lee, S., Chan, L., & Li, W. (2004). Risk assessment of exposure to volatile organic compounds in different indoor environments. *Environmental Research, Vol.94(1)*, 57-66.

Gustavson, S. (1997, September). PhD Dissertation. *Dot Gain in Colour Halftones*. Linköping, Sweden: Department of Electrical Engineering, Linköping University.

Hagen, E. (2018, December 6). *Blog: Insights4print.ceo*. Retrieved February 23, 2019, from Brand color quality in print: the chain of tool tolerances: https://www.insights4print.ceo/2018/11/brand-color-quality-in-print-the-chain-of-tool-tolerances/

Hamblyn, A. (2015, June). Effect of plate characteristics on ink transfer in flexographic printing. *M.Sc. Thesis*. UK: Swansea University.

Hamillroad Software Ltd. (2019). *Bellisima DMS*. Retrieved September 2, 2019, from Hamillroad Software website: http://www.hamillroad.com/products/bellissima/

Hasting, G. D., & Rubin, A. (2012). Colour spaces - a review of historic and modern colour models*. *South African Optometrist; Vol. 71, Iss. 3*, 133-143.

Heidelberger Druckmaschinen AG. (2007, April). *An Introduction to Screening Technology*. Germany: Heidelberger Druckmaschinen AG.

Heidelberger Druckmaschinen AG. (2009, September). Multicolor Workflow. *Prinect Color and Quality*. Heidelberg, Germany.

Henry, P. (2017). Flexing Muscle: Digital Printing Makes Inroads into Flexible Packaging Production. *PackagePrinting, 64 (3)*, pp. 18-21.

Hewlett-Packart Company. (2008, May 13). ftp://ftp-boi.external.hp.com/pub/printers/HP_Exstream/US_IMS_BRO_High.pdf. *HP IndiChrome Ink Mixing System*.

Hiremath, S. S. (2018, May). Master of Science Thesis in Print Media. *A Study of High-Chroma Inks for Expanding CMYK Color Gamut*. Rochester Institute of Technology.

Hochschule der Medien. (2010). *DPI*. Retrieved from Hochschule der Medien website: https://www.hdm-stuttgart.de/science/lexikon/lexikon_eintrag?eintrag_ID=8

Hoffstadt, H. (2019). Characterization of Multicolor Prnting: Challenges and Solutions. *2019 TAGA Proceedings* (pp. 222-236). Printing Industries of America.

Hohmann, J.-P. (2016, March 16). *Flexodruck mit fester Farbpalette – Technische Grundlagen und Marktsituation*. Retrieved from Flexo+Tiefdruck website: https://flexotiefdruck.de/dossiers/flexodruck-mit-fester-farbpalette/

Holmvall, M. (2010, Juni). NIP MECHANICS, HYDRODYNAMICS AND PRINT QUALITY IN FLEXO POST-PRINTING. *Doctoral thesis*. Sundsvall, Sweden: Mid Sweden University.

HP Inc. (2016). Technical white paper: Low environmental impact printing with HP Indigo Digital Presses. *Low environmental impact printing with HP Indigo Digital Presses For production of flexible packaging* .

Hu, J.-l., Deng, J.-b., & Zou, S.-s. (2010). A Novel Algorithm for Color Space Conversion Model from CMYK to LAB. *Journal of Multimedia, suppl. Special issue: Visual Information Engineering; Oulu Vol. 5, Iss. 2*, 159-166.

Huo, B. Q., & Yin, F. L. (2013). Image Transformation for Digital Printing Machine. *Applied mechanics and materials; Vol.401-403*, 180-183.

ICC. (2010). International Color Consortium Profile Specification. *Specification ICC.1:2010 (Profile version 4.3.0.0); Image technology colour management — Architecture, profile format, and data structure*. International Color Consortium®.

ICC. (2020, January 12). *International Color Consortium*. Retrieved from International Color Consortium website: http://www.color.org/index.xalter

ICC. (2020, January 12). *Introduction to the ICC profile format*. Retrieved from International Color Consortium website: http://www.color.org/iccprofile.xalter

Idealliance. (2016, December 1). Introducing the XCMYK Color Space. Idalliance.

Idealliance. (2019). *XCMYK Expanded Gamut*. Retrieved January 23, 2019, from Idealliance website: https://www.idealliance.org/xcmyk

Idealliance. (2019b). Idealliance ECG Calibration Guidelines v9. *The Idealliance ECG Calibration Guidelines*. www.idealliance.org.

Idealliance. (2020, January 19). *Expanded Color Gamut (ECG) Project*. Retrieved from Idealliance website: https://www.idealliance.org/ecg

Idealliance. (2020, June 11). *GRACoL Definition*. Retrieved from Idealliance website: https://www.idealliance.org/specification/gracol-definition

INOMETA GmbH. (2017, November 29). *New INOflex® anilox roller generation with highly convincing product characteristics*. Retrieved from Inometa company website: https://www.inometa.de/news/new-inoflexr-anilox-roller-generation-with-highly-convincing-product-characteristics.html

ISO. (2006, April 01). International Standard. *ISO 12647-6 Graphic technology - Process control for the production of half-tone colour separations, proofs and production prints – Part 6: Flexographic printing*. Geneva, Swizerland: ISO Org.

ISO. (2010, December). International Standard. *ISO 15076-1:2010 Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICCISO 15076-1:2010 Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC*. Geneva, Swizerland: https://www.iso.org/standard/54754.html.

ISO. (2010). *Introduction to ISO:15076:-1*. Retrieved from International Standardization Organization website: https://www.iso.org/obp/ui/#iso:std:iso:15076:-1:ed-2:v1:en

ISO. (2018). International Standard. *ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification*. Geneva, Switzerland: ISO Org.

ISO. (2012). International Standard. *ISO 12647-6 Graphic technology - Process control for the production of half-tone colour separations, proofs and production prints – Part 6: Flexographic printing*. Geneva, Switzerland: ISO Org.

ISO. (2013). *Introduction to ISO: 12647-1:2013(en) Graphic technology*. Retrieved from International Standardization Organization website: https://www.iso.org/obp/ui/#iso:std:iso:12647:-1:ed-3:v1:en

ISO. (2016). *Introduction to ISO: 12647-7:2016(en) Graphic technology*. Retrieved from International Standardization Organization website: https://www.iso.org/obp/ui/#iso:std:iso:12647:-7:ed-3:v1:en

Johnson, J., Andersson, C., Lestelius, M., Jarnstrom, L., Ratto, P., & Blohm, E. (2009). Some properties of flexographic printing plates and aspects of print quality. *Appita Journal, Vol.62(5)*, 371-378.

Kamp, F. (2002, October). A seven colour revolution in pre-press for flexography? *FlexoTech Magazine*.

Kamp, F., & White et al., M. (2004). *The Little Dictionary of Printing Terms for Flexographers*. (F. Magazine, Ed.) Whitmar Publications Ltd.

Kipphan, H. (2001). *Handbook of Print Media*. Berlin: Springer.

Kiurski, J., Marić, B., Aksentijević, S., Oros, I., & Kecić, V. (2016). Occupational hazards in printing industry. *Int. J. Environ. Sci. Technol.; 13*, 955–972.

Klein, T. (2014, December). White paper: Full HD Flexo. *Application and Implications of Full High-Definition Flexo*. Esko.

Klein, T. (2014). The Evolution of Flexo Platemaking and the Application and Implications of Full High-Definition Flexo. *TAGA Proceedings*, (pp. 260-269).

Kliopova-Galickaja, I., & Kliaugaite, D. (2018, July 06). VOC emission reduction and energy efficiency in the flexible packaging printing processes: analysis and implementation. *Clean technologies and environmental policy, Vol.20 (8)*, 1805-1818.

Kodak. (2010, September). Kodak white paper. *Flexography and Sustainability: The Great Plate Debate*. Rochester, New York, USA: https://www.kodak.com/uploadedFiles/FlexcelNX_Sustainability_WhtPaper_091510_lo.pdf.

Kodak. (2015). *Activity 4: Prinergy's Flexo Screening technologies*. Retrieved August 22, 2019, from Kodak Workflow Documentation: https://workflowhelp.kodak.com/pages/viewpage.action?pageId=40209974

Kodak. (2018, May 31). *How to measure flexo print contrast*. Retrieved September 30, 2019, from Eastman Kodak Company website: https://www.kodak.com/us/es/print/Blog/Blog_Post/?contentId=4295008077

Konttila, I. (2015, May 13). Insinöörityö. *Värinhallinnan kehittäminen ja dokumentointi*. Helsinki, Finland: Metropolia Ammattikorkeakoulu.

Kraushaar, A. (2018, October 4). Fogra Multicolor Forum 2018. *Fogra Multicolor Forum 2018 Presentation*. Germany.

Lakacha, A. (2018, September 11). *Blog: Techcon USA*. Retrieved February 23, 2019, from A Simple review of CIE ΔE* (color difference) equations:

http://www.techkonusa.com/a-simple-review-of-cie-δe-color-difference-equations/

Lankinen, K. (2019, June). *LinkedIn – Flexographic Technical Association*. Retrieved from Flexographic professionals group for discussions; ink transfer: https://www.linkedin.com/feed/update/urn:li:activity:6526825046852325377

Leach, R., & Pierce et al., R. (2002). *The Printing Ink Manual* (5th Edition ed.). Kluwer Academid Publishers.

Lindner, M., Rodler, N., Jesdinszki, M., Schmid, M., & Sängerlaub, S. (2018). Surface energy of corona treated PP, PE and PET films, its alteration as function of storage time and the effect of various corona dosages on their bond strength after lamination. *Journal of applied polymer science, Vol.135 (11)*, 45842-n/a.

Luo, M. R., & Pointer, M. (2018). CIE colour appearance models: A current perspective. *Lighting research & technology (London, England : 2001), Vol.50 (1)*, 129-140.

M.Y. PrintTech. (2005, July 6). *http://www.fmsix.com/*. Retrieved 2005, from http://www.fmsix.com/

Mahajan, M. P., & Bandyopadhyay, S. (2019). Characterization and optimization of color attributes chroma (C) and lightness (L) in offset lithography halftone print on packaging boards. *Color research and application, Vol.45 (2)*, 325-335.

Malmirchegini, K., & Rahmani, F. S. (2011). Effect of ink and paperboard characteristics on flexographic print quality based on print density. *Tappi Journal, Vol.10(9)*, 7-13.

MarketsandMarkets Research Private Ltd. (2016, October 29). *Packaging Printing Market 2020*. Retrieved November 10, 2017, from https://www.linkedin.com/pulse/packaging-printing-market-worth-58719-billion-2020at-cagr-ghorpade/

Marsh, K., & Bugusu, B. (2007). Food Packaging—Roles, Materials, and Environmental Issues. *Journal of food science, Vol.72 (3)*, 39-55.

Marvaco Ltd. (2017, November 29). *Marvaco Ltd company web page*. Retrieved February 5, 2019, from EGP PARTNERSHIP CERTIFICATE TO ELECSTER: http://www.marvaco.fi/en/articles/2017/11/29/EGP_partnership_certificate_to_Elecster

Mesic, B., Lestelius, M., & Engström, G. (2006). Influence of corona treatment decay on print quality in water-borne flexographic printing of low-density polyethylene-coated paperboard. *Packaging Technology and Science, Vol.19(2)*, 61-70.

Meyer et al., K.-H. (2000). *Flexo Printing Technology*. Verlag Coating Thomas & Co.

Miljković, P., Valdec, D., & Matijević, M. (2018). The Impact of Printing Substrate on Dot Deformation in Flexography. *Tehnički vjesnik, Vol. 25(2)*, 509-515.

Mirjalili, F., Luo, M. R., Cui, G., & Morovic, J. (2019). Color-difference formula for evaluating color pairs with no separation: ΔE NS. *Journal of the Optical Society of America. A, Optics, image science, and vision; Vol.36 (5)*, 789-799.

Mokrzycki, W., & Tatol, M. (2011). Color difference Delta E - A survey. *Machine Graphics and Vision. Vol. 20.*, 383-411.

Muñoz, I., Flury, K., Jungbluth, N., Rigarlsford, G., Milà i Canals, L., & King, H. (2019, January). Life cycle assessment of bio-based ethanol produced from different agricultural feedstocks. *The International Journal of Life Cycle Assessment*, pp. 109-119.

Narakornpijit, N. (2018). A Study of the Lightfastness of High-Chroma Water-Based Flexographic Printing Inks. *Thesis*. USA: Rochester Institute of Technology.

Nathe, P. (2013). ANALYTICAL REVIEW FOR DIFFERENT ASPECTS OF DOT GAIN. *International Journal of Advances in Engineering & Technology, Vol.6(5)*, 2211.

Niederstadt, D. (2015, June 13). DEF Pinning Top Dot Plate Technology. *Progressive Digital Media Packaging News*. London, UK.

Niederstadt, D. (2016, Mai 19). Flexo + Tief Druck Magazine. *Das Drucken mit fester Farbpalette im Flexodruck – Betrachtung der Vorteile*. Germany: https://flexotiefdruck.de/dossiers/das-drucken-mit-fester-farbpalette-im-flexodruck/.

Nussbaum, P. (2010, December). Doctoral Dissertation. *Colour Measurement and Print Quality Assessment in a Colour Managed Printing Workflow*. Oslo, Norway: Faculty of Mathematics and Natural Sciences, University of Oslo.

O'Hara, L., & Congdon, B. (2016). The influence of print sequence on expanded color gamut. *Printing Industries of America, The Magazine, Vol. 8, Iss. 7*, 50-52.

O'Hara, L., Congdon, B., & Gasque, B. (2016). Optimizing Print Sequence for Expanded Color Gamut. *2016 TAGA Proceedings* (pp. 272-282). Printing Industries of America.

O'Hara, L., Congdon, B., & Kariahlyn, L. (2019). Optimizing Chroma and Lightness of OGV Inks for Expanded Color Gamut. *2019 TAGA Proceedings* (pp. 237-245). Printing Industries of America.

Ostromoukhov, V. (1993). Chromaticity gamut enhancement by heptatone multi-color printing. *Device-independent Color Imaging and Imaging Systems Integration, Proc. IS&T/SPIE, 1909, 139-151.*, (pp. 139-151).

Pacheco, R., & Silva, C. (2019, July 1). MDPI Article about energies. *GlobalWarming Potential of Biomass-to-Ethanol: Review and Sensitivity Analysis through a Case Study*, p. 2.

Pamarco. (1982, June). The Anilox Inking System. *Information letter*, 4. Pamarco.

Pantone Inc. (2002). Pantone solid to process guide coated EURO. Pantone.

Pantone LLC. (2017). Pantone Plus Series Extended Gamut Guide coated.

Pantone LLC. (2018, May 15). *Color alignment FAQ*. Retrieved February 21, 2019, from COLOR ALIGNMENT FAQ Print Publication News from Pantone!: https://www.pantone.com/color-intelligence/articles/technical/print-enhancements

Pantone LLC. (2019). *PANTONE MATCHING SYSTEM® (PMS)*. Retrieved from Pantone LLC: https://www.pantone.com/graphics?r=Format%3AFan+Deck

Pantone. (2017, November 5). *L*a*b values for PANTONE Coated colors*. Retrieved November 5, 2017, from https://www.pantone.com/help/?t=L*a*b-values-for-PANTONE-Coated-colors

Plautz, B. (2018, January 15). PIA Color Conference 2018, Seminar paper. *Expanded Gamut Separation the Right Way*.

Politis, A., Tsigonias, A., Tsigonias, M., Gamprellis, G., Tsimis, D., & Trochoutsos, C. (2015). Extended Gamut Printing: A review on developments and trends. *1st International Printing Technologies Symposium (PrintInstanbul 2015)*. Istambul.

Poljacek, S. M., Cigula, T., Tomasegovic, T., & Brajnović, O. (2013). Meeting the Quality Requirements in the Flexographic Plate Making Process . *International Circular of Graphic Education and Research, No. 6*, 62-69.

Polymer Service GmbH. (2020, April 27). *Shore-Härte*. Retrieved from Polymer Service GmbH website: https://www.polymerservice-merseburg.de/kunststoffpruefung/mechanische-pruefungen/haerte/shore-haerte.html

POLYWEST Kunststofftechnik. (2016, January). Technical data sheet. *ONYX+ & ONYX Premium Klischeehülsen*.

Poovarodom, N., Ponnak, C., & Manatphrom, N. (2015). Impact of Production and Conversion Processes on the Carbon Footprint of Flexible Plastic Films. *Packaging technology & science, Vol.28 (6)*, 519-528.

Print Color Management Blog. (2012, September 13). *What is the difference between FM and AM screening?* Retrieved from Print Color Management Blog: http://printcolormanagement.weebly.com/articles-gallery/what-is-the-difference-between-fm-and-am-screening#

Print Media Technology Blog. (2013, 10). *Design of Web-fed Printing Presses*. Retrieved from Print Media Technology Blog: http://print-media-technology.blogspot.com/2013/10/design-of-web-fed-printing-presses.html

Pritchard, G. (2009, April 23). *Rosettes – everything you didn't realize you needed to know*. Retrieved August 27, 2019, from The Print Guide Blog: http://the-print-guide.blogspot.com/2009/04/rosettes-everything-you-didnt-realize.html

Pritchard, G. (2009, February 23). *AM Screening Halftone Dot Shapes*. Retrieved August 21, 2019, from The Print Guide Blog: http://the-print-guide.blogspot.com/2009/02/am-screening-halftone-dot-shapes.html

Pritchard, G. (2009, March 23). *AM and FM gamuts compared*. Retrieved September 9, 2019, from The Print Guide: http://the-print-guide.blogspot.com/2009/03/am-and-fm-gamuts-compared.html

Pritchard, G. (2009, May 24). *Halftone screen angles*. Retrieved August 26, 2019, from The Print Guide Blog: http://the-print-guide.blogspot.com/2009/05/halftone-screen-angles.html

Prof Steven Abbott. (2019). *Yule-Nielesen*. Retrieved September 9, 2019, from Practival Coatings - Printing: https://www.stevenabbott.co.uk/practical-coatings/Yule-Nielsen.php

Qu, Y. (2013). Color Prediction and Separation Models in Printing : Minimizing the Colorimetric and Spectral Differences employing Multiple Characterization Curves. *PhD Dissertation*. Linköping, Sweden: Linköping University.

Reed Business Information. (2006, August 17). *Hi-Fi Color*. Retrieved from TMCnet.com: https://www.tmcnet.com/usubmit/2006/08/17/1812569.htm

Rentzhog, M. (2006, January). Doctoral Thesis. *Water-Based Flexographic Printing on Polymer-Coated Board*. Stockholm, Sweden: Royal Institute of Technology.

Reproflex 3. (2019). *Flexo Magazine, Industry news*. Retrieved September 4, 2019, from Project Blue: A New Era in Flexographic Flexible Packaging: https://www.flexography.org/industry-news/project-blue-new-era-flexographic-flexible-packaging/

Rich, D. (2012, December 1). *Expanded Color Gamut Primaries: The FQC EG Project*. Retrieved February 5, 2019, from FTA - Flexo Technical Assosiation: https://www.flexography.org/industry-news/expanded-color-gamut-primaries-fqc-eg-project/28164/

Rihlama, S. (1997). *Värioppi*. Rakennustieto Oy.

Roberts, A. (2015). A Refreshing Transition. *PackagePrinting, Vol.62(11)*, 18-21.

Robinson, J. (2017, April 3). *Mapping orange, green and violet*. Retrieved from PrintAction website: https://www.printaction.com/mapping-orange-green-and-violet-4061/

Ryerson University. (2019). *Ryerson University Expanded Gamut Study 2019 – Evaluation of Spot Color Reproduction in Multicolor Printing; Version 2.7*. Toronto: Ryerson University.

Ryynänen, M., Sirviö, P., Tanninen, P., & Lindell, H. (2012). A Productivity Study of Digital Printing in the Packaging Industry. *Packaging technology & science, Vol.25 (2)*, pp. 119-124.

Samworth, M. (2016). EXPANDED GAMUT PRINTING: Fixed Inkset Printing with Extended Opportunities. *PackagePrinting, Vol.63(10)*, 36,38,40.

Sangmule, S., Lovell, V., Pekarovicova, A., & Fleming, P. (2012). Digital Proofing of Spot Color Overprints for Flexography. *Journal Of Imaging Science And Technology, Vol.56(1)*, 010507-1...010507-6.

Seth, G. (2013, April). Master's Thesis. *Extended Color Gamut for Flexographic Printing*. USA: Western Michigan University.

Seymour, J. (2018). *The Heyday of Expanded Gamut Printing Patents*. Retrieved from FlexoGlobal website: https://www.flexoglobal.com/blog-

articles/2018/seymour-05-the-heyday-of-expanded-gamut-printing-patents.html

Sharma, A. (2006). Methodology for evaluating the quality of ICC profiles—scanner, monitor and printer. *J Imaging Sci Technol.; 50*, 469-479.

Sharma, A. (2016). EXPANDED GAMUT PRINTING. *Printing Industries of America, The Magazine, Vol.8(6)*, 2-3.

Sharma, A. (2018). *Understanding Color Management (2nd ed.)*. Hoboken, NJ: John Wiley & Sons Ltd.

Sharma, A. (2019). Are You Ready for Expanded Gamut Printing? *Printing Industries of America, The Magazine, Vol.11(6)*, 6-7.

Sharma, A., & Seymour, J. (2019, December 31). Evaluation of expanded gamut software solutions for spot color reproduction. *Color Res Appl. 2019*, pp. 1-10.

Sharma, A., Leung, E., & Adams, R. (2017). Evaluation of Intermodel Agreement Using ISO 13655 M0, M1, and M2 Measurement Modes in Commercial Spectrophotometers. *Color Research & Application, Vol.42(1)*, 27-37.

Sharma, G. (2003). *Digital Color Imaging Handbook*. Boca Raton, Florida: CRC Press LLC.

Sharma, G., Wu, W., & Dalal, E. N. (2005, February). The CIEDE2000 Color-Difference Formula: Implementation Notes, Supplementary Test Data, and Mathematical Observations. *COLOR research and application*, pp. 21-30.

Sheth, G., Lovell, V., & Pekarovicova, A. (2013). Extended Color Gamut For Flexographic Printing. *2013 TAGA Proceedings* (pp. 181-193). Printing Industries of America.

Skrzynski, M. (2018, February). Expanded Color Gamut for Flexo Printing. *FOGRA Color Management Symposium*. Munich, Germany.

Strickler, M. (2019, January 14). Printing Industries of America - Color19 conference presentation. *Extended-Gamut Update – Remaining Challenges, Neglected Opportunities*. San Diego, CA, USA.

Sun Chemical. (2019). *SunECG – Solution for Customers Using Expanded Color Gamut Printing*. Retrieved September 4, 2019, from Sun Chemical company web site: https://www.sunchemical.com/suncolorbox/sunecg/

Sweeney, J. (2010). Expanded Gamut Printing: More Color Sells More. *Printing Industries of America, The Magazine, Vol.2(6)*, 8-10.

Tang, H., & Xiu, X. (2012, December). A Multi-Ink Color-Separation Algorithm Improving Printing Quality. *Applied Mechanics and Materials (Volumes 263-266)*, pp. 2195-2198.

Taylor, A. (2017, March 1). *Newton's Color Theory, ca. 1665*. Retrieved September 29, 2019, from The Scientist website: https://www.the-scientist.com/foundations/newtons-color-theory-ca-1665-31931

The Foundation of Flexographic Technical Association Inc. (1999). *Flexography: Principles And Practices - Volume 1* (5th ed., Vol. 1). The Flexographic Technical Association Inc.

The Foundation of Flexographic Technical Association Inc. (1999). *Flexography: Principles And Practices - Volume 2* (5th Edition ed., Vol. 2). The Flexographic Technical Association, Inc. and the Foundation of Flexographic Technical Association, Inc.

The Foundation of Flexographic Technical Association, Inc. (2003). *Flexographic Image Reproduction Specifications & Tolerances (FIRST) 3.0*. The Foundation of Flexographic Technical Association, Inc.

The Foundation of Flexographic Technical Association, Inc. (2013). *Flexography Principles and Practices 6.0* (6.0 ed.). USA: The Foundation of Flexographic Technical Association, Inc.

The Foundation of Flexographic Technical Association, Inc. (2017). *Flexographic Image Reproduction Specifications & Tolerances (FIRST) 6.0*. The Foundation of Flexographic Technical Association, Inc.

The Smithers Group Inc. (2020, June 8). *Smithers Market Reports*. Retrieved from The Future of Flexographic Printing to 2025: https://www.smithers.com/en-gb/services/market-reports/printing/the-future-of-flexographic-printing-to-2025?_cldee=a2FpLmxhbmtpbmVuQG1hcnZhY28uZmk%3d&recipientid=contact-f7701dd1343cea11a812000d3a86aa92-bfa5dfa531b34af8bd75c90885a32344&utm_source=ClickDim

Thorman, S. (2018). Where did the ink go? - The effect of liquid absorption on ink distribution in flexography. *DOCTORAL THESIS*. Karlstad University Studies.

Tolliver-Nigro, H. (2007). GOING BEYOND THE BENEFITS OF FLEXO: Extended Gamut Inks. *Ink Maker, Vol.85(5)*, 14-16.

Tryznowski, M., Żołek-Tryznowska, Z., & Izdebska-Podsiadły, J. (2018). The wettability effect of branched polyglycerols used as performance

additives for water-based printing inks. *Journal of Coatings Technology and Research, Vol.15 (3)*, 649-655.

U.S. EPA. (2002, February). U.S. Environmental Protection Agency Publication. *Flexographic Ink Options: A Cleaner Technologies Substitutes Assessment VOLUME 2*. Cincinnati, OH, USA: U.S. Environmental Protection Agency.

Valdec, D., Miljković, P., & Čerepinko, D. (2018). The Impact of Top Dot Shapes of the Printing Plate on Dot Formation in Flexography. *Tehnicki Vjesnik, Vol.25(2)*, 596-602.

Verso Corporation. (2019). *Ed - Verso & Education*. Retrieved August 3, 2019, from Ed #3 Stochastic / Conventional: https://edliveshere.com/content/stochastic_conventional/6/size_matters

Vorne Industries Inc. (2008, February 12). The Fast Guide to OEE™. *Vorne Industries Guide paper*. Itasca,, IL, USA.

Vorne Industries Inc. (2019). *Home: Vorne Industries Inc.* Retrieved February 19, 2019, from Vorne Industries Inc. website: https://www.oee.com

Vrhel, M. J., & Trussell, H. J. (1999). Color Device Calibration: a Mathematical Formulation. *IEEE Transactions on Image Processing 8.12*, 1796–1806.

Ward, N. (2014). Getting up to Color. *PackagePrinting, Vol.61(10)*, 40-41, 43.

Web Offset Champion Group. (2008, January). Best practice guide for web offset printers. *Total process colour control & Alternative Screening Technologies*. Great Britain.

Weeks-Atkin, J. (2015, July 21). *X-Rite Color Blog*. Retrieved March 24, 2019, from The Science of Visual Evaluation: https://www.xrite.com/blog/the-science-behind-visual-evaluation

Weiss, D. (2017, September 29). KODAK FLEXCEL NX system brochure. *Effective ink transfer*. https://www.kodak.com/uploadedFiles/Miraclon/Flexographic/FLEXCEL-NX-Effective-Ink-Transfer-whitepaper.pdf.

Wilhelm, J. (2015). 4+1 vs 7+1. *Flexo+Tied-Druck, vol. 26 (3)*, 10-13.

X-Rite Inc. (2000). *A Guide to Understanding Color Communication*. USA.

X-Rite Inc. (2019). *eXact™ Advanced*. Retrieved from X-Rite corporate website: https://www.xrite.com/categories/portable-spectrophotometers/exact-advanced

X-Rite Inc. (2019). *LAB Color Values*. Retrieved from X-Rite Color Blog: https://www.xrite.com/blog/lab-color-space

X-Rite. (2003, 12). *A Guide to Understanding Graphic Arts Densitometry*. X-Rite, Inc.

Yin, F.-L., & Huo, B.-Q. (2013). Image Transformation for Digital Printing Machine. *Applied Mechanics and Materials, Vol. 401-403*, pp. 180-183.

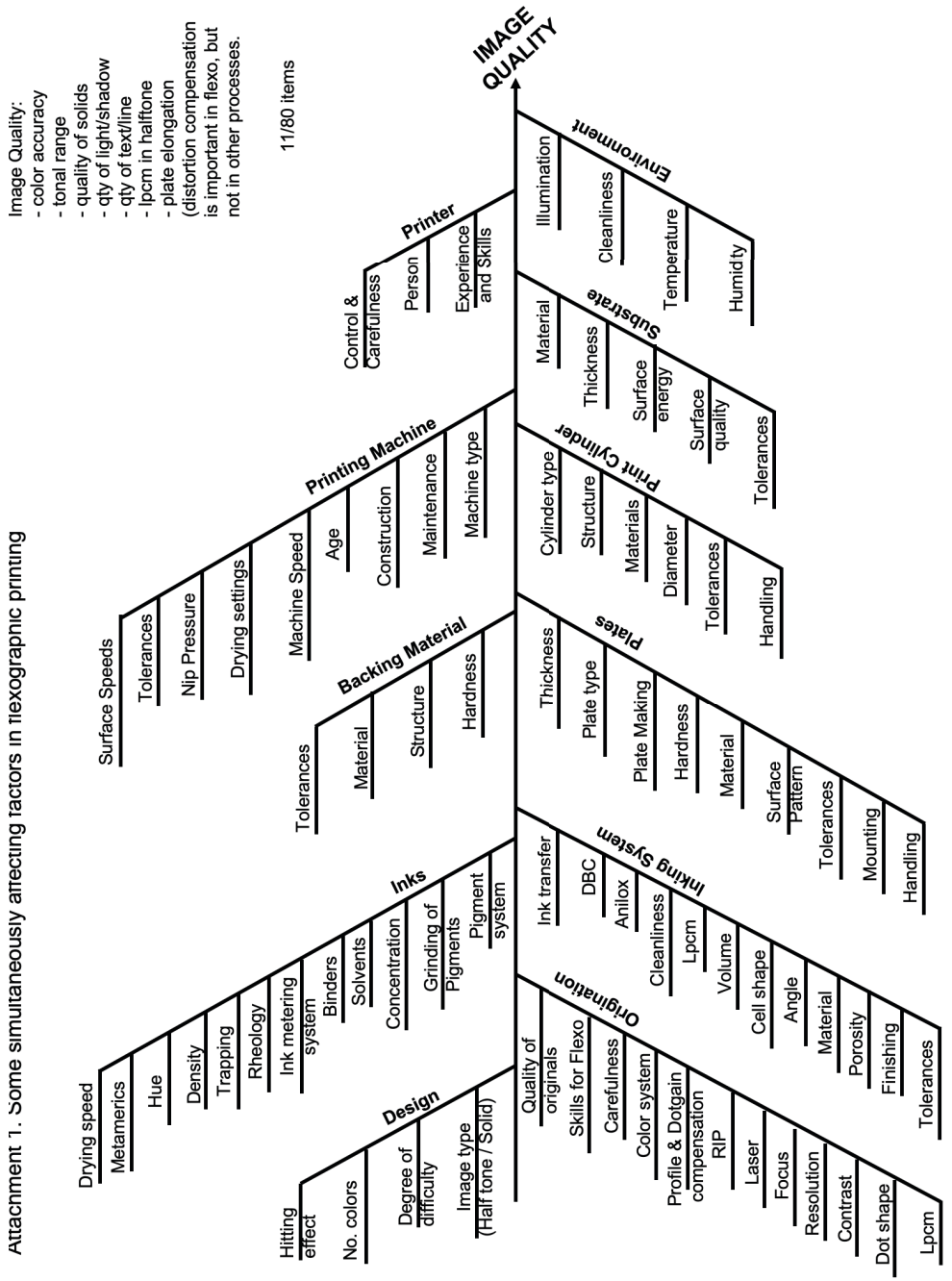
Zarwan, J. (2003, December 12). *Stochastic screening: style or substance?* Retrieved 05 10, 2006, from http://www.johnzarwan.com/pubs/01203wtt.pdf

Zerfass, L. (2016). *Anderson & Vreeland*. Retrieved March 28, 2016, from 141114_AV_Extended_Gamut_Whitepaper_final.pdf: http://andersonvreeland.com/white-papers

Żołek-Tryznowska, Z.;Izdebska, J.;& Tryznowski, M. (2015). Branched polyglycerols as performance additives for water-basedflexographic printing inks. *Progress in organic coatings, Vol.78*, 334-339.

Žitinski ElÍas, P. (2017). Dissertation. *Improving image quality in multi-channel printing – multilevel halftoning, color separation and graininess characterization*. Norrköping, Sweden: Linköping University.

APPENDIX 1: QUALITY FACTORS AFFECTING IMAGE QUALITY



APPENDIX 2: 7C EGP REFERENCE PROFILE SOMA OPTIMA² 2018

B=Black, V=Violet, C=Cyan, M=Magenta, G=Green, O=Orange, Y=Yellow

#Input Ink	B	V	C	M	G	O	Y	Lab	Current Lab
PANTONE Yellow 012 C	0	0	0	0	0	4,72	100	87,5 2,2 109,1	87,1 1,1 97,4
PANTONE Yellow 0131 C	0	0	0	0	0,36	0	29,38	93,6 -6,9 38,0	92,4 -6,2 37,5
PANTONE Red 0331 C	0	0	0	15,68	0	6,7	0	79,5 31,3 6,0	76,4 25,0 5,9
PANTONE Magenta 0521 C	0	0	1,03	22,88	0	0	0	79,9 29,2 -11,2	75,9 21,6 -3,8
PANTONE Violet 0631 C	0	41,78	0	0	0	0	0	69,4 23,8 -28,7	65,2 14,3 -22,9
PANTONE Blue 0821 C	0	0	17,68	0	10	0	0	78,3 -24,0 -22,6	75,5 -20,1 -17,8
PANTONE Green 0921 C	0	0	0	0	24,62	0	0,51	86,1 -27,1 -1,2	83,6 -24,5 -1,4
PANTONE Black 0961 C	36,83	0	0	3	0	0	4,43	62,9 1,7 5,7	62,9 1,7 5,7
PANTONE 801 C	0	0	66,69	0	18,21	0	0	55,4 -37,5 -43,2	54,9 -35,3 -40,8
PANTONE 802 C	0	0	0	0	58,46	0	69,77	75,3 -63,3 63,3	71,1 -50,3 53,2
PANTONE 803 C	0	0	0	0	0	1,85	93,72	93,2 0,3 94,4	89,2 -4,1 95,9
PANTONE 804 C	0	0	0	0	0	57,47	20	83,4 44,7 67,5	76,1 33,9 57,9
PANTONE 805 C	0	0	0	22,75	0	48,52	0	73,0 69,1 35,9	67,3 41,7 30,0
PANTONE 806 C	0	0	0	58,8	0	0	0	64,6 82,9 -10,9	59,3 52,2 -2,5
PANTONE 807 C	0	0	0	63,56	0	0	0	56,3 79,6 -32,1	56,1 57,9 -1,8
PANTONE 871 C	53,6	0	0	6,81	0	0	50,36	50,0 1,9 23,5	50,0 1,9 23,5
PANTONE 872 C	52,76	0	0	12,27	0	0	50,53	49,1 4,5 23,0	49,1 4,5 23,0
PANTONE 873 C	52,1	0	0	18,28	0	0	52,3	48,1 7,0 23,3	48,1 7,0 23,3
PANTONE 874 C	50,15	0	0	20,31	0	0	50,15	49,2 8,2 22,7	49,2 8,2 22,7
PANTONE 875 C	51,14	0	0	31,38	0	0	46,25	46,7 11,2 19,2	46,7 11,2 19,2
PANTONE 876 C	48,48	0	0	41,13	0	0	50,66	46,1 14,9 21,0	46,1 14,9 21,0
PANTONE 877 C	47	0,3	1,53	0	0	0	0	58,4 -1,0 -1,5	58,4 -1,0 -1,5
PANTONE Medium Yellow C	0	0	0	0	0	3,96	100	88,1 0,7 108,9	87,6 -0,3 97,9
PANTONE Bright Orange C	0	0	0	16,13	0	99,18	0	63,5 61,7 81,8	62,8 55,3 77,9
PANTONE Bright Red C	0	0	0	48,81	0	77,95	0	57,5 72,5 61,7	56,0 60,5 55,2
PANTONE Strong Red C	0	0,4	0	100	0	23,51	0	44,0 78,2 14,6	44,1 76,8 14,4
PANTONE Pink C	0	0	3,66	69,32	0	0	0	51,0 72,7 -15,8	49,3 58,1 -5,7
PANTONE Medium Purple C	0	100	20,41	25,8	0	0	0	20,9 50,2 -59,3	21,4 45,8 -55,0
PANTONE Dark Blue C	0	82,6	86,46	0	0	0	0	20,8 29,2 -68,5	20,8 28,9 -67,9
PANTONE Medium Blue C	2,32	0	96,62	0	1,46	0	0	47,3 -33,0 -54,0	47,3 -33,0 -54,0
PANTONE Bright Green C	0	0	15	0	100	0	9,23	59,8 -74,8 -0,4	60,1 -67,0 -0,1
PANTONE Neutral Black C	93,13	5,1	16,31	0	0	0	0	13,2 0,0 -0,3	13,2 0,0 -0,3
PANTONE 100 C	0	0	0	0	0	0	59,96	92,0 -7,6 65,8	91,6 -7,2 65,5
PANTONE 101 C	0	0	0	0	0	0	65,75	91,8 -7,5 75,1	91,3 -7,4 74,9
PANTONE 102 C	0	0	0	0	0	1,12	100	90,2 -4,9 106,3	89,8 -5,5 100,0
PANTONE Yellow C	0	0	0	0	0	2,87	100	89,0 -1,3 110,9	88,4 -2,2 98,6
PANTONE 103 C	0	0	0	0	20,12	32	100	70,2 0,4 83,7	70,5 0,7 79,4
PANTONE 104 C	0	0	0	0	38,51	47,68	94,94	63,6 -0,3 70,7	63,6 -0,3 70,7
PANTONE 105 C	51,76	0	0	4,8	0	0	77,7	51,6 -0,8 45,5	51,6 -0,8 45,5
PANTONE 7401 C	0	0	0	0	0	3,61	19,66	90,2 1,5 32,2	90,1 1,5 32,2
PANTONE 7402 C	0,63	0	0	3,11	0	0	31,21	87,0 1,4 34,3	87,0 1,4 34,3
PANTONE 7403 C	0,22	0	0	3,92	0	0	43,72	85,9 2,8 43,0	85,9 2,8 43,0
PANTONE 7404 C	0,69	0	0	0	0	3,38	66,91	87,5 -0,9 73,8	87,5 -0,9 73,8
PANTONE 7405 C	0,06	0	0	4,57	0	0	95,07	83,8 2,3 89,6	83,8 2,3 89,6
PANTONE 7406 C	2,19	0	0	0	0	11,22	93,49	81,5 6,8 88,6	81,5 6,8 88,6
PANTONE 7407 C	8,08	0	0	17,02	0	0	61,96	68,9 11,1 46,5	68,9 11,1 46,5
PANTONE 106 C	0	0	0	0	0	1,44	66,12	90,7 -4,1 74,7	90,1 -4,6 74,6
PANTONE 107 C	0	0	0	0	0	2,26	75,12	89,8 -2,5 84,1	89,1 -3,2 84,0
PANTONE 108 C	0	0	0	0	0	3,9	93,68	88,4 0,6 94,5	87,7 -0,3 94,6

PANTONE 109 C	0	0	0	0	0	8,3	100	86,3 6,0 98,5	85,5 5,0 96,5
PANTONE 110 C	0	0	0	0	9,06	36,98	100	72,6 9,3 88,9	72,9 9,2 84,0
PANTONE 111 C	0	0	0	0	44,4	59,48	91,56	59,3 4,7 68,1	59,3 4,7 68,1
PANTONE 112 C	39,46	0	0	10,17	0	0	93,12	56,2 2,5 57,2	56,2 2,5 57,2
PANTONE 113 C	0	0	0	0	0	2,83	63,1	89,7 -1,4 69,5	89,2 -1,8 69,4
PANTONE 114 C	0	0	0	0	0	3,47	67,15	89,1 -0,1 75,7	88,4 -0,7 75,4
PANTONE 115 C	0	0	0	0	0	4,34	73,9	88,2 1,6 82,5	87,5 0,9 82,2
PANTONE 116 C	0	0	0	0	0	10,79	86,83	85,4 8,2 89,5	84,7 7,4 89,1
PANTONE 117 C	0	0	0	0	22,59	55,33	98,99	66,2 11,9 78,6	66,2 11,9 78,6
PANTONE 118 C	0	0	0	0	44,04	63,85	82,24	58,1 9,0 66,3	58,1 9,0 66,3
PANTONE 119 C	51,5	0	0	11,29	0	0	81,35	49,7 2,4 45,8	49,7 2,4 45,8
PANTONE 127 C	0,68	0	0	0	0	3,19	55,46	88,3 -0,9 56,7	88,3 -0,9 56,7
PANTONE 128 C	1,01	0	0	0	0	4,83	63,28	86,2 1,9 67,5	86,2 1,9 67,5
PANTONE 129 C	1,17	0	0	0	0	6,83	66,71	84,8 3,9 71,9	84,8 3,9 71,9
PANTONE 130 C	2,53	0	0	0	0	42,83	82,5	75,3 22,1 82,9	75,3 22,1 82,9
PANTONE 131 C	15,23	0	0	0	0	52,62	84,78	63,5 21,0 73,2	63,5 21,0 73,2
PANTONE 132 C	44,41	0	0	0	0	46,72	91,5	52,6 12,8 59,4	52,6 12,8 59,4
PANTONE 133 C	61,42	0	0	20,8	0	0	83,4	38,4 4,6 36,5	38,4 4,6 36,5
PANTONE 1205 C	0	0	0	0	0	3,72	35,89	90,0 1,4 43,3	89,5 1,2 43,1
PANTONE 1215 C	0	0	0	0	0	6,25	50,84	88,0 4,5 54,3	87,6 4,2 54,0
PANTONE 1225 C	0	0	0	0	0	15,49	63,69	84,4 12,1 69,9	83,8 11,5 69,2
PANTONE 1235 C	0	0	0	0	0	32,17	69,45	80,7 20,7 79,1	80,0 19,7 77,9
PANTONE 1245 C	9,56	0	0	25,02	0	0	90,27	64,7 13,9 65,8	64,7 13,9 65,8
PANTONE 1255 C	26,36	0	0	22,53	0	0	83,91	58,3 9,9 56,3	58,3 9,9 56,3
PANTONE 1265 C	51,12	0	0	22,58	0	0	79,2	47,5 6,8 42,3	47,5 6,8 42,3
PANTONE 120 C	0	0	0	0	0	4,78	57,7	88,6 2,6 61,1	88,0 2,2 60,8
PANTONE 121 C	0	0	0	0	0	6,06	61,05	87,8 4,1 66,1	87,1 3,6 65,7
PANTONE 122 C	0	0	0	0	0	8,85	66,03	86,4 7,0 73,2	85,7 6,3 72,5
PANTONE 123 C	0	0	0	0	0	16,16	69,21	84,1 12,6 77,8	83,2 11,6 76,7
PANTONE 124 C	0,2	0	0	21,42	0	0	98,41	74,6 16,7 81,0	74,6 16,7 81,0
PANTONE 125 C	31,47	0	0	0	0	40,84	89,79	59,3 13,0 65,7	59,3 13,0 65,7
PANTONE 126 C	39,29	0	0	25,82	0	0	98,16	52,4 8,8 54,7	52,4 8,8 54,7
PANTONE 7548 C	0	0	0	0	0	16,02	100	84,2 12,8 103,4	83,2 11,0 95,7
PANTONE 7549 C	0	0	0	0	0,01	32,56	100	79,8 19,4 94,8	79,9 19,3 94,1
PANTONE 7550 C	13,62	0	0	0	0	47,1	99,13	65,4 18,7 77,4	65,4 18,7 77,4
PANTONE 7551 C	33,2	0	0	0	0	48,16	87,44	57,5 15,4 65,0	57,5 15,4 65,0
PANTONE 7552 C	59,17	0	0	39,2	0	0	83,76	38,3 9,6 36,2	38,3 9,6 36,2
PANTONE 7553 C	67,54	0	0	30,54	0	0	69,38	31,2 6,3 24,7	31,2 6,3 24,7
PANTONE 7554 C	73,34	0	0	17,2	0	0	55,2	27,0 4,0 14,0	27,0 4,0 14,0
PANTONE 7555 C	5,79	0	0	19,04	0	0	88,6	69,2 12,3 69,7	69,2 12,3 69,7
PANTONE 7556 C	18,18	0	0	21,51	0	0	83,46	61,3 10,5 59,1	61,3 10,5 59,1
PANTONE 7557 C	36,59	0	0	20,49	0	0	81,32	54,7 7,8 50,9	54,7 7,8 50,9
PANTONE 7558 C	42,17	0	0	28,71	0	0	79,89	50,8 9,9 45,9	50,8 9,9 45,9
PANTONE 7559 C	46,69	0	0	33,42	0	0	76,88	48,0 11,0 41,0	48,0 11,0 41,0
PANTONE 7560 C	55,56	0	0	24,25	0	0	69,54	43,8 7,0 33,7	43,8 7,0 33,7
PANTONE 7561 C	61,95	0	0	11,04	0	0	61,71	40,2 2,5 25,3	40,2 2,5 25,3
PANTONE 134 C	0	0	0	0	0	9,86	50,52	86,7 8,3 54,6	86,1 7,9 54,3
PANTONE 135 C	0	0	0	0	0	18,11	57,16	84,0 13,7 61,7	83,6 13,3 61,3
PANTONE 136 C	0	0	0	0	0	24,82	63,38	82,4 17,3 70,6	81,7 16,6 69,8
PANTONE 137 C	0	0	0	0	0	54,24	69,54	76,5 31,1 81,6	76,5 31,1 81,7
PANTONE 138 C	10,29	0	0	0	0	72,66	66,58	62,7 35,1 76,8	62,7 35,1 76,8
PANTONE 139 C	1,7	0	0	0	41,71	97,82	0	52,9 22,7 59,3	52,9 22,7 59,3
PANTONE 140 C	58,68	0	0	40,99	0	0	84,43	38,3 10,4 36,6	38,3 10,4 36,6
PANTONE 1345 C	0	0	0	0	0	11,73	31,38	86,4 10,4 42,9	85,9 10,0 42,6
PANTONE 1355 C	0	0	0	0	0	19,44	42,37	84,0 15,1 51,7	83,5 14,7 51,4
PANTONE 1365 C	0	0	0	0	0	37,44	55,86	80,3 23,1 64,7	79,7 22,2 63,9
PANTONE 1375 C	0,18	0	0	0	0	58,19	61,2	75,3 34,3 75,9	75,3 34,3 75,9
PANTONE 1385 C	13,88	0	0	0	0	71,39	57,69	60,8 33,3 68,9	60,8 33,3 68,9
PANTONE 1395 C	38,53	0	0	50,76	0	0	96,18	46,6 20,5 48,4	46,6 20,5 48,4
PANTONE 1405 C	60,62	0	0	45,44	0	0	81,92	35,6 12,1 32,7	35,6 12,1 32,7
PANTONE 141 C	1,64	0	0	0	0	12,22	57,02	82,8 8,7 58,1	82,8 8,7 58,1
PANTONE 142 C	1,99	0	0	0	0	18,9	61,35	80,4 12,5 64,1	80,4 12,5 64,1
PANTONE 143 C	2,38	0	0	0	0	28,77	65,32	77,9 16,8 69,0	77,9 16,8 69,0
PANTONE 144 C	4,7	0	0	0	0	66,27	62,67	68,1 35,3 76,0	68,1 35,3 76,0
PANTONE 145 C	15,26	0	0	0	0	64,42	66,8	61,4 28,6 68,6	61,4 28,6 68,6
PANTONE 146 C	27,36	0	0	46,96	0	0	98,62	51,6 20,8 54,6	51,6 20,8 54,6

PANTONE 147 C	59,75	0	0	20,32	0	0	70,16	40,5 5,3 31,7	40,5 5,3 31,7
PANTONE 7408 C	1,39	0	0	0	0	19,32	81,54	80,7 12,4 83,4	80,7 12,4 83,4
PANTONE 7409 C	2,44	0	0	0	0	28,6	69,23	77,6 16,5 73,8	77,6 16,5 73,8
PANTONE 7410 C	0,49	0	0	0	0	44,06	8,51	78,5 26,4 41,5	78,5 26,4 41,5
PANTONE 7411 C	4,79	0	0	0	0	40,76	34,64	73,6 21,1 47,1	73,6 21,1 47,1
PANTONE 7412 C	3,91	0	0	44,27	0	0	75,69	62,8 27,9 54,5	62,8 27,9 54,5
PANTONE 7413 C	0,82	0	0	45,95	0	0	76,54	64,8 32,3 57,1	64,8 32,3 57,1
PANTONE 7414 C	9,5	0	0	51,8	0	0	95,48	55,4 30,8 58,0	55,4 30,8 58,0
PANTONE 7562 C	14,67	0	0	12,45	0	0	54,71	66,5 7,7 36,2	66,5 7,7 36,2
PANTONE 7563 C	4,13	0	0	26,41	0	0	78	68,7 16,7 62,8	68,7 16,7 62,8
PANTONE 7564 C	2,34	0	0	41,37	0	0	98,39	65,5 26,7 70,4	65,5 26,7 70,4
PANTONE 7565 C	5,41	0	0	47,41	0	0	84,35	60,0 29,3 58,0	60,0 29,3 58,0
PANTONE 7566 C	31,91	3,96	0	0	0	71,66	0	50,9 28,4 41,0	50,9 28,4 41,0
PANTONE 7567 C	54,14	2,91	0	0	0	68,92	0	41,6 21,4 30,9	41,6 21,4 30,9
PANTONE 7568 C	56,8	0	0	47,35	0	0	61,43	38,4 15,3 23,3	38,4 15,3 23,3
PANTONE 7569 C	2,91	0	0	42,25	0	0	82,96	64,6 27,0 61,6	64,6 27,0 61,6
PANTONE 7570 C	3,47	0	0	44,52	0	0	79,97	63,0 28,5 57,9	63,0 28,5 57,9
PANTONE 7571 C	7,89	0	0	44,24	0	0	76,48	59,9 25,6 52,2	59,9 25,6 52,2
PANTONE 7572 C	14,61	0	0	47,34	0	0	74,02	55,1 24,8 45,8	55,1 24,8 45,8
PANTONE 7573 C	27,16	0	0	51,34	0	0	77,9	50,1 24,5 43,7	50,1 24,5 43,7
PANTONE 7574 C	35,01	0	0	44,38	0	0	68,34	50,0 18,6 36,8	50,0 18,6 36,8
PANTONE 7575 C	52,4	0	0	41,47	0	0	67,79	43,2 13,2 31,1	43,2 13,2 31,1
PANTONE 712 C	0	0	0	0	0	17,55	9,21	85,0 14,9 30,9	84,8 14,8 30,8
PANTONE 713 C	0,12	0	0	0	0	26,78	13,52	82,3 19,1 37,5	82,3 19,1 37,5
PANTONE 714 C	0,82	0	0	0	0	46,38	23,98	77,4 26,9 49,8	77,4 26,9 49,8
PANTONE 715 C	3,33	0	0	0	0	65,79	33,25	69,9 36,6 65,9	69,9 36,6 65,9
PANTONE 716 C	6,39	0	0	0	0	91,54	0	63,5 42,5 73,7	63,5 42,5 73,7
PANTONE 717 C	10,57	0	0	10,01	0	100	0	55,4 45,4 70,0	55,6 44,7 68,0
PANTONE 718 C	18,97	0	0	28,17	0	100	0	48,8 44,8 61,7	49,0 43,8 59,3
PANTONE 148 C	0	0	0	0	0	15,39	22,88	85,5 13,4 39,3	85,0 13,0 38,9
PANTONE 149 C	0	0	0	0	0	22,99	29,79	83,5 17,6 45,3	82,9 17,0 44,8
PANTONE 150 C	0	0	0	0	0	40,97	41,26	79,8 25,2 56,7	78,9 24,2 56,1
PANTONE 151 C	0	1,18	0	0	0	87,43	0	69,7 47,3 78,5	69,7 47,2 78,5
PANTONE 152 C	2,11	6,08	0	0	0	94,58	0	62,0 43,2 72,1	62,0 43,2 72,1
PANTONE 153 C	10,31	0	0	52,66	0	0	98,16	54,5 31,0 58,2	54,5 31,0 58,2
PANTONE 154 C	36,13	0	0	55,49	0	0	93,66	45,7 24,7 46,8	45,7 24,7 46,8
PANTONE 155 C	1,41	0	0	0	0	7,96	14,17	85,7 7,1 29,0	85,7 7,1 29,0
PANTONE 156 C	2,43	0	0	0	0	20,02	26,81	80,6 14,4 39,8	80,6 14,4 39,8
PANTONE 157 C	3,7	0	0	0	0	49,83	32,08	73,1 26,2 51,3	73,1 26,2 51,3
PANTONE 158 C	4,61	0	0	4,08	0	78,24	0	63,5 43,8 63,0	63,5 43,8 63,0
PANTONE 159 C	11,66	0	0	14,67	0	84,26	0	54,4 43,5 58,6	54,4 43,5 58,6
PANTONE 160 C	22,01	22,13	0	0	0	87,27	0	45,6 31,0 45,9	45,6 31,0 45,9
PANTONE 161 C	64,71	0	0	53,35	0	0	75,43	29,9 14,6 24,5	29,9 14,6 24,5
PANTONE 1485 C	0	0	0	0	0	46,87	26,14	79,8 29,6 53,9	78,2 27,8 51,9
PANTONE 1495 C	0	0	0	0	0	69,23	31,52	73,5 43,6 76,0	72,9 42,6 74,6
PANTONE 1505 C	0	0	0	5,94	0	100	20	66,1 59,0 92,9	65,9 52,9 86,4
PANTONE Orange 021 C	0	0	0	27,98	0	100	5	60,8 65,7 85,1	60,5 57,4 76,9
PANTONE 1525 C	22,7	0	0	31,76	0	100	0	46,9 45,6 62,3	47,5 43,2 57,2
PANTONE 1535 C	50,8	0	0	17,15	0	100	0	39,9 32,2 47,3	40,0 32,0 46,7
PANTONE 1545 C	63,57	12,8	0	0	0	83,27	0	29,3 19,0 28,8	29,3 19,0 28,8
PANTONE 1555 C	0	0	0	0	0	34,41	3,19	81,8 24,0 32,5	81,0 23,2 31,9
PANTONE 1565 C	0	0	0	0,44	0	56,75	0	76,4 35,1 45,8	76,2 34,7 45,7
PANTONE 1575 C	0	0	0	4,55	0	72,61	0	69,4 49,6 64,9	69,0 47,3 63,7
PANTONE 1585 C	0	0	0	12,16	0	82,73	0	65,3 57,1 71,7	64,7 52,3 68,9
PANTONE 1595 C	7,33	0	0	17,28	0	83,96	0	56,5 46,6 60,8	56,5 46,6 60,8
PANTONE 1605 C	11,71	32,01	0	0	0	85,68	0	46,3 32,4 44,2	46,3 32,4 44,2
PANTONE 1615 C	32,5	38,65	0	0	0	86,94	0	39,1 27,7 36,9	39,1 27,7 36,9
PANTONE 162 C	0	0	0	0	0	29,54	0	83,0 22,3 26,0	82,4 21,7 25,4
PANTONE 163 C	0	0	0	1,87	0	55,35	0	75,8 36,8 42,9	75,2 34,9 42,3
PANTONE 164 C	0	0	0	6,67	0	67,76	0	69,5 49,9 58,3	68,7 46,1 56,8
PANTONE 165 C	0	0	0	16,22	0	79	0	64,8 58,5 67,9	64,0 52,4 64,5
PANTONE 166 C	2,01	0	0	40,11	0	95,63	0	56,2 56,4 66,6	56,2 56,4 66,6
PANTONE 167 C	17,79	0	0	27,53	0	82,78	0	49,9 42,8 52,2	49,9 42,8 52,2
PANTONE 168 C	46,19	51,84	0	0	0	91,7	0	31,8 25,2 29,5	31,8 25,2 29,5
PANTONE 7576 C	9,18	0,44	0	0	0	63,19	0	64,9 31,5 44,5	64,9 31,5 44,5
PANTONE 7577 C	4,89	3,18	0	0	0	69,56	0	63,8 36,9 52,4	63,8 36,9 52,4

PANTONE 7578 C	6,44	0	0	12,87	0	73,84	0	59,3 43,8 53,7	59,3 43,8 53,7
PANTONE 7579 C	3,42	0	0	38,39	0	76,14	0	56,0 52,4 53,4	56,0 52,4 53,4
PANTONE 7580 C	12,82	0	0	40,42	0	70,22	0	50,0 45,4 42,4	50,0 45,4 42,4
PANTONE 7581 C	33,17	41,28	0	0	0	73,29	0	38,9 25,5 25,5	38,9 25,5 25,5
PANTONE 7582 C	65	1,35	0	0	0	57,77	0	33,8 12,8 16,6	33,8 12,8 16,6
PANTONE 1625 C	0	0	0	4,28	0	42,09	0	77,4 35,4 29,9	75,6 30,8 29,0
PANTONE 1635 C	0	0	0	7,97	0	55	0	72,6 45,0 39,8	70,9 39,1 38,1
PANTONE 1645 C	0	0	0	17,66	0	69,73	0	65,7 58,4 58,6	64,5 50,8 55,6
PANTONE 1655 C	0	0	0	36,27	0	89,12	0	60,0 67,0 72,1	59,0 57,7 66,9
PANTONE 1665 C	2,5	0	0	50	0	98,5	0	53,0 59,5 64,4	53,0 59,5 64,4
PANTONE 1675 C	31,53	0	0	44,13	0	81,63	0	43,5 42,1 44,4	43,5 42,1 44,4
PANTONE 1685 C	8,59	65,03	0	0	0	97,1	0	34,8 31,9 32,0	34,8 31,9 32,0
PANTONE 169 C	0	0	0	5,58	0	20	0	81,1 29,1 17,3	78,5 24,4 16,8
PANTONE 170 C	0	0	0	14,85	0	50,14	0	71,4 48,6 34,7	69,1 40,0 32,5
PANTONE 171 C	0	0	0	30,76	0	69,25	0	63,2 63,5 56,6	61,7 53,4 52,5
PANTONE 172 C	0	0	0	42,02	0	82,65	0	59,1 68,5 67,1	57,8 58,5 61,1
PANTONE 173 C	5,91	0	0	50,37	0	82,17	0	50,7 55,1 52,8	50,7 55,1 52,8
PANTONE 174 C	44,14	0	0	53,02	0	78,05	0	38,0 39,8 36,2	38,0 39,8 36,2
PANTONE 175 C	49,33	56,46	0	0	0	79,26	0	29,7 24,0 19,9	29,7 24,0 19,9
PANTONE 7583 C	14,28	0	0	16,11	0	73,83	0	53,9 40,0 47,7	53,9 40,0 47,7
PANTONE 7584 C	19,55	0	0	25,42	0	77,58	0	50,3 40,7 47,5	50,3 40,7 47,5
PANTONE 7585 C	0,23	49,67	0	0	0	76,84	0	49,5 35,0 37,0	49,5 35,0 37,0
PANTONE 7586 C	7,56	46,66	0	0	0	79,69	0	44,8 32,0 35,3	44,8 32,0 35,3
PANTONE 7587 C	12,76	51,15	0	0	0	80,36	0	41,2 30,4 31,8	41,2 30,4 31,8
PANTONE 7588 C	52,73	16,24	0	0	0	66,21	0	37,9 19,8 22,4	37,9 19,8 22,4
PANTONE 7589 C	66,19	0	0	34,48	0	0	45	32,3 8,5 12,7	32,3 8,5 12,7
PANTONE 7590 C	4,62	0	0	9,49	0	0	13,81	76,1 10,2 15,8	76,1 10,2 15,8
PANTONE 7591 C	12,59	5,03	0	0	0	59,13	0	59,5 26,4 30,9	59,5 26,4 30,9
PANTONE 7592 C	25,44	0	0	33,47	0	68,68	0	48,2 38,8 37,9	48,2 38,8 37,9
PANTONE 7593 C	37,5	0	0	49,19	0	69,53	0	41,4 39,8 33,6	41,4 39,8 33,6
PANTONE 7594 C	13,1	65,14	0	0	0	82,37	0	33,8 30,2 22,6	33,8 30,2 22,6
PANTONE 7595 C	53,09	42,18	0	0	0	70,5	0	31,6 21,1 18,4	31,6 21,1 18,4
PANTONE 7596 C	64,12	16,13	0	0	0	61,3	0	29,3 14,1 13,2	29,3 14,1 13,2
PANTONE 7597 C	4,24	0	0	54,34	0	79,52	0	50,7 58,0 51,0	50,7 58,0 51,0
PANTONE 7598 C	13,11	0	0	47,95	0	74,58	0	47,9 48,6 43,8	47,9 48,6 43,8
PANTONE 7599 C	19,03	0	0	54,76	0	76,62	0	44,3 49,2 42,0	44,3 49,2 42,0
PANTONE 7600 C	3,07	64,89	0	0	0	87,36	0	37,7 33,9 29,4	37,7 33,9 29,4
PANTONE 7601 C	25,79	55,8	0	0	0	80,94	0	36,5 28,2 27,1	36,5 28,2 27,1
PANTONE 7602 C	53,67	15,55	0	0	0	68,34	0	37,2 20,4 24,4	37,2 20,4 24,4
PANTONE 7603 C	62,03	10,87	0	0	0	64,02	0	32,3 15,9 18,4	32,3 15,9 18,4
PANTONE 7604 C	0,99	1,95	0	0	0	3,84	0	86,5 5,7 2,5	86,5 5,7 2,5
PANTONE 7605 C	0,52	4,79	0	0	0	13,88	0	79,2 14,9 8,9	79,2 14,9 8,9
PANTONE 7606 C	4,93	0	0	13,95	0	26,4	0	67,8 27,5 15,8	67,8 27,5 15,8
PANTONE 7607 C	10,46	0	0	31,2	0	48,89	0	56,5 35,7 23,3	56,5 35,7 23,3
PANTONE 7608 C	31,22	0	0	50,9	0	61,56	0	43,8 39,8 27,0	43,8 39,8 27,0
PANTONE 7609 C	3,21	68,18	0	0	0	80,4	0	35,1 33,1 20,2	35,1 33,1 20,2
PANTONE 7610 C	41,09	62,84	0	0	0	74,03	0	29,2 25,1 13,3	29,2 25,1 13,3
PANTONE 7611 C	4,61	1,11	0	0	0	12,01	0	79,2 11,5 10,8	79,2 11,5 10,8
PANTONE 7612 C	7,77	4,64	0	0	0	29,76	0	68,3 18,0 14,2	68,3 18,0 14,2
PANTONE 7613 C	11,21	7,81	0	0	0	39,33	0	62,5 19,6 14,4	62,5 19,6 14,4
PANTONE 7614 C	32,99	3,97	0	0	0	33,2	0	56,7 14,2 11,9	56,7 14,2 11,9
PANTONE 7615 C	49,34	6,97	0	0	0	36,18	0	47,0 12,8 8,8	47,0 12,8 8,8
PANTONE 7616 C	56,05	21,74	0	0	0	46,31	0	36,0 13,9 6,1	36,0 13,9 6,1
PANTONE 7617 C	62,56	28,06	0	0	0	49,41	0	29,1 12,8 4,7	29,1 12,8 4,7
PANTONE 7520 C	1,62	1,77	0	0	0	16,34	0	81,0 15,0 13,9	81,0 15,0 13,9
PANTONE 7521 C	10,64	0	0	18,54	0	0	24,34	67,5 13,2 18,6	67,5 13,2 18,6
PANTONE 7522 C	1,49	38,38	0	0	0	63,32	0	53,6 30,6 26,0	53,6 30,6 26,0
PANTONE 7523 C	26,56	0	0	40,53	0	48,04	0	49,2 33,1 19,0	49,2 33,1 19,0
PANTONE 7524 C	32,64	0	0	42,61	0	56,99	0	45,9 34,6 23,4	45,9 34,6 23,4
PANTONE 7525 C	39,62	4,78	0	0	0	57,73	0	49,6 19,9 23,0	49,6 19,9 23,0
PANTONE 7526 C	52,88	0	0	44,46	0	82,62	0	35,9 34,2 36,5	35,9 34,2 36,5
PANTONE 489 C	1,32	1,23	0	0	0	15,39	0	82,4 14,7 14,4	82,4 14,7 14,4
PANTONE 488 C	0,06	3,09	0	0	0	22,19	0	79,9 18,5 16,2	79,9 18,5 16,2
PANTONE 487 C	1,65	0	0	4,91	0	28,94	0	75,2 25,9 20,8	75,2 25,9 20,8
PANTONE 486 C	1,37	0	0	11,76	0	43,37	0	69,8 34,7 26,7	69,8 34,7 26,7
PANTONE 485 C	0	0	0	65,89	0	82,71	0	49,7 69,1 54,6	49,7 68,8 54,5

PANTONE 484 C	37,22	0	0	60,79	0	74,96	0	38,0	45,3	34,5	38,0 45,3 34,5
PANTONE 483 C	47,3	61,58	0	0	0	83,48	0	27,5	25,0	19,4	27,5 25,0 19,4
PANTONE 176 C	0	0	0	12,06	0	9,14	0	81,0	31,3	8,5	77,3 24,2 8,4
PANTONE 177 C	0	0	0	30,18	0	31,4	0	70,8	52,2	21,2	67,3 39,0 19,1
PANTONE 178 C	0	0	0	43,33	0	56,16	0	63,1	65,5	37,7	60,4 51,2 33,3
PANTONE Warm Red C	0	0	0	48,49	0	67,94	0	58,7	70,0	51,2	56,9 58,6 46,9
PANTONE 179 C	0,17	0	0	58,19	0	71,56	0	52,9	63,9	48,2	52,9 63,9 48,2
PANTONE 180 C	11,01	0	0	58,67	0	67,83	0	46,3	53,6	37,4	46,3 53,6 37,4
PANTONE 181 C	53,94	0	0	58,78	0	64,1	0	33,1	35,2	21,9	33,1 35,2 21,9
PANTONE 1765 C	0	0	0	21,72	0	8,23	0	77,6	37,0	7,5	73,8 28,5 6,9
PANTONE 1775 C	0	0	0	31,97	0	14,46	0	72,8	46,2	11,6	69,2 35,4 10,7
PANTONE 1785 C	0	0	0	52,43	0	52,65	0	59,5	68,9	32,0	57,2 55,4 28,8
PANTONE 1788 C	0	0	0	59,97	0	67,2	0	53,9	74,1	47,3	52,7 63,9 43,7
PANTONE 1795 C	1,89	0	0	67,58	0	69,15	0	48,1	66,3	43,2	48,1 66,3 43,2
PANTONE 1805 C	17,43	0	0	67,89	0	67,61	0	40,8	55,3	33,3	40,8 55,3 33,3
PANTONE 1815 C	54,89	0	0	66,43	0	65,6	0	30,0	38,7	21,4	30,0 38,7 21,4
PANTONE 1767 C	0	0	0	16,95	0	5	0	79,8	31,1	4,1	76,5 24,8 4,4
PANTONE 1777 C	0	0	0	47,36	0	29,72	0	64,2	61,6	19,1	61,3 47,6 16,6
PANTONE 1787 C	0	0	0	56,48	0	59,03	0	56,6	72,8	38,6	54,9 59,6 34,6
PANTONE Red 032 C	0	0	0	57,61	0	63,77	0	55,3	72,1	43,5	54,0 61,6 40,0
PANTONE 1797 C	4,26	0	0	65,32	0	64,04	0	47,9	61,2	35,6	47,9 61,2 35,6
PANTONE 1807 C	27,77	0	0	63,84	0	61,16	0	40,3	47,8	25,1	40,3 47,8 25,1
PANTONE 1817 C	49,97	60,21	0	0	0	68,82	0	28,3	23,2	10,1	28,3 23,2 10,1
PANTONE 7618 C	11,86	0	0	17,49	0	60,41	0	56,9	35,9	34,2	56,9 35,9 34,2
PANTONE 7619 C	10,33	0	0	49,45	0	67,2	0	49,4	49,3	38,5	49,4 49,3 38,5
PANTONE 7620 C	12,47	0	0	64,41	0	69,7	0	43,6	56,4	37,9	43,6 56,4 37,9
PANTONE 7621 C	18,99	0	0	70,63	0	70,07	0	39,5	56,7	35,1	39,5 56,7 35,1
PANTONE 7622 C	39,09	0	0	68,5	0	65,98	0	35,0	47,4	26,3	35,0 47,4 26,3
PANTONE 7623 C	46,35	0	0	66,2	0	66,05	0	33,7	43,2	24,9	33,7 43,2 24,9
PANTONE 7624 C	52,88	0	0	62,7	0	63,9	0	32,5	37,6	21,6	32,5 37,6 21,6
PANTONE 7625 C	0,22	0	0	50,95	0	66,15	0	56,1	58,7	43,8	56,1 58,7 43,8
PANTONE 7626 C	7,52	0	0	59,73	0	77,64	0	47,2	57,8	46,2	47,2 57,8 46,2
PANTONE 7627 C	26,3	0	0	65,01	0	70,55	0	39,5	51,5	34,3	39,5 51,5 34,3
PANTONE 7628 C	33,11	0	0	65,42	0	68,84	0	37,7	48,8	31,0	37,7 48,8 31,0
PANTONE 7629 C	34,44	64,99	0	0	0	76,06	0	29,8	26,5	14,4	29,8 26,5 14,4
PANTONE 7630 C	52,08	58,69	0	0	0	70,75	0	27,7	22,7	12,1	27,7 22,7 12,1
PANTONE 7631 C	59,23	56,55	0	0	0	68,23	0	24,6	19,9	9,5	24,6 19,9 9,5
PANTONE 7415 C	2,34	1,62	0	0	0	19,62	0	79,4	16,2	15,6	79,4 16,2 15,6
PANTONE 7416 C	0,31	0	0	39,89	0	59,15	0	60,9	50,4	37,5	60,9 50,4 37,5
PANTONE 7417 C	0,26	0	0	51,99	0	67,89	0	55,5	59,9	45,7	55,5 59,9 45,7
PANTONE 7418 C	4,43	0	0	53,65	0	49,64	0	53,3	50,2	23,5	53,3 50,2 23,5
PANTONE 7419 C	17,58	0	0	57,56	0	41,09	0	46,7	42,9	14,5	46,7 42,9 14,5
PANTONE 7420 C	30,49	0	0	75,25	0	49,49	0	36,3	51,6	15,1	36,3 51,6 15,1
PANTONE 7421 C	4,11	91,83	0	0	0	83,75	0	24,2	35,7	6,3	24,2 35,7 6,3
PANTONE 182 C	0	0	0	12,72	0	3,56	0	82,6	25,6	2,0	79,2 20,7 2,6
PANTONE 183 C	0	0	0	28,79	0	6,09	0	75,4	39,5	5,0	72,0 31,0 4,9
PANTONE 184 C	0	0	0	53,17	0	33,14	0	60,7	66,0	19,6	58,2 52,2 17,1
PANTONE 185 C	0	0	0	69,18	0	68,53	5	49,8	77,4	49,2	48,9 69,6 46,2
PANTONE 186 C	3,55	0	0	77,46	0	68,65	0	44,7	67,8	40,1	44,7 67,8 40,1
PANTONE 187 C	22,6	0	0	76,42	0	66,38	0	37,7	56,5	29,8	37,7 56,5 29,8
PANTONE 188 C	56,1	0	0	68,37	0	57,68	0	28,6	37,9	15,4	28,6 37,9 15,4
PANTONE 196 C	0	0	0	6,9	0	2,93	0	83,8	15,4	2,1	83,2 14,9 2,1
PANTONE 197 C	0	0	0	30,18	0	4,74	0	72,9	33,2	3,5	71,9 31,0 3,6
PANTONE 198 C	0	0	0	61,14	0	42,84	0	54,5	64,0	21,8	53,7 59,6 21,0
PANTONE 199 C	0	0	0	82,8	0	65,59	0	46,8	74,0	40,2	46,6 72,8 39,7
PANTONE 200 C	7,77	0	0	82,9	0	66,03	0	41,4	65,6	34,2	41,4 65,6 34,2
PANTONE 201 C	29,22	0	0	74,59	0	60,57	0	36,7	52,9	23,2	36,7 52,9 23,2
PANTONE 202 C	47,43	0	0	69,45	0	58,48	0	32,3	43,6	17,8	32,3 43,6 17,8
PANTONE 189 C	0	0	0	26,92	0	3,83	0	76,8	35,5	2,0	73,6 28,5 2,5
PANTONE 190 C	0	0	0	46,8	0	10	0	66,7	54,0	7,1	63,9 43,3 7,0
PANTONE 191 C	0	0	0	59,68	0	31,87	0	57,4	69,5	18,6	55,2 57,1 16,3
PANTONE 192 C	0	0	0	69,31	0	57,24	0	50,4	77,1	34,3	49,3 67,8 31,5
PANTONE 193 C	5,5	0	0	81,5	0	58,17	0	42,8	66,1	27,8	42,8 66,1 27,8
PANTONE 194 C	30,61	0	0	71,53	0	49,19	0	37,1	50,1	15,1	37,1 50,1 15,1
PANTONE 195 C	2,03	76,38	0	0	0	73,41	0	31,4	34,3	8,0	31,4 34,3 8,0
PANTONE 1895 C	0	0	0	19,17	0	0,93	0	80,9	26,7	-1,6	77,9 22,0 -1,0

PANTONE 1905 C	0	0	0	35,63	0	1,93	0	74,7 38,5 -0,6	71,7 31,2 -0,2
PANTONE 1915 C	0	0	0	60,05	0	14,38	0	58,6 67,3 9,9	56,5 55,4 8,9
PANTONE 1925 C	0	0	0	75,57	0	51,37	0	49,3 77,6 28,3	48,3 69,3 26,4
PANTONE 1935 C	3,29	0	0	90,4	0	57,25	0	43,1 70,3 28,4	43,1 70,3 28,4
PANTONE 1945 C	17,77	0	0	84,66	0	53,55	0	37,1 59,9 19,4	37,1 59,9 19,4
PANTONE 1955 C	42,12	0	0	81,91	0	52,13	0	31,4 49,9 14,1	31,4 49,9 14,1
PANTONE 705 C	0	0	0	3,85	0	2,02	0	89,7 10,6 1,1	87,0 9,2 1,3
PANTONE 706 C	0	0	0	6,11	0	2,62	0	86,8 16,2 1,4	84,0 13,8 1,7
PANTONE 707 C	0	0	0	14,18	0	4,47	0	80,9 27,4 3,3	77,9 22,7 3,8
PANTONE 708 C	0	0	0	32,62	0	10,2	0	72,4 42,4 8,5	69,6 34,6 8,0
PANTONE 709 C	0	0	0	50,24	0	30,39	0	61,6 58,4 18,0	59,9 49,7 16,5
PANTONE 710 C	0	0	0	61,2	0	55	0	53,5 64,5 30,3	53,1 61,9 29,7
PANTONE 711 C	4,34	0	0	66	0	69,26	0	47,1 62,9 41,5	47,1 62,9 41,5
PANTONE 698 C	0	0	0	3,88	0	3	0	87,8 11,5 2,7	86,2 10,6 2,8
PANTONE 699 C	0	0	0	8,85	0	3,53	0	83,6 19,8 2,6	81,5 17,6 2,8
PANTONE 700 C	0	0	0	17,57	0	5,46	0	77,9 28,7 4,8	76,1 25,3 4,7
PANTONE 701 C	0	0	0	40,55	0	10,06	0	67,5 40,2 7,6	67,0 38,5 7,5
PANTONE 702 C	2,28	0	0	55,8	0	26,16	0	55,9 50,2 13,2	55,9 50,2 13,2
PANTONE 703 C	11,14	0	0	64,3	0	52,56	0	45,3 53,1 21,9	45,3 53,1 21,9
PANTONE 704 C	32,53	0	0	66,65	0	66,18	0	37,7 48,9 28,2	37,7 48,9 28,2
PANTONE 203 C	0	0	0	21,84	0	0	0	79,2 25,2 -3,4	77,4 22,7 -2,1
PANTONE 204 C	0	0	0	48,26	0	0,84	0	67,2 45,4 -1,8	65,8 40,8 -1,8
PANTONE 205 C	0	0	0	66,33	0	2,09	5	55,0 65,7 7,1	54,0 59,9 6,6
PANTONE 206 C	0,19	0	0	98,82	0	60,12	0	44,1 76,1 34,3	44,1 76,1 34,3
PANTONE 207 C	18,27	0	0	94,7	0	59,1	0	36,0 61,8 23,5	36,0 61,8 23,5
PANTONE 208 C	45	0	0	78,25	0	36,73	0	31,8 46,7 7,7	31,8 46,7 7,7
PANTONE 209 C	2,18	83,38	0	0	0	75,6	0	27,9 35,5 4,5	27,9 35,5 4,5
PANTONE 210 C	0	0	0	36,47	0	0	0	76,3 38,8 -5,8	72,6 30,1 -2,7
PANTONE 211 C	0	0	0	48,72	0	0	0	68,9 51,7 -5,8	65,8 41,0 -2,9
PANTONE 212 C	0	0	0	61,53	0	0	0	59,9 67,4 -1,6	57,4 55,4 -2,1
PANTONE 213 C	0	0	0	74,4	0	0	5,57	52,2 75,3 5,6	50,7 66,6 5,0
PANTONE 214 C	1,06	0	0	84,27	0	9,86	0	46,9 70,9 7,1	46,9 70,9 7,1
PANTONE 215 C	13,7	0	0	83,64	0	14,43	0	39,4 60,5 4,7	39,4 60,5 4,7
PANTONE 216 C	52,08	0	0	76,92	0	15,49	0	30,4 42,2 1,8	30,4 42,2 1,8
PANTONE 7422 C	0	0	0	5,22	0	3,13	0	86,2 15,2 2,4	84,3 13,5 2,6
PANTONE 7423 C	0	0	0	56,31	0	10,54	0	59,6 53,5 6,9	59,1 51,1 6,7
PANTONE 7424 C	0	0	0	65,63	0	0	3,6	55,8 64,9 3,3	54,8 59,2 3,0
PANTONE 7425 C	9,32	0	0	76,38	0	32,55	0	42,4 59,6 11,8	42,4 59,6 11,8
PANTONE 7426 C	19,98	0	0	82,67	0	51,81	0	37,0 58,2 18,0	37,0 58,2 18,0
PANTONE 7427 C	33,73	0	0	78,71	0	63,34	0	34,6 52,9 24,2	34,6 52,9 24,2
PANTONE 7428 C	12,5	78,14	0	0	0	70,57	0	28,0 31,0 3,8	28,0 31,0 3,8
PANTONE 7632 C	3,33	2,61	0	0	0	3,52	0	82,2 5,3 1,0	82,2 5,3 1,0
PANTONE 7633 C	4,3	9,82	0	0	0	13,44	0	70,4 13,7 2,9	70,4 13,7 2,9
PANTONE 7634 C	6,99	0	0	54,47	0	4,86	0	55,7 40,9 1,9	55,7 40,9 1,9
PANTONE 7635 C	3,25	0	0	69,78	0	23,26	0	47,8 61,5 11,0	47,8 61,5 11,0
PANTONE 7636 C	6,13	0	0	78,12	0	47,11	0	43,3 63,5 19,5	43,3 63,5 19,5
PANTONE 7637 C	38	0	0	68,84	0	42,39	0	36,1 45,1 10,9	36,1 45,1 10,9
PANTONE 7638 C	51,29	0	0	67,73	0	39,64	0	32,2 38,5 8,4	32,2 38,5 8,4
PANTONE 217 C	0	2,11	0	11,43	0	0	0	81,9 21,1 -8,2	79,1 16,6 -4,3
PANTONE 218 C	0	0	0	54,84	0	0	0	63,2 55,0 -12,2	61,9 47,4 -3,0
PANTONE 219 C	0	0	0	77,65	0	0	0	50,3 75,3 -4,7	49,9 69,3 -0,5
PANTONE Rubine Red C	0	0,64	0	100	0	19,05	0	43,8 79,3 12,7	44,0 76,9 12,4
PANTONE 220 C	0	26,75	0	100	0	28,74	0	35,7 65,5 5,4	35,8 65,4 5,4
PANTONE 221 C	35,85	0	0	98,58	0	19,66	0	32,1 56,9 4,4	32,1 56,9 4,4
PANTONE 222 C	59,11	0	0	81,06	0	2,22	0	26,1 39,3 -3,8	26,1 39,3 -3,8
PANTONE 7639 C	22,57	29,43	0	0	0	35,84	0	50,2 17,5 3,0	50,2 17,5 3,0
PANTONE 7640 C	38,02	0	0	62,88	0	24,43	0	39,6 39,3 6,6	39,6 39,3 6,6
PANTONE 7641 C	40,16	0	0	70,36	0	33,87	0	35,1 45,0 7,9	35,1 45,0 7,9
PANTONE 7642 C	2,46	79,18	0	0	0	67,2	0	30,4 34,3 -0,5	30,4 34,3 -0,5
PANTONE 7643 C	17,52	76,97	0	0	0	65,89	0	28,0 29,3 -0,9	28,0 29,3 -0,9
PANTONE 7644 C	48,87	68,45	0	0	0	61,57	0	25,1 23,1 -2,3	25,1 23,1 -2,3
PANTONE 7645 C	57,2	64,01	0	0	0	59,67	0	23,2 20,2 -1,5	23,2 20,2 -1,5
PANTONE 223 C	0	0	0	41,09	0	0	0	73,1 41,4 -13,9	70,8 32,9 -2,8
PANTONE 224 C	0	0	0	53	0	0	0	64,9 56,3 -16,0	63,1 45,5 -3,0
PANTONE 225 C	0	0	1,65	70	0	0	0	51,9 76,5 -12,1	50,4 62,5 -3,1
PANTONE 226 C	0	0	0,53	99,85	0	0	0	44,8 80,2 0,0	44,7 77,8 1,0

PANTONE 227 C	0	23,81	0	98,5	0	5,45	0	37,2 66,7 -3,6	37,2 66,7 -3,6
PANTONE 228 C	33,65	7,59	0	89,23	0	0	0	31,3 53,0 -7,1	31,3 53,0 -7,1
PANTONE 229 C	61,1	0,62	0	77,03	0	0	0	25,7 35,2 -4,8	25,7 35,2 -4,8
PANTONE 230 C	0	0	0	31,15	0	0	0	77,6 35,3 -11,7	74,3 27,4 -2,5
PANTONE 231 C	0	0	0	49,98	0	0	0	67,6 55,3 -16,8	65,0 42,4 -2,9
PANTONE 232 C	0	0	0	63,36	0	0	0	57,2 72,5 -17,4	56,2 57,6 -1,9
PANTONE Rhodamine Red C	0	0	1,95	71,25	0	0	0	51,5 78,8 -13,9	49,9 62,6 -3,4
PANTONE 233 C	0	0	4,65	89,38	0	0	0	44,1 74,8 -9,9	43,5 67,2 -5,8
PANTONE 234 C	4,28	21,69	0	96,52	0	0	0	36,1 63,1 -8,5	36,1 63,1 -8,5
PANTONE 235 C	38,71	7,75	0	88,61	0	0	0	30,1 51,1 -7,3	30,1 51,1 -7,3
PANTONE 670 C	0	0,92	0	4,87	0	0	0	87,0 10,9 -4,2	85,5 9,9 -2,7
PANTONE 671 C	0	2,44	0	11,34	0	0	0	80,9 20,1 -7,7	78,7 16,6 -4,6
PANTONE 672 C	0	0	2,13	32,31	0	0	0	73,4 30,2 -10,5	71,4 24,9 -5,4
PANTONE 673 C	0	0	2,87	45,08	0	0	0	66,6 39,6 -12,6	65,0 32,8 -6,1
PANTONE 674 C	0	0	5,9	61,41	0	0	0	54,2 52,5 -13,0	52,9 45,6 -8,3
PANTONE 675 C	0,11	20,03	0	80,48	0	0	0	41,9 60,2 -8,0	41,9 60,2 -8,0
PANTONE 676 C	32,49	0	0	96,92	0	9,07	0	33,5 58,2 0,8	33,5 58,2 0,8
PANTONE 677 C	0	1,25	0	5,21	0	0	0	85,1 11,0 -3,6	84,7 10,6 -3,1
PANTONE 678 C	0	1,86	0	6,53	0	0	0	83,4 12,6 -4,5	82,8 12,0 -3,9
PANTONE 679 C	0	2,82	0	8,87	0	0	0	80,3 15,4 -5,8	79,7 14,6 -5,0
PANTONE 680 C	0	8,15	0	26,46	0	0	0	67,9 25,0 -8,5	67,8 24,6 -8,2
PANTONE 681 C	2,47	16,45	0	47,4	0	0	0	54,6 33,8 -10,3	54,6 33,8 -10,3
PANTONE 682 C	10,16	18,95	0	61,48	0	0	0	43,2 40,4 -10,1	43,2 40,4 -10,1
PANTONE 683 C	49,18	4,04	0	74,69	0	0	0	31,3 41,2 -6,0	31,3 41,2 -6,0
PANTONE 684 C	0,36	0,73	0	7,82	0	0	0	82,9 12,9 -2,7	82,9 12,9 -2,7
PANTONE 685 C	0,68	1,91	0	12,46	0	0	0	78,1 16,9 -4,0	78,1 16,9 -4,0
PANTONE 686 C	1,62	3,51	0	21,89	0	0	0	71,5 21,5 -5,2	71,5 21,5 -5,2
PANTONE 687 C	3,86	5,82	0	37,28	0	0	0	62,2 27,0 -6,6	62,2 27,0 -6,6
PANTONE 688 C	9,9	8,86	0	50,97	0	0	0	51,4 32,6 -7,9	51,4 32,6 -7,9
PANTONE 689 C	33,56	10,78	0	64,73	0	0	0	37,5 37,9 -7,9	37,5 37,9 -7,9
PANTONE 690 C	12,86	84,81	0	0	0	68,86	0	24,5 32,3 -3,1	24,5 32,3 -3,1
PANTONE 510 C	0	0	0	10,24	0	2,29	0	81,7 18,2 0,8	81,3 17,7 0,9
PANTONE 509 C	0	0	0	16,08	0	2,03	0	78,7 21,6 0,4	78,5 21,3 0,4
PANTONE 508 C	0,33	0	0	21,99	0	2,27	0	75,8 24,4 0,6	75,8 24,4 0,6
PANTONE 507 C	3,34	0	0	36,53	0	1,41	0	68,3 28,5 -0,8	68,3 28,5 -0,8
PANTONE 506 C	50,31	0	0	65,47	0	19,55	0	34,7 36,7 4,1	34,7 36,7 4,1
PANTONE 505 C	10,13	77,25	0	0	0	71,06	0	29,1 31,5 5,0	29,1 31,5 5,0
PANTONE 504 C	54,22	65,22	0	0	0	68,51	0	23,6 22,5 5,0	23,6 22,5 5,0
PANTONE 7429 C	0,5	0,29	0	13,03	0	0	0	80,1 17,2 -2,3	80,1 17,2 -2,3
PANTONE 7430 C	0,61	1,21	0	23,28	0	0	0	74,8 22,9 -3,2	74,8 22,9 -3,2
PANTONE 7431 C	4,53	0,75	0	46,63	0	0	0	62,4 33,9 -3,2	62,4 33,9 -3,2
PANTONE 7432 C	11,51	0	0	59,12	0	1,23	0	51,6 41,9 -2,0	51,6 41,9 -2,0
PANTONE 7433 C	18,23	0	0	68,68	0	8,89	0	42,6 50,0 2,0	42,6 50,0 2,0
PANTONE 7434 C	29,88	0	0	69,87	0	13,58	0	39,0 48,0 3,1	39,0 48,0 3,1
PANTONE 7435 C	45,78	0	0	76,9	0	8,03	0	33,1 45,4 -0,4	33,1 45,4 -0,4
PANTONE 691 C	0,46	0	0	4,14	0	2,97	0	85,2 10,9 2,6	85,2 10,9 2,6
PANTONE 692 C	1,64	0	0	6,72	0	3,73	0	80,6 14,9 3,2	80,6 14,9 3,2
PANTONE 693 C	3,8	0	0	16,18	0	5,27	0	72,4 21,6 4,0	72,4 21,6 4,0
PANTONE 694 C	8,82	0	0	32,7	0	8,15	0	62,6 27,2 4,7	62,6 27,2 4,7
PANTONE 695 C	15,01	0	0	45,4	0	12,42	0	54,5 31,9 5,6	54,5 31,9 5,6
PANTONE 696 C	37,22	0	0	57,39	0	30,47	0	42,1 35,7 9,2	42,1 35,7 9,2
PANTONE 697 C	48,09	0	0	59,78	0	43,68	0	37,0 34,7 11,6	37,0 34,7 11,6
PANTONE 496 C	0	0	0	7,45	0	3,12	0	84,4 17,2 2,2	82,7 15,7 2,3
PANTONE 495 C	0	0	0	10	0	3,6	0	81,9 20,5 2,5	80,6 18,9 2,7
PANTONE 494 C	0	0	0	23,31	0	5,06	0	74,5 28,5 4,2	74,2 27,9 4,2
PANTONE 493 C	1,78	0	0	38,21	0	8,89	0	66,3 35,0 6,3	66,3 35,0 6,3
PANTONE 492 C	44,5	0	0	62,58	0	60,06	0	36,0 40,5 20,8	36,0 40,5 20,8
PANTONE 491 C	0,08	74,06	0	0	0	82,73	0	32,5 35,2 16,9	32,5 35,2 16,9
PANTONE 490 C	50,01	66,16	0	0	0	77,31	0	24,7 24,1 10,8	24,7 24,1 10,8
PANTONE 503 C	0,99	0	0	4,74	0	4,08	0	82,8 13,5 4,1	82,8 13,5 4,1
PANTONE 502 C	1,47	0	0	7,91	0	3,94	0	79,9 16,3 3,4	79,9 16,3 3,4
PANTONE 501 C	3,72	0	0	13,81	0	5,72	0	73,3 20,7 4,6	73,3 20,7 4,6
PANTONE 500 C	9,62	0	0	27,75	0	11,31	0	63,0 25,9 6,7	63,0 25,9 6,7
PANTONE 499 C	34,59	56,74	0	0	0	69,46	0	34,6 25,4 16,0	34,6 25,4 16,0
PANTONE 498 C	51,26	54,74	0	0	0	68,19	0	30,2 22,0 12,9	30,2 22,0 12,9
PANTONE 497 C	64,38	43,57	0	0	0	63,41	0	24,2 15,5 8,5	24,2 15,5 8,5

PANTONE 5035 C	0,43	4,85	0	0	0	7,78	0	81,1 11,2 3,7	81,1 11,2 3,7
PANTONE 5025 C	3,74	0	0	6,23	0	3,93	0	78,0 13,7 3,3	78,0 13,7 3,3
PANTONE 5015 C	1,64	13,85	0	0	0	18,22	0	70,7 16,7 4,4	70,7 16,7 4,4
PANTONE 5005 C	4,26	32,6	0	0	0	37,96	0	57,8 21,5 5,6	57,8 21,5 5,6
PANTONE 4995 C	5,7	51,87	0	0	0	52,84	0	48,4 25,5 6,7	48,4 25,5 6,7
PANTONE 4985 C	12,01	59,9	0	0	0	61,54	0	40,0 26,7 8,5	40,0 26,7 8,5
PANTONE 4975 C	68,89	60,78	0	0	0	72,88	0	16,9 15,9 7,2	16,9 15,9 7,2
PANTONE 236 C	0	0	1,54	28,72	0	0	0	77,6 34,1 -14,6	73,4 23,9 -4,6
PANTONE 237 C	0	0	2,11	44,24	0	0	0	69,9 47,6 -19,4	66,3 33,1 -5,3
PANTONE 238 C	0	0	3,27	55,8	0	0	0	61,1 61,6 -23,0	58,4 42,5 -6,2
PANTONE 239 C	0	0	6,54	63,03	0	0	0	55,0 69,0 -24,0	51,7 46,9 -8,6
PANTONE 240 C	0	0	10,06	69,53	0	0	0	48,2 67,0 -21,9	46,3 51,5 -10,6
PANTONE 241 C	0	0	17,33	83,77	0	0	0	41,6 63,9 -19,3	40,5 55,8 -13,4
PANTONE 242 C	23,1	38,58	0	74,42	0	0	0	31,7 45,0 -11,8	31,7 45,0 -11,8
PANTONE 2365 C	0	2,83	0	12,83	0	0	0	81,5 24,9 -11,4	77,5 17,7 -4,9
PANTONE 2375 C	0	0	4,06	47,82	0	0	0	65,6 51,4 -24,2	62,1 33,6 -7,3
PANTONE 2385 C	0	0	10	63,74	0	0	0	53,5 69,3 -28,8	50,0 44,7 -11,1
PANTONE 2395 C	0	0	13,08	76,71	0	0	0	46,2 76,5 -28,3	43,4 54,0 -11,9
PANTONE 2405 C	0	0	23,48	85,94	0	0	0	40,2 70,3 -26,5	38,7 54,5 -15,4
PANTONE 2415 C	0	0	31,25	94,01	0	0	0	36,1 64,1 -23,6	35,3 55,4 -17,5
PANTONE 2425 C	0	56,06	5,56	94,61	0	0	0	29,7 55,0 -18,2	29,7 55,0 -18,2
PANTONE 243 C	0	4,53	0	10,48	0	0	0	80,7 24,9 -14,2	76,3 16,5 -6,9
PANTONE 244 C	0	8,49	0	21,53	0	0	0	73,6 36,5 -20,4	69,2 22,4 -8,6
PANTONE 245 C	0	14,44	0	33,7	0	0	0	66,5 47,0 -26,1	62,3 27,5 -10,5
PANTONE 246 C	0	0	15,27	67,02	0	0	0	49,0 71,3 -33,5	46,1 45,6 -13,2
PANTONE 247 C	0	0	20,95	72,92	0	0	0	45,2 69,7 -31,9	42,1 48,3 -14,9
PANTONE 248 C	0	0	30,57	81,28	0	0	0	40,1 62,3 -28,3	38,4 49,2 -17,7
PANTONE 249 C	5,26	59,72	0	67,19	0	0	0	33,0 44,6 -18,4	33,0 44,6 -18,4
PANTONE 7646 C	20,65	2,06	0	47,63	0	0	0	53,3 27,3 -4,1	53,3 27,3 -4,1
PANTONE 7647 C	10,61	4,39	0	68,38	0	0	0	43,6 50,4 -5,6	43,6 50,4 -5,6
PANTONE 7648 C	10,05	15,8	0	81,41	0	0	0	36,6 55,1 -8,5	36,6 55,1 -8,5
PANTONE 7649 C	13,49	32,82	0	81,73	0	0	0	32,9 51,1 -11,1	32,9 51,1 -11,1
PANTONE 7650 C	39,09	40,64	0	73,67	0	0	0	28,5 40,6 -11,7	28,5 40,6 -11,7
PANTONE 7651 C	40,07	51,77	0	64,74	0	0	0	28,6 34,7 -14,6	28,6 34,7 -14,6
PANTONE 7652 C	52,16	51,16	0	64,84	0	0	0	25,6 30,9 -13,0	25,6 30,9 -13,0
PANTONE 250 C	0	5	0	9,23	0	0	0	80,8 22,8 -14,6	76,4 15,5 -7,4
PANTONE 251 C	0	12,83	0	16,52	0	0	0	72,8 34,3 -23,6	68,3 20,3 -10,7
PANTONE 252 C	0	36,71	0	37,78	0	0	0	58,6 53,6 -36,4	54,4 28,8 -16,1
PANTONE Purple C	0	56,02	0	51,97	0	0	0	47,5 68,9 -42,5	43,5 38,8 -20,2
PANTONE 253 C	0	59,33	0	55	0	0	0	43,0 67,2 -40,9	40,0 41,1 -22,6
PANTONE 254 C	0	62,81	0	55,77	0	0	0	38,4 59,6 -36,1	37,1 41,8 -25,1
PANTONE 255 C	5,47	67,03	0	64,19	0	0	0	29,8 42,6 -23,7	29,8 42,6 -23,7
PANTONE 517 C	0	1,83	0	8,28	0	0	0	84,0 16,7 -6,9	81,5 13,8 -3,9
PANTONE 516 C	0	3,37	0	8,97	0	0	0	81,6 18,6 -9,3	78,9 14,8 -5,6
PANTONE 515 C	0	5,03	0	14,29	0	0	0	76,9 25,3 -12,9	74,0 18,9 -7,1
PANTONE 514 C	0	13,24	0	27,36	0	0	0	67,5 35,0 -18,7	64,8 24,9 -10,3
PANTONE 513 C	0	61,13	0	55	0	0	0	39,3 48,1 -28,7	38,6 41,3 -24,1
PANTONE 512 C	3,46	61,09	0	60,94	0	0	0	35,4 41,7 -20,9	35,4 41,7 -20,9
PANTONE 511 C	56,46	40,03	0	62,64	0	0	0	27,1 28,1 -10,1	27,1 28,1 -10,1
PANTONE 7436 C	0	0	0,7	4,59	0	0	0	89,2 9,5 -5,3	86,4 7,9 -2,8
PANTONE 7437 C	0	11,28	0	7,15	0	0	0	74,6 16,8 -13,0	73,4 14,6 -10,8
PANTONE 7438 C	0	14,65	0	12,91	0	0	0	72,0 29,4 -20,7	68,7 18,8 -11,8
PANTONE 7439 C	0	32,02	0	14,57	0	0	0	62,3 24,0 -19,2	61,5 21,2 -16,7
PANTONE 7440 C	0,35	41,4	0	23,71	0	0	0	56,0 24,7 -18,2	56,0 24,7 -18,2
PANTONE 7441 C	0	61,17	0	10	0	0	0	50,8 41,5 -41,2	48,3 28,6 -31,0
PANTONE 7442 C	0	67,59	0	10,47	0	0	0	43,7 52,9 -50,3	41,3 33,6 -37,6
PANTONE 2562 C	0	15	0	7,89	0	0	0	75,3 25,6 -22,3	70,8 15,8 -12,5
PANTONE 2572 C	0	31,46	0	10,76	0	0	0	66,8 35,4 -31,0	62,9 19,8 -17,1
PANTONE 2582 C	0	60,73	0	20	0	0	0	50,5 52,7 -44,3	47,0 29,8 -28,6
PANTONE 2592 C	0	66,25	0	40,71	0	0	0	41,3 60,9 -49,7	38,6 36,5 -31,0
PANTONE 2602 C	0	70,98	0	48,51	0	0	0	35,1 57,1 -44,8	33,1 40,8 -33,2
PANTONE 2612 C	0	70,93	0	54,72	0	0	0	32,0 46,2 -34,3	31,6 42,7 -31,9
PANTONE 2622 C	36,25	59,65	0	54,75	0	0	0	29,4 30,8 -20,0	29,4 30,8 -20,0
PANTONE 7653 C	33,72	5,65	0	6,22	0	0	0	57,9 7,7 -5,2	57,9 7,7 -5,2
PANTONE 7654 C	6,5	22,43	0	29,2	0	0	0	55,9 22,6 -12,2	55,9 22,6 -12,2
PANTONE 7655 C	0	45,24	0	48,1	0	0	0	48,8 37,1 -18,5	48,4 35,2 -17,2

PANTONE 7656 C	0	58,76	0	59,26	0	0	0	39,1 43,7 -20,9	39,1 42,9 -20,5
PANTONE 7657 C	27,53	58,09	0	63,44	0	0	0	29,8 36,4 -17,5	29,8 36,4 -17,5
PANTONE 7658 C	42,94	48,01	0	58,9	0	0	0	30,7 30,0 -14,3	30,7 30,0 -14,3
PANTONE 7659 C	57,95	37,76	0	53,25	0	0	0	28,8 22,1 -9,8	28,8 22,1 -9,8
PANTONE 524 C	0	5,54	0	4,03	0	0	0	80,7 10,5 -8,3	80,2 10,0 -7,7
PANTONE 523 C	0	11,71	0	5,01	0	0	0	75,3 14,0 -12,4	74,5 12,9 -11,2
PANTONE 522 C	0	22,71	0	7,6	0	0	0	68,3 18,1 -16,7	67,7 16,6 -15,1
PANTONE 521 C	0	44,37	0	11,94	0	0	0	58,5 23,2 -21,4	58,1 22,1 -20,6
PANTONE 520 C	25,17	66,2	0	50,47	0	0	0	29,1 32,3 -24,9	29,1 32,3 -24,9
PANTONE 519 C	48,52	60,13	0	46,84	0	0	0	27,5 25,4 -19,3	27,5 25,4 -19,3
PANTONE 518 C	63,98	46,61	0	46,15	0	0	0	24,0 16,9 -9,9	24,0 16,9 -9,9
PANTONE 5245 C	3,03	0,02	0	3,84	0	0	0	83,9 6,1 -1,3	83,9 6,1 -1,3
PANTONE 5235 C	4,82	0,88	0	4,91	0	0	0	78,7 8,1 -2,2	78,7 8,1 -2,2
PANTONE 5225 C	7,18	1,77	0	6,93	0	0	0	74,2 9,7 -3,1	74,2 9,7 -3,1
PANTONE 5215 C	14,55	3,4	0	12,41	0	0	0	64,6 12,5 -4,6	64,6 12,5 -4,6
PANTONE 5205 C	41,78	8,19	0	33,07	0	0	0	46,7 16,9 -6,4	46,7 16,9 -6,4
PANTONE 5195 C	58,22	14,54	0	47,44	0	0	0	33,5 18,3 -6,4	33,5 18,3 -6,4
PANTONE 5185 C	68,16	21,79	0	49,79	0	0	0	23,8 14,7 -5,3	23,8 14,7 -5,3
PANTONE 5175 C	2,77	0,95	0	4,42	0	0	0	82,2 7,8 -2,4	82,2 7,8 -2,4
PANTONE 5165 C	2,91	2,23	0	4,81	0	0	0	79,7 9,2 -3,8	79,7 9,2 -3,8
PANTONE 5155 C	5,96	4,48	0	9,62	0	0	0	70,6 13,3 -6,2	70,6 13,3 -6,2
PANTONE 5145 C	15,72	13,46	0	27,52	0	0	0	54,4 19,2 -9,3	54,4 19,2 -9,3
PANTONE 5135 C	34,52	25,05	0	44,62	0	0	0	41,7 23,4 -11,0	41,7 23,4 -11,0
PANTONE 5125 C	50,68	35,61	0	55,43	0	0	0	32,3 25,7 -11,1	32,3 25,7 -11,1
PANTONE 5115 C	63,99	35,71	0	60,84	0	0	0	23,5 22,3 -7,5	23,5 22,3 -7,5
PANTONE 531 C	0	5,82	0	3,84	0	0	0	83,4 13,2 -12,1	80,2 9,7 -7,9
PANTONE 530 C	0	11,18	0	4,67	0	0	0	78,9 17,9 -17,2	75,2 12,3 -11,0
PANTONE 529 C	0	22,32	0	6,49	0	0	0	72,0 24,3 -24,3	68,5 15,7 -15,2
PANTONE 528 C	0	49,24	0	7,12	0	0	0	61,8 32,7 -33,2	57,8 21,4 -23,3
PANTONE 527 C	0	74,87	0	13,26	0	0	0	37,2 48,6 -48,1	35,6 38,7 -42,5
PANTONE 526 C	0	75,49	0	39,67	0	0	0	32,9 40,9 -37,9	32,8 40,7 -37,7
PANTONE 525 C	46,01	63,43	0	48,2	0	0	0	26,0 27,4 -21,6	26,0 27,4 -21,6
PANTONE 256 C	0	7,67	0	4,4	0	0	0	80,1 13,6 -11,8	78,0 11,1 -9,0
PANTONE 257 C	0	18,1	0	8,77	0	0	0	70,9 21,3 -17,9	69,0 16,9 -13,5
PANTONE 258 C	0	62,79	0	40,52	0	0	0	42,2 40,1 -31,6	41,5 35,0 -27,9
PANTONE 259 C	2,08	74,58	0	57,43	0	0	0	28,9 43,0 -31,6	28,9 43,0 -31,6
PANTONE 260 C	20,59	67,13	0	58,2	0	0	0	27,5 36,0 -24,3	27,5 36,0 -24,3
PANTONE 261 C	40,29	62,84	0	56,93	0	0	0	26,2 31,3 -21,0	26,2 31,3 -21,0
PANTONE 262 C	57,43	56,68	0	55,47	0	0	0	23,5 24,8 -14,7	23,5 24,8 -14,7
PANTONE 2563 C	0	19,13	0	7,55	0	0	0	72,3 22,9 -21,0	69,2 16,0 -14,0
PANTONE 2573 C	0	42,34	0	10	0	0	0	62,7 30,7 -28,3	59,3 21,0 -20,2
PANTONE 2583 C	0	59,13	0	19,9	0	0	0	50,8 39,2 -34,6	48,7 28,8 -27,0
PANTONE 2593 C	0	68,6	0	42,02	0	0	0	37,4 47,2 -40,1	36,3 37,9 -32,8
PANTONE 2603 C	0	77,27	0	51,9	0	0	0	30,0 45,3 -36,8	29,8 43,6 -35,5
PANTONE 2613 C	4,36	77,1	0	55,08	0	0	0	27,4 42,0 -33,0	27,4 42,0 -33,0
PANTONE 2623 C	19,37	72,09	0	57,09	0	0	0	25,6 36,7 -27,3	25,6 36,7 -27,3
PANTONE 7660 C	20,88	12,95	0	1,72	0	0	0	61,4 6,5 -9,2	61,4 6,5 -9,2
PANTONE 7661 C	11,15	43,84	0	15,31	0	0	0	50,8 19,6 -17,4	50,8 19,6 -17,4
PANTONE 7662 C	5,52	63,32	0	44,77	0	0	0	37,4 33,8 -25,7	37,4 33,8 -25,7
PANTONE 7663 C	10,22	68,39	0	48,16	0	0	0	31,1 35,4 -28,4	31,1 35,4 -28,4
PANTONE 7664 C	14,51	69,27	0	38,09	0	0	0	30,7 32,6 -30,4	30,7 32,6 -30,4
PANTONE 7665 C	36,34	64,32	0	34,81	0	0	0	30,1 26,9 -24,9	30,1 26,9 -24,9
PANTONE 7666 C	58,47	38,16	0	8,05	0	0	0	35,1 10,3 -10,3	35,1 10,3 -10,3
PANTONE 2567 C	0	28,03	0	3,62	0	0	0	70,6 20,8 -24,3	67,9 14,4 -17,5
PANTONE 2577 C	0	55,88	0	3,5	0	0	0	58,7 29,0 -33,8	56,4 21,7 -27,4
PANTONE 2587 C	0	69,11	0	6,21	0	0	0	41,6 40,5 -45,2	40,7 34,0 -40,4
PANTONE 2597 C	3,42	97,99	0	12,64	0	0	0	24,6 48,2 -51,5	24,6 48,2 -51,5
PANTONE 2607 C	0	93,26	18,77	54,13	0	0	0	21,0 42,8 -45,1	21,0 42,8 -45,1
PANTONE 2617 C	0	82,87	40,79	67,34	0	0	0	18,3 38,2 -39,4	18,3 38,2 -39,4
PANTONE 2627 C	57,06	94,22	0	32,41	0	0	0	15,5 30,2 -30,3	15,5 30,2 -30,3
PANTONE 263 C	0	9,3	0	2,23	0	0	0	82,1 11,7 -14,0	79,1 8,4 -10,3
PANTONE 264 C	0	32	0	0	0	0	0	72,6 19,1 -26,2	69,4 12,0 -19,8
PANTONE 265 C	0	64,18	0	0	0	0	0	50,9 35,4 -48,3	48,9 27,2 -37,7
PANTONE 266 C	0	77,27	0	0	0	0	0	38,7 44,8 -58,5	37,3 38,2 -48,7
PANTONE 267 C	1,71	87,86	2,7	0	0	0	0	29,8 43,9 -55,2	29,8 43,9 -55,2
PANTONE 268 C	22,66	81,04	0	3,16	0	0	0	28,0 34,2 -41,2	28,0 34,2 -41,2

PANTONE 269 C	43,64	72,6	0	12,87	0	0	0	26,1 27,1 -30,5	26,1 27,1 -30,5
PANTONE 2635 C	0	22,65	0	0	0	0	0	76,1 13,0 -21,2	73,7 9,7 -16,6
PANTONE 2645 C	0	45,88	0	0	0	0	0	66,2 19,6 -32,4	63,6 15,6 -24,5
PANTONE 2655 C	0	59,02	1,11	0	0	0	0	56,5 26,3 -42,5	54,4 21,6 -32,8
PANTONE 2665 C	0	66,99	2,99	0	0	0	0	45,4 34,5 -52,9	44,0 28,7 -42,3
PANTONE Violet C	0	100	40,99	12,35	0	0	0	18,7 54,6 -69,5	20,2 43,9 -60,2
PANTONE 2685 C	0	100	59,17	58,14	0	0	0	13,5 41,0 -53,4	14,0 38,2 -50,8
PANTONE 2695 C	67,03	81,08	4,72	0	0	0	0	14,3 17,6 -24,2	14,3 17,6 -24,2
PANTONE 270 C	0	17,42	3,52	0	0	0	0	74,6 6,8 -21,6	73,1 5,6 -18,4
PANTONE 271 C	0	38,17	7,1	0	0	0	0	63,4 10,8 -31,5	62,3 9,0 -26,8
PANTONE 272 C	0	56,98	17,63	0	0	0	0	51,5 15,0 -40,7	50,9 13,9 -37,4
PANTONE 273 C	55,37	99,31	50,81	0	0	0	0	13,1 24,8 -42,5	13,1 24,8 -42,5
PANTONE 274 C	62,24	82,83	47,89	0	0	0	0	12,0 19,4 -34,8	12,0 19,4 -34,8
PANTONE 275 C	66,63	80,28	42,13	0	0	0	0	11,5 15,7 -28,9	11,5 15,7 -28,9
PANTONE 276 C	76,22	64,77	23,67	0	0	0	0	12,2 8,0 -15,2	12,2 8,0 -15,2
PANTONE 2705 C	0	29,62	4,37	0	0	0	0	69,3 11,0 -30,2	67,0 8,1 -23,0
PANTONE 2715 C	0	52,99	8,24	0	0	0	0	58,5 16,8 -41,7	56,4 13,5 -32,1
PANTONE 2725 C	0	64,11	20,65	0	0	0	0	44,5 25,3 -55,0	43,1 20,9 -44,2
PANTONE 2735 C	0	100	62,25	35,84	0	0	0	14,3 48,5 -68,4	15,7 38,5 -58,1
PANTONE 2745 C	0	99,23	68,57	53,45	0	0	0	12,8 36,0 -54,5	12,8 36,0 -54,5
PANTONE 2755 C	0	71,82	76,98	76,38	0	0	0	12,6 27,4 -44,8	12,6 27,4 -44,8
PANTONE 2765 C	66,5	81,82	42,93	0	0	0	0	11,1 16,3 -29,5	11,1 16,3 -29,5
PANTONE 7667 C	21,24	22,41	18,34	0	0	0	0	51,9 1,9 -21,6	51,9 1,9 -21,6
PANTONE 7668 C	15,11	44,71	18,62	0	0	0	0	47,3 7,3 -27,8	47,3 7,3 -27,8
PANTONE 7669 C	12,8	58,68	17,78	0	0	0	0	42,3 13,6 -33,5	42,3 13,6 -33,5
PANTONE 7670 C	14,94	62,36	24,49	0	0	0	0	37,6 15,8 -36,5	37,6 15,8 -36,5
PANTONE 7671 C	25	66,3	18,46	0	0	0	0	33,5 18,6 -36,5	33,5 18,6 -36,5
PANTONE 7672 C	30,42	67,35	20,54	0	0	0	0	31,3 18,9 -36,7	31,3 18,9 -36,7
PANTONE 7673 C	34,92	55,9	21,4	0	0	0	0	37,4 10,1 -28,7	37,4 10,1 -28,7
PANTONE 7443 C	0	4,03	0	0	0	0	0	87,7 3,2 -6,6	87,2 2,8 -6,5
PANTONE 7444 C	0	14,47	3,35	0	0	0	0	75,5 5,4 -18,6	74,8 4,9 -17,1
PANTONE 7445 C	4,27	20,11	1,98	0	0	0	0	68,0 7,0 -16,2	68,0 7,0 -16,2
PANTONE 7446 C	0	49,81	8,74	0	0	0	0	58,3 13,5 -35,2	57,3 12,3 -31,3
PANTONE 7447 C	46,24	61,4	0	2,15	0	0	0	34,4 17,5 -23,5	34,4 17,5 -23,5
PANTONE 7448 C	64,92	44,53	0	23,61	0	0	0	26,3 12,4 -9,2	26,3 12,4 -9,2
PANTONE 7449 C	69,62	42,99	0	52,8	0	0	0	19,9 16,0 -7,0	19,9 16,0 -7,0
PANTONE 7674 C	8,04	29,3	8,08	0	0	0	0	58,9 5,8 -22,0	58,9 5,8 -22,0
PANTONE 7675 C	10,14	39,51	9,41	0	0	0	0	54,2 7,3 -24,1	54,2 7,3 -24,1
PANTONE 7676 C	12,2	58,89	3,55	0	0	0	0	46,4 17,0 -29,5	46,4 17,0 -29,5
PANTONE 7677 C	15,77	64,68	0	3,07	0	0	0	39,9 24,1 -30,9	39,9 24,1 -30,9
PANTONE 7678 C	16,99	67,94	0	2,83	0	0	0	36,7 26,3 -33,7	36,7 26,3 -33,7
PANTONE 7679 C	32,62	71,03	3,07	0	0	0	0	31,4 23,9 -35,1	31,4 23,9 -35,1
PANTONE 7680 C	40,1	75,81	0	1,43	0	0	0	27,7 27,4 -35,0	27,7 27,4 -35,0
PANTONE 663 C	0,17	1,23	0	1,41	0	0	0	90,0 2,4 -2,3	90,0 2,4 -2,3
PANTONE 664 C	0,38	2,19	0	1,49	0	0	0	88,0 3,3 -3,4	88,0 3,3 -3,4
PANTONE 665 C	2,52	7,73	0	1,89	0	0	0	77,5 6,9 -8,7	77,5 6,9 -8,7
PANTONE 666 C	8,73	24,31	0	2,31	0	0	0	62,7 10,8 -14,5	62,7 10,8 -14,5
PANTONE 667 C	26,68	48,04	0	2,68	0	0	0	47,4 14,4 -19,5	47,4 14,4 -19,5
PANTONE 668 C	44,53	59,37	0	2,84	0	0	0	36,0 17,0 -22,4	36,0 17,0 -22,4
PANTONE 669 C	61,46	69,11	0	1,4	0	0	0	21,6 17,5 -22,7	21,6 17,5 -22,7
PANTONE 5315 C	1,89	2,76	0	0,37	0	0	0	86,3 1,8 -3,9	86,3 1,8 -3,9
PANTONE 5305 C	4,14	4,91	0,3	0	0	0	0	79,7 2,9 -7,1	79,7 2,9 -7,1
PANTONE 5295 C	7,04	8,74	0,99	0	0	0	0	72,6 3,9 -9,8	72,6 3,9 -9,8
PANTONE 5285 C	18,43	22,15	2,25	0	0	0	0	58,2 6,1 -14,5	58,2 6,1 -14,5
PANTONE 5275 C	49,32	49,9	6,99	0	0	0	0	37,4 8,7 -20,0	37,4 8,7 -20,0
PANTONE 5265 C	59,39	58,84	14,94	0	0	0	0	26,4 10,1 -21,9	26,4 10,1 -21,9
PANTONE 5255 C	76,29	66,49	34,3	0	0	0	0	10,7 7,9 -16,9	10,7 7,9 -16,9
PANTONE 538 C	3,28	1,7	2,95	0	0	0	0	82,6 -1,7 -6,9	82,6 -1,7 -6,9
PANTONE 537 C	3,48	2,8	3,93	0	0	0	0	79,7 -1,6 -9,6	79,7 -1,6 -9,6
PANTONE 536 C	6,45	4,72	7,5	0	0	0	0	71,8 -1,9 -13,9	71,8 -1,9 -13,9
PANTONE 535 C	9,19	9,01	11,16	0	0	0	0	64,8 -0,6 -17,8	64,8 -0,6 -17,8
PANTONE 534 C	60,63	53,21	59,29	0	0	0	0	21,9 1,5 -27,7	21,9 1,5 -27,7
PANTONE 533 C	69,72	54,02	50,79	0	0	0	0	17,0 2,6 -18,6	17,0 2,6 -18,6
PANTONE 532 C	84,99	47,63	35,23	0	0	0	0	11,9 1,3 -7,7	11,9 1,3 -7,7
PANTONE 7541 C	1,6	1,11	0	0	1,39	0	0	88,8 -2,1 -2,1	88,8 -2,1 -2,1
PANTONE 7542 C	5,31	4,72	0	0	8,65	0	0	74,3 -6,7 -6,8	74,3 -6,7 -6,8

PANTONE 7543 C	24,76	1,08	4,69	0	0	0	0	66,7 -2,9 -6,8	66,7 -2,9 -6,8
PANTONE 7544 C	43,85	2,09	11,13	0	0	0	0	54,8 -3,5 -9,0	54,8 -3,5 -9,0
PANTONE 7545 C	62,53	4,8	35	0	0	0	0	34,7 -4,2 -11,6	34,7 -4,2 -11,6
PANTONE 7546 C	70,48	16,74	50,41	0	0	0	0	22,1 -3,8 -12,1	22,1 -3,8 -12,1
PANTONE 7547 C	86,55	38,35	60,06	0	0	0	0	10,7 -2,4 -9,0	10,7 -2,4 -9,0
PANTONE 552 C	2,77	0	4,49	0	1,84	0	0	82,6 -7,1 -8,3	82,6 -7,1 -8,3
PANTONE 551 C	4,25	0	7,33	0	3,12	0	0	77,7 -9,8 -10,6	77,7 -9,8 -10,6
PANTONE 550 C	6,78	0	14,2	0	3,44	0	0	72,0 -11,6 -14,3	72,0 -11,6 -14,3
PANTONE 549 C	12,14	0	27,7	0	5,69	0	0	63,6 -14,7 -17,6	63,6 -14,7 -17,6
PANTONE 548 C	68,44	0	81,8	0	20,97	0	0	21,1 -20,5 -17,7	21,1 -20,5 -17,7
PANTONE 547 C	75,39	0	82,4	0	18,53	0	0	16,5 -17,0 -13,8	16,5 -17,0 -13,8
PANTONE 546 C	74,26	50,58	0	0	97,37	0	0	15,0 -10,8 -8,3	15,0 -10,8 -8,3
PANTONE 5455 C	1,49	4,34	0	0	4,08	0	0	81,7 -3,8 -6,4	81,7 -3,8 -6,4
PANTONE 5445 C	5,93	0,07	4,43	0	0	0	0	79,6 -4,2 -7,5	79,6 -4,2 -7,5
PANTONE 5435 C	9,46	0,19	7,26	0	0	0	0	74,5 -5,1 -9,7	74,5 -5,1 -9,7
PANTONE 5425 C	25,62	0,7	20,56	0	0	0	0	61,1 -7,1 -14,3	61,1 -7,1 -14,3
PANTONE 5415 C	40,35	1,48	37,89	0	0	0	0	50,8 -8,2 -17,1	50,8 -8,2 -17,1
PANTONE 5405 C	47,13	1,41	42,1	0	0	0	0	46,9 -8,7 -17,1	46,9 -8,7 -17,1
PANTONE 5395 C	84,51	37,28	68,91	0	0	0	0	10,5 -5,2 -11,7	10,5 -5,2 -11,7
PANTONE 642 C	0,98	0,96	2,88	0	0	0	0	87,3 -2,4 -6,5	87,3 -2,4 -6,5
PANTONE 643 C	1,35	1,38	4,09	0	0	0	0	84,5 -3,1 -9,2	84,5 -3,1 -9,2
PANTONE 644 C	3,86	3,29	13,31	0	0	0	0	73,1 -5,1 -17,5	73,1 -5,1 -17,5
PANTONE 645 C	6,94	4,82	26,76	0	0	0	0	64,5 -6,1 -22,9	64,5 -6,1 -22,9
PANTONE 646 C	11,86	8,26	41,01	0	0	0	0	55,5 -6,6 -27,5	55,5 -6,6 -27,5
PANTONE 647 C	30,5	28,7	60,36	0	0	0	0	38,7 -6,5 -34,1	38,7 -6,5 -34,1
PANTONE 648 C	60	57,06	81,18	0	0	0	0	17,6 -0,3 -34,4	17,6 -0,3 -34,4
PANTONE 649 C	0,47	1,23	1,6	0	0	0	0	89,4 -1,1 -4,6	89,4 -1,1 -4,6
PANTONE 650 C	0,72	1,85	2,98	0	0	0	0	86,2 -1,7 -7,6	86,2 -1,7 -7,6
PANTONE 651 C	2,94	4,33	8,8	0	0	0	0	75,2 -3,0 -15,9	75,2 -3,0 -15,9
PANTONE 652 C	6,93	8,35	24,64	0	0	0	0	62,7 -3,6 -23,4	62,7 -3,6 -23,4
PANTONE 653 C	26,18	33,79	56,18	0	0	0	0	39,8 -3,4 -33,9	39,8 -3,4 -33,9
PANTONE 654 C	51,16	56,66	69,76	0	0	0	0	23,5 0,3 -37,2	23,5 0,3 -37,2
PANTONE 655 C	62,45	62,29	81,31	0	0	0	0	14,4 3,6 -33,5	14,4 3,6 -33,5
PANTONE 656 C	0	1,19	1,78	0	0	0	0	90,4 -1,2 -5,1	90,0 -1,3 -4,9
PANTONE 657 C	0	2,32	4,33	0	0	0	0	85,4 -2,4 -11,7	84,7 -2,6 -11,0
PANTONE 658 C	0	4,09	8,84	0	0	0	0	79,8 -3,1 -18,6	79,0 -3,4 -17,2
PANTONE 659 C	0	12,51	30,43	0	0	0	0	65,9 -3,3 -33,5	65,1 -3,7 -30,2
PANTONE 660 C	0	35,31	53,04	0	0	0	0	51,1 -1,3 -46,5	50,5 -1,9 -42,1
PANTONE 661 C	0	68,38	98,97	9,68	0	0	0	23,5 13,9 -59,8	23,5 13,9 -59,8
PANTONE 662 C	0	98,97	79,3	0	69,8	0	0	13,9 21,3 -52,6	13,9 21,3 -52,6
PANTONE 7450 C	1,7	4,99	3,72	0	0	0	0	79,3 0,6 -12,2	79,3 0,6 -12,2
PANTONE 7451 C	0	12,87	22,27	0	0	0	0	68,8 -1,0 -33,1	67,3 -2,0 -27,4
PANTONE 7452 C	0	32,07	19,79	0	0	0	0	62,0 6,9 -40,3	60,0 4,4 -30,9
PANTONE 7453 C	0	12,01	30	0	0	0	0	66,4 -3,3 -34,0	65,4 -3,8 -30,0
PANTONE 7454 C	12,9	5,53	40,17	0	0	0	0	56,7 -7,9 -26,0	56,7 -7,9 -26,0
PANTONE 7455 C	1,92	57,87	56,43	0	0	0	0	40,1 7,7 -47,8	40,1 7,7 -47,8
PANTONE 7456 C	2,46	54,25	34,91	0	0	0	0	47,5 9,0 -38,8	47,5 9,0 -38,8
PANTONE 2706 C	0	4,5	3,25	0	0	0	0	84,3 0,9 -13,1	82,8 0,5 -11,4
PANTONE 2716 C	0	17	10	0	0	0	0	71,4 4,1 -29,6	69,4 2,5 -23,5
PANTONE 2726 C	0	61,32	46,72	0	0	0	0	42,0 18,2 -59,6	40,7 14,7 -48,3
PANTONE 2736 C	0	83,61	65	0	0	0	0	23,4 35,7 -72,6	22,9 32,6 -65,4
PANTONE 2746 C	4,87	87,24	73,35	0	0	0	0	18,9 31,2 -63,9	18,9 31,2 -63,9
PANTONE 2756 C	45,57	78,63	68,81	0	0	0	0	15,9 19,2 -47,1	15,9 19,2 -47,1
PANTONE 2766 C	64,11	70,52	64,99	0	0	0	0	12,1 11,2 -32,6	12,1 11,2 -32,6
PANTONE 2708 C	0	4,22	6,9	0	0	0	0	81,2 -1,9 -17,6	79,9 -2,3 -15,7
PANTONE 2718 C	0	33,71	40,07	0	0	0	0	56,2 3,0 -48,0	54,5 1,0 -37,1
PANTONE 2728 C	0	66,08	66,13	0	0	0	0	32,5 17,8 -68,1	31,7 15,1 -57,8
PANTONE 2738 C	0	100	95	12,93	0	0	0	14,1 39,3 -70,2	14,3 37,3 -66,7
PANTONE 2748 C	0	99,73	87,31	0	68,07	0	0	13,5 22,4 -53,7	13,5 22,4 -53,7
PANTONE 2758 C	54,2	74,45	87,65	0	0	0	0	13,5 14,0 -43,9	13,5 14,0 -43,9
PANTONE 2768 C	66,31	66,86	78,15	0	0	0	0	11,3 6,4 -30,5	11,3 6,4 -30,5
PANTONE 2707 C	0	2,41	5,16	0	0	0	0	84,8 -2,9 -14,3	83,6 -3,3 -12,7
PANTONE 2717 C	0	4,53	12,12	0	0	0	0	78,5 -3,6 -23,7	76,7 -4,1 -19,8
PANTONE 2727 C	0	41,87	50,19	0	0	0	0	51,9 3,0 -59,1	49,3 0,9 -42,1
PANTONE Blue 072 C	0	99	74,42	0	0	0	0	17,5 42,9 -76,0	17,2 40,0 -70,3
PANTONE 2747 C	0	98,35	100	0	66,55	0	0	13,7 21,8 -54,5	13,7 21,8 -54,4

PANTONE 2757 C	55,27	71,2	100	0	0	0	0	13,2 12,5 -43,3	13,2 12,5 -43,1
PANTONE 2767 C	66,84	58,17	64,25	0	0	0	0	16,0 1,7 -24,7	16,0 1,7 -24,7
PANTONE 277 C	0	2,85	11,32	0	0	0	0	79,7 -5,4 -19,4	79,1 -5,5 -18,2
PANTONE 278 C	0	4,7	24,54	0	0	0	0	72,8 -6,3 -29,7	71,5 -6,7 -25,9
PANTONE 279 C	0	21,43	50,4	0	0	0	0	56,9 -4,6 -48,9	55,5 -5,4 -39,4
PANTONE Reflex Blue C	0	99,26	100	0	20,37	0	0	14,9 31,9 -67,1	15,2 31,6 -64,9
PANTONE 280 C	48,82	75,65	82,99	0	0	0	0	15,1 15,2 -46,5	15,1 15,2 -46,5
PANTONE 281 C	58,9	67,06	100	0	0	0	0	12,8 9,0 -40,6	13,0 9,0 -39,8
PANTONE 282 C	69,53	63,94	80,71	0	0	0	0	11,1 2,5 -26,3	11,1 2,5 -26,3
PANTONE 283 C	0	2,46	22,65	0	0	0	0	75,5 -8,4 -25,9	74,8 -8,6 -23,9
PANTONE 284 C	0	5,19	38,66	0	0	0	0	67,5 -9,2 -36,0	66,5 -9,4 -31,8
PANTONE 285 C	0	40,67	64,44	0	0	0	0	45,3 -4,7 -58,9	44,1 -5,0 -49,1
PANTONE 286 C	0	74,23	100	0	2,93	0	0	23,0 17,9 -67,9	23,4 17,7 -63,3
PANTONE 287 C	0	78,05	98,61	0	37,94	0	0	20,9 12,5 -56,1	20,9 12,5 -56,1
PANTONE 288 C	42,68	66,7	95,52	0	0	0	0	18,6 8,3 -46,5	18,6 8,3 -46,5
PANTONE 289 C	71,55	57,37	67,49	0	0	0	0	13,1 0,1 -21,6	13,1 0,1 -21,6
PANTONE 7681 C	3,72	9,2	12,81	0	0	0	0	68,3 -1,0 -20,5	68,3 -1,0 -20,5
PANTONE 7682 C	5,85	21,66	35,76	0	0	0	0	55,1 -1,2 -30,0	55,1 -1,2 -30,0
PANTONE 7683 C	7,7	39,59	52,4	0	0	0	0	44,8 -0,4 -38,1	44,8 -0,4 -38,1
PANTONE 7684 C	12,32	49,41	55,25	0	0	0	0	39,3 2,5 -39,7	39,3 2,5 -39,7
PANTONE 7685 C	15,27	53,66	58,75	0	0	0	0	36,0 2,7 -41,1	36,0 2,7 -41,1
PANTONE 7686 C	20,09	55,67	63,02	0	0	0	0	33,0 2,3 -42,4	33,0 2,3 -42,4
PANTONE 7687 C	23,83	61,69	64,71	0	0	0	0	28,5 7,8 -44,9	28,5 7,8 -44,9
PANTONE 545 C	1,1	0,26	4,63	0	0	0	0	85,7 -4,8 -9,5	85,7 -4,8 -9,5
PANTONE 544 C	1,11	0,49	6,32	0	0	0	0	83,9 -5,5 -11,7	83,9 -5,5 -11,7
PANTONE 543 C	1,53	1,05	13,44	0	0	0	0	78,3 -7,6 -17,6	78,3 -7,6 -17,6
PANTONE 542 C	3,12	2,31	32,24	0	0	0	0	68,6 -10,0 -25,4	68,6 -10,0 -25,4
PANTONE 541 C	51,58	49,59	98,82	0	0	0	0	22,6 -7,0 -39,1	22,6 -7,0 -39,1
PANTONE 540 C	63,21	47,58	97,63	0	0	0	0	17,5 -7,1 -30,4	17,5 -7,1 -30,4
PANTONE 539 C	76	42,25	73,66	0	0	0	0	13,4 -6,5 -17,3	13,4 -6,5 -17,3
PANTONE 290 C	0	0	7,75	0	0,79	0	0	84,6 -7,9 -13,1	84,5 -7,9 -13,0
PANTONE 291 C	0	0	19,86	0	0	0	0	79,0 -10,6 -21,9	78,7 -10,6 -21,4
PANTONE 292 C	0	2,27	40,75	0	0	0	0	69,4 -13,0 -34,5	68,7 -13,1 -31,7
PANTONE 293 C	0	68,03	100	0	2,2	0	0	25,8 11,1 -66,5	26,3 11,1 -61,7
PANTONE 294 C	50,68	62,19	94,15	0	0	0	0	18,8 3,7 -42,5	18,8 3,7 -42,5
PANTONE 295 C	62,93	57,76	100	0	0	0	0	14,8 -1,8 -33,7	15,1 -1,5 -32,8
PANTONE 296 C	83,53	49,79	78,54	0	0	0	0	9,0 -4,3 -13,9	9,0 -4,3 -13,9
PANTONE 2905 C	0	0	24,03	0	1,19	0	0	77,2 -13,4 -23,4	76,6 -12,9 -22,6
PANTONE 2915 C	0	0,58	43,33	0	0	0	0	69,5 -15,9 -33,4	69,3 -15,9 -32,5
PANTONE 2925 C	0	4,23	58,12	0	0	0	0	59,5 -17,2 -45,0	59,1 -17,1 -42,0
PANTONE 2935 C	0	56,96	95	0	0	0	0	34,0 -2,2 -64,2	33,7 -2,4 -59,7
PANTONE 2945 C	0	61,61	100	0	25,77	0	0	29,2 -5,8 -52,9	29,2 -5,8 -52,8
PANTONE 2955 C	57,83	45,61	95,01	0	0	0	0	20,9 -8,2 -34,4	20,9 -8,2 -34,4
PANTONE 2965 C	73,28	45,34	83,88	0	0	0	0	13,2 -7,2 -20,3	13,2 -7,2 -20,3
PANTONE 297 C	0	0	29,46	0	4,06	0	0	74,9 -19,6 -26,8	73,3 -17,3 -23,8
PANTONE 298 C	0	0	46,2	0	2,81	0	0	68,7 -22,5 -35,1	67,5 -20,2 -32,4
PANTONE 299 C	0	0	60,84	0	0,15	0	0	61,0 -24,3 -44,2	60,8 -23,9 -43,6
PANTONE 300 C	0	47,27	100	0	0	0	0	35,8 -9,7 -62,0	36,0 -9,1 -59,2
PANTONE 301 C	0	62,42	96,66	0	59,78	0	0	27,8 -12,3 -45,3	27,8 -12,3 -45,3
PANTONE 302 C	62,32	22,55	85,71	0	0	0	0	21,5 -13,5 -28,0	21,5 -13,5 -28,0
PANTONE 303 C	75,69	18,79	74,18	0	0	0	0	14,8 -9,1 -15,2	14,8 -9,1 -15,2
PANTONE 7688 C	3,8	4,03	51,73	0	0	0	0	59,2 -13,9 -34,8	59,2 -13,9 -34,8
PANTONE 7689 C	6,27	3,7	57,47	0	0	0	0	55,0 -16,1 -36,4	55,0 -16,1 -36,4
PANTONE 7690 C	17,17	5,86	64,98	0	0	0	0	45,3 -16,9 -37,1	45,3 -16,9 -37,1
PANTONE 7691 C	25,97	17,81	70,36	0	0	0	0	37,5 -13,8 -39,7	37,5 -13,8 -39,7
PANTONE 7692 C	39,15	30,02	67,96	0	0	0	0	33,4 -9,5 -35,7	33,4 -9,5 -35,7
PANTONE 7693 C	50,91	39,57	67,56	0	0	0	0	28,6 -6,9 -32,6	28,6 -6,9 -32,6
PANTONE 7694 C	56,38	40,13	66,9	0	0	0	0	25,9 -6,1 -29,5	25,9 -6,1 -29,5
PANTONE 2975 C	0	0	11,05	0	4,7	0	0	81,7 -16,7 -17,4	79,8 -14,9 -15,0
PANTONE 2985 C	0	0	33,59	0	6,13	0	0	73,0 -23,3 -29,5	71,1 -19,9 -25,1
PANTONE 2995 C	0	0	58,39	0	3,69	0	0	62,5 -27,8 -42,0	61,7 -25,2 -39,1
PANTONE 3005 C	0	12,87	91,65	0	0	0	0	43,9 -21,3 -57,9	43,8 -21,2 -56,9
PANTONE 3015 C	24,6	10,64	97,01	0	0	0	0	35,8 -22,5 -44,6	35,8 -22,5 -44,6
PANTONE 3025 C	56,93	2,89	83,93	0	0	0	0	28,8 -21,5 -30,1	28,8 -21,5 -30,1
PANTONE 3035 C	67,73	0,25	77,32	0	0	0	0	22,6 -17,1 -19,0	22,6 -17,1 -19,0
PANTONE 7695 C	12,25	0	22,85	0	2,81	0	0	65,7 -11,4 -16,3	65,7 -11,4 -16,3

PANTONE 7696 C	17,41	0	31,71	0	5,72	0	0	59,8 -14,6 -17,7	59,8 -14,6 -17,7
PANTONE 7697 C	0,27	46,6	0	0	55,25	0	0	53,0 -14,0 -20,3	53,0 -14,0 -20,3
PANTONE 7698 C	46,51	0,4	49,98	0	0	0	0	45,7 -11,9 -19,9	45,7 -11,9 -19,9
PANTONE 7699 C	52,62	2,77	53,69	0	0	0	0	39,9 -10,9 -20,4	39,9 -10,9 -20,4
PANTONE 7700 C	51,14	10,07	61,5	0	0	0	0	35,8 -11,4 -26,2	35,8 -11,4 -26,2
PANTONE 7701 C	55,45	2,88	68,87	0	0	0	0	32,8 -17,4 -26,6	32,8 -17,4 -26,6
PANTONE 7457 C	0	0	4,64	0	3,07	0	0	85,6 -9,7 -9,3	85,5 -9,6 -9,2
PANTONE 7458 C	4,81	0	26,55	0	6,74	0	0	68,5 -17,0 -19,3	68,5 -17,0 -19,3
PANTONE 7459 C	11,19	0	45,22	0	9,61	0	0	58,1 -20,4 -24,2	58,1 -20,4 -24,2
PANTONE 7460 C	0,79	0	96,66	0	19,59	0	0	47,1 -40,8 -48,6	47,1 -40,8 -48,6
PANTONE 7461 C	6,54	5,31	68,79	0	0	0	0	47,3 -19,9 -44,5	47,3 -19,9 -44,5
PANTONE 7462 C	32,81	36,3	71,63	0	0	0	0	32,9 -9,3 -39,4	32,9 -9,3 -39,4
PANTONE 7463 C	68,08	48,34	80,43	0	0	0	0	15,7 -5,5 -24,3	15,7 -5,5 -24,3
PANTONE 304 C	0	0	8,07	0	8,59	0	0	83,0 -19,0 -14,6	80,5 -17,0 -12,1
PANTONE 305 C	0	0	25	0	12,25	0	0	75,4 -27,3 -26,2	72,7 -22,2 -20,5
PANTONE 306 C	0	0	50,34	0	16,08	0	0	65,9 -35,1 -38,0	63,5 -28,7 -30,9
PANTONE Process Blue C	2,17	0	94,93	0	2,18	0	0	47,6 -33,4 -53,4	47,6 -33,4 -53,4
PANTONE 307 C	0	23,91	100	0	37,1	0	0	38,4 -29,8 -47,0	38,4 -29,6 -46,7
PANTONE 308 C	52,61	0	100	0	2,3	0	0	31,3 -28,0 -33,1	31,3 -28,0 -33,1
PANTONE 309 C	69,59	0	76,14	0	23,65	0	0	21,0 -18,7 -15,8	21,0 -18,7 -15,8
PANTONE 635 C	0	0	7,28	0	6,03	0	0	83,6 -16,1 -13,3	81,7 -14,7 -11,6
PANTONE 636 C	0	0	12,5	0	8,61	0	0	80,1 -20,2 -18,0	78,1 -18,0 -15,3
PANTONE 637 C	0	0	30,48	0	14,51	0	0	72,5 -27,5 -26,5	70,7 -23,9 -22,3
PANTONE 638 C	0	0	51,76	0	18,9	0	0	64,0 -33,8 -35,0	62,7 -30,2 -31,0
PANTONE 639 C	0	0	68,68	0	20,26	0	0	53,8 -37,6 -42,6	53,6 -36,8 -41,8
PANTONE 640 C	4,46	0	84,75	0	11,3	0	0	46,5 -35,9 -45,8	46,5 -35,9 -45,8
PANTONE 641 C	0	31,07	100	0	43,7	0	0	36,7 -28,6 -46,4	36,8 -28,2 -45,6
PANTONE 7702 C	3,57	0	40,31	0	13,4	0	0	63,9 -22,9 -24,7	63,9 -22,9 -24,7
PANTONE 7703 C	4,43	0	54,56	0	17,87	0	0	57,9 -28,1 -29,7	57,9 -28,1 -29,7
PANTONE 7704 C	10,14	0	65,92	0	17,24	0	0	49,0 -30,3 -34,1	49,0 -30,3 -34,1
PANTONE 7705 C	32,41	0	70,1	0	6,47	0	0	41,3 -26,2 -32,9	41,3 -26,2 -32,9
PANTONE 7706 C	40,86	0	69,41	0	3,64	0	0	39,5 -23,8 -30,7	39,5 -23,8 -30,7
PANTONE 7707 C	51,05	0	68,13	0	3,89	0	0	36,3 -21,6 -26,6	36,3 -21,6 -26,6
PANTONE 7708 C	56,88	0	69,96	0	4,67	0	0	31,9 -21,2 -24,4	31,9 -21,2 -24,4
PANTONE 628 C	0,13	0	3,57	0	4,87	0	0	85,4 -12,1 -7,1	85,4 -12,1 -7,1
PANTONE 629 C	0,03	0	8,02	0	8,55	0	0	80,5 -16,9 -12,1	80,5 -16,9 -12,1
PANTONE 630 C	0,25	0	17,45	0	14,15	0	0	74,5 -22,0 -17,1	74,5 -22,0 -17,1
PANTONE 631 C	1,07	0	36,92	0	23,69	0	0	66,1 -27,8 -23,2	66,1 -27,8 -23,2
PANTONE 632 C	5,07	0	59,25	0	34,18	0	0	53,8 -33,9 -29,5	53,8 -33,9 -29,5
PANTONE 633 C	22,29	0	75,78	0	31,26	0	0	41,4 -34,3 -33,0	41,4 -34,3 -33,0
PANTONE 634 C	45,86	0	92,11	0	11,26	0	0	33,8 -30,3 -32,9	33,8 -30,3 -32,9
PANTONE 310 C	0	0	15,56	0	16,14	0	0	77,7 -27,7 -20,4	75,1 -22,8 -16,1
PANTONE 311 C	0	0	30,54	0	25,36	0	0	71,4 -35,2 -26,9	68,9 -28,4 -20,8
PANTONE 312 C	0	0	56,8	0	40,95	0	0	60,1 -45,2 -36,1	58,4 -38,4 -29,7
PANTONE 313 C	0	0	74,09	0	44,27	0	0	51,1 -47,5 -40,8	50,6 -44,9 -38,4
PANTONE 314 C	6,32	0	82,3	0	47,94	0	0	44,5 -44,1 -36,2	44,5 -44,1 -36,2
PANTONE 315 C	38,47	0	77,68	0	51,38	0	0	36,3 -36,8 -27,1	36,3 -36,8 -27,1
PANTONE 316 C	65,2	0	62,31	0	53,26	0	0	26,0 -22,6 -13,4	26,0 -22,6 -13,4
PANTONE 3105 C	0	0	12,44	0	22,6	0	0	77,8 -29,6 -18,0	75,0 -25,2 -13,9
PANTONE 3115 C	0	0	28,81	0	39,45	0	0	69,7 -40,3 -24,9	67,5 -33,6 -18,9
PANTONE 3125 C	0	0	50	0	51,22	0	0	61,4 -48,9 -30,3	59,6 -42,1 -24,8
PANTONE 3135 C	0	0	76,65	0	63,09	0	0	48,7 -53,9 -34,2	48,5 -52,8 -33,4
PANTONE 3145 C	16,91	0	75,06	0	64,77	0	0	41,4 -45,4 -27,1	41,4 -45,4 -27,1
PANTONE 3155 C	44,91	0	74,56	0	64,88	0	0	34,3 -38,8 -22,2	34,3 -38,8 -22,2
PANTONE 3165 C	60,78	0	67,54	0	62,95	0	0	27,7 -30,2 -16,3	27,7 -30,2 -16,3
PANTONE 7709 C	5,42	0	17,76	0	24,93	0	0	67,3 -23,4 -14,3	67,3 -23,4 -14,3
PANTONE 7710 C	2,57	0	38,56	0	46,38	0	0	61,1 -36,0 -20,4	61,1 -36,0 -20,4
PANTONE 7711 C	3,65	0	56,12	0	57,92	0	0	54,0 -44,1 -24,3	54,0 -44,1 -24,3
PANTONE 7712 C	11,05	0	63,15	0	54,76	0	0	47,6 -40,3 -26,4	47,6 -40,3 -26,4
PANTONE 7713 C	21,19	0	60,72	0	64,37	0	0	44,4 -41,7 -21,1	44,4 -41,7 -21,1
PANTONE 7714 C	32,44	0	56,34	0	66,07	0	0	42,4 -39,5 -18,1	42,4 -39,5 -18,1
PANTONE 7715 C	53,18	0	53,77	0	64,01	0	0	35,4 -31,6 -14,4	35,4 -31,6 -14,4
PANTONE 317 C	0	0	2,25	0	9,78	0	0	86,7 -17,2 -6,3	85,2 -16,4 -5,3
PANTONE 318 C	0	0	4,89	0	20,32	0	0	81,9 -26,1 -11,4	79,6 -23,2 -9,0
PANTONE 319 C	0	0	12,5	0	41,52	0	0	74,1 -39,1 -17,2	71,8 -33,8 -12,9
PANTONE 320 C	0	0	59,22	0	85	0	0	53,3 -62,5 -24,8	52,9 -58,9 -22,5

PANTONE 321 C	4,15	0	62,85	0	91,35	0	0	48,4 -56,4 -22,1	48,4 -56,4 -22,1
PANTONE 322 C	33,56	0	58,71	0	84,43	0	0	40,2 -45,4 -16,9	40,2 -45,4 -16,9
PANTONE 323 C	54,42	0	52,79	0	80,47	0	0	33,8 -36,3 -12,6	33,8 -36,3 -12,6
PANTONE 7464 C	3,06	0,8	0	0	17,63	0	0	79,9 -17,4 -3,0	79,9 -17,4 -3,0
PANTONE 7465 C	2,14	0	0	0	58,21	2,18	0	70,3 -40,4 -1,8	70,3 -40,4 -1,8
PANTONE 7466 C	0	0	38,41	0	62,71	0	0	61,6 -54,5 -22,9	60,4 -48,8 -18,7
PANTONE 7467 C	0	0	54,03	0	70,89	0	0	56,3 -59,5 -24,3	55,5 -55,2 -21,4
PANTONE 7468 C	33,07	0	66,45	0	4,52	0	0	43,1 -23,8 -30,8	43,1 -23,8 -30,8
PANTONE 7469 C	48,64	1,26	77,58	0	0	0	0	35,2 -22,5 -32,4	35,2 -22,5 -32,4
PANTONE 7470 C	55,88	0	67,35	0	20,75	0	0	33,1 -23,2 -22,1	33,1 -23,2 -22,1
PANTONE 7471 C	0	0	1,54	0	33,89	0	0	81,5 -31,2 -6,2	80,1 -29,3 -4,5
PANTONE 7472 C	2,76	4,63	0	0	50,41	0	0	68,6 -29,9 -7,0	68,6 -29,9 -7,0
PANTONE 7473 C	2,31	0	60,2	0	0	0	46,25	56,4 -35,5 -2,5	56,4 -35,5 -2,5
PANTONE 7474 C	34,46	0	54,63	0	59,99	0	0	42,9 -35,5 -18,1	42,9 -35,5 -18,1
PANTONE 7475 C	42,57	8,24	0	0	53,04	0	0	47,5 -17,8 -6,9	47,5 -17,8 -6,9
PANTONE 7476 C	57,95	33,7	0	0	77,07	0	0	30,7 -19,7 -9,9	30,7 -19,7 -9,9
PANTONE 7477 C	56,91	46,23	0	0	64,7	0	0	29,8 -11,5 -13,0	29,8 -11,5 -13,0
PANTONE 5523 C	3,39	2,11	0	0	6,39	0	0	81,1 -8,2 -4,0	81,1 -8,2 -4,0
PANTONE 5513 C	3,86	3,01	0	0	9,44	0	0	78,1 -9,5 -5,1	78,1 -9,5 -5,1
PANTONE 5503 C	5,75	4,64	0	0	18,22	0	0	71,8 -11,8 -6,9	71,8 -11,8 -6,9
PANTONE 5493 C	8,08	7,54	0	0	28,84	0	0	66,0 -13,6 -8,3	66,0 -13,6 -8,3
PANTONE 5483 C	18,57	17,18	0	0	52,33	0	0	52,1 -17,7 -10,8	52,1 -17,7 -10,8
PANTONE 5473 C	45,94	40,66	0	0	74,36	0	0	35,4 -20,6 -12,8	35,4 -20,6 -12,8
PANTONE 5463 C	83,09	0	67,68	0	15,76	0	0	13,5 -10,1 -8,2	13,5 -10,1 -8,2
PANTONE 7716 C	9,42	10,33	0	0	70,92	0	0	54,5 -38,6 -8,7	54,5 -38,6 -8,7
PANTONE 7717 C	33,12	0	16,47	0	78,92	0	0	47,5 -43,3 -8,6	47,5 -43,3 -8,6
PANTONE 7718 C	39,84	0	36,45	0	93,52	0	0	41,8 -43,4 -11,0	41,8 -43,4 -11,0
PANTONE 7719 C	51,58	0	24,75	0	81,31	0	0	39,1 -37,4 -8,5	39,1 -37,4 -8,5
PANTONE 7720 C	58,86	0	13,35	0	83,76	0	0	35,7 -33,6 -5,8	35,7 -33,6 -5,8
PANTONE 7721 C	58,33	0	33,15	0	67,93	0	0	34,2 -28,9 -8,9	34,2 -28,9 -8,9
PANTONE 7722 C	63,53	0	37,14	0	65,59	0	0	29,6 -24,5 -8,2	29,6 -24,5 -8,2
PANTONE 324 C	0	0	3	0	16,73	0	0	82,8 -21,1 -6,7	82,4 -20,7 -6,4
PANTONE 325 C	0	0	5,78	0	39,18	0	0	75,5 -32,4 -9,4	75,3 -32,1 -9,1
PANTONE 326 C	2,52	0	13,67	0	65,21	0	0	63,3 -48,8 -10,6	63,3 -48,8 -10,6
PANTONE 327 C	0	0	71,89	0	72,66	0	39,52	45,7 -64,2 -7,0	45,7 -64,2 -7,0
PANTONE 328 C	13,6	0	91,95	0	0	0	58,72	39,6 -53,2 -7,4	39,6 -53,2 -7,4
PANTONE 329 C	34,84	0	86,16	0	0	0	57,41	36,1 -45,7 -6,9	36,1 -45,7 -6,9
PANTONE 330 C	64,32	5,06	0	0	93,21	0	0	30,2 -26,5 -3,8	30,2 -26,5 -3,8
PANTONE 3242 C	0	0	2,34	0	37,06	0	0	80,6 -33,9 -8,0	78,6 -30,8 -5,5
PANTONE 3252 C	0	0	3,6	0	50,93	0	0	75,5 -43,9 -10,0	73,8 -39,9 -6,8
PANTONE 3262 C	0	0	9,7	0	69,07	0	0	66,4 -59,3 -12,1	65,5 -55,3 -9,3
PANTONE 3272 C	0	0	43,16	0	100	0	2,63	55,7 -69,9 -14,0	55,5 -63,0 -12,9
PANTONE 3282 C	1,25	0	87,28	0	0	0	57,05	45,7 -57,5 -9,5	45,7 -57,5 -9,5
PANTONE 3292 C	52,79	0	82,4	0	0	0	57,02	31,3 -37,4 -5,3	31,3 -37,4 -5,3
PANTONE 3302 C	68,3	0	7,4	0	83,91	0	0	27,7 -25,6 -3,1	27,7 -25,6 -3,1
PANTONE 3245 C	0	0	0	0	38,1	0	0	82,3 -33,5 -4,8	80,6 -31,3 -2,8
PANTONE 3255 C	0	0	0,31	0	55,26	0	0	76,4 -46,2 -6,0	75,2 -43,7 -3,6
PANTONE 3265 C	0	0	2,07	0	69,3	0	0	69,5 -59,5 -6,6	68,9 -57,5 -4,9
PANTONE 3275 C	0	0	12,6	0	100	0	2,17	60,9 -71,1 -6,1	61,2 -66,7 -5,9
PANTONE 3285 C	0	0	57,14	0	68,26	0	27,12	52,3 -57,9 -4,9	52,3 -57,9 -4,9
PANTONE 3295 C	12,19	0	81,61	0	0	0	60,1	41,8 -50,2 -3,3	41,8 -50,2 -3,3
PANTONE 3305 C	61,22	0	70,04	0	0	0	57,18	28,4 -26,0 -0,8	28,4 -26,0 -0,8
PANTONE 3248 C	2,52	0	0	0	44,76	0	1,5	75,6 -33,3 -0,2	75,6 -33,3 -0,2
PANTONE 3258 C	1,98	0	0	0	56	1,57	0	71,7 -39,4 -2,1	71,7 -39,4 -2,1
PANTONE 3268 C	0,34	0	0	0	94,28	9,7	0	60,2 -55,4 0,2	60,2 -55,4 0,2
PANTONE 3278 C	0	0	47,53	0	87,51	0	34,99	53,5 -62,8 2,8	53,5 -62,8 2,8
PANTONE 3288 C	3,57	0	80,96	0	0	0	64,65	45,1 -56,5 2,4	45,1 -56,5 2,4
PANTONE 3298 C	36	0	77,94	0	0	0	63,99	37,3 -43,4 2,1	37,3 -43,4 2,1
PANTONE 3308 C	65,12	0	69,47	0	0	0	61,67	25,2 -23,4 1,8	25,2 -23,4 1,8
PANTONE 566 C	0,46	0	0	0	12,66	1,63	0	84,8 -14,0 0,1	84,8 -14,0 0,1
PANTONE 565 C	1,47	0	0	0	22,09	1,11	0	81,3 -19,9 -1,0	81,3 -19,9 -1,0
PANTONE 564 C	4,5	0	0	0	34,34	0,34	0	75,7 -24,8 -2,3	75,7 -24,8 -2,3
PANTONE 563 C	8,16	0,13	0	0	45,43	0	0	70,1 -29,2 -2,9	70,1 -29,2 -2,9
PANTONE 562 C	54,97	1,42	0	0	88,08	0	0	40,5 -36,0 -3,2	40,5 -36,0 -3,2
PANTONE 561 C	55,92	0	68,36	0	0	0	55,71	32,8 -27,8 -0,9	32,8 -27,8 -0,9
PANTONE 560 C	71,12	0	62,68	0	0	0	52,81	22,6 -14,6 0,9	22,6 -14,6 0,9

PANTONE 573 C	0,3	0	0	0	12,29	0	0,65	86,5 -17,2 -0,6	86,5 -17,2 -0,6
PANTONE 572 C	0,38	0	0	0	19,56	0	0,47	84,3 -21,6 -1,3	84,3 -21,6 -1,3
PANTONE 571 C	0,15	0	0	0	27,5	0,59	0	82,3 -24,7 -1,9	82,3 -24,7 -1,9
PANTONE 570 C	2,53	0	0	0	46,36	0,56	0	74,8 -33,3 -2,5	74,8 -33,3 -2,5
PANTONE 569 C	6,85	0	73,65	0	0	0	58,72	45,9 -47,3 -2,2	45,9 -47,3 -2,2
PANTONE 568 C	38	0	69,39	0	0	0	57,42	39,3 -35,5 -0,5	39,3 -35,5 -0,5
PANTONE 567 C	69,36	0	65,69	0	0	0	55,79	23,2 -17,3 1,0	23,2 -17,3 1,0
PANTONE 559 C	1,68	0	12,37	0	0	0	12,35	78,7 -12,2 4,9	78,7 -12,2 4,9
PANTONE 558 C	2,68	0	20,67	0	0	0	19,27	73,7 -15,0 5,2	73,7 -15,0 5,2
PANTONE 557 C	4,72	0	31,35	0	0	0	28,85	68,1 -17,6 5,6	68,1 -17,6 5,6
PANTONE 556 C	7,62	0	41,57	0	0	0	40,78	62,1 -21,3 7,4	62,1 -21,3 7,4
PANTONE 555 C	40,95	0	60,85	0	0	0	63,18	42,3 -29,4 11,0	42,3 -29,4 11,0
PANTONE 554 C	56,98	0	62,35	0	0	0	64,67	34,2 -24,9 9,2	34,2 -24,9 9,2
PANTONE 553 C	67,2	0	56,98	0	0	0	61,38	27,2 -15,0 7,1	27,2 -15,0 7,1
PANTONE 5595 C	3,69	0	4,76	0	0	0	5,04	81,2 -7,0 3,4	81,2 -7,0 3,4
PANTONE 5585 C	6,31	0	10,21	0	0	0	8,96	74,6 -9,7 2,7	74,6 -9,7 2,7
PANTONE 5575 C	11,37	0	17,3	0	0	0	13,59	68,0 -11,3 2,4	68,0 -11,3 2,4
PANTONE 5565 C	18,39	0	27,24	0	0	0	19,82	61,8 -13,1 2,4	61,8 -13,1 2,4
PANTONE 5555 C	40,12	0	42,41	0	0	0	36	50,0 -15,7 2,6	50,0 -15,7 2,6
PANTONE 5545 C	53,28	0	50,93	0	0	0	44,73	41,0 -17,1 2,8	41,0 -17,1 2,8
PANTONE 5535 C	77,86	0	63,01	0	0	0	55,11	17,5 -12,1 1,2	17,5 -12,1 1,2
PANTONE 5665 C	7,72	0	3,59	0	0	0	4,81	78,4 -5,2 4,4	78,4 -5,2 4,4
PANTONE 5655 C	10,04	0	4,45	0	0	0	6,17	75,1 -6,0 4,5	75,1 -6,0 4,5
PANTONE 5645 C	14,23	0	6,12	0	0	0	8,33	70,8 -6,8 4,8	70,8 -6,8 4,8
PANTONE 5635 C	23,46	0	8,75	0	0	0	11,87	65,9 -7,7 5,3	65,9 -7,7 5,3
PANTONE 5625 C	43,9	0	20,23	0	0	0	28,23	53,3 -9,8 6,6	53,3 -9,8 6,6
PANTONE 5615 C	52,18	0	30,5	0	0	0	38,83	46,4 -10,7 7,4	46,4 -10,7 7,4
PANTONE 5605 C	74,87	0	56,35	0	0	0	57,56	20,9 -11,0 4,3	20,9 -11,0 4,3
PANTONE 5527 C	6,04	0	3,94	0	0	0	2,96	79,7 -4,7 -0,0	79,7 -4,7 -0,0
PANTONE 5517 C	8,32	0	4,89	0	0	0	3,44	76,4 -5,6 -0,3	76,4 -5,6 -0,3
PANTONE 5507 C	14,02	0	8,21	0	0	0	4,47	70,0 -6,9 -0,8	70,0 -6,9 -0,8
PANTONE 5497 C	38,29	0,19	0	0	11,19	0	0	61,1 -8,3 -1,4	61,1 -8,3 -1,4
PANTONE 5487 C	55,49	1,33	0	0	27,71	0	0	48,3 -10,2 -1,8	48,3 -10,2 -1,8
PANTONE 5477 C	64,05	1,97	0	0	46,84	0	0	36,7 -12,0 -1,6	36,7 -12,0 -1,6
PANTONE 5467 C	78,26	8,16	0	0	66,02	0	0	19,0 -11,2 -1,2	19,0 -11,2 -1,2
PANTONE 621 C	2,21	0	0	0	3,24	0	1,6	87,9 -6,7 2,4	87,9 -6,7 2,4
PANTONE 622 C	2,18	0	8,5	0	0	0	7,27	80,4 -9,5 2,3	80,4 -9,5 2,3
PANTONE 623 C	4,71	0	18,59	0	0	0	13,95	72,5 -13,1 2,1	72,5 -13,1 2,1
PANTONE 624 C	12,46	0	34,73	0	0	0	26,26	62,0 -16,3 2,1	62,0 -16,3 2,1
PANTONE 625 C	35,84	0	49,65	0	0	0	41,66	49,3 -20,0 2,2	49,3 -20,0 2,2
PANTONE 626 C	57,05	0	60,71	0	0	0	53,05	34,9 -21,9 2,0	34,9 -21,9 2,0
PANTONE 627 C	81,62	0,92	0	0	73,71	0	0	18,0 -13,8 0,3	18,0 -13,8 0,3
PANTONE 331 C	0	0	0	0	19,5	0	0,75	86,5 -23,4 -0,5	84,8 -21,8 -0,7
PANTONE 332 C	0	0	0	0	32,32	0	0,62	83,7 -30,9 -1,2	81,8 -28,5 -1,4
PANTONE 333 C	0	0	0	0	53,58	0	0,67	78,2 -47,4 -1,7	75,9 -42,4 -2,0
PANTONE Green C	0	0	24,69	0	100	0	13,95	57,7 -77,2 0,2	58,0 -66,2 0,2
PANTONE 334 C	0	0	54,39	0	100	0	33,74	51,6 -67,3 0,4	51,6 -65,6 0,4
PANTONE 335 C	9,22	0	79,06	0	0	0	63,43	43,2 -51,6 1,8	43,2 -51,6 1,8
PANTONE 336 C	42,71	0	75,4	0	0	0	62,56	36,2 -39,4 1,8	36,2 -39,4 1,8
PANTONE 337 C	1,46	0	0	0	31,28	0	3,21	79,9 -27,1 3,8	79,9 -27,1 3,8
PANTONE 338 C	1,8	0	0	0	45,62	0	3,59	75,9 -35,0 3,6	75,9 -35,0 3,6
PANTONE 339 C	5,4	0	0	0	70,59	0	10,75	63,4 -53,6 7,6	63,4 -53,6 7,6
PANTONE 340 C	0	0	50,62	0	90,73	0	59,24	51,8 -65,4 14,6	51,8 -65,4 14,6
PANTONE 341 C	12,72	0	73,62	0	0	0	68,53	43,2 -48,4 10,0	43,2 -48,4 10,0
PANTONE 342 C	42,56	0	71,82	0	0	0	67,74	36,9 -38,6 8,2	36,9 -38,6 8,2
PANTONE 343 C	58,1	0	66,27	0	0	0	63,98	31,9 -26,9 6,3	31,9 -26,9 6,3
PANTONE 7723 C	15,6	0	0	0	55,48	0	11,47	61,8 -33,6 8,3	61,8 -33,6 8,3
PANTONE 7724 C	0,99	0	63,94	0	0	0	62,6	53,9 -44,6 10,4	53,9 -44,6 10,4
PANTONE 7725 C	2,55	0	73,44	0	0	0	70,69	47,3 -55,1 13,9	47,3 -55,1 13,9
PANTONE 7726 C	9,87	0	77,08	0	0	0	74,64	43,0 -53,7 13,9	43,0 -53,7 13,9
PANTONE 7727 C	29,97	0	75,18	0	0	0	73,69	39,0 -46,2 12,5	39,0 -46,2 12,5
PANTONE 7728 C	41,45	0	71,69	0	0	0	69,22	37,2 -39,4 9,8	37,2 -39,4 9,8
PANTONE 7729 C	55,62	0	72,41	0	0	0	63,1	31,6 -32,0 2,6	31,6 -32,0 2,6
PANTONE 3375 C	0	0	0	0	41,19	0	3,8	82,2 -38,1 5,2	79,4 -33,6 4,6
PANTONE 3385 C	0	0	0	0	54,47	0	5,56	77,0 -48,1 7,3	75,1 -43,5 6,3
PANTONE 3395 C	0	0	0	0	85,34	0	17,39	67,5 -66,9 12,3	67,2 -65,4 12,0

PANTONE 3405 C	0	0	10	0	100	0	43,36	59,2 -79,0 19,0	59,7 -68,6 17,0
PANTONE 3415 C	14,15	0	77,3	0	0	0	73,94	41,6 -51,6 12,8	41,6 -51,6 12,8
PANTONE 3425 C	45,73	0	73,7	0	0	0	70,36	35,4 -39,4 9,7	35,4 -39,4 9,7
PANTONE 3435 C	65,1	0	66,39	0	0	0	65,12	26,2 -22,2 5,9	26,2 -22,2 5,9
PANTONE 344 C	0,81	0	0	0	23,38	0	8,31	81,8 -24,7 12,0	81,8 -24,7 12,0
PANTONE 345 C	0,65	0	0	0	32,04	0	9,46	79,9 -29,3 12,5	79,9 -29,3 12,5
PANTONE 346 C	1,42	0	0	0	46,99	0	17,69	75,0 -37,5 16,2	75,0 -37,5 16,2
PANTONE 347 C	0	0	41,19	0	84,05	0	74,1	53,6 -64,2 30,5	53,6 -64,2 30,5
PANTONE 348 C	4,54	0	71,22	0	0	0	87,82	46,6 -54,1 26,1	46,6 -54,1 26,1
PANTONE 349 C	41,97	0	67,05	0	0	0	79,7	38,5 -37,1 19,5	38,5 -37,1 19,5
PANTONE 350 C	62,48	0	58,62	0	0	0	67,6	31,1 -19,6 12,4	31,1 -19,6 12,4
PANTONE 351 C	0	0	0	0	24,43	0	8,41	84,9 -28,5 13,4	82,7 -25,9 12,4
PANTONE 352 C	0	0	0	0	33,58	0	10,23	83,3 -35,3 15,1	80,3 -30,8 13,4
PANTONE 353 C	0	0	0	0	40,76	0	13,65	81,6 -39,9 17,2	78,5 -34,7 15,3
PANTONE 354 C	0	0	3,7	0	100	0	67,28	60,4 -76,6 39,9	60,9 -71,1 37,6
PANTONE 355 C	0	0	44,61	0	92,66	0	82,74	52,0 -67,0 33,9	52,0 -67,0 33,9
PANTONE 356 C	12,11	0	71,81	0	0	0	94,58	43,2 -51,0 27,3	43,2 -51,0 27,3
PANTONE 357 C	58,38	0	63,84	0	0	0	74,71	32,3 -26,7 15,1	32,3 -26,7 15,1
PANTONE 7478 C	0	0	0	0	27,38	0	5,24	84,5 -29,6 9,3	82,4 -27,0 8,4
PANTONE 7479 C	0	0	0	0	61,67	0	38,27	73,3 -58,6 27,6	71,1 -52,0 24,7
PANTONE 7480 C	0	0	0	0	86,86	0	42,56	66,1 -68,9 24,2	65,5 -66,6 23,4
PANTONE 7481 C	0	0	0	0	98,73	0	62,85	62,9 -72,7 35,9	62,8 -72,1 35,6
PANTONE 7482 C	0	0	34,53	0	86,47	0	67,58	55,1 -64,3 28,0	55,1 -64,3 28,0
PANTONE 7483 C	55,79	0	62,61	0	0	0	71,17	34,8 -26,5 14,8	34,8 -26,5 14,8
PANTONE 7484 C	56,41	0	69,46	0	0	0	66,23	31,7 -30,5 6,2	31,7 -30,5 6,2
PANTONE 7730 C	6,3	0	56,09	0	0	0	64,38	55,5 -33,3 19,2	55,5 -33,3 19,2
PANTONE 7731 C	9,24	0	62,77	0	0	0	75,3	49,6 -41,2 24,3	49,6 -41,2 24,3
PANTONE 7732 C	16,42	0	68,76	0	0	0	80,74	43,4 -45,4 21,6	43,4 -45,4 21,6
PANTONE 7733 C	34,47	0	67,88	0	0	0	74,07	40,3 -39,1 16,2	40,3 -39,1 16,2
PANTONE 7734 C	53,95	0	61,88	0	0	0	67,28	36,4 -26,2 12,4	36,4 -26,2 12,4
PANTONE 7735 C	61,3	0	53,74	0	0	0	62,85	33,6 -17,3 11,5	33,6 -17,3 11,5
PANTONE 7736 C	62,2	0	50,74	0	0	0	55,45	33,4 -14,8 7,3	33,4 -14,8 7,3
PANTONE 7737 C	1,45	0	49,44	0	0	0	84,67	61,8 -33,5 46,8	61,8 -33,5 46,8
PANTONE 7738 C	13,7	0	0	0	63,11	0	67,89	59,1 -43,3 40,3	59,1 -43,3 40,3
PANTONE 7739 C	17,32	0	0	0	68,25	0	65,96	56,1 -46,1 35,6	56,1 -46,1 35,6
PANTONE 7740 C	5	0	60,26	0	0	0	82,21	53,1 -40,7 33,4	53,1 -40,7 33,4
PANTONE 7741 C	13,94	0	57,84	0	0	0	79,56	50,5 -34,5 31,1	50,5 -34,5 31,1
PANTONE 7742 C	39,23	0	53,89	0	0	0	75,52	45,6 -25,9 26,6	45,6 -25,9 26,6
PANTONE 7743 C	52,24	0	53,11	0	0	0	69,5	40,6 -21,7 20,0	40,6 -21,7 20,0
PANTONE 358 C	0	0	0	0	20,29	0	32,26	82,7 -25,6 30,9	82,4 -25,3 30,6
PANTONE 359 C	0	0	0	0	27,63	0	39,85	80,8 -29,4 34,6	80,6 -29,2 34,4
PANTONE 360 C	2,13	0	0	0	53,47	0	66,49	70,7 -43,5 48,9	70,7 -43,5 48,9
PANTONE 361 C	5,62	0	0	0	65,33	0	81,59	63,1 -50,7 52,9	63,1 -50,7 52,9
PANTONE 362 C	0,55	0	57,21	0	0	0	95,14	58,1 -40,5 46,5	58,1 -40,5 46,5
PANTONE 363 C	10,96	0	56,28	0	0	0	95,91	52,3 -35,2 42,2	52,3 -35,2 42,2
PANTONE 364 C	39,96	0	53,2	0	0	0	92,99	45,2 -26,8 35,8	45,2 -26,8 35,8
PANTONE 7485 C	2,44	0	0	0	3,58	0	8,46	86,7 -9,4 15,4	86,7 -9,4 15,4
PANTONE 7486 C	0	0	0	0	12,78	0	32,35	85,2 -21,8 33,0	84,7 -21,2 32,6
PANTONE 7487 C	0	0	0	0	37,99	0	55,88	80,7 -42,0 49,0	77,7 -35,0 43,1
PANTONE 7488 C	0	0	0	0	48,55	0	64,69	77,4 -48,6 56,0	74,5 -42,3 50,7
PANTONE 7489 C	0,86	0	45,84	0	0	0	71,75	64,0 -30,7 39,3	64,0 -30,7 39,3
PANTONE 7490 C	10,88	0	41,4	0	0	0	69,82	58,7 -24,0 36,0	58,7 -24,0 36,0
PANTONE 7491 C	41,33	0	18,84	0	0	0	70,11	53,5 -13,3 37,2	53,5 -13,3 37,2
PANTONE 365 C	0	0	0	0	10,69	0	39,17	85,6 -20,8 38,6	85,2 -20,4 38,3
PANTONE 366 C	0	0	0	0	16,44	0	49,21	83,5 -24,8 43,9	83,2 -24,3 43,4
PANTONE 367 C	0	0	0	0	27,79	0	60,53	80,0 -30,9 52,0	79,8 -30,4 51,5
PANTONE 368 C	3,41	0	0	0	49,46	0	84,32	69,9 -40,3 63,0	69,9 -40,3 63,0
PANTONE 369 C	12,33	0	0	0	55,67	0	97,5	61,8 -38,8 59,9	61,8 -38,8 59,9
PANTONE 370 C	38,83	0	0	0	47,44	0	88,87	53,8 -26,7 50,2	53,8 -26,7 50,2
PANTONE 371 C	59,28	0	32,26	0	0	0	83,99	39,1 -12,9 32,7	39,1 -12,9 32,7
PANTONE 372 C	0	0	0	0	6,29	0	38,79	89,7 -18,8 42,0	87,1 -16,5 40,1
PANTONE 373 C	0	0	0	0	8,58	0	48,09	88,8 -21,8 47,5	85,9 -19,1 45,1
PANTONE 374 C	0	0	0	0	11,44	0	56,29	87,3 -25,6 54,5	84,6 -21,6 50,3
PANTONE 375 C	0	0	0	0	36,31	0	85	78,9 -40,5 77,3	77,0 -35,6 71,8
PANTONE 376 C	4,07	0	0	0	43,84	0	100	70,2 -37,2 73,4	70,4 -36,3 71,3
PANTONE 377 C	0	0	0	0	61,26	32,32	94,85	59,2 -25,2 60,5	59,2 -25,2 60,5

PANTONE 378 C	60,1	0	23,65	0	0	0	91,79	39,4 -11,3 36,0	39,4 -11,3 36,0
PANTONE 580 C	0,21	0	7,14	0	0	0	28,9	83,3 -11,9 22,0	83,3 -11,9 22,0
PANTONE 579 C	0,39	0	9,36	0	0	0	35,52	81,1 -13,5 24,1	81,1 -13,5 24,1
PANTONE 578 C	0,32	0	11,18	0	0	0	39,71	79,9 -14,6 25,4	79,9 -14,6 25,4
PANTONE 577 C	1,19	0	16,76	0	0	0	53,63	75,7 -17,3 30,7	75,7 -17,3 30,7
PANTONE 576 C	9,95	0	37,98	0	0	0	69,27	60,4 -22,7 37,6	60,4 -22,7 37,6
PANTONE 575 C	38,45	0	37,62	0	0	0	74,9	50,8 -18,4 34,3	50,8 -18,4 34,3
PANTONE 574 C	62,38	0	31,52	0	0	0	68,05	36,5 -10,5 22,0	36,5 -10,5 22,0
PANTONE 5807 C	5,65	0	1,08	0	0	0	13,85	83,1 -4,9 18,6	83,1 -4,9 18,6
PANTONE 5797 C	8,3	0	1,74	0	0	0	21,74	79,5 -5,8 21,9	79,5 -5,8 21,9
PANTONE 5787 C	12,1	0	2,35	0	0	0	31,44	75,4 -6,5 24,6	75,4 -6,5 24,6
PANTONE 5777 C	27,65	0	3,47	0	0	0	50,77	66,3 -7,8 30,6	66,3 -7,8 30,6
PANTONE 5767 C	43,17	0	4,76	0	0	0	62,15	57,2 -8,4 34,6	57,2 -8,4 34,6
PANTONE 5757 C	56,09	0	8,67	0	0	0	72,6	46,1 -8,5 35,4	46,1 -8,5 35,4
PANTONE 5747 C	70,68	0	32,95	0	0	0	81,53	27,5 -7,9 21,6	27,5 -7,9 21,6
PANTONE 5875 C	7,32	0	0	0,36	0	0	19,53	82,2 -3,5 24,1	82,2 -3,5 24,1
PANTONE 5865 C	10,11	0	0	0,3	0	0	25,76	79,6 -3,8 26,3	79,6 -3,8 26,3
PANTONE 5855 C	15,01	0	0	0,5	0	0	31,64	75,3 -3,6 26,9	75,3 -3,6 26,9
PANTONE 5845 C	28,95	0	0	0,65	0	0	44,93	68,9 -3,8 31,3	68,9 -3,8 31,3
PANTONE 5835 C	39,15	0	0	1,06	0	0	56,12	62,7 -3,8 34,8	62,7 -3,8 34,8
PANTONE 5825 C	52,08	0	0	1,49	0	0	65,15	53,8 -3,3 37,5	53,8 -3,3 37,5
PANTONE 5815 C	69,56	0	0,25	0	0	0	68,18	33,8 -2,4 25,9	33,8 -2,4 25,9
PANTONE 5803 C	9,18	0	1,58	0	0	0	11,45	79,1 -4,7 14,6	79,1 -4,7 14,6
PANTONE 5793 C	13,6	0	2,88	0	0	0	19,41	73,8 -6,1 17,0	73,8 -6,1 17,0
PANTONE 5783 C	24,04	0	3,5	0	0	0	30,13	68,2 -6,6 18,7	68,2 -6,6 18,7
PANTONE 5773 C	41,27	0	5,48	0	0	0	46,48	58,4 -7,6 22,0	58,4 -7,6 22,0
PANTONE 5763 C	52,09	0	9,4	0	0	0	57,28	50,0 -8,3 24,2	50,0 -8,3 24,2
PANTONE 5753 C	59,09	0	15,88	0	0	0	64,27	41,8 -8,8 24,6	41,8 -8,8 24,6
PANTONE 5743 C	68,91	0	35,32	0	0	0	69,01	29,0 -8,5 18,1	29,0 -8,5 18,1
PANTONE 7492 C	2,84	0	6,49	0	0	0	49,71	79,6 -12,4 35,8	79,6 -12,4 35,8
PANTONE 7493 C	6,1	0	4,58	0	0	0	32,52	77,6 -9,2 23,7	77,6 -9,2 23,7
PANTONE 7494 C	11,6	0	12,53	0	0	0	34,97	68,9 -12,0 16,8	68,9 -12,0 16,8
PANTONE 7495 C	28,13	0	11,47	0	0	0	70,07	61,0 -12,9 45,0	61,0 -12,9 45,0
PANTONE 7496 C	35,57	0	28,13	0	0	0	98,19	53,6 -17,4 50,1	53,6 -17,4 50,1
PANTONE 7497 C	57,33	0	0	3,11	0	0	36,4	48,1 0,1 16,3	48,1 0,1 16,3
PANTONE 7498 C	60,92	0	14,31	0	0	0	63,92	40,1 -7,9 23,7	40,1 -7,9 23,7
PANTONE 7744 C	7,33	0	5,11	0	0	0	85,83	74,3 -12,7 71,2	74,3 -12,7 71,2
PANTONE 7745 C	15,26	0	4,9	0	0	0	82,02	68,7 -11,5 63,1	68,7 -11,5 63,1
PANTONE 7746 C	32,49	0	4,77	0	0	0	76,19	62,2 -10,2 52,3	62,2 -10,2 52,3
PANTONE 7747 C	41,68	0	6,9	0	0	0	75,72	56,7 -10,3 46,4	56,7 -10,3 46,4
PANTONE 7748 C	50,11	0	7,2	0	0	0	71,16	52,1 -9,2 39,5	52,1 -9,2 39,5
PANTONE 7749 C	56,18	0	4,48	0	0	0	66,81	47,4 -6,9 32,6	47,4 -6,9 32,6
PANTONE 7750 C	60,76	0	4,75	0	0	0	63,99	42,2 -6,0 27,0	42,2 -6,0 27,0
PANTONE 379 C	0	0	0	0	3,02	0	58,48	89,6 -13,6 59,9	88,8 -12,8 59,1
PANTONE 380 C	0	0	0	0	4,41	0	67,49	87,7 -16,5 72,4	87,1 -15,6 71,5
PANTONE 381 C	0,09	0	0	0	8,4	0	88,28	84,4 -20,2 85,1	84,4 -20,2 85,1
PANTONE 382 C	1,1	0	0	0	10,89	0	93,96	82,0 -21,5 85,0	82,0 -21,5 85,0
PANTONE 383 C	0	0	0	0	36,79	20,07	100	68,6 -14,2 74,7	68,6 -14,1 74,1
PANTONE 384 C	0	0	0	0	53,31	47,74	96,64	59,4 -9,8 64,9	59,4 -9,8 64,9
PANTONE 385 C	58,42	0	0	0,56	0	0	79,54	47,0 -4,1 42,9	47,0 -4,1 42,9
PANTONE 386 C	0	0	0	0	2,07	0	57,79	91,2 -12,4 60,4	89,7 -11,0 59,1
PANTONE 387 C	0	0	0	0	3,33	0	69,48	89,6 -16,0 78,2	88,0 -13,8 76,0
PANTONE 388 C	0	0	0	0	3,87	0	75,37	89,0 -17,1 82,1	87,3 -14,9 80,0
PANTONE 389 C	0	0	0	0	8,52	0	100	85,2 -21,6 94,3	84,5 -19,9 91,5
PANTONE 390 C	0	0	0	0	24,52	9,01	100	74,0 -17,3 85,8	74,4 -15,9 79,7
PANTONE 391 C	0	0	0	0	50,32	46,43	100	60,4 -8,6 67,7	60,5 -8,6 67,4
PANTONE 392 C	0	0	0	0	64,39	65,97	78,68	50,6 -5,0 54,5	50,6 -5,0 54,5
PANTONE 587 C	1,16	0	0	0	1,69	0	38,67	89,1 -9,0 42,1	89,1 -9,0 42,1
PANTONE 586 C	1,34	0	0	0	2,1	0	48,98	88,1 -10,3 48,9	88,1 -10,3 48,9
PANTONE 585 C	1,89	0	0	0	2,57	0	55,43	86,7 -11,4 52,6	86,7 -11,4 52,6
PANTONE 584 C	2,88	0	0	0	3,65	0	63,14	83,8 -13,3 61,2	83,8 -13,3 61,2
PANTONE 583 C	4,16	0	8,7	0	0	0	91,23	74,8 -15,4 72,4	74,8 -15,4 72,4
PANTONE 582 C	44,97	0	2,97	0	0	0	93,05	57,1 -8,4 56,8	57,1 -8,4 56,8
PANTONE 581 C	65,29	0	0	0,1	0	0	78,1	39,0 -3,3 34,4	39,0 -3,3 34,4
PANTONE 393 C	0	0	0	0	0,87	0	55,34	92,0 -9,6 57,5	91,0 -8,7 56,8
PANTONE 394 C	0	0	0	0	1,61	0	68,8	90,7 -11,9 78,4	89,6 -10,6 77,2

PANTONE 395 C	0	0	0	0	1,93	0	76,67	90,1 -12,7 84,8	89,1 -11,3 83,5
PANTONE 396 C	0	0	0	0	3,84	0	100	86,9 -15,1 98,9	87,1 -14,4 95,2
PANTONE 397 C	0	0	0	0	20,69	14,27	100	73,6 -10,4 85,4	73,9 -9,6 80,6
PANTONE 398 C	0	0	0	0	36,28	31,66	100	66,5 -7,7 75,0	66,6 -7,5 73,4
PANTONE 399 C	0	0	0	0	48,26	51,26	100	60,2 -4,3 68,7	60,2 -4,3 68,5
PANTONE 3935 C	0	0	0	0	0,42	0	61,18	91,5 -8,5 67,1	91,1 -8,1 66,8
PANTONE 3945 C	0,01	0	0	0	0,68	0	86,63	90,0 -9,0 92,2	90,0 -9,0 92,2
PANTONE 3955 C	1,27	0	0	0	0,09	0	100	88,1 -8,3 104,0	88,5 -7,6 98,1
PANTONE 3965 C	1,79	0	0	0	0	0,31	100	87,1 -7,5 103,3	87,5 -6,9 96,9
PANTONE 3975 C	0	0	0	0	26,71	33,16	100	68,4 -2,4 79,5	68,6 -2,1 76,8
PANTONE 3985 C	0	0	0	0	53,05	59,75	81,32	56,7 -0,7 61,0	56,7 -0,7 61,0
PANTONE 3995 C	63,09	0	0	5,58	0	0	78,94	39,5 -0,2 35,3	39,5 -0,2 35,3
PANTONE 600 C	0,35	0	0	0,05	0	0	31,08	92,1 -5,5 38,7	92,1 -5,5 38,7
PANTONE 601 C	0,61	0	0,03	0	0	0	37,52	91,5 -6,0 43,6	91,5 -6,0 43,6
PANTONE 602 C	0,68	0	0,02	0	0	0	50,24	90,9 -6,7 53,0	90,9 -6,7 53,0
PANTONE 603 C	1,72	0	0	0,13	0	0	65,39	88,5 -7,0 70,6	88,5 -7,0 70,6
PANTONE 604 C	2,35	0	0	0,5	0	0	75,63	86,6 -6,4 80,4	86,6 -6,4 80,4
PANTONE 605 C	4,2	0	0	1,39	0	0	97,09	82,1 -4,6 88,2	82,1 -4,6 88,2
PANTONE 606 C	0	0	0	0	12,5	21,17	100	74,3 -1,1 88,4	74,6 -0,8 83,7
PANTONE 607 C	1,57	0	0	0,21	0	0	31,15	90,0 -5,0 37,0	90,0 -5,0 37,0
PANTONE 608 C	2,27	0	0	0,1	0	0	42,23	88,7 -5,8 44,9	88,7 -5,8 44,9
PANTONE 609 C	2,81	0	0	0,15	0	0	51,29	87,5 -6,2 50,8	87,5 -6,2 50,8
PANTONE 610 C	4,26	0	0	0,33	0	0	63,21	84,5 -6,3 62,4	84,5 -6,3 62,4
PANTONE 611 C	7,22	0	0	0,87	0	0	77,16	79,9 -5,6 73,8	79,9 -5,6 73,8
PANTONE 612 C	0	0	0	0	19,73	24,42	99,42	72,0 -3,0 79,9	72,0 -3,0 79,9
PANTONE 613 C	0	0	0	0	35,08	44,97	100	64,7 -0,4 75,4	64,8 -0,3 73,6
PANTONE 461 C	1,9	0	0	0,9	0	0	32,21	88,5 -3,5 36,4	88,5 -3,5 36,4
PANTONE 460 C	3,03	0	0	1,33	0	0	46,29	85,7 -3,3 45,1	85,7 -3,3 45,1
PANTONE 459 C	4,41	0	0	1,98	0	0	58,9	82,3 -2,7 54,0	82,3 -2,7 54,0
PANTONE 458 C	5,77	0	0	2,28	0	0	62,55	80,1 -2,4 57,0	80,1 -2,4 57,0
PANTONE 457 C	19,89	0	0	6,87	0	0	84,47	65,9 2,0 64,5	65,9 2,0 64,5
PANTONE 456 C	36,25	0	0	6,59	0	0	77,51	59,6 0,8 52,9	59,6 0,8 52,9
PANTONE 455 C	62,67	0	0	10,7	0	0	75,69	39,2 1,5 33,0	39,2 1,5 33,0
PANTONE 614 C	4,65	0	0	0,57	0	0	26,62	84,9 -3,7 29,9	84,9 -3,7 29,9
PANTONE 615 C	6,94	0	0	0,62	0	0	34,15	82,4 -3,9 33,3	82,4 -3,9 33,3
PANTONE 616 C	9,29	0	0	0,73	0	0	39,84	80,1 -4,0 35,6	80,1 -4,0 35,6
PANTONE 617 C	16,25	0	0	1,26	0	0	56,62	73,4 -3,9 43,7	73,4 -3,9 43,7
PANTONE 618 C	31,78	0	0	2,24	0	0	68,65	65,1 -3,2 51,0	65,1 -3,2 51,0
PANTONE 619 C	39,78	0	0	3,17	0	0	77,16	60,0 -2,5 53,2	60,0 -2,5 53,2
PANTONE 620 C	51,48	0	0	4,64	0	0	84,85	51,8 -1,1 50,7	51,8 -1,1 50,7
PANTONE 7751 C	10,68	0	0	3,43	0	0	64,78	74,3 -0,8 55,1	74,3 -0,8 55,1
PANTONE 7752 C	8,55	0	0	6,17	0	0	80,07	73,0 2,7 68,6	73,0 2,7 68,6
PANTONE 7753 C	13,95	0	0	8,88	0	0	82,88	67,6 4,2 64,8	67,6 4,2 64,8
PANTONE 7754 C	37,27	0	0	11,33	0	0	78,22	57,2 3,6 50,9	57,2 3,6 50,9
PANTONE 7755 C	51,62	0	0	9,1	0	0	71,2	50,5 1,7 40,3	50,5 1,7 40,3
PANTONE 7756 C	59,75	0	0	5,9	0	0	63,41	43,7 0,4 29,4	43,7 0,4 29,4
PANTONE 7757 C	63,44	0	0	4,15	0	0	62,28	39,9 -0,2 25,7	39,9 -0,2 25,7
PANTONE 7758 C	7,9	0	0	1,37	0	0	84,32	78,4 -4,8 77,7	78,4 -4,8 77,7
PANTONE 7759 C	13,99	0	0	2,14	0	0	93,49	72,4 -3,6 75,1	72,4 -3,6 75,1
PANTONE 7760 C	48,08	0	0	3,35	0	0	74,9	55,3 -2,1 46,9	55,3 -2,1 46,9
PANTONE 7761 C	58,44	0	1,12	0	0	0	65,08	47,1 -4,7 32,5	47,1 -4,7 32,5
PANTONE 7762 C	60,48	0	13,41	0	0	0	62,18	40,8 -7,8 22,9	40,8 -7,8 22,9
PANTONE 7763 C	63,85	0	8,22	0	0	0	56,48	37,9 -5,4 18,2	37,9 -5,4 18,2
PANTONE 7764 C	66,87	0	4,85	0	0	0	57,03	35,1 -4,1 17,7	35,1 -4,1 17,7
PANTONE 7765 C	18,58	0	0,74	0	0	0	79,67	71,9 -7,5 66,5	71,9 -7,5 66,5
PANTONE 7766 C	26,46	0	0	0,67	0	0	80,95	68,6 -5,7 64,6	68,6 -5,7 64,6
PANTONE 7767 C	33,31	0	0	1,96	0	0	74,81	64,4 -3,8 55,7	64,4 -3,8 55,7
PANTONE 7768 C	50,19	0	0	4,55	0	0	68,94	53,4 -0,7 41,3	53,4 -0,7 41,3
PANTONE 7769 C	60,65	0	0	9,85	0	0	63,28	42,0 1,9 27,9	42,0 1,9 27,9
PANTONE 7770 C	64,82	0	0	4,37	0	0	55,91	38,3 0,4 20,6	38,3 0,4 20,6
PANTONE 7771 C	72,36	0	0,28	0	0	0	47,92	31,2 -1,2 14,0	31,2 -1,2 14,0
PANTONE 4545 C	6,02	0	0	1,94	0	0	18,86	81,6 -0,6 22,9	81,6 -0,6 22,9
PANTONE 4535 C	8,45	0	0	2,1	0	0	26,34	79,1 -0,7 26,0	79,1 -0,7 26,0
PANTONE 4525 C	12,63	0	0	2,77	0	0	34,89	74,8 -0,0 28,5	74,8 -0,0 28,5
PANTONE 4515 C	24,26	0	0	4,01	0	0	48,3	67,5 0,7 32,4	67,5 0,7 32,4
PANTONE 4505 C	41,91	0	0	8,54	0	0	63,97	56,5 2,3 38,3	56,5 2,3 38,3

PANTONE 4495 C	50,24	0	0	11,73	0	0	69,91	51,0 3,2 39,8	51,0 3,2 39,8
PANTONE 4485 C	65	0	0	19,44	0	0	70,08	35,0 4,5 27,5	35,0 4,5 27,5
PANTONE 454 C	9,13	0	0	1,07	0	0	10,54	79,8 -1,5 16,1	79,8 -1,5 16,1
PANTONE 453 C	13,74	0	0	1,3	0	0	15,28	75,5 -1,4 18,1	75,5 -1,4 18,1
PANTONE 452 C	25,97	0	0	1,75	0	0	31,77	69,1 -1,5 23,1	69,1 -1,5 23,1
PANTONE 451 C	40,39	0	0	2,64	0	0	48,93	60,9 -1,4 28,5	60,9 -1,4 28,5
PANTONE 450 C	67,47	0	0	18,96	0	0	67,8	32,5 4,2 23,9	32,5 4,2 23,9
PANTONE 449 C	70,05	0	0	14,77	0	0	65,24	30,5 2,9 20,6	30,5 2,9 20,6
PANTONE 448 C	73,24	0	0	8,94	0	0	57,33	28,2 2,1 15,7	28,2 2,1 15,7
PANTONE 7499 C	0,31	0	0	0	0	1,97	14,14	91,1 -1,1 26,5	91,1 -1,1 26,5
PANTONE 7500 C	3,28	0	0	2,65	0	0	17,09	84,3 1,0 22,8	84,3 1,0 22,8
PANTONE 7501 C	4,57	0	0	3,48	0	0	19,86	81,2 2,3 23,4	81,2 2,3 23,4
PANTONE 7502 C	8,33	0	0	4,8	0	0	32,51	75,9 3,8 27,6	75,9 3,8 27,6
PANTONE 7503 C	31,75	0	0	4,81	0	0	44,88	63,7 1,8 27,8	63,7 1,8 27,8
PANTONE 7504 C	43,56	0	0	19,22	0	0	40,59	52,9 8,9 19,4	52,9 8,9 19,4
PANTONE 7505 C	53,45	0	0	35,61	0	0	57,95	43,9 11,3 24,3	43,9 11,3 24,3
PANTONE 468 C	3,46	0	0	3,78	0	0	17,08	82,5 3,2 21,8	82,5 3,2 21,8
PANTONE 467 C	5,66	0	0	5,74	0	0	29,95	77,4 5,2 26,8	77,4 5,2 26,8
PANTONE 466 C	9,58	0	0	9,75	0	0	41,23	71,2 7,2 30,5	71,2 7,2 30,5
PANTONE 465 C	14,91	0	0	16,25	0	0	55,99	64,8 9,7 36,3	64,8 9,7 36,3
PANTONE 464 C	46,9	0	0	49,88	0	0	76,29	43,7 18,9 36,6	43,7 18,9 36,6
PANTONE 463 C	57,79	0	0	47,92	0	0	71,35	37,3 14,7 29,2	37,3 14,7 29,2
PANTONE 462 C	66,34	0	0	35,65	0	0	62,11	31,8 8,2 20,2	31,8 8,2 20,2
PANTONE 7506 C	0,82	0	0	0	0	4,36	9,42	88,5 3,7 22,8	88,5 3,7 22,8
PANTONE 7507 C	0	0	0	0	0	10,73	17,43	87,2 10,3 34,3	86,5 9,9 34,0
PANTONE 7508 C	2,33	0	0	10,64	0	0	41,7	77,6 10,4 35,2	77,6 10,4 35,2
PANTONE 7509 C	4,23	0	0	19,18	0	0	57,16	71,3 14,1 42,4	71,3 14,1 42,4
PANTONE 7510 C	8,86	0	0	34,99	0	0	68,8	62,7 19,3 49,0	62,7 19,3 49,0
PANTONE 7511 C	14,73	0	0	43,37	0	0	80,36	56,5 21,6 51,8	56,5 21,6 51,8
PANTONE 7512 C	28,4	0	0	52,12	0	0	92,56	49,4 24,3 50,3	49,4 24,3 50,3
PANTONE 719 C	2,48	0	0	0	0	10,83	7,67	83,3 10,0 24,0	83,3 10,0 24,0
PANTONE 720 C	0,73	0	0	13,68	0	0	34,08	78,3 13,8 30,2	78,3 13,8 30,2
PANTONE 721 C	2,33	0	0	23,22	0	0	49,64	72,3 17,8 36,7	72,3 17,8 36,7
PANTONE 722 C	7,72	0	0	41,25	0	0	67,66	61,4 23,5 46,3	61,4 23,5 46,3
PANTONE 723 C	17,36	0	0	50,72	0	0	84,25	52,7 26,5 50,7	52,7 26,5 50,7
PANTONE 724 C	44,17	11,6	0	0	0	96,59	0	41,4 27,5 46,5	41,4 27,5 46,5
PANTONE 725 C	46,58	37,88	0	0	0	99,27	0	34,9 25,2 37,3	34,9 25,2 37,3
PANTONE 475 C	0,96	0	0	0	0	9,7	3,84	86,0 10,3 19,2	86,0 10,3 19,2
PANTONE 474 C	1,62	0	0	0	0	14,52	4,16	83,5 13,0 22,4	83,5 13,0 22,4
PANTONE 473 C	2,16	0	0	0	0	19,79	4,64	81,4 15,5 25,7	81,4 15,5 25,7
PANTONE 472 C	0,33	0	0	0	5,87	56,11	0	71,9 24,4 37,2	71,9 24,4 37,2
PANTONE 471 C	10,25	16,59	0	0	0	82,34	0	51,7 34,1 49,4	51,7 34,1 49,4
PANTONE 470 C	31,77	10,03	0	0	0	77,52	0	47,2 28,7 41,4	47,2 28,7 41,4
PANTONE 469 C	64,05	4,6	0	0	0	72,2	0	31,6 17,4 25,2	31,6 17,4 25,2
PANTONE 726 C	2,37	0	0	7,62	0	0	18,94	80,2 8,4 21,8	80,2 8,4 21,8
PANTONE 727 C	3,76	0	0	10,83	0	0	27,53	76,1 10,6 24,6	76,1 10,6 24,6
PANTONE 728 C	6,89	0	0	18,14	0	0	40,14	69,8 13,2 29,0	69,8 13,2 29,0
PANTONE 729 C	17,1	0	0	34,34	0	0	59,47	58,9 17,0 35,3	58,9 17,0 35,3
PANTONE 730 C	35,19	0	0	47,33	0	0	75,8	48,9 20,0 41,2	48,9 20,0 41,2
PANTONE 731 C	61,93	0	0	0	1,31	89,25	0	34,5 21,0 38,0	34,5 21,0 38,0
PANTONE 732 C	63,24	20,82	0	0	0	98,83	0	27,9 19,4 30,7	27,9 19,4 30,7
PANTONE 4685 C	2,57	0	0	5,71	0	0	10,73	81,7 7,1 16,0	81,7 7,1 16,0
PANTONE 4675 C	3,27	0	0	7,11	0	0	12,9	79,6 8,2 16,8	79,6 8,2 16,8
PANTONE 4665 C	7,1	0	0	13,74	0	0	27,33	71,7 11,4 22,1	71,7 11,4 22,1
PANTONE 4655 C	11,95	0	0	22,98	0	0	36,27	65,0 14,1 23,8	65,0 14,1 23,8
PANTONE 4645 C	23,51	0	0	35,47	0	0	52,03	56,8 16,7 28,0	56,8 16,7 28,0
PANTONE 4635 C	41,64	0	0	48,27	0	0	67,12	46,3 19,5 32,7	46,3 19,5 32,7
PANTONE 4625 C	67,96	35,34	0	0	0	78,45	0	22,6 15,5 17,3	22,6 15,5 17,3
PANTONE 7513 C	4,59	0,59	0	0	0	17,52	0	78,2 14,0 14,6	78,2 14,0 14,6
PANTONE 7514 C	4	0	0	22,41	0	0	29,33	71,2 17,1 22,8	71,2 17,1 22,8
PANTONE 7515 C	8,41	0	0	34,73	0	0	45,83	63,5 20,3 28,5	63,5 20,3 28,5
PANTONE 7516 C	36,23	14,12	0	0	0	76,81	0	44,2 27,0 37,4	44,2 27,0 37,4
PANTONE 7517 C	33,02	45,72	0	0	0	91,5	0	37,1 27,7 35,6	37,1 27,7 35,6
PANTONE 7518 C	59,24	9,05	0	0	0	47,44	0	36,9 12,7 10,0	36,9 12,7 10,0
PANTONE 7519 C	66,02	0	0	24,75	0	0	39,26	33,7 6,9 12,1	33,7 6,9 12,1
PANTONE 4755 C	4,2	0	0	4,71	0	0	4,82	80,5 6,6 8,8	80,5 6,6 8,8

PANTONE 4745 C	6,83	0	0	7,86	0	0	7,52	75,6 8,5 10,4	75,6 8,5 10,4
PANTONE 4735 C	11,65	0	0	12,49	0	0	13,31	69,3 10,4 13,1	69,3 10,4 13,1
PANTONE 4725 C	31,4	0,64	0	0	0	30,72	0	60,8 13,6 14,6	60,8 13,6 14,6
PANTONE 4715 C	44,78	3,16	0	0	0	50,27	0	49,8 16,6 18,2	49,8 16,6 18,2
PANTONE 4705 C	48,7	24,46	0	0	0	65,03	0	38,3 20,6 20,1	38,3 20,6 20,1
PANTONE 4695 C	61,08	40,22	0	0	0	71,18	0	26,7 18,3 16,3	26,7 18,3 16,3
PANTONE 482 C	3,38	0	0	4,54	0	0	6,45	81,8 6,1 11,2	81,8 6,1 11,2
PANTONE 481 C	4,91	0	0	7,23	0	0	9,11	77,5 8,1 12,8	77,5 8,1 12,8
PANTONE 480 C	8,76	0	0	11,65	0	0	17,13	71,6 10,3 16,2	71,6 10,3 16,2
PANTONE 479 C	24,06	0	0	33,66	0	0	39,02	57,5 16,3 21,0	57,5 16,3 21,0
PANTONE 478 C	49,2	45,46	0	0	0	76,78	0	32,8 23,1 22,6	32,8 23,1 22,6
PANTONE 477 C	60,52	27,29	0	0	0	68,68	0	29,6 17,9 18,3	29,6 17,9 18,3
PANTONE 476 C	71,77	4,43	0	0	0	60,15	0	25,5 11,0 13,0	25,5 11,0 13,0
PANTONE 7527 C	5	0	0	1,18	0	0	3,77	84,3 -0,0 7,4	84,3 -0,0 7,4
PANTONE 7528 C	11,09	0	0	3,17	0	0	5,04	76,1 2,8 8,4	76,1 2,8 8,4
PANTONE 7529 C	18,25	0	0	4,11	0	0	7,5	70,3 3,4 9,6	70,3 3,4 9,6
PANTONE 7530 C	33,37	0	0	6,12	0	0	12,59	62,2 4,1 11,2	62,2 4,1 11,2
PANTONE 7531 C	56,77	0	0	13,43	0	0	31,67	45,4 5,5 13,5	45,4 5,5 13,5
PANTONE 7532 C	64,31	0	0	19,5	0	0	45,91	35,9 6,1 14,5	35,9 6,1 14,5
PANTONE 7533 C	74,88	0	0	30,42	0	0	53,12	24,7 5,7 12,1	24,7 5,7 12,1
PANTONE 7534 C	6,96	0	0	1,29	0	0	4,19	82,2 0,0 8,1	82,2 0,0 8,1
PANTONE 7535 C	19	0	0	1,92	0	0	8,35	72,0 0,1 11,3	72,0 0,1 11,3
PANTONE 7536 C	31,96	0	0	2,41	0	0	13,35	65,7 0,2 13,1	65,7 0,2 13,1
PANTONE 7537 C	24,45	0	2,08	0	0	0	4,36	69,8 -3,2 4,5	69,8 -3,2 4,5
PANTONE 7538 C	36,76	0	3,13	0	0	0	5,68	62,9 -3,8 4,3	62,9 -3,8 4,3
PANTONE 7539 C	46,47	0	0,47	0	0	0	2,91	59,4 -1,3 3,2	59,4 -1,3 3,2
PANTONE 7540 C	67,49	3,86	7,68	0	0	0	0	33,4 -0,6 -3,7	33,4 -0,6 -3,7
PANTONE 427 C	5,71	0,11	0,41	0	0	0	0	84,4 -0,9 -1,1	84,4 -0,9 -1,1
PANTONE 428 C	9,43	0,19	1,19	0	0	0	0	79,5 -1,3 -2,1	79,5 -1,3 -2,1
PANTONE 429 C	25,7	0,31	2,36	0	0	0	0	69,0 -1,8 -3,1	69,0 -1,8 -3,1
PANTONE 430 C	47,15	1,01	5,22	0	0	0	0	55,4 -2,6 -5,5	55,4 -2,6 -5,5
PANTONE 431 C	59,59	2,32	13,55	0	0	0	0	42,6 -2,9 -7,0	42,6 -2,9 -7,0
PANTONE 432 C	71,26	5,3	35,38	0	0	0	0	25,7 -2,8 -7,7	25,7 -2,8 -7,7
PANTONE 433 C	82,89	16,22	45,9	0	0	0	0	14,3 -1,9 -6,4	14,3 -1,9 -6,4
PANTONE 420 C	9,4	0	0	0,29	0	0	0,52	80,7 -0,4 0,4	80,7 -0,4 0,4
PANTONE 421 C	21,28	0	0,06	0	0	0	0,48	73,1 -0,7 0,3	73,1 -0,7 0,3
PANTONE 422 C	34,31	0,49	0	0	0,57	0	0	66,2 -0,8 -0,7	66,2 -0,8 -0,7
PANTONE 423 C	47,8	0,09	1,31	0	0	0	0	58,2 -1,0 -1,1	58,2 -1,0 -1,1
PANTONE 424 C	58,58	0,12	1,21	0	0	0	0	48,0 -0,6 -0,3	48,0 -0,6 -0,3
PANTONE 425 C	65,79	1,35	4,46	0	0	0	0	36,9 -1,0 -1,9	36,9 -1,0 -1,9
PANTONE 426 C	86,89	5,86	26,32	0	0	0	0	15,8 -0,8 -2,3	15,8 -0,8 -2,3
PANTONE 441 C	7,74	0	3,17	0	0	0	2,27	79,1 -3,6 -0,3	79,1 -3,6 -0,3
PANTONE 442 C	24,2	0,36	0	0	3,79	0	0	69,6 -4,6 -1,2	69,6 -4,6 -1,2
PANTONE 443 C	34,09	1,1	0	0	4,95	0	0	63,6 -5,2 -1,9	63,6 -5,2 -1,9
PANTONE 444 C	52,43	2,74	0	0	10,83	0	0	51,1 -5,3 -2,4	51,1 -5,3 -2,4
PANTONE 445 C	65,22	4,75	0	0	17,82	0	0	36,5 -4,2 -2,1	36,5 -4,2 -2,1
PANTONE 446 C	73,17	2,91	0	0	21,47	0	0	28,5 -3,7 -0,3	28,5 -3,7 -0,3
PANTONE 447 C	77,31	0	19,08	0	0	0	14,32	23,9 -2,3 1,6	23,9 -2,3 1,6
PANTONE 413 C	16,55	0	0	0,08	0	0	2,9	75,5 -1,3 4,7	75,5 -1,3 4,7
PANTONE 414 C	30,52	0	0	0,02	0	0	3,52	69,0 -1,5 5,3	69,0 -1,5 5,3
PANTONE 415 C	43,7	0	1,03	0	0	0	4,65	60,5 -2,1 5,2	60,5 -2,1 5,2
PANTONE 416 C	54,06	0	0,94	0	0	0	5,57	52,8 -1,8 5,5	52,8 -1,8 5,5
PANTONE 417 C	61,91	0	2,29	0	0	0	10,11	43,0 -2,1 5,4	43,0 -2,1 5,4
PANTONE 418 C	68,17	0	4,35	0	0	0	14,3	34,9 -2,2 4,9	34,9 -2,2 4,9
PANTONE 419 C	95,28	0,54	25,61	0	0	0	0	13,4 -1,0 0,4	13,4 -1,0 0,4
PANTONE 400 C	11,17	0	0	1,85	0	0	3,17	77,5 1,0 5,0	77,5 1,0 5,0
PANTONE 401 C	24,28	0	0	2,36	0	0	3,96	69,7 1,3 5,7	69,7 1,3 5,7
PANTONE 402 C	37,52	0	0	3,01	0	0	4,59	62,5 1,6 5,9	62,5 1,6 5,9
PANTONE 403 C	48,67	0	0	3,53	0	0	5,53	55,9 1,8 6,1	55,9 1,8 6,1
PANTONE 404 C	57,05	0	0	4,56	0	0	9,36	47,2 2,3 6,8	47,2 2,3 6,8
PANTONE 405 C	61,78	0	0	4,8	0	0	10,11	41,7 2,3 6,3	41,7 2,3 6,3
PANTONE Black C	89,65	1,49	1,58	0	0	0	0	17,1 1,3 2,5	17,1 1,3 2,5
PANTONE 406 C	10,62	0	0	2,8	0	0	2,6	76,8 2,5 3,7	76,8 2,5 3,7
PANTONE 407 C	21,41	0	0	3,83	0	0	3,2	69,5 3,5 4,2	69,5 3,5 4,2
PANTONE 408 C	42,61	0,69	0	0	0	6,13	0	59,1 4,4 3,9	59,1 4,4 3,9
PANTONE 409 C	53,05	0,78	0	0	0	9,01	0	51,7 4,8 4,5	51,7 4,8 4,5

PANTONE 410 C	59,57	1,44	0	0	0	13,27	0	44,6 5,5 4,8	44,6 5,5 4,8
PANTONE 411 C	66,17	2,75	0	0	0	16,94	0	35,8 5,7 4,4	35,8 5,7 4,4
PANTONE 412 C	81,48	4,22	0	0	0	14	0	20,3 4,2 2,7	20,3 4,2 2,7
PANTONE 434 C	5,67	1,97	0	0	0	3,12	0	80,3 4,1 1,0	80,3 4,1 1,0
PANTONE 435 C	10,12	3,09	0	0	0	3,9	0	74,1 5,3 0,4	74,1 5,3 0,4
PANTONE 436 C	22,11	4,62	0	0	0	5,58	0	64,8 6,8 0,4	64,8 6,8 0,4
PANTONE 437 C	54,15	8,5	0	0	0	15,43	0	44,9 8,5 1,3	44,9 8,5 1,3
PANTONE 438 C	67,07	8,61	0	0	0	24,12	0	31,3 7,8 2,6	31,3 7,8 2,6
PANTONE 439 C	75,28	6,76	0	0	0	24,15	0	24,3 6,3 3,1	24,3 6,3 3,1
PANTONE 440 C	82,13	3,89	0	0	0	14,11	0	20,0 4,2 2,9	20,0 4,2 2,9
PANTONE Warm Gray 1 C	4,46	0	0	1,69	0	0	2,39	84,5 1,2 4,0	84,5 1,2 4,0
PANTONE Warm Gray 2 C	8,4	0	0	2,17	0	0	2,95	79,6 1,7 4,7	79,6 1,7 4,7
PANTONE Warm Gray 3 C	13,1	0	0	2,6	0	0	3,39	75,1 2,0 5,1	75,1 2,0 5,1
PANTONE Warm Gray 4 C	18,81	0	0	2,96	0	0	3,74	71,4 2,3 5,4	71,4 2,3 5,4
PANTONE Warm Gray 5 C	26,9	0	0	3,39	0	0	4,06	67,6 2,6 5,5	67,6 2,6 5,5
PANTONE Warm Gray 6 C	31,73	0	0	3,69	0	0	4,16	65,1 2,7 5,4	65,1 2,7 5,4
PANTONE Warm Gray 7 C	42,02	0	0	4,6	0	0	4,9	59,0 3,1 5,8	59,0 3,1 5,8
PANTONE Warm Gray 8 C	48,16	0	0	5,15	0	0	5,83	55,1 3,4 6,1	55,1 3,4 6,1
PANTONE Warm Gray 9 C	52,52	0	0	6,36	0	0	7,22	51,3 3,6 6,2	51,3 3,6 6,2
PANTONE Warm Gray 10 C	56,1	0	0	7,78	0	0	9,12	47,3 3,9 6,4	47,3 3,9 6,4
PANTONE Warm Gray 11 C	60,35	0	0	9,78	0	0	11,57	42,5 4,1 6,7	42,5 4,1 6,7
PANTONE Cool Gray 1 C	4,03	0	0	0,63	0	0	0,86	86,7 -0,1 1,0	86,7 -0,1 1,0
PANTONE Cool Gray 2 C	6,57	0	0	0,59	0	0	0,76	83,4 -0,1 0,8	83,4 -0,1 0,8
PANTONE Cool Gray 3 C	9,01	0	0	0,54	0	0	0,49	80,8 -0,1 0,4	80,8 -0,1 0,4
PANTONE Cool Gray 4 C	14,44	0,16	0	0	0	0,38	0	76,2 -0,2 -0,2	76,2 -0,2 -0,2
PANTONE Cool Gray 5 C	21,47	0,15	0	0,31	0	0	0	72,6 -0,2 -0,5	72,6 -0,2 -0,5
PANTONE Cool Gray 6 C	28,84	0,86	0,08	0	0	0	0	68,9 -0,2 -1,1	68,9 -0,2 -1,1
PANTONE Cool Gray 7 C	38,55	1,18	0,42	0	0	0	0	63,1 -0,2 -1,4	63,1 -0,2 -1,4
PANTONE Cool Gray 8 C	47,01	1,6	0,92	0	0	0	0	57,6 -0,2 -1,8	57,6 -0,2 -1,8
PANTONE Cool Gray 9 C	55,05	2,19	1,81	0	0	0	0	50,2 -0,2 -2,4	50,2 -0,2 -2,4
PANTONE Cool Gray 10 C	60,83	2,85	2,95	0	0	0	0	42,9 -0,2 -2,8	42,9 -0,2 -2,8
PANTONE Cool Gray 11 C	65,43	3,54	4,31	0	0	0	0	36,4 -0,3 -3,1	36,4 -0,3 -3,1
PANTONE Black 2 C	85,67	0	1,25	0	0	0	46,42	19,4 0,3 9,8	19,4 0,3 9,8
PANTONE Black 3 C	88,71	0	45,2	0	0	0	36,65	14,9 -4,1 2,7	14,9 -4,1 2,7
PANTONE Black 4 C	89,55	0	0	14,87	0	0	48,19	16,2 4,1 8,1	16,2 4,1 8,1
PANTONE Black 5 C	72,15	37,22	0	0	0	48,37	0	19,9 10,1 1,4	19,9 10,1 1,4
PANTONE Black 6 C	96,03	39	61,34	0	0	0	0	7,9 -1,9 -7,0	7,9 -1,9 -7,0
PANTONE Black 7 C	79,34	0	0	1,28	0	0	1,2	24,2 1,3 2,9	24,2 1,3 2,9
PANTONE 2337 C	0	0	0	4,02	0	12,21	0	83,1 20,5 12,5	81,8 18,9 12,4
PANTONE 2338 C	3,85	0	0	8,36	0	17,73	0	73,0 22,8 12,9	73,0 22,8 12,9
PANTONE 2339 C	0	0	0	20,75	0	26,19	0	71,7 36,5 17,7	70,9 34,2 17,4
PANTONE 2340 C	4,5	0	0	44,09	0	29,17	0	59,1 40,2 14,7	59,1 40,2 14,7
PANTONE 2341 C	16,45	0	0	36,63	0	32,14	0	54,7 31,1 13,8	54,7 31,1 13,8
PANTONE 2342 C	13,36	0	0	52,22	0	33,23	0	50,8 40,1 13,1	50,8 40,1 13,1
PANTONE 2343 C	23,57	0	0	54,36	0	22,09	0	47,7 36,9 8,0	47,7 36,9 8,0
PANTONE 2344 C	0	0	0	23,32	0	49,43	0	67,3 43,6 31,0	67,0 42,2 30,6
PANTONE 2345 C	0	0	0	30,75	0	52,76	0	67,3 59,7 35,4	64,5 45,5 32,1
PANTONE 2346 C	0	0	0	44,86	0	49,34	0	64,1 67,2 31,7	60,5 50,1 27,7
PANTONE 2347 C	0	0	0	67,2	0	100	10	49,4 75,1 67,2	49,1 70,0 63,8
PANTONE 2348 C	0	0	0	50,52	0	59,38	0	57,6 58,2 36,5	57,2 56,4 35,9
PANTONE 2349 C	6,21	0	0	57,78	0	100	0	47,8 59,4 59,9	47,9 58,8 58,7
PANTONE 2350 C	16,72	0	0	68,21	0	83,42	0	40,4 57,0 43,5	40,4 57,0 43,5
PANTONE 2351 C	0	23,67	0	35,05	0	0	0	60,3 34,4 -18,2	58,8 27,9 -13,0
PANTONE 2352 C	0	31,82	0	45,32	0	0	0	54,4 40,8 -20,1	53,0 33,2 -14,2
PANTONE 2353 C	0	0	12,5	62,69	0	0	0	51,8 55,6 -23,2	49,8 42,0 -12,3
PANTONE 2354 C	0,78	56,45	0	48,29	0	0	0	43,9 36,2 -21,0	43,9 36,2 -21,0
PANTONE 2355 C	0	0	44,81	95,57	0	0	0	32,0 57,0 -28,8	31,3 49,8 -23,0
PANTONE 2356 C	0	62,47	10	98,91	0	0	0	25,4 52,5 -23,2	25,3 52,0 -22,9
PANTONE 2357 C	56,5	26,4	0	84,86	0	0	0	22,7 39,6 -8,4	22,7 39,6 -8,4
PANTONE 2358 C	16,31	3,76	0	3,2	0	0	0	68,3 5,3 -4,3	68,3 5,3 -4,3
PANTONE 2359 C	44,22	13,19	0	4,52	0	0	0	50,1 7,6 -7,6	50,1 7,6 -7,6
PANTONE 2360 C	39,32	19,95	1,71	0	0	0	0	51,5 4,8 -11,4	51,5 4,8 -11,4
PANTONE 2361 C	38,18	26,37	5	0	0	0	0	48,1 4,9 -15,9	48,1 4,9 -15,9
PANTONE 2362 C	47,35	27,38	2,78	0	0	0	0	45,6 5,2 -12,7	45,6 5,2 -12,7
PANTONE 2363 C	52,96	35,11	2,94	0	0	0	0	40,5 5,9 -13,2	40,5 5,9 -13,2
PANTONE 2364 C	55,9	26,7	0	7,27	0	0	0	39,6 9,4 -9,0	39,6 9,4 -9,0

PANTONE 2366 C	0	58,73	25,24	0	0	0	0	49,4 18,3 -51,1	47,7 14,8 -40,5
PANTONE 2367 C	0	67,03	40,7	0	0	0	0	37,1 23,5 -54,4	36,7 22,0 -50,7
PANTONE 2368 C	0	67,93	40,6	0	0	0	0	37,1 27,6 -61,9	35,9 23,0 -51,4
PANTONE 2369 C	0	70,21	52,23	0	0	0	0	32,6 27,6 -64,6	31,7 24,2 -56,2
PANTONE 2370 C	4,59	79,94	59,44	0	0	0	0	24,1 28,8 -58,8	24,1 28,8 -58,8
PANTONE 2371 C	0	100	58,35	9,52	0	0	0	18,3 42,1 -63,5	18,3 41,7 -63,1
PANTONE 2372 C	33,28	83,25	57,9	0	0	0	0	18,2 26,3 -50,4	18,2 26,3 -50,4
PANTONE 2373 C	26,99	12,49	17,48	0	0	0	0	53,9 -0,4 -18,3	53,9 -0,4 -18,3
PANTONE 2374 C	45,37	25,64	35,11	0	0	0	0	39,8 0,2 -21,8	39,8 0,2 -21,8
PANTONE 2376 C	55,48	17,68	26,37	0	0	0	0	38,2 -0,3 -15,7	38,2 -0,3 -15,7
PANTONE 2377 C	55,81	15,2	52,32	0	0	0	0	33,8 -5,8 -21,3	33,8 -5,8 -21,3
PANTONE 2378 C	57,43	33,61	42,45	0	0	0	0	30,3 0,5 -20,8	30,3 0,5 -20,8
PANTONE 2379 C	64,1	26,25	31,55	0	0	0	0	28,9 0,2 -13,9	28,9 0,2 -13,9
PANTONE 2380 C	68,06	40,22	46,28	0	0	0	0	21,1 0,2 -15,9	21,1 0,2 -15,9
PANTONE 2381 C	0	20,73	42,03	0	0	0	0	59,5 -2,6 -43,2	58,2 -3,5 -36,1
PANTONE 2382 C	0	15,81	60	0	0	0	0	53,9 -10,5 -50,5	53,0 -10,7 -44,2
PANTONE 2383 C	9,2	19,52	59,98	0	0	0	0	46,1 -8,7 -38,8	46,1 -8,7 -38,8
PANTONE 2384 C	12,95	29,9	71,3	0	0	0	0	37,7 -10,4 -44,3	37,7 -10,4 -44,3
PANTONE 2386 C	0	55,07	57,27	0	0	0	0	44,0 5,3 -54,9	43,1 4,2 -48,0
PANTONE 2387 C	0	57,17	60,93	0	0	0	0	41,3 7,2 -61,4	40,1 5,5 -50,8
PANTONE 2388 C	0	60,78	76,47	0	0	0	0	33,5 7,0 -63,2	33,1 6,1 -58,3
PANTONE 2389 C	6,51	0	49,43	0	0,43	0	0	61,2 -17,1 -30,2	61,2 -17,1 -30,2
PANTONE 2390 C	17,29	3,96	61,72	0	0	0	0	48,0 -16,7 -34,4	48,0 -16,7 -34,4
PANTONE 2391 C	20,76	0	60,99	0	5,7	0	0	48,9 -23,0 -29,9	48,9 -23,0 -29,9
PANTONE 2392 C	49,62	0,99	61,66	0	0	0	0	40,1 -16,0 -24,8	40,1 -16,0 -24,8
PANTONE 2393 C	1,65	0	68,81	0	6,41	0	0	53,4 -31,0 -44,5	53,4 -31,0 -44,5
PANTONE 2394 C	1,84	0	79,33	0	1,71	0	0	50,7 -30,8 -50,7	50,7 -30,8 -50,7
PANTONE 2396 C	2,68	0	57,88	0	48,13	0	0	55,1 -40,0 -27,6	55,1 -40,0 -27,6
PANTONE 2397 C	0	0	27,45	0	55,4	0	0	65,4 -45,4 -18,6	64,7 -42,9 -16,7
PANTONE 2398 C	0,84	0	11,75	0	60,23	0	0	66,8 -46,2 -10,8	66,8 -46,2 -10,8
PANTONE 2399 C	0	0	28,69	0	100	0	0	58,8 -67,7 -13,7	58,8 -64,3 -12,6
PANTONE 2400 C	5,65	0	0	0	82,15	1,08	0	61,9 -55,5 -2,7	61,9 -55,5 -2,7
PANTONE 2401 C	14,68	0,51	0	0	60,32	0	0	61,4 -36,1 -3,3	61,4 -36,1 -3,3
PANTONE 2402 C	0	0	47,13	0	89,05	0	17,51	54,2 -62,1 -4,2	54,2 -62,1 -4,2
PANTONE 2403 C	0	0	69,67	0	100	0	27,24	46,4 -67,7 -9,9	46,3 -65,9 -9,7
PANTONE 2404 C	8,68	0	9,82	0	0	0	20,63	72,9 -10,6 11,7	72,9 -10,6 11,7
PANTONE 2406 C	17,55	0	26	0	0	0	31,42	62,3 -13,9 7,9	62,3 -13,9 7,9
PANTONE 2407 C	29,17	0	37,91	0	0	0	43,33	55,3 -16,5 9,1	55,3 -16,5 9,1
PANTONE 2408 C	39	0	52,07	0	0	0	60,23	46,8 -23,0 13,8	46,8 -23,0 13,8
PANTONE 2409 C	56,75	0	42,97	0	0	0	58,49	40,1 -14,5 13,4	40,1 -14,5 13,4
PANTONE 2410 C	60,84	0	45,78	0	0	0	61,14	35,8 -14,3 13,3	35,8 -14,3 13,3
PANTONE 2411 C	67,74	0	64,61	0	0	0	84,62	24,1 -20,8 15,6	24,1 -20,8 15,6
PANTONE 2412 C	0	0	0	0	56,43	0	19,62	76,2 -51,1 17,6	73,9 -45,8 16,1
PANTONE 2413 C	5,59	0	0	0	61,37	0	9,92	66,3 -44,6 8,1	66,3 -44,6 8,1
PANTONE 2414 C	2,33	0	0	0	69,28	0	27,83	66,3 -56,1 16,7	66,3 -56,1 16,7
PANTONE 2416 C	4,86	0	0	0	82,64	0	28,95	62,1 -59,1 15,4	62,1 -59,1 15,4
PANTONE 2417 C	19,01	0	0	0	67,02	0	32,43	57,2 -43,3 15,4	57,2 -43,3 15,4
PANTONE 2418 C	0	0	66,12	0	100	0	79,54	45,2 -75,4 22,8	45,0 -72,7 22,3
PANTONE 2419 C	11,78	0	71,78	0	0	0	66,31	44,2 -46,7 8,1	44,2 -46,7 8,1
PANTONE 2420 C	0	0	0	0	69,54	0	57,41	69,0 -65,8 36,2	67,5 -59,7 33,3
PANTONE 2421 C	0	0	0	0	68,22	2,17	100	64,8 -60,5 69,8	65,3 -56,2 63,5
PANTONE 2422 C	6,36	0	0	0	91,74	0	80,43	58,7 -62,3 46,4	58,7 -62,3 46,4
PANTONE 2423 C	0	0	9,55	0	100	0	97,7	58,5 -74,5 53,2	58,6 -70,5 51,0
PANTONE 2424 C	0	0	0	0	84,82	14,95	100	56,8 -53,6 60,7	57,2 -50,6 56,5
PANTONE 2426 C	0	0	60,28	0	62,41	0	100	48,2 -68,5 43,7	49,6 -63,3 37,6
PANTONE 2427 C	62	0	0	0	100	0	80,98	34,0 -37,6 28,3	34,4 -35,9 27,5
PANTONE 3514 C	0	0	0	0	1,79	28,46	100	79,0 14,4 91,8	79,0 14,4 91,7
PANTONE 3596 C	2,88	0	0	8,71	0	0	32,9	78,4 8,8 29,5	78,4 8,8 29,5
PANTONE 3547 C	9,84	0	0	27,1	0	0	89,03	64,0 14,8 64,5	64,0 14,8 64,5
PANTONE 3588 C	0,66	0	0	0	0	64,53	43,28	73,1 38,2 71,9	73,1 38,2 71,9
PANTONE 3564 C	6,67	0	0	0	0	100	68,33	62,0 49,5 94,1	62,9 42,6 88,5
PANTONE 2428 C	1,46	0	0	43,24	0	0	80,79	65,5 29,1 60,9	65,5 29,1 60,9
PANTONE 2429 C	20,38	0	0	8,99	0	82,51	0	52,8 38,7 54,9	52,8 38,7 54,9
PANTONE 2430 C	3,57	0	0	23,41	0	0	40,07	71,2 17,4 29,7	71,2 17,4 29,7
PANTONE 2431 C	1,54	0	0	36,92	0	0	62,77	68,3 25,0 46,5	68,3 25,0 46,5
PANTONE 2432 C	1,18	0	0	41,67	0	0	59,86	66,8 28,8 41,8	66,8 28,8 41,8

PANTONE 2433 C	7,27	0	0	6,93	0	62,01	0	62,7 36,1 41,0	62,7 36,1 41,0
PANTONE 2434 C	2,87	0	0	20,36	0	56,97	0	63,4 41,4 35,3	63,4 41,4 35,3
PANTONE 2435 C	15,01	0	0	14,24	0	56,21	0	56,7 31,7 28,6	56,7 31,7 28,6
PANTONE 2436 C	19,54	0	0	40,29	0	64,6	0	48,8 40,4 33,9	48,8 40,4 33,9
PANTONE 2437 C	1,88	0	0	0	0	20,33	3,16	81,7 16,1 23,7	81,7 16,1 23,7
PANTONE 2438 C	4,46	1,27	0	0	0	42,19	0	72,8 23,2 26,2	72,8 23,2 26,2
PANTONE 2439 C	7,38	9,31	0	0	0	50,22	0	62,3 23,9 21,6	62,3 23,9 21,6
PANTONE 2440 C	17,7	3,84	0	0	0	23,47	0	63,9 13,6 10,1	63,9 13,6 10,1
PANTONE 2441 C	18,2	14,68	0	0	0	55,64	0	53,0 22,4 19,5	53,0 22,4 19,5
PANTONE 2442 C	8,42	41,63	0	0	0	61,77	0	48,1 26,9 19,0	48,1 26,9 19,0
PANTONE 2443 C	50,11	0	0	49,13	0	77,34	0	36,8 36,4 34,1	36,8 36,4 34,1
PANTONE 3544 C	2,23	0	0	11,73	0	0	11	78,0 13,1 14,5	78,0 13,1 14,5
PANTONE 2444 C	0,28	8,71	0	0	0	27,92	0	73,4 20,5 13,4	73,4 20,5 13,4
PANTONE 3519 C	1,37	0	0	16,94	0	6,93	0	74,4 24,6 5,7	74,4 24,6 5,7
PANTONE 3572 C	0	0	0	16,27	0	20,71	0	76,4 40,0 15,8	73,2 30,9 14,9
PANTONE 2445 C	1,85	0	0	32,56	0	19,88	0	66,5 35,4 12,7	66,5 35,4 12,7
PANTONE 2446 C	5,09	0	0	31,15	0	17,62	0	64,2 31,2 10,4	64,2 31,2 10,4
PANTONE 2447 C	20,16	0	0	37,72	0	18,35	0	54,7 28,1 8,3	54,7 28,1 8,3
PANTONE 2448 C	3,05	0	0	41,34	0	58,41	0	57,9 47,7 33,9	57,9 47,7 33,9
PANTONE 3556 C	0	0	0	54,61	0	70,13	0	55,4 69,7 51,6	54,5 62,3 48,1
PANTONE 3516 C	1,15	0	0	58,65	0	93,37	0	51,2 64,5 60,0	51,2 64,5 60,0
PANTONE 3546 C	1,55	0	0	86,93	0	82,82	0	44,6 72,6 50,9	44,6 72,6 50,9
PANTONE 3517 C	0	6,2	0	100	0	86,04	0	40,4 73,7 48,5	40,6 72,2 47,8
PANTONE 3523 C	7,14	74,8	0	0	0	80,09	0	30,2 32,2 13,7	30,2 32,2 13,7
PANTONE 2449 C	64,66	61,37	0	0	0	69,17	0	19,6 17,8 7,0	19,6 17,8 7,0
PANTONE 3568 C	0	0	0	10	0	0	0	84,7 17,2 -2,6	82,8 15,4 -2,1
PANTONE 3595 C	0	0	0	15,91	0	0	0	82,0 23,1 -4,1	79,7 19,5 -2,1
PANTONE 2450 C	0	0	0,32	67,09	0	0	0	53,6 62,8 -2,7	53,4 61,5 -1,8
PANTONE 3527 C	0	0	3,82	65	0	0	0	53,5 65,1 -15,5	52,0 52,7 -6,1
PANTONE 3582 C	0	0	2,95	52,74	0	0	0	61,1 43,1 -8,9	60,5 40,0 -6,0
PANTONE 2451 C	9,69	0	0	66,79	0	5,22	0	47,2 51,9 1,0	47,2 51,9 1,0
PANTONE 2452 C	4,35	0	0	70,39	0	7,03	0	47,7 60,0 3,3	47,7 60,0 3,3
PANTONE 2453 C	0	25,59	0	8,56	0	0	0	66,8 19,7 -17,9	66,0 17,8 -15,8
PANTONE 3520 C	0	47,43	0	11,67	0	0	0	59,8 32,1 -28,7	57,2 22,6 -21,6
PANTONE 3559 C	0	63,66	0	20,54	0	0	0	45,1 37,8 -35,7	44,1 31,8 -31,4
PANTONE 3593 C	0	57,68	0	7,87	0	0	0	53,6 28,6 -30,7	52,7 25,1 -27,9
PANTONE 3575 C	0	60,31	0	0	0	0	0	54,5 27,2 -37,0	53,5 23,5 -33,5
PANTONE 3543 C	0	50,87	0,09	0	0	0	0	63,0 19,4 -31,5	61,5 17,0 -26,4
PANTONE 3515 C	0	97,77	0	50,11	0	0	0	23,5 50,4 -44,0	23,4 49,2 -43,2
PANTONE 3558 C	0	26,94	12,67	0	0	0	0	65,1 5,5 -30,2	64,3 4,6 -27,1
PANTONE 3555 C	30,9	84,25	0	5,73	0	0	0	24,4 35,3 -40,8	24,4 35,3 -40,8
PANTONE 3583 C	25,12	91,41	1,25	0	0	0	0	24,8 37,9 -46,8	24,8 37,9 -46,8
PANTONE 3574 C	37,73	65,85	1,65	0	0	0	0	34,0 20,1 -29,8	34,0 20,1 -29,8
PANTONE 3566 C	43,97	79,4	4,76	0	0	0	0	24,5 26,5 -37,3	24,5 26,5 -37,3
PANTONE 3535 C	0	100	42,73	28,15	0	0	0	18,9 43,3 -57,6	19,0 42,6 -56,8
PANTONE 3542 C	27,45	98,38	46,91	0	0	0	0	17,7 34,1 -53,8	17,7 34,1 -53,8
PANTONE 3506 C	2,67	51,19	63,93	0	0	0	0	40,0 0,1 -48,6	40,0 0,1 -48,6
PANTONE 3590 C	7,76	57,84	54,54	0	0	0	0	37,7 7,6 -44,0	37,7 7,6 -44,0
PANTONE 3584 C	35,43	62,43	56,8	0	0	0	0	27,6 10,2 -40,1	27,6 10,2 -40,1
PANTONE 3591 C	25,09	77,62	81,3	0	0	0	0	18,5 19,0 -53,9	18,5 19,0 -53,9
PANTONE 3597 C	45,44	62,11	63,66	0	0	0	0	23,9 7,8 -39,3	23,9 7,8 -39,3
PANTONE 3581 C	50,32	63,88	60,85	0	0	0	0	22,4 9,9 -37,8	22,4 9,9 -37,8
PANTONE 3524 C	63,9	65,01	28,22	0	0	0	0	18,8 11,6 -24,1	18,8 11,6 -24,1
PANTONE 3577 C	1,63	1,46	26,74	0	0	0	0	72,8 -10,1 -23,8	72,8 -10,1 -23,8
PANTONE 3545 C	0	0	41,9	0	20	0	0	68,7 -34,9 -33,0	66,0 -28,0 -26,4
PANTONE 3551 C	0	0	59,33	0	53,94	0	0	57,7 -54,5 -36,8	55,8 -45,2 -28,7
PANTONE 3538 C	0,66	0	68,94	0	1,86	0	0	54,7 -28,6 -48,2	54,7 -28,6 -48,2
PANTONE 3553 C	0	20,83	100	0	12,61	0	0	39,9 -25,1 -52,3	39,9 -25,0 -52,1
PANTONE 2454 C	30,99	0,34	58,27	0	0	0	0	48,5 -17,0 -28,0	48,5 -17,0 -28,0
PANTONE 3526 C	22,63	9,81	0	0	18,99	0	0	59,1 -7,1 -8,3	59,1 -7,1 -8,3
PANTONE 2455 C	1,92	0	26,06	0	0	0	14,03	73,1 -16,0 -1,0	73,1 -16,0 -1,0
PANTONE 3533 C	0	0	0	0	45	0	0	79,8 -37,8 -3,2	78,7 -36,0 -3,0
PANTONE 3534 C	0	0	17,8	0	95,13	0	0	61,2 -64,8 -10,8	61,1 -64,2 -10,4
PANTONE 2456 C	1,87	0	59,05	0	0	0	46,03	57,4 -34,6 -1,6	57,4 -34,6 -1,6
PANTONE 3560 C	3,94	0	21,58	0	100	0	0	56,8 -60,8 -10,5	56,8 -60,8 -10,5
PANTONE 3557 C	26,16	0	52,34	0	78,64	0	0	44,0 -45,4 -16,2	44,0 -45,4 -16,2

PANTONE 3541 C	0	0	66,01	0	96,72	0	0	50,0 -61,6 -24,7	49,9 -61,0 -24,3
PANTONE 2457 C	10,55	0	22,57	0	0	0	20,66	66,7 -13,4 4,4	66,7 -13,4 4,4
PANTONE 2458 C	13,04	0	43,1	0	0	0	40,33	58,7 -20,4 5,7	58,7 -20,4 5,7
PANTONE 2459 C	11,64	0	0	0	53,38	0	5,71	65,1 -33,5 4,8	65,1 -33,5 4,8
PANTONE 2460 C	8,42	3,64	0	0	43,81	0	0	66,4 -23,5 -5,9	66,4 -23,5 -5,9
PANTONE 2461 C	11,49	10	0	0	64,12	0	0	55,2 -32,1 -8,7	55,2 -32,1 -8,7
PANTONE 2462 C	42,86	0	0	0	45,22	0	0	54,6 -19,4 -1,8	54,6 -19,4 -1,9
PANTONE 2463 C	57,41	0,29	0	0	28,91	0	0	47,2 -10,7 -1,0	47,2 -10,7 -1,0
PANTONE 2464 C	5,04	0	0	0	45,1	0	45,57	70,4 -33,7 30,5	70,4 -33,7 30,5
PANTONE 2465 C	39,15	0	64,22	0	0	0	86,19	40,5 -36,1 26,1	40,5 -36,1 26,1
PANTONE 3522 C	0	0	63,87	0	71,65	0	96,41	46,9 -69,1 32,0	46,9 -69,1 32,0
PANTONE 3536 C	0	0	99,22	0	70	0	90,8	39,4 -78,1 18,9	39,6 -79,9 19,1
PANTONE 3500 C	21,49	0	84,72	0	0	0	93,73	37,6 -57,9 19,9	37,6 -57,9 19,9
PANTONE 3537 C	61,52	0	81,84	0	0	0	100	24,8 -39,1 16,3	25,1 -38,0 15,2
PANTONE 2466 C	65,67	5,83	0	0	61,01	0	0	31,2 -15,2 -3,1	31,2 -15,2 -3,1
PANTONE 3570 C	0	0	0	0	21,41	0	100	80,3 -30,2 91,7	80,6 -27,9 85,2
PANTONE 3507 C	1,2	0	0	0	22,79	0	100	78,6 -27,8 83,1	78,7 -27,8 82,8
PANTONE 3561 C	1,34	0	0	0	50,47	0	100	71,4 -44,3 74,0	71,6 -43,0 71,7
PANTONE 3501 C	6,57	0	0	0	64,02	0	98,48	62,7 -49,4 60,2	62,7 -49,4 60,2
PANTONE 3529 C	7,84	0	0	0	72,91	0	83,65	59,7 -54,6 50,4	59,7 -54,6 50,4
PANTONE 3539 C	0,3	0	60,28	0	0	0	97,1	56,1 -44,8 44,4	56,1 -44,8 44,4
PANTONE 3508 C	44,07	0	41,57	0	0	0	80,93	47,4 -19,2 35,0	47,4 -19,2 35,0
PANTONE 3599 C	4,42	0	0	4,57	0	0	36,54	79,6 3,7 32,7	79,6 3,7 32,7
PANTONE 2467 C	15,72	0	0	19,54	0	0	41	63,6 11,8 25,7	63,6 11,8 25,7
PANTONE 2468 C	38,9	0	0	43,11	0	0	54,13	49,4 17,6 24,3	49,4 17,6 24,3
PANTONE 2469 C	47,55	7,13	0	0	0	65,77	0	43,8 21,7 27,8	43,8 21,7 27,8
PANTONE 2470 C	39,89	0	0	15,99	0	0	39,76	55,5 8,0 20,0	55,5 8,0 20,0
PANTONE 2471 C	31,03	0	0	16,72	0	0	20,12	59,4 10,0 14,0	59,4 10,0 14,0
PANTONE 2472 C	65,07	0	0	49,47	0	0	64,1	30,5 13,1 19,9	30,5 13,1 19,9
PANTONE 2473 C	9,58	0,05	0	4,37	0	0	0	75,9 5,6 -1,0	75,9 5,6 -1,0
PANTONE 2474 C	22,92	0	0	5,41	0	0	4,84	67,4 5,2 6,6	67,4 5,2 6,6
PANTONE 2475 C	34,85	3,11	0	0	0	19,24	0	58,6 10,4 7,7	58,6 10,4 7,7
PANTONE 2476 C	50,57	7,33	0	0	0	21,76	0	47,7 10,1 4,3	47,7 10,1 4,3
PANTONE 2477 C	58,65	6,44	0	0	0	32,86	0	40,1 10,2 6,6	40,1 10,2 6,6
PANTONE 2478 C	65,94	33,97	0	0	0	45,58	0	25,3 11,5 1,3	25,3 11,5 1,3
PANTONE 2479 C	80,17	1,02	0	0	0	20,31	0	22,7 4,4 5,0	22,7 4,4 5,0
PANTONE 2001 C	0	0	0	0	0	2,68	29,52	91,2 -0,3 38,5	90,5 -0,6 38,3
PANTONE 2002 C	0	0	0	0	0	3,15	46,93	90,3 -0,1 51,3	89,6 -0,5 51,1
PANTONE 2003 C	0	0	0	0	0	2,63	57,93	90,2 -1,6 61,5	89,6 -2,0 61,4
PANTONE 2004 C	0	0	0	0	0	4,57	47,51	89,3 2,8 51,8	88,5 2,3 51,5
PANTONE 2005 C	0	0	0	0	0	7,49	40,79	88,3 6,5 48,0	87,3 5,9 47,5
PANTONE 2006 C	0,5	0	0	10,44	0	0	65,09	79,3 9,7 60,4	79,3 9,7 60,4
PANTONE 2007 C	2,09	0	0	21,73	0	0	80,7	72,3 15,7 68,4	72,3 15,7 68,4
PANTONE 2008 C	2,36	0	0	0	0	18,19	39,83	80,8 12,8 47,0	80,8 12,8 47,0
PANTONE 2009 C	2,69	0	0	0	0	26,85	43,53	78,5 16,7 50,8	78,5 16,7 50,8
PANTONE 2010 C	0	0	0	0	0	45,42	100	79,0 27,3 99,9	77,9 25,1 94,0
PANTONE 2011 C	3,93	0	0	0	0	54,42	55,21	71,7 28,5 63,6	71,7 28,5 63,6
PANTONE 2012 C	3,95	0	0	0	0	58,48	69,59	70,8 30,4 78,0	70,8 30,4 78,0
PANTONE 2013 C	0	0	0	0	0	62,63	91,51	74,8 38,2 95,4	74,2 36,8 93,7
PANTONE 2014 C	32,39	0	0	0	0	66,46	82,16	54,9 25,5 67,4	54,9 25,5 67,4
PANTONE 2015 C	0,18	0	0	0	0	11,58	6,92	86,3 11,4 25,2	86,3 11,4 25,2
PANTONE 2016 C	0	0	0	0	0	37,91	21,55	81,6 25,4 47,5	80,1 23,4 45,5
PANTONE 2017 C	1,53	0	0	0	0	41,32	21,54	77,5 23,8 45,2	77,5 23,8 45,2
PANTONE 2018 C	0	0	0	2,34	0	100	0	68,4 54,3 88,7	68,2 51,5 85,8
PANTONE 2019 C	7,9	3,8	0	0	0	97,66	0	58,5 40,0 69,7	58,5 40,0 69,7
PANTONE 2020 C	23,72	0	0	12,88	0	100	0	50,0 41,1 62,6	50,3 40,3 60,4
PANTONE 2021 C	44,65	0	0	19,99	0	88,45	0	42,2 34,3 46,3	42,2 34,3 46,3
PANTONE 2022 C	0	0	0	2,89	0	40,15	0	77,7 29,1 28,5	77,4 28,4 28,4
PANTONE 2023 C	0	0	0	6,58	0	53,05	0	72,3 38,9 37,3	71,9 37,5 36,9
PANTONE 2024 C	0	0	0	16,17	0	60,87	0	67,3 48,0 44,8	66,7 45,5 43,9
PANTONE 2025 C	0	0	0	1,62	0	68,95	0	72,4 46,4 63,4	71,9 44,2 62,7
PANTONE 2026 C	0	0	0	31,75	0	69,1	0	62,1 57,2 53,6	61,5 53,5 52,1
PANTONE 2027 C	0	0	0	46,84	0	65,89	0	58,6 61,9 46,5	57,8 56,9 44,7
PANTONE 2028 C	0	0	0	54,67	0	99,57	0	54,1 70,3 69,4	53,5 64,5 66,0
PANTONE 2029 C	0	0	0	28,82	0	39,24	0	68,0 45,3 23,4	66,7 40,5 22,6
PANTONE 2030 C	0	0	0	51,83	0	0	36,8	63,2 40,9 22,0	63,2 40,9 22,0

PANTONE 2031 C	2,89	0	0	43,42	0	47,4	0	58,7 45,4 24,6	58,7 45,4 24,6
PANTONE 2032 C	4,12	0	0	49,7	0	54,25	0	54,8 49,3 27,6	54,8 49,3 27,6
PANTONE 2033 C	7,06	0	0	57,37	0	60,77	0	49,5 53,2 31,8	49,5 53,2 31,8
PANTONE 2034 C	0	0	0	58,2	0	64,45	0	54,4 67,7 42,6	53,7 62,1 40,7
PANTONE 2035 C	0	0	0	80,52	0	75,63	15	47,0 73,7 52,7	46,8 72,8 52,2
PANTONE 2036 C	0	0	0	16,19	0	0	0	83,1 24,7 -3,2	79,6 19,6 -2,1
PANTONE 2037 C	0	0	0	41,58	0	0	0	73,5 41,8 -8,7	70,5 33,3 -2,8
PANTONE 2038 C	0	0	0	57,54	0	0	0	62,5 61,3 -4,8	60,2 50,6 -2,7
PANTONE 2039 C	0	0	0	67,27	0	0	1,14	55,1 70,9 0,3	53,6 61,9 0,0
PANTONE 2040 C	0	0	0	84,43	0	0	36,04	49,1 74,3 18,8	48,4 69,7 17,8
PANTONE 2041 C	23,5	0	0	76,65	0	35,14	0	37,9 53,7 9,9	37,9 53,7 9,9
PANTONE 2042 C	3,77	81,1	0	0	0	75,39	0	28,3 34,3 5,7	28,3 34,3 5,7
PANTONE 2043 C	0	0	0	9,67	0	0,62	0	83,1 15,9 -1,3	82,7 15,5 -1,3
PANTONE 2044 C	0	0	0	42,33	0	0	0	71,1 36,9 -3,5	70,0 34,2 -2,8
PANTONE 2045 C	0	0	0	53,33	0	0	0	63,1 46,3 -3,0	62,9 45,8 -3,0
PANTONE 2046 C	2,39	0	0	61,71	0	1,05	0	55,3 52,5 -1,4	55,3 52,5 -1,4
PANTONE 2047 C	23,71	0	0	64,87	0	2,06	0	44,4 43,6 -2,2	44,4 43,6 -2,2
PANTONE 2048 C	35,62	0	0	67,23	0	5,48	0	39,5 42,7 -0,4	39,5 42,7 -0,4
PANTONE 2049 C	49,19	0	0	69,06	0	17,61	0	33,5 40,1 3,2	33,5 40,1 3,2
PANTONE 2050 C	0	0	0	4,96	0	0	0	88,4 10,9 -3,5	86,7 9,9 -1,8
PANTONE 2051 C	1,24	1,23	0	7,78	0	0	0	81,1 12,5 -3,1	81,1 12,5 -3,1
PANTONE 2052 C	3,13	3,87	0	19,43	0	0	0	70,2 19,5 -5,5	70,2 19,5 -5,5
PANTONE 2053 C	7	6,76	0	36,51	0	0	0	59,7 25,0 -7,0	59,7 25,0 -7,0
PANTONE 2054 C	16,58	7,78	0	40,64	0	0	0	53,1 23,7 -7,1	53,1 23,7 -7,1
PANTONE 2055 C	30,41	7,75	0	49,21	0	0	0	46,6 26,0 -7,1	46,6 26,0 -7,1
PANTONE 2056 C	44,67	7,94	0	57,9	0	0	0	38,6 28,4 -6,8	38,6 28,4 -6,8
PANTONE 2057 C	0	6,87	0	30,97	0	0	0	67,9 29,1 -9,2	67,2 26,7 -7,4
PANTONE 2058 C	0,93	15,59	0	30,27	0	0	0	62,2 25,5 -10,9	62,2 25,5 -10,9
PANTONE 2059 C	1,69	12,55	0	40,26	0	0	0	59,5 29,5 -9,3	59,5 29,5 -9,3
PANTONE 2060 C	0	13,73	0	48,61	0	0	0	58,4 44,4 -14,8	56,8 37,1 -9,4
PANTONE 2061 C	0,06	25,36	0	58,76	0	0	0	48,9 44,2 -11,3	48,9 44,2 -11,3
PANTONE 2062 C	0	0	12,03	67,13	0	0	0	47,8 52,1 -15,2	47,2 47,5 -11,7
PANTONE 2063 C	0	0	17,7	79,52	0	0	0	41,6 54,2 -14,4	41,4 53,3 -13,7
PANTONE 2064 C	0	6,91	0	20	0	0	0	74,1 30,8 -15,5	70,8 21,7 -7,8
PANTONE 2065 C	0	9,27	0	12,34	0	0	0	75,6 27,5 -18,2	71,8 18,1 -9,5
PANTONE 2066 C	0	18,05	0	22,25	0	0	0	68,0 35,9 -24,1	64,5 22,6 -12,2
PANTONE 2067 C	0	38,05	0	35,82	0	0	0	57,8 45,8 -30,6	54,5 28,1 -16,5
PANTONE 2068 C	0	54,61	0	43,88	0	0	0	50,3 51,6 -34,5	47,0 33,8 -20,4
PANTONE 2069 C	0	59,2	0	50	0	0	0	44,2 55,3 -36,6	41,7 38,1 -23,1
PANTONE 2070 C	0	65,62	0	55,04	0	0	0	36,2 56,9 -37,8	35,2 41,9 -27,8
PANTONE 2071 C	0	20	0	1,9	0	0	0	75,5 14,7 -19,5	73,2 10,9 -15,3
PANTONE 2072 C	0	35,71	0	3,26	0	0	0	67,1 21,9 -26,4	64,9 15,6 -19,9
PANTONE 2073 C	0	44,94	0	0	0	0	0	66,1 19,4 -27,9	64,0 15,3 -24,1
PANTONE 2074 C	0	61,14	0	2,59	0	0	0	52,2 30,3 -37,4	51,0 25,7 -33,3
PANTONE 2075 C	0	63,42	1,02	0	0	0	0	49,7 27,4 -40,3	49,2 25,9 -37,4
PANTONE 2076 C	0	66,07	0	2,03	0	0	0	46,2 32,8 -41,4	45,7 29,9 -38,7
PANTONE 2077 C	3,01	75,98	0	0,08	0	0	0	36,8 35,7 -45,9	36,8 35,7 -45,9
PANTONE 2078 C	3,46	15,41	0	6,3	0	0	0	67,9 13,8 -12,2	67,9 13,8 -12,2
PANTONE 2079 C	7,86	34,38	0	10,63	0	0	0	56,6 17,5 -15,9	56,6 17,5 -15,9
PANTONE 2080 C	1,08	55,18	0	10,28	0	0	0	53,9 23,6 -24,4	53,9 23,6 -24,4
PANTONE 2081 C	4,02	60,18	0	14,03	0	0	0	46,3 26,5 -27,4	46,3 26,5 -27,4
PANTONE 2082 C	7,92	64	0	17,39	0	0	0	40,5 28,2 -29,2	40,5 28,2 -29,2
PANTONE 2083 C	0	64,95	0	0	0	0	0	50,1 38,6 -46,1	47,9 27,9 -38,5
PANTONE 2084 C	0	75,63	0	4,37	0	0	0	38,4 47,9 -52,5	36,8 38,4 -45,7
PANTONE 2085 C	0	5,4	0	2,87	0	0	0	84,4 10,5 -10,7	81,8 8,0 -7,6
PANTONE 2086 C	0	51,95	0,38	0	0	0	0	61,8 18,7 -30,3	60,9 17,2 -27,0
PANTONE 2087 C	0	58,32	0	0	0	0	0	58,2 26,1 -40,6	56,2 21,4 -31,2
PANTONE 2088 C	0	65,56	2,06	0	0	0	0	47,6 33,0 -50,1	46,2 27,6 -40,3
PANTONE 2089 C	0	71,24	3,58	0	0	0	0	40,7 37,4 -55,6	39,5 32,6 -46,7
PANTONE 2090 C	0	77,39	5,89	0	0	0	0	35,7 40,4 -59,1	34,9 36,6 -51,6
PANTONE 2091 C	0	94,91	23,1	0	0	0	0	24,9 46,3 -64,8	24,7 45,1 -62,5
PANTONE 2092 C	0	26,43	0,2	0	0	0	0	72,5 11,3 -20,0	71,8 10,5 -18,1
PANTONE 2093 C	3,43	33,29	0	0,04	0	0	0	65,3 11,6 -19,1	65,3 11,6 -19,1
PANTONE 2094 C	8,9	46,22	0,61	0	0	0	0	56,0 13,7 -22,6	56,0 13,7 -22,6
PANTONE 2095 C	1,32	62,27	6,32	0	0	0	0	47,5 21,7 -38,2	47,5 21,7 -38,2
PANTONE 2096 C	3,98	68,29	9,86	0	0	0	0	39,2 25,0 -42,6	39,2 25,0 -42,6

PANTONE 2097 C	0	72,42	13,16	0	0	0	0	37,9 34,7 -58,8	36,8 30,5 -49,5
PANTONE 2098 C	0	84,89	32,27	0	0	0	0	27,8 40,9 -65,0	27,4 38,3 -59,6
PANTONE 2099 C	0,56	29,98	0	0,69	0	0	0	69,1 12,0 -18,8	69,1 12,0 -18,8
PANTONE 2100 C	0	46,92	1,78	0	0	0	0	62,6 15,4 -28,0	62,0 14,6 -26,1
PANTONE 2101 C	0	59,14	4,58	0	0	0	0	54,4 24,3 -45,1	52,4 19,8 -35,3
PANTONE 2102 C	0	65,14	20,26	0	0	0	0	42,3 22,6 -46,1	42,1 22,1 -45,0
PANTONE 2103 C	0,7	69,11	27,37	0	0	0	0	36,8 25,3 -49,0	36,8 25,3 -49,0
PANTONE 2104 C	4,81	75,81	37,73	0	0	0	0	29,7 28,1 -51,8	29,7 28,1 -51,8
PANTONE 2105 C	30,22	83,65	39,1	0	0	0	0	20,9 29,5 -48,3	20,9 29,5 -48,3
PANTONE 2106 C	3,48	9,23	3,4	0	0	0	0	74,0 2,6 -13,5	74,0 2,6 -13,5
PANTONE 2107 C	7,93	16,11	7,97	0	0	0	0	63,4 2,9 -18,9	63,4 2,9 -18,9
PANTONE 2108 C	13,1	30,56	13,09	0	0	0	0	53,7 4,9 -23,2	53,7 4,9 -23,2
PANTONE 2109 C	20,52	43,68	16,32	0	0	0	0	46,7 7,1 -25,8	46,7 7,1 -25,8
PANTONE 2110 C	29,68	47,53	21,76	0	0	0	0	41,9 7,4 -27,1	41,9 7,4 -27,1
PANTONE 2111 C	41,91	53,82	34,96	0	0	0	0	34,1 7,6 -29,0	34,1 7,6 -29,0
PANTONE 2112 C	53,68	79,6	30,52	0	0	0	0	18,5 22,4 -37,1	18,5 22,4 -37,1
PANTONE 2113 C	0	17,33	7,97	0	0	0	0	72,2 4,9 -27,5	70,3 3,3 -22,1
PANTONE 2114 C	0	37,47	15,14	0	0	0	0	59,6 7,3 -32,2	59,3 6,8 -30,5
PANTONE 2115 C	0	52,09	25,32	0	0	0	0	52,2 9,8 -37,3	52,1 9,8 -37,0
PANTONE 2116 C	1,39	58	33,76	0	0	0	0	45,7 12,6 -41,3	45,7 12,6 -41,3
PANTONE 2117 C	6,63	65,82	46,29	0	0	0	0	34,3 17,2 -46,7	34,3 17,2 -46,7
PANTONE 2118 C	38,71	66,85	49,33	0	0	0	0	25,3 15,6 -39,9	25,3 15,6 -39,9
PANTONE 2119 C	55,12	65,65	49,78	0	0	0	0	21,1 12,8 -33,9	21,1 12,8 -33,9
PANTONE 2120 C	0	5,44	4,88	0	0	0	0	81,2 0,5 -17,3	79,7 -0,2 -15,0
PANTONE 2121 C	0	10,51	19,88	0	0	0	0	69,2 -2,4 -26,6	69,1 -2,5 -26,1
PANTONE 2122 C	0	15,11	12,5	0	0	0	0	71,0 2,4 -29,8	69,3 1,2 -24,1
PANTONE 2123 C	0	31,02	24,53	0	0	0	0	61,2 5,4 -41,0	59,5 3,3 -31,8
PANTONE 2124 C	0	53,15	25,19	0	0	0	0	53,7 13,1 -47,9	51,8 10,1 -37,3
PANTONE 2125 C	0	60,22	40,73	0	0	0	0	44,4 18,0 -56,2	42,9 14,3 -45,9
PANTONE 2126 C	0	72,12	57,07	0	0	0	0	30,5 27,7 -66,2	29,8 24,8 -58,4
PANTONE 2127 C	0,64	3,73	6,25	0	0	0	0	80,2 -2,4 -14,4	80,2 -2,4 -14,4
PANTONE 2128 C	0	8,26	16,35	0	0	0	0	72,9 -2,3 -27,2	71,7 -2,8 -23,9
PANTONE 2129 C	0	28,23	40	0	0	0	0	57,8 0,9 -45,4	56,3 -0,6 -36,4
PANTONE 2130 C	0	51,25	41,36	0	0	0	0	50,4 9,0 -51,8	48,7 6,8 -41,3
PANTONE 2131 C	0	60,33	55,87	0	0	0	0	40,0 12,9 -57,3	39,3 11,3 -50,6
PANTONE 2132 C	0	60,76	62,48	0	0	0	0	38,0 11,8 -63,8	36,9 9,6 -53,4
PANTONE 2133 C	4,67	56,84	64	0	0	0	0	36,6 3,6 -48,8	36,6 3,6 -48,8
PANTONE 2134 C	1,27	15,3	14,02	0	0	0	0	67,4 0,8 -24,1	67,4 0,8 -24,1
PANTONE 2135 C	2,47	28,42	28,72	0	0	0	0	57,7 1,8 -30,9	57,7 1,8 -30,9
PANTONE 2136 C	8,85	14,42	15,76	0	0	0	0	60,8 0,4 -21,6	60,8 0,4 -21,6
PANTONE 2137 C	13,09	24,58	24,9	0	0	0	0	53,1 1,6 -25,1	53,1 1,6 -25,1
PANTONE 2138 C	37,76	12,03	24,35	0	0	0	0	48,8 -1,6 -18,1	48,8 -1,6 -18,1
PANTONE 2139 C	27,27	29,01	42,79	0	0	0	0	43,5 -0,6 -28,3	43,5 -0,6 -28,3
PANTONE 2140 C	40,12	44,75	49,3	0	0	0	0	34,8 1,8 -30,6	34,8 1,8 -30,6
PANTONE 2141 C	0	2,17	27,07	0	0	0	0	74,3 -9,7 -27,2	73,7 -9,8 -25,5
PANTONE 2142 C	0	8,12	29,89	0	0	0	0	68,7 -5,2 -33,2	67,6 -5,7 -29,0
PANTONE 2143 C	0	22,88	55,57	0	0	0	0	53,6 -6,2 -44,1	53,3 -6,4 -41,8
PANTONE 2144 C	0	47,88	66,6	0	0	0	0	41,5 -2,5 -53,1	41,3 -2,6 -51,5
PANTONE 2145 C	1,56	60,2	81,1	0	0	0	0	32,1 4,0 -57,8	32,1 4,0 -57,8
PANTONE 2146 C	10,2	69,52	88,99	0	0	0	0	23,3 12,5 -56,4	23,3 12,5 -56,4
PANTONE 2147 C	34,62	74,67	82,75	0	0	0	0	17,8 16,2 -50,9	17,8 16,2 -50,9
PANTONE 2148 C	13,84	3,69	39,91	0	0	0	0	57,6 -9,0 -24,6	57,6 -9,0 -24,6
PANTONE 2149 C	21,13	5,36	47,94	0	0	0	0	51,6 -9,8 -27,0	51,6 -9,8 -27,0
PANTONE 2150 C	28,08	8,93	55,5	0	0	0	0	45,9 -10,2 -29,5	45,9 -10,2 -29,5
PANTONE 2151 C	14,42	26,6	60,42	0	0	0	0	42,6 -6,9 -37,4	42,6 -6,9 -37,4
PANTONE 2152 C	36,86	13,93	61,03	0	0	0	0	39,6 -10,6 -31,1	39,6 -10,6 -31,1
PANTONE 2153 C	48,19	18,75	65,84	0	0	0	0	33,2 -10,8 -30,9	33,2 -10,8 -30,9
PANTONE 2154 C	38,48	52,53	73,52	0	0	0	0	27,7 -3,0 -40,9	27,7 -3,0 -40,9
PANTONE 2155 C	6,51	3,02	10,14	0	0	0	0	72,4 -4,4 -14,6	72,4 -4,4 -14,6
PANTONE 2156 C	9	4,12	16,82	0	0	0	0	66,5 -4,7 -17,9	66,5 -4,7 -17,9
PANTONE 2157 C	13,5	5,82	27,83	0	0	0	0	59,5 -5,1 -21,2	59,5 -5,1 -21,2
PANTONE 2158 C	22,35	7,57	39,55	0	0	0	0	52,4 -6,1 -24,1	52,4 -6,1 -24,1
PANTONE 2159 C	28,54	11,27	45,46	0	0	0	0	47,7 -6,1 -26,0	47,7 -6,1 -26,0
PANTONE 2160 C	34,66	17,14	51,22	0	0	0	0	42,5 -5,8 -27,7	42,5 -5,8 -27,7
PANTONE 2161 C	44,72	29,14	57,88	0	0	0	0	35,0 -5,1 -29,4	35,0 -5,1 -29,4
PANTONE 2162 C	16,78	3,79	4,03	0	0	0	0	67,6 -0,7 -8,5	67,6 -0,7 -8,5

PANTONE 2163 C	22,03	2,69	13,47	0	0	0	0	62,9 -4,5 -13,0	62,9 -4,5 -13,0
PANTONE 2164 C	27,01	3,43	15,86	0	0	0	0	59,8 -4,3 -13,9	59,8 -4,3 -13,9
PANTONE 2165 C	37,21	4,33	26,11	0	0	0	0	52,4 -4,8 -16,0	52,4 -4,8 -16,0
PANTONE 2166 C	44,49	5,94	34,81	0	0	0	0	46,5 -5,1 -17,6	46,5 -5,1 -17,6
PANTONE 2167 C	47,33	6,64	38,54	0	0	0	0	44,2 -5,3 -18,2	44,2 -5,3 -18,2
PANTONE 2168 C	64,39	3,35	56,62	0	0	0	0	29,3 -9,4 -15,6	29,3 -9,4 -15,6
PANTONE 2169 C	4,06	1,7	29,67	0	0	0	0	69,1 -9,8 -23,3	69,1 -9,8 -23,3
PANTONE 2170 C	6,16	3,49	43,61	0	0	0	0	60,9 -11,4 -29,2	60,9 -11,4 -29,2
PANTONE 2171 C	0	6,33	50,75	0	0	0	0	62,0 -12,2 -41,7	61,3 -12,3 -37,8
PANTONE 2172 C	0	35,09	58,7	0	0	0	0	49,3 -3,3 -53,9	48,3 -4,1 -45,1
PANTONE 2173 C	0	19,58	61,68	0	0	0	0	51,8 -10,0 -52,3	51,0 -10,2 -45,7
PANTONE 2174 C	0	32,23	65,76	0	0	0	0	46,4 -7,7 -57,0	45,6 -8,1 -49,1
PANTONE 2175 C	0	42,21	74,57	0	0	0	0	41,2 -7,5 -61,1	40,4 -7,6 -53,8
PANTONE 2176 C	6,48	4,98	0	0	6,93	0	0	73,5 -5,1 -7,0	73,5 -5,1 -7,0
PANTONE 2177 C	7,63	13,99	0	0	25,42	0	0	63,4 -9,4 -11,0	63,4 -9,4 -11,0
PANTONE 2178 C	12,51	18,79	0	0	35,35	0	0	56,8 -10,2 -12,0	56,8 -10,2 -12,0
PANTONE 2179 C	21,5	29,68	0	0	48,09	0	0	48,6 -11,3 -13,7	48,6 -11,3 -13,7
PANTONE 2180 C	28,03	39,62	0	0	56,8	0	0	42,7 -12,5 -15,2	42,7 -12,5 -15,2
PANTONE 2181 C	41,67	47,95	0	0	64,02	0	0	35,6 -12,9 -15,9	35,6 -12,9 -15,9
PANTONE 2182 C	52,86	55,4	0	0	71,84	0	0	28,5 -12,7 -16,1	28,5 -12,7 -16,1
PANTONE 2183 C	7,62	0	59,1	0	4,45	0	0	55,2 -23,7 -33,7	55,2 -23,7 -33,7
PANTONE 2184 C	0	14,36	66,03	0	0	0	0	50,7 -14,2 -53,8	50,1 -14,1 -48,3
PANTONE 2185 C	23,65	0,65	69,98	0	0	0	0	43,9 -23,5 -37,7	43,9 -23,5 -37,7
PANTONE 2186 C	32,27	47,64	96,57	0	0	0	0	27,7 -8,3 -45,1	27,7 -8,3 -45,1
PANTONE 2187 C	49,3	39,92	83,17	0	0	0	0	26,5 -10,6 -37,1	26,5 -10,6 -37,1
PANTONE 2188 C	56,83	31,37	79,33	0	0	0	0	24,8 -10,9 -31,6	24,8 -10,9 -31,6
PANTONE 2189 C	69,13	19,38	69,48	0	0	0	0	19,0 -9,1 -19,0	19,0 -9,1 -19,0
PANTONE 2190 C	0	0	44,67	0	1,1	0	0	69,6 -19,4 -33,9	68,8 -18,1 -32,5
PANTONE 2191 C	0	1,69	57,81	0	0	0	0	61,8 -20,3 -43,4	61,4 -20,2 -41,4
PANTONE 2192 C	0	2,86	68,37	0	0	0	0	53,9 -23,8 -52,1	53,6 -23,6 -49,8
PANTONE 2193 C	0	4,87	65,14	0	0	0	0	54,6 -20,0 -51,2	54,1 -19,7 -47,5
PANTONE 2194 C	0	6,3	73,31	0	0	0	0	50,2 -21,9 -55,6	49,8 -21,6 -52,1
PANTONE 2195 C	0	25,95	69,68	0	0	0	0	45,7 -11,7 -58,9	45,0 -11,9 -51,6
PANTONE 2196 C	5,31	21,56	88,64	0	0	0	0	39,4 -17,4 -51,9	39,4 -17,4 -51,9
PANTONE 2197 C	0	0	15,03	0	12,97	0	0	78,6 -25,4 -20,5	75,9 -21,1 -16,2
PANTONE 2198 C	0	0	24,96	0	17,81	0	0	74,4 -30,5 -25,3	71,7 -24,8 -19,7
PANTONE 2199 C	0	0	41,72	0	26,88	0	0	67,7 -37,8 -32,0	65,1 -30,4 -25,3
PANTONE 2200 C	1,11	0	47,67	0	23,11	0	0	62,6 -29,8 -27,8	62,6 -29,8 -27,8
PANTONE 2201 C	0	0	55	0	29,45	0	0	62,4 -41,6 -37,1	60,4 -34,4 -30,6
PANTONE 2202 C	0	0	62,81	0	10,59	0	0	59,5 -36,9 -46,4	57,9 -31,2 -39,9
PANTONE 2203 C	7,19	0	67,57	0	27,31	0	0	49,0 -34,5 -34,8	49,0 -34,5 -34,8
PANTONE 2204 C	3,44	0	5,52	0	2,52	0	0	80,2 -8,5 -9,5	80,2 -8,5 -9,5
PANTONE 2205 C	8,85	0	16,72	0	2,66	0	0	69,9 -10,8 -15,0	69,9 -10,8 -15,0
PANTONE 2206 C	16,71	0	27,64	0	0,45	0	0	62,9 -9,5 -16,9	62,9 -9,5 -16,9
PANTONE 2207 C	15,78	0	34,4	0	3,19	0	0	60,1 -13,3 -19,3	60,1 -13,3 -19,3
PANTONE 2208 C	29,98	0	43,89	0	0,77	0	0	53,9 -12,4 -20,8	53,9 -12,4 -20,8
PANTONE 2209 C	30,84	0	47,09	0	1,95	0	0	52,2 -14,2 -21,8	52,2 -14,2 -21,8
PANTONE 2210 C	55,08	18,17	64,49	0	0	0	0	30,7 -9,8 -26,8	30,7 -9,8 -26,8
PANTONE 2211 C	9,18	13,7	0	0	35,8	0	0	60,7 -12,8 -10,6	60,7 -12,8 -10,6
PANTONE 2212 C	13,32	25,42	0	0	50,68	0	0	51,9 -15,0 -13,2	51,9 -15,0 -13,2
PANTONE 2213 C	34,45	27,24	0	0	62,16	0	0	43,4 -19,1 -11,8	43,4 -19,1 -11,8
PANTONE 2214 C	29,42	36,87	0	0	62,48	0	0	42,6 -17,3 -14,0	42,6 -17,3 -14,0
PANTONE 2215 C	50,54	45,6	0	0	61,6	0	0	33,8 -10,9 -14,3	33,8 -10,9 -14,3
PANTONE 2216 C	59,2	40,28	0	0	57,89	0	0	30,5 -9,4 -11,4	30,5 -9,4 -11,4
PANTONE 2217 C	66,21	46,75	0	0	98,3	0	0	20,9 -15,0 -10,3	20,9 -15,0 -10,3
PANTONE 2218 C	7,75	0	18,15	0	13,28	0	0	67,5 -18,1 -14,7	67,5 -18,1 -14,7
PANTONE 2219 C	10,36	0	27	0	17,57	0	0	62,6 -20,1 -16,6	62,6 -20,1 -16,6
PANTONE 2220 C	14,09	0	35,86	0	21,15	0	0	57,4 -21,5 -18,4	57,4 -21,5 -18,4
PANTONE 2221 C	19,49	0	43,52	0	27,57	0	0	53,0 -23,6 -19,7	53,0 -23,6 -19,7
PANTONE 2222 C	28,28	0	49,84	0	23,04	0	0	49,3 -23,1 -21,0	49,3 -23,1 -21,0
PANTONE 2223 C	35,72	0	56,21	0	21,75	0	0	45,1 -23,5 -22,3	45,1 -23,5 -22,3
PANTONE 2224 C	2,06	60,22	0	0	96,55	0	0	39,1 -23,1 -23,6	39,1 -23,1 -23,6
PANTONE 2225 C	0	0	9,67	0	18,36	0	0	79,5 -27,0 -16,3	77,1 -22,7 -12,6
PANTONE 2226 C	0	0	18,83	0	30,67	0	0	74,2 -35,0 -20,9	71,5 -29,5 -16,2
PANTONE 2227 C	0,54	0	19,76	0	28,64	0	0	71,0 -28,4 -16,6	71,0 -28,4 -16,6
PANTONE 2228 C	0	0	56,52	0	57,8	0	0	57,8 -53,0 -30,9	56,6 -46,8 -26,0

PANTONE 2229 C	0	0	62,83	0	60,54	0	0	54,2 -54,2 -32,4	53,4 -49,4 -28,7
PANTONE 2230 C	8,58	0	59,4	0	52,27	0	0	50,5 -39,2 -25,5	50,5 -39,2 -25,5
PANTONE 2231 C	16,96	0	67,16	0	54,05	0	0	44,0 -39,4 -27,0	44,0 -39,4 -27,0
PANTONE 2232 C	2,14	10,12	0	0	42,01	0	0	67,2 -20,3 -9,9	67,2 -20,3 -9,9
PANTONE 2233 C	9,71	0	18,9	0	30,55	0	0	63,3 -23,9 -13,4	63,3 -23,9 -13,4
PANTONE 2234 C	2,32	19,08	0	0	55,8	0	0	60,4 -24,7 -12,3	60,4 -24,7 -12,3
PANTONE 2235 C	0,31	32,43	0	0	65,14	0	0	55,2 -28,5 -15,5	55,2 -28,5 -15,5
PANTONE 2236 C	2,5	29,03	0	0	64,63	0	0	54,6 -28,1 -14,3	54,6 -28,1 -14,3
PANTONE 2237 C	4,18	33,93	0	0	69,65	0	0	50,1 -29,6 -14,8	50,1 -29,6 -14,8
PANTONE 2238 C	46,56	0	59,43	0	57,75	0	0	38,0 -32,2 -18,2	38,0 -32,2 -18,2
PANTONE 2239 C	0	0	0	0	63,25	0	0,1	73,1 -53,6 -3,0	72,5 -52,1 -3,1
PANTONE 2240 C	0,56	0	0	0	93,07	0	1,1	66,5 -67,2 -1,6	66,5 -67,2 -1,6
PANTONE 2241 C	2,83	0	51,84	0	0	0	39,14	61,0 -27,7 -0,0	61,0 -27,7 -0,0
PANTONE 2242 C	0	0	33,61	0	84,5	0	36,45	56,6 -61,9 7,6	56,6 -61,9 7,6
PANTONE 2243 C	0,4	0	65,42	0	0	0	57,62	53,6 -44,5 1,7	53,6 -44,5 1,7
PANTONE 2244 C	18,32	0	63,27	0	0	0	53,08	47,4 -33,4 0,3	47,4 -33,4 0,3
PANTONE 2245 C	0	0	67,44	0	97,18	0	63,96	45,3 -70,1 10,6	45,3 -70,1 10,6
PANTONE 2246 C	2,96	0	0	0	16,38	0	4,39	81,1 -18,9 7,2	81,1 -18,9 7,2
PANTONE 2247 C	4,9	0	0	0	42,4	0	10,9	72,1 -30,8 11,1	72,1 -30,8 11,1
PANTONE 2248 C	8,09	0	0	0	45,37	0	13,89	68,7 -30,9 11,9	68,7 -30,9 11,9
PANTONE 2249 C	12,55	0	0	0	54,13	0	20,34	63,5 -34,3 13,5	63,5 -34,3 13,5
PANTONE 2250 C	4,41	0	0	0	71,96	0	35,16	63,4 -55,3 19,0	63,4 -55,3 19,0
PANTONE 2251 C	6,48	0	0	0	85,96	0	33,58	60,6 -59,1 16,8	60,6 -59,1 16,8
PANTONE 2252 C	0	0	17,65	0	100	0	63,55	57,0 -77,2 30,9	57,4 -68,3 28,1
PANTONE 2253 C	0	0	0	0	11,56	0	4,78	88,3 -19,4 9,7	86,6 -18,2 9,3
PANTONE 2254 C	0,05	0	0	0	17,74	0	9,9	84,1 -22,5 15,0	84,1 -22,5 15,0
PANTONE 2255 C	0,59	0	0	0	39,63	0	23,39	77,8 -33,8 21,4	77,8 -33,8 21,4
PANTONE 2256 C	1,96	0	0	0	57,13	0	46,48	70,3 -45,6 29,3	70,3 -45,6 29,3
PANTONE 2257 C	5,55	0	0	0	75,37	0	62,14	61,3 -56,4 34,4	61,3 -56,4 34,4
PANTONE 2258 C	35,74	0	0	0	100	0	83,18	47,5 -52,1 39,8	47,6 -51,4 39,4
PANTONE 2259 C	52,85	0	0	0	98,16	0	81,36	41,1 -43,3 33,1	41,1 -43,3 33,1
PANTONE 2260 C	4,78	0	0	0	8,89	0	8,71	80,6 -14,2 13,0	80,6 -14,2 13,0
PANTONE 2261 C	1,94	0	24,81	0	0	0	40,24	72,3 -18,4 17,0	72,3 -18,4 17,0
PANTONE 2262 C	6,58	0	28,9	0	0	0	40,36	67,2 -17,7 13,8	67,2 -17,7 13,8
PANTONE 2263 C	17,04	0	37,71	0	0	0	54,62	58,3 -19,3 17,5	58,3 -19,3 17,5
PANTONE 2264 C	12,03	0	44,99	0	0	0	61,96	57,5 -24,7 22,9	57,5 -24,7 22,9
PANTONE 2265 C	37,69	0	45,73	0	0	0	63,28	49,2 -20,8 20,0	49,2 -20,8 20,0
PANTONE 2266 C	60,44	0	57,78	0	0	0	86,65	32,4 -22,3 23,5	32,4 -22,3 23,5
PANTONE 2267 C	0	0	0	0	30,21	0	25,75	83,1 -33,5 26,9	80,4 -29,7 24,6
PANTONE 2268 C	0	0	0	0	45,91	0	42,42	78,8 -44,5 34,9	76,2 -39,1 31,7
PANTONE 2269 C	0,68	0	0	0	46,2	0	53,67	74,9 -39,3 37,9	74,9 -39,3 37,9
PANTONE 2270 C	0	0	0	0	64,72	0	64,09	70,5 -60,7 46,2	69,0 -55,8 43,2
PANTONE 2271 C	0	0	0	0	85,57	0	78,78	65,0 -68,3 51,0	64,8 -67,1 50,3
PANTONE 2272 C	14,6	0	0	0	84,27	0	96,44	54,5 -55,4 49,9	54,5 -55,4 49,9
PANTONE 2273 C	53,33	0	0	0	75,01	0	78,42	41,8 -36,9 32,6	41,8 -36,9 32,6
PANTONE 2274 C	0,88	0	3,96	0	0	0	17,84	85,7 -8,9 18,7	85,7 -8,9 18,7
PANTONE 2275 C	1,5	0	0	0	8,25	0	31,28	84,4 -17,0 32,0	84,4 -17,0 32,0
PANTONE 2276 C	6,04	0	32,28	0	0	0	68,26	64,9 -21,8 40,8	64,9 -21,8 40,8
PANTONE 2277 C	28,07	0	0	0	59,5	0	90,69	55,3 -36,9 50,9	55,3 -36,9 50,9
PANTONE 2278 C	46,18	0	0	0	59,33	0	84,61	48,4 -30,9 43,2	48,4 -30,9 43,2
PANTONE 2279 C	38,28	0	43,99	0	0	0	88,65	48,7 -22,1 39,5	48,7 -22,1 39,5
PANTONE 2280 C	58,79	0	0	0	53,26	0	83,15	40,9 -22,1 36,4	40,9 -22,1 36,4
PANTONE 2281 C	0	0	0	0	4,32	0	31,35	89,8 -14,3 36,2	88,7 -13,4 35,5
PANTONE 2282 C	0	0	0	0	9,57	0	33,28	88,2 -21,5 36,1	85,8 -19,2 34,3
PANTONE 2283 C	0	0	0	0	25,31	0	57,25	83,2 -34,1 52,7	80,5 -29,2 47,9
PANTONE 2284 C	1,9	0	0	0	15,68	0	44,29	81,0 -22,2 38,7	81,0 -22,2 38,7
PANTONE 2285 C	0	0	0	0	37,3	0	64,59	79,8 -40,6 59,6	77,4 -34,9 54,2
PANTONE 2286 C	0	0	0	0	50,29	0	97,97	74,1 -47,0 75,1	73,1 -44,3 72,3
PANTONE 2287 C	0	0	0	0	59,81	0	95,7	70,6 -53,9 68,5	70,1 -52,2 66,9
PANTONE 2288 C	0	0	0	0	9,02	0	50,95	86,3 -20,3 47,3	85,7 -19,6 46,8
PANTONE 2289 C	2,17	0	0	0	7,42	0	47,64	83,4 -17,0 43,2	83,4 -17,0 43,2
PANTONE 2290 C	0	0	0	0	25,96	0	77,77	81,5 -33,8 74,3	79,6 -30,2 70,5
PANTONE 2291 C	0	0	0	0	28,38	0	100	79,4 -33,9 86,1	78,8 -31,6 82,3
PANTONE 2292 C	1,54	0	0	0	37,83	0	87,37	74,8 -34,9 70,7	74,8 -34,9 70,7
PANTONE 2293 C	2,21	0	0	0	39,82	0	100	72,7 -38,9 83,3	73,4 -35,4 75,0
PANTONE 2294 C	0	0	0	0	58	14,34	100	63,8 -33,7 68,1	63,9 -32,5 65,4

PANTONE 2295 C	0	0	0	0	3,43	0	41,87	90,7 -13,9 45,3	89,1 -12,6 44,2
PANTONE 2296 C	0	0	0	0	5,64	0	58,65	88,5 -19,0 59,1	86,7 -17,0 57,0
PANTONE 2297 C	0	0	0	0	14,64	0	78,24	84,2 -27,2 78,5	82,5 -24,4 75,6
PANTONE 2298 C	0	0	0	0	17,52	0	62,42	82,7 -26,0 58,1	82,3 -25,3 57,3
PANTONE 2299 C	0,3	0	0	0	29,11	0	74,05	78,5 -31,2 66,4	78,5 -31,2 66,4
PANTONE 2300 C	6,33	0	0	0	17,8	0	68,59	74,6 -21,9 58,6	74,6 -21,9 58,6
PANTONE 2301 C	3,53	0	32,9	0	0	0	98,84	66,4 -24,5 63,3	66,4 -24,5 63,3
PANTONE 2302 C	8,35	0	7,82	0	0	0	59,79	72,6 -12,7 41,5	72,6 -12,7 41,5
PANTONE 2303 C	6,32	0	16,87	0	0	0	64,81	69,7 -16,9 43,3	69,7 -16,9 43,3
PANTONE 2304 C	12,66	0	10,21	0	0	0	65,97	67,7 -13,7 45,4	67,7 -13,7 45,4
PANTONE 2305 C	23,28	0	0	0	8,83	0	95,72	66,0 -15,0 67,2	66,0 -15,0 67,2
PANTONE 2306 C	35,75	0	18,41	0	0	0	85,37	55,7 -14,7 49,6	55,7 -14,7 49,6
PANTONE 2307 C	58,02	0	0	0	17,16	0	97,32	44,9 -11,8 45,4	44,9 -11,8 45,4
PANTONE 2308 C	66,92	0	1,84	0	0	0	82,08	36,1 -4,0 33,2	36,1 -4,0 33,2
PANTONE 2309 C	1,08	0	0	4,85	0	0	9,51	84,5 6,6 15,8	84,5 6,6 15,8
PANTONE 2310 C	4,16	0	0	5,65	0	0	10,57	79,5 6,5 15,1	79,5 6,5 15,1
PANTONE 2311 C	7,36	0	0	13,19	0	0	29,59	71,6 10,8 23,3	71,6 10,8 23,3
PANTONE 2312 C	17,85	0	0	11,18	0	0	25,14	66,1 8,2 17,8	66,1 8,2 17,8
PANTONE 2313 C	10,48	0	0	24,51	0	0	48,31	65,1 14,7 31,3	65,1 14,7 31,3
PANTONE 2314 C	24,69	0	0	39,38	0	0	64,16	55,0 17,8 36,9	55,0 17,8 36,9
PANTONE 2315 C	54,99	0	0	4,57	0	89,26	0	40,3 29,0 45,7	40,3 29,0 45,7
PANTONE 2316 C	13,66	0	0	14,91	0	0	33,41	66,4 10,4 22,6	66,4 10,4 22,6
PANTONE 2317 C	19,07	0	0	27,95	0	0	51,25	60,3 14,2 29,9	60,3 14,2 29,9
PANTONE 2318 C	31,99	0	0	37,23	0	0	60,58	53,5 15,7 32,4	53,5 15,7 32,4
PANTONE 2319 C	48,09	0	0	46,71	0	0	70,17	44,1 17,0 33,9	44,1 17,0 33,9
PANTONE 2320 C	59,27	0	0	52,87	0	0	76,01	34,8 16,5 29,5	34,8 16,5 29,5
PANTONE 2321 C	60,28	0	0	39,17	0	0	57,47	37,5 10,7 20,7	37,5 10,7 20,7
PANTONE 2322 C	72	0	0	46,61	0	0	62,83	25,0 9,7 15,7	25,0 9,7 15,7
PANTONE 2323 C	17,79	0	0	1,83	0	0	10,93	72,5 -0,3 13,8	72,5 -0,3 13,8
PANTONE 2324 C	24,82	0	0	3,94	0	0	21,3	67,7 2,0 18,1	67,7 2,0 18,1
PANTONE 2325 C	37,51	0	0	5,11	0	0	27,36	60,8 2,6 17,7	60,8 2,6 17,7
PANTONE 2326 C	50,68	0	0	6,39	0	0	38,06	53,0 2,6 18,7	53,0 2,6 18,7
PANTONE 2327 C	54,12	0	0	3,42	0	0	41,23	51,2 0,1 19,5	51,2 0,1 19,5
PANTONE 2328 C	57,99	0	0	10,38	0	0	49,34	44,7 3,2 20,5	44,7 3,2 20,5
PANTONE 2329 C	63,16	0	0	11,13	0	0	52,67	38,8 3,1 19,2	38,8 3,1 19,2
PANTONE 2330 C	6,71	0	0	1,13	0	0	1,47	82,6 0,5 2,1	82,6 0,5 2,1
PANTONE 2331 C	24,66	0	0	2,56	0	0	1,96	69,4 1,9 2,3	69,4 1,9 2,3
PANTONE 2332 C	48,35	0	0	1,98	0	0	2,18	57,4 0,9 2,4	57,4 0,9 2,4
PANTONE 2333 C	59,39	0	0	2,26	0	0	2,36	46,5 1,1 2,5	46,5 1,1 2,5
PANTONE 2334 C	61,23	1,6	0	0	0	4,58	0	43,2 3,0 2,3	43,2 3,0 2,3
PANTONE 2335 C	66,19	0	0	14,91	0	0	18	35,2 5,1 7,6	35,2 5,1 7,6
PANTONE 2336 C	71,72	0,1	0	0	0	1,47	0	32,0 1,1 2,3	32,0 1,1 2,3

APPENDIX 3: 4C EGP REFERENCE PROFILE SOMA OPTIMA^2 2018

B=Black, C=Cyan, M=Magenta, Y=Yellow

#Input Ink	B	C	M	Y	Lab	Current Lab
PANTONE Yellow 012 C	0	0	2,76	100	87,5 2,2 109,1	86,5 -1,5 95,0
PANTONE Yellow 0131 C	0	0,07	0	30,17	93,6 -6,9 38,0	92,7 -5,7 37,4
PANTONE Red 0331 C	0	0	27,01	3,86	79,5 31,3 6,0	75,2 24,3 5,0
PANTONE Magenta 0521 C	0	1,04	23,19	0	79,9 29,2 -11,2	75,8 21,7 -3,8
PANTONE Violet 0631 C	0	12,96	28,62	0	69,4 23,8 -28,7	65,7 14,0 -14,6
PANTONE Blue 0821 C	0	31,89	0	3,22	78,3 -24,0 -22,6	73,9 -14,9 -17,9
PANTONE Green 0921 C	0	18,35	0	10	86,1 -27,1 -1,2	78,1 -14,4 -0,6
PANTONE Black 0961 C	37,22	0	2,86	4,39	62,9 1,7 5,7	62,9 1,7 5,7
PANTONE 801 C	0	69,24	0	5	55,4 -37,5 -43,2	54,3 -33,0 -39,6
PANTONE 802 C	0	45	0	70,23	75,3 -63,3 63,3	65,2 -30,7 39,5
PANTONE 803 C	0	0	0,61	95,47	93,2 0,3 94,4	89,7 -6,2 96,7
PANTONE 804 C	0	0	28,54	61,21	83,4 44,7 67,5	72,9 21,6 48,4
PANTONE 805 C	0	0	49,63	38,94	73,0 69,1 35,9	64,4 38,5 23,4
PANTONE 806 C	0	0	58,8	0	64,6 82,9 -10,9	59,3 52,2 -2,5
PANTONE 807 C	0	6,62	63,09	0	56,3 79,6 -32,1	51,8 46,4 -9,0
PANTONE 871 C	53,56	0	6,79	50,96	50,0 1,9 23,5	50,0 1,9 23,5
PANTONE 872 C	52,66	0	12,19	51,47	49,1 4,5 23,0	49,1 4,5 23,0
PANTONE 873 C	52	0	18,09	53,33	48,1 7,0 23,3	48,1 7,0 23,3
PANTONE 874 C	50,04	0	19,99	51,25	49,2 8,2 22,7	49,2 8,2 22,7
PANTONE 875 C	50,93	0	31,38	47,78	46,7 11,2 19,2	46,7 11,2 19,2
PANTONE 876 C	48,38	0	41,13	52,05	46,1 14,9 21,0	46,1 14,9 21,0
PANTONE 877 C	47,03	1,91	0,26	0	58,4 -1,0 -1,5	58,4 -1,0 -1,5
PANTONE Medium Yellow C	0	0	2,28	100	88,1 0,7 108,9	87,2 -2,6 95,9
PANTONE Bright Orange C	0	0	56,38	100	63,5 61,7 81,8	59,8 44,0 65,3
PANTONE Bright Red C	0	0	65,45	81,72	57,5 72,5 61,7	54,4 55,0 51,3
PANTONE Strong Red C	1,33	0	100	29,53	44,0 78,2 14,6	44,3 75,2 14,2
PANTONE Pink C	0	3,64	69,22	0	51,0 72,7 -15,8	49,3 57,9 -5,8
PANTONE Medium Purple C	0	68,97	100	0	20,9 50,2 -59,3	19,7 34,5 -38,9
PANTONE Dark Blue C	0	84,97	89,77	0	20,8 29,2 -68,5	18,4 19,4 -44,4
PANTONE Medium Blue C	2,1	97,71	0	0,71	47,3 -33,0 -54,0	47,3 -33,0 -54,0
PANTONE Bright Green C	0	65,98	0	56,97	59,8 -74,8 -0,4	53,6 -45,1 0,3
PANTONE Neutral Black C	93,35	33,41	7,1	0	13,2 0,0 -0,3	13,2 0,0 -0,3
PANTONE 100 C	0	0	0	60,1	92,0 -7,6 65,8	91,6 -7,2 65,4
PANTONE 101 C	0	0	0	65,77	91,8 -7,5 75,1	91,3 -7,4 74,9
PANTONE 102 C	0	0	0,52	100	90,2 -4,9 106,3	89,8 -6,4 99,3
PANTONE Yellow C	0	0	1,56	100	89,0 -1,3 110,9	88,2 -4,1 97,3
PANTONE 103 C	11,53	0	4,89	100	70,2 0,4 83,7	70,8 0,8 76,2
PANTONE 104 C	26,98	0	4,92	100	63,6 -0,3 70,7	63,8 -0,2 68,0
PANTONE 105 C	51,81	0	4,7	78,03	51,6 -0,8 45,5	51,6 -0,8 45,5
PANTONE 7401 C	0	0	2,63	26,85	90,2 1,5 32,2	88,8 0,5 31,9
PANTONE 7402 C	0,59	0	3,13	32,41	87,0 1,4 34,3	87,0 1,4 34,3
PANTONE 7403 C	0,19	0	3,97	45,29	85,9 2,8 43,0	85,9 2,8 43,0
PANTONE 7404 C	0	0	2,62	68,24	87,5 -0,9 73,8	87,2 -1,4 73,7
PANTONE 7405 C	0,02	0	4,56	95,52	83,8 2,3 89,6	83,8 2,3 89,6
PANTONE 7406 C	0	0	7,73	98,92	81,5 6,8 88,6	81,2 6,4 88,5
PANTONE 7407 C	7,86	0	17	62,26	68,9 11,1 46,5	68,9 11,1 46,5
PANTONE 106 C	0	0	0,9	66,91	90,7 -4,1 74,7	89,9 -5,3 74,7
PANTONE 107 C	0	0	1,41	77,49	89,8 -2,5 84,1	88,7 -4,3 84,2
PANTONE 108 C	0	0	2,42	97,9	88,4 0,6 94,5	87,0 -2,2 94,5

PANTONE 109 C	0	0	4,19	100	86,3 6,0 98,5	84,4 1,4 92,6
PANTONE 110 C	3,91	0	12,79	100	72,6 9,3 88,9	73,3 9,0 79,4
PANTONE 111 C	29,12	0	12,47	100	59,3 4,7 68,1	59,8 4,6 63,1
PANTONE 112 C	39,01	0	10,17	93,39	56,2 2,5 57,2	56,2 2,5 57,2
PANTONE 113 C	0	0	1,87	64,66	89,7 -1,4 69,5	88,5 -3,0 69,4
PANTONE 114 C	0	0	2,28	68,85	89,1 -0,1 75,7	87,7 -2,2 75,3
PANTONE 115 C	0	0	2,84	78,43	88,2 1,6 82,5	86,6 -1,1 82,2
PANTONE 116 C	0	0	5,35	92,22	85,4 8,2 89,5	83,0 3,8 86,9
PANTONE 117 C	7,95	0	20,47	100	66,2 11,9 78,6	66,8 11,4 71,7
PANTONE 118 C	25,47	0	20,87	100	58,1 9,0 66,3	58,6 8,7 62,1
PANTONE 119 C	51,55	0	10,96	81,8	49,7 2,4 45,8	49,7 2,4 45,8
PANTONE 127 C	0	0	2,5	57,4	88,3 -0,9 56,7	88,0 -1,2 56,6
PANTONE 128 C	0	0	3,75	65,3	86,2 1,9 67,5	85,7 1,2 67,3
PANTONE 129 C	0	0	4,6	68,83	84,8 3,9 71,9	84,2 2,9 71,5
PANTONE 130 C	0	0	24,68	100	75,3 22,1 82,9	73,7 18,7 80,4
PANTONE 131 C	6,3	0	35,3	100	63,5 21,0 73,2	63,9 20,2 69,0
PANTONE 132 C	34,84	0	34,06	100	52,6 12,8 59,4	53,0 12,4 55,9
PANTONE 133 C	61,49	0	19,77	83,71	38,4 4,6 36,5	38,4 4,6 36,5
PANTONE 1205 C	0	0	2,63	42,57	90,0 1,4 43,3	88,3 -0,1 42,8
PANTONE 1215 C	0	0	3,95	56,62	88,0 4,5 54,3	85,9 2,1 53,3
PANTONE 1225 C	0	0	8,09	67,61	84,4 12,1 69,9	81,3 7,3 66,5
PANTONE 1235 C	0	0	15,19	81,68	80,7 20,7 79,1	76,9 13,5 74,2
PANTONE 1245 C	9,17	0	25,02	90,25	64,7 13,9 65,8	64,7 13,9 65,8
PANTONE 1255 C	26,26	0	22,17	84,19	58,3 9,9 56,3	58,3 9,9 56,3
PANTONE 1265 C	51,19	0	21,75	79,6	47,5 6,8 42,3	47,5 6,8 42,3
PANTONE 120 C	0	0	3,25	60,44	88,6 2,6 61,1	86,7 0,3 60,4
PANTONE 121 C	0	0	3,76	63,92	87,8 4,1 66,1	85,7 1,3 65,1
PANTONE 122 C	0	0	4,72	68,8	86,4 7,0 73,2	84,0 3,1 71,2
PANTONE 123 C	0	0	8,21	77,37	84,1 12,6 77,8	81,0 7,4 75,4
PANTONE 124 C	0,16	0	21,27	99,05	74,6 16,7 81,0	74,6 16,7 81,0
PANTONE 125 C	17,75	0	28,98	100	59,3 13,0 65,7	59,5 12,8 63,5
PANTONE 126 C	39,65	0	25,22	98,4	52,4 8,8 54,7	52,4 8,8 54,7
PANTONE 7548 C	0	0	7,45	100	84,2 12,8 103,4	81,4 6,1 89,2
PANTONE 7549 C	0	0	14,53	100	79,8 19,4 94,8	77,4 12,7 84,6
PANTONE 7550 C	5,5	0	30,29	100	65,4 18,7 77,4	66,0 17,8 71,4
PANTONE 7551 C	19,14	0	33,73	100	57,5 15,4 65,0	57,9 15,0 61,7
PANTONE 7552 C	59,04	0	38,65	83,83	38,3 9,6 36,2	38,3 9,6 36,2
PANTONE 7553 C	67,34	0	29,9	69,68	31,2 6,3 24,7	31,2 6,3 24,7
PANTONE 7554 C	73,25	0	17,04	56,41	27,0 4,0 14,0	27,0 4,0 14,0
PANTONE 7555 C	5,51	0	19,02	88,63	69,2 12,3 69,7	69,2 12,3 69,7
PANTONE 7556 C	17,82	0	21,27	83,68	61,3 10,5 59,1	61,3 10,5 59,1
PANTONE 7557 C	36,68	0	20,03	81,75	54,7 7,8 50,9	54,7 7,8 50,9
PANTONE 7558 C	42,64	0	28,12	80,26	50,8 9,9 45,9	50,8 9,9 45,9
PANTONE 7559 C	47,13	0	32,91	77,17	48,0 11,0 41,0	48,0 11,0 41,0
PANTONE 7560 C	55,56	0	23,48	69,94	43,8 7,0 33,7	43,8 7,0 33,7
PANTONE 7561 C	62,01	0	10,76	62,39	40,2 2,5 25,3	40,2 2,5 25,3
PANTONE 134 C	0	0	5,59	57,49	86,7 8,3 54,6	83,8 5,0 52,8
PANTONE 135 C	0	0	9,33	62,91	84,0 13,7 61,7	80,7 9,0 58,2
PANTONE 136 C	0	0	12,06	68,56	82,4 17,3 70,6	78,8 11,0 65,4
PANTONE 137 C	0	0	29,4	91,89	76,5 31,1 81,6	72,0 21,5 74,6
PANTONE 138 C	1,52	0	46,99	100	62,7 35,1 76,8	63,4 32,7 68,8
PANTONE 139 C	21,47	0	46,74	100	52,9 22,7 59,3	53,2 22,2 56,9
PANTONE 140 C	58,56	0	40,7	84,48	38,3 10,4 36,6	38,3 10,4 36,6
PANTONE 1345 C	0	0	6,78	45,23	86,4 10,4 42,9	83,3 7,1 40,7
PANTONE 1355 C	0	0	10,36	56,95	84,0 15,1 51,7	80,5 10,3 48,2
PANTONE 1365 C	0	0	18,55	65,46	80,3 23,1 64,7	76,2 15,4 58,0
PANTONE 1375 C	0	0	33,73	82,31	75,3 34,3 75,9	70,7 23,8 67,6
PANTONE 1385 C	3,21	0	48,72	100	60,8 33,3 68,9	61,0 32,4 66,1
PANTONE 1395 C	39,17	0	50,46	96,03	46,6 20,5 48,4	46,6 20,5 48,4
PANTONE 1405 C	60,4	0	45,26	82,04	35,6 12,1 32,7	35,6 12,1 32,7
PANTONE 141 C	0	0	7,91	61,59	82,8 8,7 58,1	81,9 7,4 57,2
PANTONE 142 C	0	0	11,41	66,52	80,4 12,5 64,1	79,3 10,6 62,6
PANTONE 143 C	0	0	17,06	73,33	77,9 16,8 69,0	76,5 14,3 67,5
PANTONE 144 C	0	0	43,8	100	68,1 35,3 76,0	66,5 31,2 72,3
PANTONE 145 C	4,44	0	45,07	100	61,4 28,6 68,6	61,6 28,0 66,7
PANTONE 146 C	27,75	0	46,63	98,33	51,6 20,8 54,6	51,6 20,8 54,6

PANTONE 147 C	59,79	0	19,57	71,03	40,5 5,3 31,7	40,5 5,3 31,7
PANTONE 7408 C	0	0	10,64	90,77	80,7 12,4 83,4	79,2 9,8 82,3
PANTONE 7409 C	0	0	16,73	80,08	77,6 16,5 73,8	76,4 14,3 72,4
PANTONE 7410 C	0	0	24,62	48,49	78,5 26,4 41,5	74,6 20,1 36,7
PANTONE 7411 C	0	0	27,04	59,68	73,6 21,1 47,1	73,4 20,8 46,8
PANTONE 7412 C	3,83	0	44,33	75,72	62,8 27,9 54,5	62,8 27,9 54,5
PANTONE 7413 C	0,82	0	45,92	76,57	64,8 32,3 57,1	64,8 32,3 57,1
PANTONE 7414 C	9,15	0	51,91	95,37	55,4 30,8 58,0	55,4 30,8 58,0
PANTONE 7562 C	14,46	0	12,45	55,57	66,5 7,7 36,2	66,5 7,7 36,2
PANTONE 7563 C	4,06	0	26,3	78,07	68,7 16,7 62,8	68,7 16,7 62,8
PANTONE 7564 C	2,29	0	41,22	98,64	65,5 26,7 70,4	65,5 26,7 70,4
PANTONE 7565 C	5,16	0	47,59	84,36	60,0 29,3 58,0	60,0 29,3 58,0
PANTONE 7566 C	19,68	0	54,01	72,61	50,9 28,4 41,0	50,9 28,4 41,0
PANTONE 7567 C	48,78	0	54,2	69,31	41,6 21,4 30,9	41,6 21,4 30,9
PANTONE 7568 C	56,54	0	47,51	62,27	38,4 15,3 23,3	38,4 15,3 23,3
PANTONE 7569 C	2,86	0	42,25	82,93	64,6 27,0 61,6	64,6 27,0 61,6
PANTONE 7570 C	3,39	0	44,56	79,99	63,0 28,5 57,9	63,0 28,5 57,9
PANTONE 7571 C	7,65	0	44,4	76,47	59,9 25,6 52,2	59,9 25,6 52,2
PANTONE 7572 C	14,39	0	47,58	74,1	55,1 24,8 45,8	55,1 24,8 45,8
PANTONE 7573 C	27,21	0	51,48	78,05	50,1 24,5 43,7	50,1 24,5 43,7
PANTONE 7574 C	35,64	0	44,34	68,48	50,0 18,6 36,8	50,0 18,6 36,8
PANTONE 7575 C	52,45	0	41,28	68,03	43,2 13,2 31,1	43,2 13,2 31,1
PANTONE 712 C	0	0	9,84	29,78	85,0 14,9 30,9	81,3 11,4 28,7
PANTONE 713 C	0	0	14,25	40,86	82,3 19,1 37,5	78,7 14,4 34,1
PANTONE 714 C	0	0	26,13	57,9	77,4 26,9 49,8	73,8 20,5 44,7
PANTONE 715 C	0	0	42,85	78,26	69,9 36,6 65,9	67,2 30,1 60,7
PANTONE 716 C	0	0	50,94	100	63,5 42,5 73,7	62,8 38,3 68,3
PANTONE 717 C	3,03	0	57,87	100	55,4 45,4 70,0	56,3 42,1 61,3
PANTONE 718 C	9,27	0	62,21	100	48,8 44,8 61,7	49,6 41,7 54,1
PANTONE 148 C	0	0	8,73	41,22	85,5 13,4 39,3	81,9 9,6 36,6
PANTONE 149 C	0	0	12,24	49,95	83,5 17,6 45,3	79,6 12,3 41,2
PANTONE 150 C	0	0	21,49	60,7	79,8 25,2 56,7	75,3 17,5 50,2
PANTONE 151 C	0	0	46,6	93,56	69,7 47,3 78,5	65,1 33,9 67,8
PANTONE 152 C	0	0	52,86	100	62,0 43,2 72,1	61,8 40,2 67,2
PANTONE 153 C	9,91	0	52,69	98,38	54,5 31,0 58,2	54,5 31,0 58,2
PANTONE 154 C	36,39	0	55,39	93,31	45,7 24,7 46,8	45,7 24,7 46,8
PANTONE 155 C	0	0	5,57	25,82	85,7 7,1 29,0	84,8 6,4 28,6
PANTONE 156 C	0	0	12,72	46,57	80,6 14,4 39,8	79,4 12,9 38,7
PANTONE 157 C	0	0	31,9	62,38	73,1 26,2 51,3	71,7 23,4 48,9
PANTONE 158 C	0	0	52,37	83,97	63,5 43,8 63,0	62,2 39,4 59,7
PANTONE 159 C	3,8	0	59,82	97,94	54,4 43,5 58,6	54,4 43,5 58,6
PANTONE 160 C	29,44	0	59,26	90,9	45,6 31,0 45,9	45,6 31,0 45,9
PANTONE 161 C	64,42	0	53,46	75,76	29,9 14,6 24,5	29,9 14,6 24,5
PANTONE 1485 C	0	0	25	58,6	79,8 29,6 53,9	74,1 19,8 46,0
PANTONE 1495 C	0	0	41,74	81,92	73,5 43,6 76,0	67,7 29,0 64,0
PANTONE 1505 C	0	0	51,26	100	66,1 59,0 92,9	62,6 38,6 68,1
PANTONE Orange 021 C	0	0	58,86	100	60,8 65,7 85,1	58,3 47,2 64,1
PANTONE 1525 C	11,34	0	63,25	100	46,9 45,6 62,3	48,0 41,6 52,4
PANTONE 1535 C	40,41	0	62,51	100	39,9 32,2 47,3	40,5 30,8 43,4
PANTONE 1545 C	63,05	0	60,43	89,38	29,3 19,0 28,8	29,3 19,0 28,8
PANTONE 1555 C	0	0	18,69	33,81	81,8 24,0 32,5	77,1 17,3 28,3
PANTONE 1565 C	0	0	33,01	53,49	76,4 35,1 45,8	71,5 24,7 38,1
PANTONE 1575 C	0	0	48,25	72,54	69,4 49,6 64,9	64,5 35,3 54,2
PANTONE 1585 C	0	0	54,73	88,59	65,3 57,1 71,7	60,9 41,8 60,8
PANTONE 1595 C	1,35	0	59,86	97,19	56,5 46,6 60,8	56,5 46,6 60,8
PANTONE 1605 C	25,71	0	59,68	84,32	46,3 32,4 44,2	46,3 32,4 44,2
PANTONE 1615 C	46,86	0	61,57	84,03	39,1 27,7 36,9	39,1 27,7 36,9
PANTONE 162 C	0	0	15,81	22,5	83,0 22,3 26,0	78,4 16,1 22,6
PANTONE 163 C	0	0	35	50,23	75,8 36,8 42,9	70,9 26,0 35,3
PANTONE 164 C	0	0	48,05	66,09	69,5 49,9 58,3	64,7 35,5 47,7
PANTONE 165 C	0	0	55,46	81,14	64,8 58,5 67,9	60,6 42,5 56,2
PANTONE 166 C	0	0	62,89	100	56,2 56,4 66,6	55,7 52,2 62,0
PANTONE 167 C	8,29	0	62,6	93,95	49,9 42,8 52,2	49,9 42,8 52,2
PANTONE 168 C	57,71	0	64,11	83,2	31,8 25,2 29,5	31,8 25,2 29,5
PANTONE 7576 C	1,39	0	45,19	63,58	64,9 31,5 44,5	64,9 31,5 44,5
PANTONE 7577 C	0	0	49,8	70,75	63,8 36,9 52,4	63,8 36,9 52,4

PANTONE 7578 C	0,45	0	57	79,04	59,3 43,8 53,7	59,3 43,8 53,7
PANTONE 7579 C	0	0	63,01	82,42	56,0 52,4 53,4	55,9 51,9 53,0
PANTONE 7580 C	7,01	0	64,06	75,02	50,0 45,4 42,4	50,0 45,4 42,4
PANTONE 7581 C	50,22	0	59,79	65,44	38,9 25,5 25,5	38,9 25,5 25,5
PANTONE 7582 C	62,37	0	45,9	55,43	33,8 12,8 16,6	33,8 12,8 16,6
PANTONE 1625 C	0	0	32,91	32,48	77,4 35,4 29,9	72,2 25,3 24,5
PANTONE 1635 C	0	0	43,35	49,76	72,6 45,0 39,8	67,5 32,0 32,2
PANTONE 1645 C	0	0	54,97	68,84	65,7 58,4 58,6	61,1 42,0 47,9
PANTONE 1655 C	0	0	61,78	97,68	60,0 67,0 72,1	56,4 50,7 61,5
PANTONE 1665 C	0	0	66,79	100	53,0 59,5 64,4	53,3 57,1 60,1
PANTONE 1675 C	19,48	0	66,74	91,72	43,5 42,1 44,4	43,5 42,1 44,4
PANTONE 1685 C	50,61	0	66,97	82,8	34,8 31,9 32,0	34,8 31,9 32,0
PANTONE 169 C	0	0	22,92	10,91	81,1 29,1 17,3	76,0 21,2 13,9
PANTONE 170 C	0	0	45,55	44,73	71,4 48,6 34,7	66,5 34,3 27,9
PANTONE 171 C	0	0	58,31	68,74	63,2 63,5 56,6	59,0 46,1 46,1
PANTONE 172 C	0	0	63,2	89,58	59,1 68,5 67,1	55,6 52,3 56,8
PANTONE 173 C	2,34	0	67,95	91,54	50,7 55,1 52,8	50,7 55,1 52,8
PANTONE 174 C	36,49	0	69,42	84,83	38,0 39,8 36,2	38,0 39,8 36,2
PANTONE 175 C	60,46	0	63,41	65,7	29,7 24,0 19,9	29,7 24,0 19,9
PANTONE 7583 C	5,74	0	58,74	78,02	53,9 40,0 47,7	53,9 40,0 47,7
PANTONE 7584 C	9,1	0	61,43	82,88	50,3 40,7 47,5	50,3 40,7 47,5
PANTONE 7585 C	14,85	0	59,13	68,75	49,5 35,0 37,0	49,5 35,0 37,0
PANTONE 7586 C	31,16	0	60,27	72,3	44,8 32,0 35,3	44,8 32,0 35,3
PANTONE 7587 C	40,72	0	61,51	71,76	41,2 30,4 31,8	41,2 30,4 31,8
PANTONE 7588 C	54,73	0	54,56	61,66	37,9 19,8 22,4	37,9 19,8 22,4
PANTONE 7589 C	65,93	0	34,92	47,29	32,3 8,5 12,7	32,3 8,5 12,7
PANTONE 7590 C	4,53	0	9,44	13,69	76,1 10,2 15,8	76,1 10,2 15,8
PANTONE 7591 C	8,39	0	44,71	55,18	59,5 26,4 30,9	59,5 26,4 30,9
PANTONE 7592 C	13,58	0	61,97	70,81	48,2 38,8 37,9	48,2 38,8 37,9
PANTONE 7593 C	29,47	0	67,13	74,16	41,4 39,8 33,6	41,4 39,8 33,6
PANTONE 7594 C	53,12	0	66,15	66,5	33,8 30,2 22,6	33,8 30,2 22,6
PANTONE 7595 C	60,28	0	59,35	61,16	31,6 21,1 18,4	31,6 21,1 18,4
PANTONE 7596 C	65,82	0	51,51	53,2	29,3 14,1 13,2	29,3 14,1 13,2
PANTONE 7597 C	1,41	0	69,34	87,11	50,7 58,0 51,0	50,7 58,0 51,0
PANTONE 7598 C	7,39	0	67,04	80,49	47,9 48,6 43,8	47,9 48,6 43,8
PANTONE 7599 C	11,11	0	69,73	83,03	44,3 49,2 42,0	44,3 49,2 42,0
PANTONE 7600 C	43,95	0	66,01	72,71	37,7 33,9 29,4	37,7 33,9 29,4
PANTONE 7601 C	51,08	0	63,14	69,61	36,5 28,2 27,1	36,5 28,2 27,1
PANTONE 7602 C	54,99	0	55,8	65,43	37,2 20,4 24,4	37,2 20,4 24,4
PANTONE 7603 C	62,12	0	52,74	60,4	32,3 15,9 18,4	32,3 15,9 18,4
PANTONE 7604 C	1,18	0	3,73	1,8	86,5 5,7 2,5	86,5 5,7 2,5
PANTONE 7605 C	1,26	0	12,56	5,43	79,2 14,9 8,9	79,2 14,9 8,9
PANTONE 7606 C	2,45	0	38,42	19,31	67,8 27,5 15,8	67,8 27,5 15,8
PANTONE 7607 C	6,51	0	54,14	46,89	56,5 35,7 23,3	56,5 35,7 23,3
PANTONE 7608 C	23,76	0	65,17	63,42	43,8 39,8 27,0	43,8 39,8 27,0
PANTONE 7609 C	50,25	0	67,02	62,09	35,1 33,1 20,2	35,1 33,1 20,2
PANTONE 7610 C	61,02	0	64,5	54,57	29,2 25,1 13,3	29,2 25,1 13,3
PANTONE 7611 C	2,58	0	9,32	7,1	79,2 11,5 10,8	79,2 11,5 10,8
PANTONE 7612 C	6,86	0	24,88	15,65	68,3 18,0 14,2	68,3 18,0 14,2
PANTONE 7613 C	11,97	0	32,24	20,31	62,5 19,6 14,4	62,5 19,6 14,4
PANTONE 7614 C	31,46	0	28,12	18,11	56,7 14,2 11,9	56,7 14,2 11,9
PANTONE 7615 C	50,8	0	33	16,62	47,0 12,8 8,8	47,0 12,8 8,8
PANTONE 7616 C	60,95	0	44,88	15,71	36,0 13,9 6,1	36,0 13,9 6,1
PANTONE 7617 C	67,28	0	48,42	16,23	29,1 12,8 4,7	29,1 12,8 4,7
PANTONE 7520 C	0	0	12,08	9,29	81,0 15,0 13,9	80,7 14,7 13,8
PANTONE 7521 C	10,23	0	18,56	24,74	67,5 13,2 18,6	67,5 13,2 18,6
PANTONE 7522 C	13,06	0	52,95	54,36	53,6 30,6 26,0	53,6 30,6 26,0
PANTONE 7523 C	20	0	57,62	46,26	49,2 33,1 19,0	49,2 33,1 19,0
PANTONE 7524 C	26,31	0	60,87	57,46	45,9 34,6 23,4	45,9 34,6 23,4
PANTONE 7525 C	36,27	0	45,83	52,72	49,6 19,9 23,0	49,6 19,9 23,0
PANTONE 7526 C	46,47	0	67,69	93,04	35,9 34,2 36,5	35,9 34,2 36,5
PANTONE 489 C	0	0	10,72	9,24	82,4 14,7 14,4	81,4 13,7 13,9
PANTONE 488 C	0	0	15,57	11,71	79,9 18,5 16,2	78,8 17,0 15,4
PANTONE 487 C	0	0	28,88	21,83	75,2 25,9 20,8	73,7 23,6 19,7
PANTONE 486 C	0	0	42,51	37,23	69,8 34,7 26,7	68,4 31,5 25,0
PANTONE 485 C	0	0	79,58	91,94	49,7 69,1 54,6	49,1 65,7 52,8

PANTONE 484 C	30,96	0	74,34	81,49	38,0 45,3 34,5	38,0 45,3 34,5
PANTONE 483 C	61,92	0	65,99	67,49	27,5 25,0 19,4	27,5 25,0 19,4
PANTONE 176 C	0	0	25	4,82	81,0 31,3 8,5	75,8 23,1 7,0
PANTONE 177 C	0	0	47,34	22,76	70,8 52,2 21,2	65,9 37,1 16,4
PANTONE 178 C	0	0	58,45	56,3	63,1 65,5 37,7	58,8 47,6 30,3
PANTONE Warm Red C	0	0	64,02	68,21	58,7 70,0 51,2	55,3 53,4 42,6
PANTONE 179 C	0	0	69,07	76,05	52,9 63,9 48,2	52,1 59,5 46,1
PANTONE 180 C	6,44	0	70,7	71,21	46,3 53,6 37,4	46,3 53,6 37,4
PANTONE 181 C	51,02	0	69,66	66,14	33,1 35,2 21,9	33,1 35,2 21,9
PANTONE 1765 C	0	0	33,69	4,71	77,6 37,0 7,5	72,9 27,8 6,2
PANTONE 1775 C	0	0	43,52	8,2	72,8 46,2 11,6	68,3 34,3 8,8
PANTONE 1785 C	0	0	62,72	52,61	59,5 68,9 32,0	56,2 52,8 26,3
PANTONE 1788 C	0	0	70,44	69,48	53,9 74,1 47,3	51,4 61,0 41,3
PANTONE 1795 C	0,58	0	82,47	76,49	48,1 66,3 43,2	48,1 66,3 43,2
PANTONE 1805 C	12,76	0	80,82	73,08	40,8 55,3 33,3	40,8 55,3 33,3
PANTONE 1815 C	53,35	0	78,37	68,98	30,0 38,7 21,4	30,0 38,7 21,4
PANTONE 1767 C	0	0	26,46	2,95	79,8 31,1 4,1	75,5 24,1 3,3
PANTONE 1777 C	0	0	56,99	25	64,2 61,6 19,1	60,5 46,7 15,3
PANTONE 1787 C	0	0	66,35	60,31	56,6 72,8 38,6	53,9 56,9 32,3
PANTONE Red 032 C	0	0	67,8	65,17	55,3 72,1 43,5	52,9 58,3 37,3
PANTONE 1797 C	2,52	0	76,49	67,38	47,9 61,2 35,6	47,9 61,2 35,6
PANTONE 1807 C	22,56	0	73,28	63,65	40,3 47,8 25,1	40,3 47,8 25,1
PANTONE 1817 C	62,94	0	63,44	47,59	28,3 23,2 10,1	28,3 23,2 10,1
PANTONE 7618 C	5,43	0	54,16	60,85	56,9 35,9 34,2	56,9 35,9 34,2
PANTONE 7619 C	5,54	0	66,25	69,37	49,4 49,3 38,5	49,4 49,3 38,5
PANTONE 7620 C	8,07	0	77,98	76,39	43,6 56,4 37,9	43,6 56,4 37,9
PANTONE 7621 C	13,73	0	84,34	78,59	39,5 56,7 35,1	39,5 56,7 35,1
PANTONE 7622 C	36,95	0	80,46	70,19	35,0 47,4 26,3	35,0 47,4 26,3
PANTONE 7623 C	43,83	0	78,06	69,84	33,7 43,2 24,9	33,7 43,2 24,9
PANTONE 7624 C	50,82	0	73,45	66,55	32,5 37,6 21,6	32,5 37,6 21,6
PANTONE 7625 C	0	0	64,32	67,4	56,1 58,7 43,8	55,1 53,9 41,3
PANTONE 7626 C	3,92	0	73,98	84,44	47,2 57,8 46,2	47,2 57,8 46,2
PANTONE 7627 C	18,98	0	78,61	77,94	39,5 51,5 34,3	39,5 51,5 34,3
PANTONE 7628 C	28,13	0	78,18	74,93	37,7 48,8 31,0	37,7 48,8 31,0
PANTONE 7629 C	59,74	0	65,3	56,31	29,8 26,5 14,4	29,8 26,5 14,4
PANTONE 7630 C	63,4	0	63,61	53,46	27,7 22,7 12,1	27,7 22,7 12,1
PANTONE 7631 C	67,62	0	63,31	50,91	24,6 19,9 9,5	24,6 19,9 9,5
PANTONE 7415 C	0	0	14,37	11,72	79,4 16,2 15,6	79,4 16,2 15,6
PANTONE 7416 C	0	0	57,15	60	60,9 50,4 37,5	59,6 45,7 35,3
PANTONE 7417 C	0	0	65,26	69,09	55,5 59,9 45,7	54,5 54,9 43,1
PANTONE 7418 C	2,9	0	63,65	50,67	53,3 50,2 23,5	53,3 50,2 23,5
PANTONE 7419 C	14,59	0	64,47	38,47	46,7 42,9 14,5	46,7 42,9 14,5
PANTONE 7420 C	30,79	0	82,08	52,53	36,3 51,6 15,1	36,3 51,6 15,1
PANTONE 7421 C	61,76	0	82,01	43,85	24,2 35,7 6,3	24,2 35,7 6,3
PANTONE 182 C	0	0	18,23	1,75	82,6 25,6 2,0	78,6 20,0 1,4
PANTONE 183 C	0	0	38,63	3,82	75,4 39,5 5,0	71,3 30,5 4,1
PANTONE 184 C	0	0	61,26	29,24	60,7 66,0 19,6	57,7 51,7 16,2
PANTONE 185 C	0	0	84,15	78,35	49,8 77,4 49,2	48,2 67,8 44,6
PANTONE 186 C	2,53	0	90,84	76,01	44,7 67,8 40,1	44,7 67,8 40,1
PANTONE 187 C	18,98	0	87,85	71,67	37,7 56,5 29,8	37,7 56,5 29,8
PANTONE 188 C	55,74	0	79,02	61,01	28,6 37,9 15,4	28,6 37,9 15,4
PANTONE 196 C	0	0	9,96	1,85	83,8 15,4 2,1	82,6 14,4 1,9
PANTONE 197 C	0	0	38,33	3,32	72,9 33,2 3,5	71,5 30,4 3,2
PANTONE 198 C	0	0	67,52	41,55	54,5 64,0 21,8	53,5 58,8 20,4
PANTONE 199 C	0	0	91,64	70,21	46,8 74,0 40,2	46,5 71,4 39,2
PANTONE 200 C	6,17	0	94,19	70,99	41,4 65,6 34,2	41,4 65,6 34,2
PANTONE 201 C	27,35	0	83,6	64,41	36,7 52,9 23,2	36,7 52,9 23,2
PANTONE 202 C	47	0	79,93	61,56	32,3 43,6 17,8	32,3 43,6 17,8
PANTONE 189 C	0	0	34,02	2,22	76,8 35,5 2,0	73,1 28,3 1,5
PANTONE 190 C	0	0	52,3	5,48	66,7 54,0 7,1	63,7 42,7 5,5
PANTONE 191 C	0	0	65,3	29,58	57,4 69,5 18,6	55,1 56,7 15,9
PANTONE 192 C	0	0	81,59	61,25	50,4 77,1 34,3	48,9 67,1 31,1
PANTONE 193 C	4,8	0	91,51	62,33	42,8 66,1 27,8	42,8 66,1 27,8
PANTONE 194 C	30,52	0	79,4	51,81	37,1 50,1 15,1	37,1 50,1 15,1
PANTONE 195 C	55,22	0	69,86	39,29	31,4 34,3 8,0	31,4 34,3 8,0
PANTONE 1895 C	0	0	21,07	0	80,9 26,7 -1,6	77,7 22,3 -2,1

PANTONE 1905 C	0	0	39,3	1,09	74,7 38,5 -0,6	71,5 31,3 -0,8
PANTONE 1915 C	0	0	63,44	10,43	58,6 67,3 9,9	56,2 55,4 8,6
PANTONE 1925 C	0	0	84,65	56,08	49,3 77,6 28,3	48,0 69,1 26,1
PANTONE 1935 C	3,13	0	96,53	61,38	43,1 70,3 28,4	43,1 70,3 28,4
PANTONE 1945 C	18,67	0	94,53	57,63	37,1 59,9 19,4	37,1 59,9 19,4
PANTONE 1955 C	43,8	0	90	56,19	31,4 49,9 14,1	31,4 49,9 14,1
PANTONE 705 C	0	0	4,91	1,15	89,7 10,6 1,1	86,6 9,2 0,9
PANTONE 706 C	0	0	8,99	1,4	86,8 16,2 1,4	83,4 13,5 1,1
PANTONE 707 C	0	0	22,16	2,49	80,9 27,4 3,3	77,0 21,9 2,7
PANTONE 708 C	0	0	42,86	5,78	72,4 42,4 8,5	69,0 33,8 6,6
PANTONE 709 C	0	0	58,93	26,84	61,6 58,4 18,0	59,2 49,0 15,6
PANTONE 710 C	0	0	68,42	57,47	53,5 64,5 30,3	52,6 59,4 28,6
PANTONE 711 C	2,38	0	79,88	75,91	47,1 62,9 41,5	47,1 62,9 41,5
PANTONE 698 C	0	0	5,9	1,85	87,8 11,5 2,7	85,6 10,0 2,4
PANTONE 699 C	0	0	13,21	2,04	83,6 19,8 2,6	80,8 16,8 2,2
PANTONE 700 C	0	0	27,22	3,48	77,9 28,7 4,8	75,2 24,4 4,3
PANTONE 701 C	0	0	46,9	6,72	67,5 40,2 7,6	66,6 37,6 7,1
PANTONE 702 C	1,86	0	61,74	23,09	55,9 50,2 13,2	55,9 50,2 13,2
PANTONE 703 C	8,5	0	71,34	55,41	45,3 53,1 21,9	45,3 53,1 21,9
PANTONE 704 C	28,69	0	78,26	69,58	37,7 48,9 28,2	37,7 48,9 28,2
PANTONE 203 C	0	0	21,84	0	79,2 25,2 -3,4	77,4 22,7 -2,1
PANTONE 204 C	0	0	48,83	0,61	67,2 45,4 -1,8	65,8 40,9 -1,9
PANTONE 205 C	0	0	66,8	7,54	55,0 65,7 7,1	54,0 59,9 6,5
PANTONE 206 C	0,29	0	100	64,82	44,1 76,1 34,3	44,3 75,1 34,0
PANTONE 207 C	20,13	0	100	63,3	36,0 61,8 23,5	36,1 60,9 23,3
PANTONE 208 C	46,39	0	82,77	40,5	31,8 46,7 7,7	31,8 46,7 7,7
PANTONE 209 C	58,19	0	75,75	28,95	27,9 35,5 4,5	27,9 35,5 4,5
PANTONE 210 C	0	0	36,5	0	76,3 38,8 -5,8	72,6 30,1 -2,7
PANTONE 211 C	0	0	48,72	0	68,9 51,7 -5,8	65,8 41,0 -2,9
PANTONE 212 C	0	0	61,53	0	59,9 67,4 -1,6	57,4 55,4 -2,1
PANTONE 213 C	0	0	74,42	5,7	52,2 75,3 5,6	50,7 66,6 5,1
PANTONE 214 C	1,26	0	86,76	10,28	46,9 70,9 7,1	46,9 70,9 7,1
PANTONE 215 C	13,99	0	85,01	14,88	39,4 60,5 4,7	39,4 60,5 4,7
PANTONE 216 C	51,9	0	79,04	15,71	30,4 42,2 1,8	30,4 42,2 1,8
PANTONE 7422 C	0	0	8,75	1,84	86,2 15,2 2,4	83,5 13,1 2,0
PANTONE 7423 C	0	0	59,49	7,31	59,6 53,5 6,9	58,9 50,9 6,5
PANTONE 7424 C	0	0	65,62	3,63	55,8 64,9 3,3	54,8 59,2 3,0
PANTONE 7425 C	9,84	0	81,71	34,05	42,4 59,6 11,8	42,4 59,6 11,8
PANTONE 7426 C	20,76	0	91,58	56,11	37,0 58,2 18,0	37,0 58,2 18,0
PANTONE 7427 C	33,13	0	88,48	67,55	34,6 52,9 24,2	34,6 52,9 24,2
PANTONE 7428 C	60,06	0	70,16	22,03	28,0 31,0 3,8	28,0 31,0 3,8
PANTONE 7632 C	4,04	0	3,67	1,12	82,2 5,3 1,0	82,2 5,3 1,0
PANTONE 7633 C	8,85	0	14,8	2,79	70,4 13,7 2,9	70,4 13,7 2,9
PANTONE 7634 C	6,75	0	56,89	3,9	55,7 40,9 1,9	55,7 40,9 1,9
PANTONE 7635 C	3,54	0	75,28	22,11	47,8 61,5 11,0	47,8 61,5 11,0
PANTONE 7636 C	5,9	0	85,28	50,13	43,3 63,5 19,5	43,3 63,5 19,5
PANTONE 7637 C	38,54	0	75,47	43,43	36,1 45,1 10,9	36,1 45,1 10,9
PANTONE 7638 C	51,84	0	73,79	40,5	32,2 38,5 8,4	32,2 38,5 8,4
PANTONE 217 C	0	1,11	14,34	0	81,9 21,1 -8,2	79,1 16,8 -3,9
PANTONE 218 C	0	0	54,84	0	63,2 55,0 -12,2	61,9 47,4 -3,0
PANTONE 219 C	0	0	77,65	0	50,3 75,3 -4,7	49,9 69,3 -0,5
PANTONE Rubine Red C	1,55	0	100	24	43,8 79,3 12,7	44,3 75,1 12,3
PANTONE 220 C	20,53	0	100	20,61	35,7 65,5 5,4	36,1 62,6 5,2
PANTONE 221 C	37,14	0	100	26,12	32,1 56,9 4,4	32,2 56,2 4,3
PANTONE 222 C	58,85	0	81,64	2,35	26,1 39,3 -3,8	26,1 39,3 -3,8
PANTONE 7639 C	41,79	0	40,11	4,7	50,2 17,5 3,0	50,2 17,5 3,0
PANTONE 7640 C	37,45	0	66,66	22,13	39,6 39,3 6,6	39,6 39,3 6,6
PANTONE 7641 C	41,01	0	76,22	35,89	35,1 45,0 7,9	35,1 45,0 7,9
PANTONE 7642 C	56,24	0	69,97	6,32	30,4 34,3 -0,5	30,4 34,3 -0,5
PANTONE 7643 C	61,06	0	68,17	4,7	28,0 29,3 -0,9	28,0 29,3 -0,9
PANTONE 7644 C	66,44	0	65,06	0,6	25,1 23,1 -2,3	25,1 23,1 -2,3
PANTONE 7645 C	69,29	0	63,96	1,17	23,2 20,2 -1,5	23,2 20,2 -1,5
PANTONE 223 C	0	1,1	40,5	0	73,1 41,4 -13,9	69,9 30,7 -4,3
PANTONE 224 C	0	0	53	0	64,9 56,3 -16,0	63,1 45,5 -3,0
PANTONE 225 C	0	1,64	70	0	51,9 76,5 -12,1	50,4 62,5 -3,2
PANTONE 226 C	0	0,54	99,84	0	44,8 80,2 0,0	44,7 77,8 1,0

PANTONE 227 C	13,11	0,28	100	0	37,2 66,7 -3,6	37,3 65,9 -3,5
PANTONE 228 C	38,08	2,57	92,12	0	31,3 53,0 -7,1	31,3 53,0 -7,1
PANTONE 229 C	61,17	0,08	77,51	0	25,7 35,2 -4,8	25,7 35,2 -4,8
PANTONE 230 C	0	0	31,15	0	77,6 35,3 -11,7	74,3 27,4 -2,5
PANTONE 231 C	0	0	49,98	0	67,6 55,3 -16,8	65,0 42,4 -2,9
PANTONE 232 C	0	0	63,36	0	57,2 72,5 -17,4	56,2 57,6 -1,9
PANTONE Rhodamine Red C	0	1,94	71,1	0	51,5 78,8 -13,9	49,9 62,5 -3,5
PANTONE 233 C	0	4,55	88,99	0	44,1 74,8 -9,9	43,4 67,3 -5,8
PANTONE 234 C	8,2	6,74	100	0	36,1 63,1 -8,5	36,2 62,8 -8,4
PANTONE 235 C	42,89	2,62	92,34	0	30,1 51,1 -7,3	30,1 51,1 -7,3
PANTONE 670 C	0	0,5	5,42	0	87,0 10,9 -4,2	85,7 9,7 -2,6
PANTONE 671 C	0	1,34	14,67	0	80,9 20,1 -7,7	78,7 16,7 -4,2
PANTONE 672 C	0	2,15	33,11	0	73,4 30,2 -10,5	71,3 25,1 -5,6
PANTONE 673 C	0	2,91	45,62	0	66,6 39,6 -12,6	65,0 32,8 -6,6
PANTONE 674 C	0	5,65	61,84	0	54,2 52,5 -13,0	53,0 45,7 -8,4
PANTONE 675 C	2,95	6,05	83,05	0	41,9 60,2 -8,0	41,9 60,2 -8,0
PANTONE 676 C	31,56	0	97,37	10,42	33,5 58,2 0,8	33,5 58,2 0,8
PANTONE 677 C	0	0,68	6,55	0	85,1 11,0 -3,6	84,6 10,5 -3,0
PANTONE 678 C	0	1,05	8,44	0	83,4 12,6 -4,5	82,7 12,0 -3,7
PANTONE 679 C	0	1,66	12,21	0	80,3 15,4 -5,8	79,6 14,4 -4,8
PANTONE 680 C	0	4,06	37,31	0	67,9 25,0 -8,5	67,8 24,7 -8,2
PANTONE 681 C	2,73	7,65	55,34	0	54,6 33,8 -10,3	54,6 33,8 -10,3
PANTONE 682 C	11,67	8,45	65,68	0	43,2 40,4 -10,1	43,2 40,4 -10,1
PANTONE 683 C	50,75	1,44	76,45	0	31,3 41,2 -6,0	31,3 41,2 -6,0
PANTONE 684 C	0,31	0,43	8,54	0	82,9 12,9 -2,7	82,9 12,9 -2,7
PANTONE 685 C	0,51	1,19	15,03	0	78,1 16,9 -4,0	78,1 16,9 -4,0
PANTONE 686 C	1,57	2,06	27,67	0	71,5 21,5 -5,2	71,5 21,5 -5,2
PANTONE 687 C	4,07	3,24	43,25	0	62,2 27,0 -6,6	62,2 27,0 -6,6
PANTONE 688 C	9,86	4,56	55,91	0	51,4 32,6 -7,9	51,4 32,6 -7,9
PANTONE 689 C	36,23	4,33	67,41	0	37,5 37,9 -7,9	37,5 37,9 -7,9
PANTONE 690 C	63,21	0	76,22	2,54	24,5 32,3 -3,1	24,5 32,3 -3,1
PANTONE 510 C	0	0	13,43	1,33	81,7 18,2 0,8	80,8 17,2 0,7
PANTONE 509 C	0	0	19,44	1,22	78,7 21,6 0,4	78,1 20,9 0,3
PANTONE 508 C	0,02	0	26,24	1,52	75,8 24,4 0,6	75,8 24,4 0,6
PANTONE 507 C	3,21	0	38,74	1,06	68,3 28,5 -0,8	68,3 28,5 -0,8
PANTONE 506 C	49,63	0	68,42	17,83	34,7 36,7 4,1	34,7 36,7 4,1
PANTONE 505 C	58,87	0	69,55	27,75	29,1 31,5 5,0	29,1 31,5 5,0
PANTONE 504 C	67,31	0	66,39	29,68	23,6 22,5 5,0	23,6 22,5 5,0
PANTONE 7429 C	0,48	0,17	13,4	0	80,1 17,2 -2,3	80,1 17,2 -2,3
PANTONE 7430 C	0,67	0,65	25,16	0	74,8 22,9 -3,2	74,8 22,9 -3,2
PANTONE 7431 C	4,66	0,27	47,26	0	62,4 33,9 -3,2	62,4 33,9 -3,2
PANTONE 7432 C	11,1	0	59,69	1,07	51,6 41,9 -2,0	51,6 41,9 -2,0
PANTONE 7433 C	17,94	0	69,9	7,69	42,6 50,0 2,0	42,6 50,0 2,0
PANTONE 7434 C	29,81	0	72,71	12,6	39,0 48,0 3,1	39,0 48,0 3,1
PANTONE 7435 C	45,12	0	78	8,07	33,1 45,4 -0,4	33,1 45,4 -0,4
PANTONE 691 C	0	0	6,73	1,98	85,2 10,9 2,6	85,0 10,8 2,6
PANTONE 692 C	0,81	0	11,43	2,51	80,6 14,9 3,2	80,6 14,9 3,2
PANTONE 693 C	2,9	0	25,75	3,51	72,4 21,6 4,0	72,4 21,6 4,0
PANTONE 694 C	7,63	0	42,07	5,26	62,6 27,2 4,7	62,6 27,2 4,7
PANTONE 695 C	13,38	0	52,15	9,19	54,5 31,9 5,6	54,5 31,9 5,6
PANTONE 696 C	36	0	63,28	29,23	42,1 35,7 9,2	42,1 35,7 9,2
PANTONE 697 C	46,86	0	66,47	43,3	37,0 34,7 11,6	37,0 34,7 11,6
PANTONE 496 C	0	0	10,74	1,84	84,4 17,2 2,2	82,2 15,0 1,9
PANTONE 495 C	0	0	15	2,09	81,9 20,5 2,5	79,8 18,1 2,2
PANTONE 494 C	0	0	31,96	3,52	74,5 28,5 4,2	73,6 27,0 4,0
PANTONE 493 C	1,23	0	45,48	6,02	66,3 35,0 6,3	66,3 35,0 6,3
PANTONE 492 C	41,82	0	71,72	62,01	36,0 40,5 20,8	36,0 40,5 20,8
PANTONE 491 C	52,18	0	69,9	59,37	32,5 35,2 16,9	32,5 35,2 16,9
PANTONE 490 C	65,46	0	67,05	54,1	24,7 24,1 10,8	24,7 24,1 10,8
PANTONE 503 C	0,04	0	9,44	2,81	82,8 13,5 4,1	82,8 13,5 4,1
PANTONE 502 C	0,57	0	13,29	2,64	79,9 16,3 3,4	79,9 16,3 3,4
PANTONE 501 C	2,64	0	23,54	3,71	73,3 20,7 4,6	73,3 20,7 4,6
PANTONE 500 C	7,5	0	40,65	7,56	63,0 25,9 6,7	63,0 25,9 6,7
PANTONE 499 C	55,67	0	61,66	54,67	34,6 25,4 16,0	34,6 25,4 16,0
PANTONE 498 C	61,57	0	61,01	52,1	30,2 22,0 12,9	30,2 22,0 12,9
PANTONE 497 C	69,95	0	57,51	47,35	24,2 15,5 8,5	24,2 15,5 8,5

PANTONE 5035 C	2,01	0	8,02	2,66	81,1 11,2 3,7	81,1 11,2 3,7
PANTONE 5025 C	2,85	0	11,3	2,67	78,0 13,7 3,3	78,0 13,7 3,3
PANTONE 5015 C	6,38	0	19,42	3,7	70,7 16,7 4,4	70,7 16,7 4,4
PANTONE 5005 C	19,15	0	39,49	7,17	57,8 21,5 5,6	57,8 21,5 5,6
PANTONE 4995 C	34,85	0	51,64	13,81	48,4 25,5 6,7	48,4 25,5 6,7
PANTONE 4985 C	49,69	0	59,02	27,71	40,0 26,7 8,5	40,0 26,7 8,5
PANTONE 4975 C	77,68	0	64,34	54,59	16,9 15,9 7,2	16,9 15,9 7,2
PANTONE 236 C	0	1,61	29,38	0	77,6 34,1 -14,6	73,1 24,0 -4,8
PANTONE 237 C	0	2,36	44,52	0	69,9 47,6 -19,4	66,1 32,6 -5,9
PANTONE 238 C	0	3,42	56,29	0	61,1 61,6 -23,0	58,3 42,1 -6,7
PANTONE 239 C	0	6,31	63,26	0	55,0 69,0 -24,0	51,8 46,9 -8,8
PANTONE 240 C	0	10	69,38	0	48,2 67,0 -21,9	46,4 51,3 -10,8
PANTONE 241 C	0	16,93	83,09	0	41,6 63,9 -19,3	40,5 55,8 -13,4
PANTONE 242 C	31,87	14,02	81,6	0	31,7 45,0 -11,8	31,7 45,0 -11,8
PANTONE 2365 C	0	1,45	16,8	0	81,5 24,9 -11,4	77,7 17,8 -4,4
PANTONE 2375 C	0	4,23	48,44	0	65,6 51,4 -24,2	62,1 33,3 -8,0
PANTONE 2385 C	0	9,82	63,9	0	53,5 69,3 -28,8	50,1 44,7 -11,2
PANTONE 2395 C	0	12,83	76,14	0	46,2 76,5 -28,3	43,5 53,9 -11,9
PANTONE 2405 C	0	22,91	85,38	0	40,2 70,3 -26,5	38,7 54,5 -15,4
PANTONE 2415 C	0	30,96	93,57	0	36,1 64,1 -23,6	35,3 55,5 -17,5
PANTONE 2425 C	7,8	34,16	100	0	29,7 55,0 -18,2	30,1 52,9 -17,7
PANTONE 243 C	0	2,43	17,18	0	80,7 24,9 -14,2	76,4 16,6 -5,9
PANTONE 244 C	0	3,78	34,27	0	73,6 36,5 -20,4	69,1 23,6 -7,8
PANTONE 245 C	0	6,47	45,67	0	66,5 47,0 -26,1	62,2 28,5 -10,1
PANTONE 246 C	0	15	66,95	0	49,0 71,3 -33,5	46,3 45,5 -13,3
PANTONE 247 C	0	20,57	72,49	0	45,2 69,7 -31,9	42,2 48,3 -14,9
PANTONE 248 C	0	30,15	80,73	0	40,1 62,3 -28,3	38,4 49,2 -17,7
PANTONE 249 C	7,99	35,67	82,86	0	33,0 44,6 -18,4	33,0 44,6 -18,4
PANTONE 7646 C	21,18	1,13	49,22	0	53,3 27,3 -4,1	53,3 27,3 -4,1
PANTONE 7647 C	11,55	2,22	69,67	0	43,6 50,4 -5,6	43,6 50,4 -5,6
PANTONE 7648 C	13,99	5,09	84,37	0	36,6 55,1 -8,5	36,6 55,1 -8,5
PANTONE 7649 C	22,74	10,8	88,2	0	32,9 51,1 -11,1	32,9 51,1 -11,1
PANTONE 7650 C	44,22	15,8	81,27	0	28,5 40,6 -11,7	28,5 40,6 -11,7
PANTONE 7651 C	41,77	29,48	75,59	0	28,6 34,7 -14,6	28,6 34,7 -14,6
PANTONE 7652 C	52,81	28,77	75,3	0	25,6 30,9 -13,0	25,6 30,9 -13,0
PANTONE 250 C	0	2,86	15,26	0	80,8 22,8 -14,6	76,7 15,1 -6,6
PANTONE 251 C	0	5,18	32,17	0	72,8 34,3 -23,6	68,4 20,9 -9,6
PANTONE 252 C	0	14,28	54,64	0	58,6 53,6 -36,4	54,7 31,0 -14,2
PANTONE Purple C	0	27,24	66,23	0	47,5 68,9 -42,5	44,0 39,5 -17,4
PANTONE 253 C	0	34,12	72,06	0	43,0 67,2 -40,9	39,7 42,5 -19,3
PANTONE 254 C	0	40,85	79,33	0	38,4 59,6 -36,1	36,4 43,5 -21,6
PANTONE 255 C	4,71	47,65	88,59	0	29,8 42,6 -23,7	29,8 42,6 -23,7
PANTONE 517 C	0	1	10	0	84,0 16,7 -6,9	81,6 13,8 -3,7
PANTONE 516 C	0	1,91	12,94	0	81,6 18,6 -9,3	79,0 14,6 -5,1
PANTONE 515 C	0	2,94	23,36	0	76,9 25,3 -12,9	73,7 19,2 -6,6
PANTONE 514 C	0	5,76	41,43	0	67,5 35,0 -18,7	64,8 25,4 -9,8
PANTONE 513 C	0	40	72,92	0	39,3 48,1 -28,7	38,2 40,4 -21,3
PANTONE 512 C	2,7	40,54	77,9	0	35,4 41,7 -20,9	35,4 41,7 -20,9
PANTONE 511 C	56,7	16,71	69,12	0	27,1 28,1 -10,1	27,1 28,1 -10,1
PANTONE 7436 C	0	0,7	4,59	0	89,2 9,5 -5,3	86,4 7,9 -2,8
PANTONE 7437 C	0	5	17,86	0	74,6 16,8 -13,0	73,3 14,0 -9,7
PANTONE 7438 C	0	5,85	30,52	0	72,0 29,4 -20,7	68,6 19,6 -10,1
PANTONE 7439 C	0	13,87	41,54	0	62,3 24,0 -19,2	61,1 20,3 -14,6
PANTONE 7440 C	0	20,68	48,96	0	56,0 24,7 -18,2	55,6 23,4 -16,7
PANTONE 7441 C	0	35,9	57,35	0	50,8 41,5 -41,2	47,7 25,1 -21,3
PANTONE 7442 C	0	44,2	65	0	43,7 52,9 -50,3	40,8 30,0 -23,8
PANTONE 2562 C	0	5,88	22,79	0	75,3 25,6 -22,3	71,1 15,8 -10,2
PANTONE 2572 C	0	11,17	40	0	66,8 35,4 -31,0	62,9 20,5 -13,5
PANTONE 2582 C	0	33,03	60	0	50,5 52,7 -44,3	46,8 29,6 -20,0
PANTONE 2592 C	0	43,6	69,22	0	41,3 60,9 -49,7	38,4 35,4 -23,1
PANTONE 2602 C	0	50	81,05	0	35,1 57,1 -44,8	33,0 39,1 -25,9
PANTONE 2612 C	0	53,15	85	0	32,0 46,2 -34,3	31,1 39,5 -27,3
PANTONE 2622 C	27,54	44,9	73,32	0	29,4 30,8 -20,0	29,4 30,8 -20,0
PANTONE 7653 C	32,97	3,53	13,63	0	57,9 7,7 -5,2	57,9 7,7 -5,2
PANTONE 7654 C	5,26	10,95	45,92	0	55,9 22,6 -12,2	55,9 22,6 -12,2
PANTONE 7655 C	0	22,67	60,9	0	48,8 37,1 -18,5	48,4 34,8 -16,5

PANTONE 7656 C	0	35,93	73,46	0	39,1 43,7 -20,9	38,9 42,5 -19,9
PANTONE 7657 C	28,05	37,51	77,43	0	29,8 36,4 -17,5	29,8 36,4 -17,5
PANTONE 7658 C	41,88	29,08	68,64	0	30,7 30,0 -14,3	30,7 30,0 -14,3
PANTONE 7659 C	57,78	18,25	63,12	0	28,8 22,1 -9,8	28,8 22,1 -9,8
PANTONE 524 C	0	3,23	8,86	0	80,7 10,5 -8,3	79,8 9,7 -7,2
PANTONE 523 C	0	5,25	14,89	0	75,3 14,0 -12,4	74,3 12,3 -10,0
PANTONE 522 C	0	9,97	28,16	0	68,3 18,1 -16,7	67,0 15,4 -13,2
PANTONE 521 C	0	21,48	45	0	58,5 23,2 -21,4	57,4 19,9 -17,2
PANTONE 520 C	10,87	52,51	78,29	0	29,1 32,3 -24,9	29,1 32,3 -24,9
PANTONE 519 C	40,16	46,6	69,8	0	27,5 25,4 -19,3	27,5 25,4 -19,3
PANTONE 518 C	63,15	29,91	62,28	0	24,0 16,9 -9,9	24,0 16,9 -9,9
PANTONE 5245 C	2,97	0	3,75	0,02	83,9 6,1 -1,3	83,9 6,1 -1,3
PANTONE 5235 C	4,78	0,43	5,24	0	78,7 8,1 -2,2	78,7 8,1 -2,2
PANTONE 5225 C	6,81	1,02	8,45	0	74,2 9,7 -3,1	74,2 9,7 -3,1
PANTONE 5215 C	13,3	2,27	17,65	0	64,6 12,5 -4,6	64,6 12,5 -4,6
PANTONE 5205 C	40,54	4,65	43,82	0	46,7 16,9 -6,4	46,7 16,9 -6,4
PANTONE 5195 C	58,54	6,48	55,47	0	33,5 18,3 -6,4	33,5 18,3 -6,4
PANTONE 5185 C	68,31	12,55	58,59	0	23,8 14,7 -5,3	23,8 14,7 -5,3
PANTONE 5175 C	2,75	0,52	4,75	0	82,2 7,8 -2,4	82,2 7,8 -2,4
PANTONE 5165 C	2,62	1,34	6,92	0	79,7 9,2 -3,8	79,7 9,2 -3,8
PANTONE 5155 C	4,59	3,05	16,59	0	70,6 13,3 -6,2	70,6 13,3 -6,2
PANTONE 5145 C	13,44	7,61	42,12	0	54,4 19,2 -9,3	54,4 19,2 -9,3
PANTONE 5135 C	34,01	13,64	56,56	0	41,7 23,4 -11,0	41,7 23,4 -11,0
PANTONE 5125 C	50,53	18,16	64,14	0	32,3 25,7 -11,1	32,3 25,7 -11,1
PANTONE 5115 C	64,43	14,44	67,01	0	23,5 22,3 -7,5	23,5 22,3 -7,5
PANTONE 531 C	0	3,26	8,9	0	83,4 13,2 -12,1	79,7 9,7 -7,2
PANTONE 530 C	0	4,92	13,87	0	78,9 17,9 -17,2	75,0 11,8 -9,8
PANTONE 529 C	0	9,12	26,51	0	72,0 24,3 -24,3	68,0 15,1 -12,6
PANTONE 528 C	0	19,76	44,15	0	61,8 32,7 -33,2	58,2 19,8 -16,6
PANTONE 527 C	0	52,92	72,36	0	37,2 48,6 -48,1	34,5 31,8 -27,1
PANTONE 526 C	0	55,9	78,86	0	32,9 40,9 -37,9	31,7 33,6 -28,7
PANTONE 525 C	35,36	51,19	74,97	0	26,0 27,4 -21,6	26,0 27,4 -21,6
PANTONE 256 C	0	3,88	10,62	0	80,1 13,6 -11,8	77,9 10,6 -8,3
PANTONE 257 C	0	7,85	26,69	0	70,9 21,3 -17,9	68,7 16,1 -11,6
PANTONE 258 C	0	41,93	65,46	0	42,2 40,1 -31,6	41,2 31,9 -22,8
PANTONE 259 C	0	56	90,63	0	28,9 43,0 -31,6	28,5 40,5 -29,0
PANTONE 260 C	12,24	51,56	83,61	0	27,5 36,0 -24,3	27,5 36,0 -24,3
PANTONE 261 C	32,93	48,57	78,59	0	26,2 31,3 -21,0	26,2 31,3 -21,0
PANTONE 262 C	54,99	40,38	71,47	0	23,5 24,8 -14,7	23,5 24,8 -14,7
PANTONE 2563 C	0	7,85	25	0	72,3 22,9 -21,0	69,2 15,3 -11,6
PANTONE 2573 C	0	15,81	42,77	0	62,7 30,7 -28,3	59,9 20,3 -15,3
PANTONE 2583 C	0	33,11	57,61	0	50,8 39,2 -34,6	48,3 26,6 -20,3
PANTONE 2593 C	0	49,48	73,2	0	37,4 47,2 -40,1	35,3 34,6 -25,6
PANTONE 2603 C	0	56,36	87,84	0	30,0 45,3 -36,8	29,1 38,6 -29,2
PANTONE 2613 C	0	57,99	92,43	0	27,4 42,0 -33,0	27,1 39,6 -30,4
PANTONE 2623 C	8,99	56,23	89,49	0	25,6 36,7 -27,3	25,6 36,7 -27,3
PANTONE 7660 C	15,84	7,99	13,4	0	61,4 6,5 -9,2	61,4 6,5 -9,2
PANTONE 7661 C	4,75	27,11	49,77	0	50,8 19,6 -17,4	50,8 19,6 -17,4
PANTONE 7662 C	0	47,23	69,18	0	37,4 33,8 -25,7	37,3 33,0 -24,7
PANTONE 7663 C	0,32	55,43	81,18	0	31,1 35,4 -28,4	31,1 35,4 -28,4
PANTONE 7664 C	0	57,72	79,69	0	30,7 32,6 -30,4	30,6 32,3 -30,0
PANTONE 7665 C	13,11	53,81	71,98	0	30,1 26,9 -24,9	30,1 26,9 -24,9
PANTONE 7666 C	55,39	24,56	45,22	0	35,1 10,3 -10,3	35,1 10,3 -10,3
PANTONE 2567 C	0	10,98	25,25	0	70,6 20,8 -24,3	67,5 13,4 -13,7
PANTONE 2577 C	0	27,03	45,55	0	58,7 29,0 -33,8	55,8 18,3 -18,9
PANTONE 2587 C	0	49,68	64,83	0	41,6 40,5 -45,2	39,2 26,3 -26,3
PANTONE 2597 C	0	64,78	96,54	0	24,6 48,2 -51,5	22,7 35,9 -35,5
PANTONE 2607 C	0	66,91	100	0	21,0 42,8 -45,1	20,7 36,2 -37,3
PANTONE 2617 C	0	68,28	100	0	18,3 38,2 -39,4	20,0 35,0 -38,3
PANTONE 2627 C	41,56	65,33	100	0	15,5 30,2 -30,3	16,1 28,6 -29,0
PANTONE 263 C	0	4,36	8,81	0	82,1 11,7 -14,0	78,4 8,4 -9,0
PANTONE 264 C	0	11,34	21,1	0	72,6 19,1 -26,2	68,6 11,2 -14,0
PANTONE 265 C	0	41,8	55	0	50,9 35,4 -48,3	47,6 19,7 -23,8
PANTONE 266 C	0	55,2	66,48	0	38,7 44,8 -58,5	36,5 24,7 -28,5
PANTONE 267 C	0	62,78	82,47	0	29,8 43,9 -55,2	27,5 29,1 -33,4
PANTONE 268 C	0	63,2	83,09	0	28,0 34,2 -41,2	27,1 29,1 -33,7

PANTONE 269 C	7,66	61,72	80,23	0	26,1 27,1 -30,5	26,1 27,1 -30,5
PANTONE 2635 C	0	8,98	12,53	0	76,1 13,0 -21,2	73,2 8,1 -13,1
PANTONE 2645 C	0	20	28,91	0	66,2 19,6 -32,4	63,3 11,3 -17,6
PANTONE 2655 C	0	36,5	45,67	0	56,5 26,3 -42,5	53,2 14,7 -22,3
PANTONE 2665 C	0	50	59,02	0	45,4 34,5 -52,9	42,7 19,4 -27,0
PANTONE Violet C	0	72,41	100	0	18,7 54,6 -69,5	18,6 32,5 -40,6
PANTONE 2685 C	0	78,54	100	0	13,5 41,0 -53,4	17,1 29,6 -43,1
PANTONE 2695 C	56,61	67,52	83,56	0	14,3 17,6 -24,2	14,3 17,6 -24,2
PANTONE 270 C	0	13,2	9,99	0	74,6 6,8 -21,6	72,3 4,5 -16,0
PANTONE 271 C	0	30,45	25,66	0	63,4 10,8 -31,5	61,6 6,4 -21,4
PANTONE 272 C	0	47,91	46,34	0	51,5 15,0 -40,7	49,5 9,4 -27,0
PANTONE 273 C	10,98	84,32	100	0	13,1 24,8 -42,5	14,1 23,0 -41,0
PANTONE 274 C	43,13	82,64	100	0	12,0 19,4 -34,8	12,1 19,2 -34,5
PANTONE 275 C	55,07	79,83	92,88	0	11,5 15,7 -28,9	11,5 15,7 -28,9
PANTONE 276 C	68,72	65,81	69,57	0	12,2 8,0 -15,2	12,2 8,0 -15,2
PANTONE 2705 C	0	20,48	16,81	0	69,3 11,0 -30,2	66,8 5,8 -18,7
PANTONE 2715 C	0	38,52	37,75	0	58,5 16,8 -41,7	55,8 8,5 -23,5
PANTONE 2725 C	0	55,29	56,96	0	44,5 25,3 -55,0	42,3 13,9 -29,5
PANTONE 2735 C	0	80,03	100	0	14,3 48,5 -68,4	16,7 28,9 -43,7
PANTONE 2745 C	0	84,17	100	0	12,8 36,0 -54,5	15,7 26,9 -45,3
PANTONE 2755 C	6,22	84,58	100	0	12,6 27,4 -44,8	14,6 24,2 -42,5
PANTONE 2765 C	54,79	80,66	95,49	0	11,1 16,3 -29,5	11,1 16,3 -29,5
PANTONE 7667 C	10,12	41,13	25,21	0	51,9 1,9 -21,6	51,9 1,9 -21,6
PANTONE 7668 C	1,8	51,21	46,35	0	47,3 7,3 -27,8	47,3 7,3 -27,8
PANTONE 7669 C	0	56,52	56,52	0	42,3 13,6 -33,5	41,9 12,2 -30,3
PANTONE 7670 C	0	60,03	61,36	0	37,6 15,8 -36,5	37,3 14,0 -32,3
PANTONE 7671 C	0	62,29	66,15	0	33,5 18,6 -36,5	33,2 17,1 -33,3
PANTONE 7672 C	0	64,08	68,32	0	31,3 18,9 -36,7	31,0 17,7 -34,4
PANTONE 7673 C	7,74	58,18	57,23	0	37,4 10,1 -28,7	37,4 10,1 -28,7
PANTONE 7443 C	0	2,6	3,04	0	87,7 3,2 -6,6	86,2 2,5 -5,3
PANTONE 7444 C	0	11,23	8,52	0	75,5 5,4 -18,6	74,0 3,9 -15,0
PANTONE 7445 C	0,82	15,33	16,05	0	68,0 7,0 -16,2	68,0 7,0 -16,2
PANTONE 7446 C	0	37,94	36,5	0	58,3 13,5 -35,2	56,3 8,2 -23,4
PANTONE 7447 C	18,37	51,78	61,93	0	34,4 17,5 -23,5	34,4 17,5 -23,5
PANTONE 7448 C	63,27	29,08	54,97	0	26,3 12,4 -9,2	26,3 12,4 -9,2
PANTONE 7449 C	69,39	22,83	64,43	0	19,9 16,0 -7,0	19,9 16,0 -7,0
PANTONE 7674 C	1,36	34,2	27,85	0	58,9 5,8 -22,0	58,9 5,8 -22,0
PANTONE 7675 C	1	41,14	37,91	0	54,2 7,3 -24,1	54,2 7,3 -24,1
PANTONE 7676 C	0	48,21	54,4	0	46,4 17,0 -29,5	45,9 15,4 -26,6
PANTONE 7677 C	0	52,81	62,85	0	39,9 24,1 -30,9	39,5 22,0 -27,8
PANTONE 7678 C	0	56,15	66,14	0	36,7 26,3 -33,7	36,3 23,3 -29,2
PANTONE 7679 C	0	61,68	70,58	0	31,4 23,9 -35,1	31,1 22,5 -32,6
PANTONE 7680 C	0	63,84	80,4	0	27,7 27,4 -35,0	27,5 26,8 -34,1
PANTONE 663 C	0	0,8	2,17	0	90,0 2,4 -2,3	90,0 2,4 -2,2
PANTONE 664 C	0	1,45	2,89	0	88,0 3,3 -3,4	88,0 3,2 -3,4
PANTONE 665 C	1,28	4,38	7,67	0	77,5 6,9 -8,7	77,5 6,9 -8,7
PANTONE 666 C	3,51	14,99	25,95	0	62,7 10,8 -14,5	62,7 10,8 -14,5
PANTONE 667 C	8,48	36,58	48,18	0	47,4 14,4 -19,5	47,4 14,4 -19,5
PANTONE 668 C	19,05	49,05	60,01	0	36,0 17,0 -22,4	36,0 17,0 -22,4
PANTONE 669 C	49,89	60,44	71,09	0	21,6 17,5 -22,7	21,6 17,5 -22,7
PANTONE 5315 C	1,13	1,94	2,39	0	86,3 1,8 -3,9	86,3 1,8 -3,9
PANTONE 5305 C	2,58	3,74	3,91	0	79,7 2,9 -7,1	79,7 2,9 -7,1
PANTONE 5295 C	4,8	6,19	6,2	0	72,6 3,9 -9,8	72,6 3,9 -9,8
PANTONE 5285 C	11,1	19,01	20,31	0	58,2 6,1 -14,5	58,2 6,1 -14,5
PANTONE 5275 C	34,18	47,4	50,4	0	37,4 8,7 -20,0	37,4 8,7 -20,0
PANTONE 5265 C	49,63	58,38	61,32	0	26,4 10,1 -21,9	26,4 10,1 -21,9
PANTONE 5255 C	68,75	69,01	76,61	0	10,7 7,9 -16,9	10,7 7,9 -16,9
PANTONE 538 C	2,97	3,83	1,24	0	82,6 -1,7 -6,9	82,6 -1,7 -6,9
PANTONE 537 C	3,04	5,48	2,05	0	79,7 -1,6 -9,6	79,7 -1,6 -9,6
PANTONE 536 C	5,14	12,17	3,5	0	71,8 -1,9 -13,9	71,8 -1,9 -13,9
PANTONE 535 C	6,11	22,78	7,82	0	64,8 -0,6 -17,8	64,8 -0,6 -17,8
PANTONE 534 C	50,97	72,29	61,17	0	21,9 1,5 -27,7	21,9 1,5 -27,7
PANTONE 533 C	64,75	67,23	60,93	0	17,0 2,6 -18,6	17,0 2,6 -18,6
PANTONE 532 C	79,97	58,03	54,33	0	11,9 1,3 -7,7	11,9 1,3 -7,7
PANTONE 7541 C	2,01	1,55	0	0,37	88,8 -2,1 -2,1	88,8 -2,1 -2,1
PANTONE 7542 C	8,39	8,89	0	1,87	74,3 -6,7 -6,8	74,3 -6,7 -6,8

PANTONE 7543 C	24,46	5,45	0,81	0	66,7 -2,9 -6,8	66,7 -2,9 -6,8
PANTONE 7544 C	43,48	13,8	1,76	0	54,8 -3,5 -9,0	54,8 -3,5 -9,0
PANTONE 7545 C	61,37	42,32	5,13	0	34,7 -4,2 -11,6	34,7 -4,2 -11,6
PANTONE 7546 C	69,16	57,6	26,87	0	22,1 -3,8 -12,1	22,1 -3,8 -12,1
PANTONE 7547 C	81,88	67,17	50,41	0	10,7 -2,4 -9,0	10,7 -2,4 -9,0
PANTONE 552 C	1,59	7,77	0	1,43	82,6 -7,1 -8,3	82,6 -7,1 -8,3
PANTONE 551 C	2,22	14,55	0	2,39	77,7 -9,8 -10,6	77,7 -9,8 -10,6
PANTONE 550 C	4,06	24,25	0	2,44	72,0 -11,6 -14,3	72,0 -11,6 -14,3
PANTONE 549 C	8,66	39,86	0	3,4	63,6 -14,7 -17,6	63,6 -14,7 -17,6
PANTONE 548 C	67,83	84,44	0	4,29	21,1 -20,5 -17,7	21,1 -20,5 -17,7
PANTONE 547 C	75,03	84,25	0	3,15	16,5 -17,0 -13,8	16,5 -17,0 -13,8
PANTONE 546 C	80,12	67,86	0	3,38	15,0 -10,8 -8,3	15,0 -10,8 -8,3
PANTONE 5455 C	4,68	3,85	0	0,06	81,7 -3,8 -6,4	81,7 -3,8 -6,4
PANTONE 5445 C	5,87	4,46	0,05	0	79,6 -4,2 -7,5	79,6 -4,2 -7,5
PANTONE 5435 C	9,44	7,42	0,12	0	74,5 -5,1 -9,7	74,5 -5,1 -9,7
PANTONE 5425 C	25,07	22,07	0,62	0	61,1 -7,1 -14,3	61,1 -7,1 -14,3
PANTONE 5415 C	39,46	40,25	1,59	0	50,8 -8,2 -17,1	50,8 -8,2 -17,1
PANTONE 5405 C	46,31	43,78	1,68	0	46,9 -8,7 -17,1	46,9 -8,7 -17,1
PANTONE 5395 C	79,37	77,15	50,01	0	10,5 -5,2 -11,7	10,5 -5,2 -11,7
PANTONE 642 C	0,83	3,37	0,68	0	87,3 -2,4 -6,5	87,3 -2,4 -6,5
PANTONE 643 C	1,19	4,69	0,98	0	84,5 -3,1 -9,2	84,5 -3,1 -9,2
PANTONE 644 C	3,09	17,4	2,53	0	73,1 -5,1 -17,5	73,1 -5,1 -17,5
PANTONE 645 C	4,42	34,2	4,7	0	64,5 -6,1 -22,9	64,5 -6,1 -22,9
PANTONE 646 C	6,65	48,27	10,96	0	55,5 -6,6 -27,5	55,5 -6,6 -27,5
PANTONE 647 C	9,83	66,03	41,48	0	38,7 -6,5 -34,1	38,7 -6,5 -34,1
PANTONE 648 C	41,6	97,03	67,83	0	17,6 -0,3 -34,4	17,6 -0,3 -34,4
PANTONE 649 C	0,22	2,33	0,89	0	89,4 -1,1 -4,6	89,4 -1,1 -4,6
PANTONE 650 C	0,43	3,91	1,34	0	86,2 -1,7 -7,6	86,2 -1,7 -7,6
PANTONE 651 C	2,02	13,26	3,17	0	75,2 -3,0 -15,9	75,2 -3,0 -15,9
PANTONE 652 C	3,84	35,74	8,3	0	62,7 -3,6 -23,4	62,7 -3,6 -23,4
PANTONE 653 C	6,67	64,43	44,64	0	39,8 -3,4 -33,9	39,8 -3,4 -33,9
PANTONE 654 C	17,62	83,92	64,36	0	23,5 0,3 -37,2	23,5 0,3 -37,2
PANTONE 655 C	46,9	99,04	75,75	0	14,4 3,6 -33,5	14,4 3,6 -33,5
PANTONE 656 C	0	2,41	0,77	0	90,4 -1,2 -5,1	89,8 -1,4 -4,7
PANTONE 657 C	0	5,5	1,54	0	85,4 -2,4 -11,7	84,6 -2,7 -10,6
PANTONE 658 C	0	12,15	2,59	0	79,8 -3,1 -18,6	78,7 -3,7 -16,3
PANTONE 659 C	0	39,13	9,01	0	65,9 -3,3 -33,5	64,5 -4,5 -27,1
PANTONE 660 C	0	57,78	33,29	0	51,1 -1,3 -46,5	50,0 -3,5 -33,9
PANTONE 661 C	0	86,78	75,46	0	23,5 13,9 -59,8	22,0 9,6 -43,8
PANTONE 662 C	0	100	98,16	0	13,9 21,3 -52,6	14,0 20,3 -48,6
PANTONE 7450 C	0,48	7,46	3,85	0	79,3 0,6 -12,2	79,3 0,6 -12,2
PANTONE 7451 C	0	32,95	8,55	0	68,8 -1,0 -33,1	66,8 -2,9 -24,5
PANTONE 7452 C	0	40	23,44	0	62,0 6,9 -40,3	59,6 2,3 -25,4
PANTONE 7453 C	0	38,56	8,64	0	66,4 -3,3 -34,0	64,9 -4,6 -26,9
PANTONE 7454 C	8,67	46,01	7,14	0	56,7 -7,9 -26,0	56,7 -7,9 -26,0
PANTONE 7455 C	0	63,74	55,29	0	40,1 7,7 -47,8	39,0 4,5 -35,7
PANTONE 7456 C	0	55,09	47,53	0	47,5 9,0 -38,8	46,6 6,5 -30,3
PANTONE 2706 C	0	5,51	3	0	84,3 0,9 -13,1	82,5 -0,0 -10,5
PANTONE 2716 C	0	22,76	10	0	71,4 4,1 -29,6	68,9 1,4 -20,4
PANTONE 2726 C	0	60	56,65	0	42,0 18,2 -59,6	40,1 9,2 -32,9
PANTONE 2736 C	0	78,7	88,45	0	23,4 35,7 -72,6	20,3 21,7 -41,9
PANTONE 2746 C	0	85	94,68	0	18,9 31,2 -63,9	17,1 22,6 -44,9
PANTONE 2756 C	0	94,85	94,17	0	15,9 19,2 -47,1	15,8 19,2 -47,0
PANTONE 2766 C	49,97	90,46	87,54	0	12,1 11,2 -32,6	12,1 11,2 -32,6
PANTONE 2708 C	0	9,96	2,73	0	81,2 -1,9 -17,6	79,6 -2,8 -15,0
PANTONE 2718 C	0	50,63	28,73	0	56,2 3,0 -48,0	54,3 -1,0 -30,2
PANTONE 2728 C	0	69,93	65	0	32,5 17,8 -68,1	30,1 8,7 -39,0
PANTONE 2738 C	0	89,23	100	0	14,1 39,3 -70,2	14,9 25,1 -46,6
PANTONE 2748 C	0	100	99,38	0	13,5 22,4 -53,7	13,7 21,2 -48,7
PANTONE 2758 C	11,75	100	92,15	0	13,5 14,0 -43,9	13,9 14,0 -42,4
PANTONE 2768 C	55,14	98,1	82,61	0	11,3 6,4 -30,5	11,3 6,4 -30,5
PANTONE 2707 C	0	7,19	1,49	0	84,8 -2,9 -14,3	83,4 -3,6 -12,3
PANTONE 2717 C	0	16,51	2,83	0	78,5 -3,6 -23,7	76,5 -4,8 -18,8
PANTONE 2727 C	0	56,93	35	0	51,9 3,0 -59,1	50,0 -2,2 -33,0
PANTONE Blue 072 C	0	85	100	0	17,5 42,9 -76,0	15,5 26,5 -45,7
PANTONE 2747 C	0	100	98,34	0	13,7 21,8 -54,5	14,0 20,4 -48,6

PANTONE 2757 C	16,57	100	90,55	0	13,2 12,5 -43,3	13,8 12,6 -41,0
PANTONE 2767 C	60,3	77,93	64,54	0	16,0 1,7 -24,7	16,0 1,7 -24,7
PANTONE 277 C	0	13,99	1,77	0	79,7 -5,4 -19,4	78,9 -5,8 -17,7
PANTONE 278 C	0	30,22	3,49	0	72,8 -6,3 -29,7	71,4 -7,4 -24,4
PANTONE 279 C	0	54,9	18,41	0	56,9 -4,6 -48,9	55,3 -7,0 -33,7
PANTONE Reflex Blue C	0	95,73	100	0	14,9 31,9 -67,1	14,0 23,0 -47,9
PANTONE 280 C	2,91	100	91,86	0	15,1 15,2 -46,5	15,2 15,2 -46,1
PANTONE 281 C	32,4	100	84,61	0	12,8 9,0 -40,6	13,7 9,3 -37,7
PANTONE 282 C	61,37	96,87	76,6	0	11,1 2,5 -26,3	11,1 2,5 -26,3
PANTONE 283 C	0	25,83	1,74	0	75,5 -8,4 -25,9	74,7 -9,0 -23,2
PANTONE 284 C	0	42,38	4,22	0	67,5 -9,2 -36,0	66,3 -10,2 -29,8
PANTONE 285 C	0	65,72	40,89	0	45,3 -4,7 -58,9	43,6 -6,7 -38,8
PANTONE 286 C	0	89,13	79,17	0	23,0 17,9 -67,9	20,7 11,3 -44,5
PANTONE 287 C	0	94,88	79,68	0	20,9 12,5 -56,1	19,8 9,9 -45,7
PANTONE 288 C	1,21	100	79,98	0	18,6 8,3 -46,5	18,8 8,4 -46,0
PANTONE 289 C	65,17	82,01	65,86	0	13,1 0,1 -21,6	13,1 0,1 -21,6
PANTONE 7681 C	1,46	24,5	7,83	0	68,3 -1,0 -20,5	68,3 -1,0 -20,5
PANTONE 7682 C	0	49,68	26,93	0	55,1 -1,2 -30,0	55,1 -1,2 -29,9
PANTONE 7683 C	0	61,38	44,76	0	44,8 -0,4 -38,1	44,5 -0,9 -35,1
PANTONE 7684 C	0	65,15	53,56	0	39,3 2,5 -39,7	39,1 1,9 -36,9
PANTONE 7685 C	0	68,19	56,91	0	36,0 2,7 -41,1	35,8 2,2 -38,5
PANTONE 7686 C	0	72,47	59,44	0	33,0 2,3 -42,4	32,8 1,9 -40,4
PANTONE 7687 C	0	75,9	65,82	0	28,5 7,8 -44,9	28,2 6,7 -40,7
PANTONE 545 C	1,08	4,73	0,18	0	85,7 -4,8 -9,5	85,7 -4,8 -9,5
PANTONE 544 C	1,03	6,75	0,34	0	83,9 -5,5 -11,7	83,9 -5,5 -11,7
PANTONE 543 C	1,32	14,56	0,77	0	78,3 -7,6 -17,6	78,3 -7,6 -17,6
PANTONE 542 C	2,29	35,2	2,24	0	68,6 -10,0 -25,4	68,6 -10,0 -25,4
PANTONE 541 C	24,71	100	60,56	0	22,6 -7,0 -39,1	22,7 -6,8 -38,5
PANTONE 540 C	55,48	100	60,38	0	17,5 -7,1 -30,4	17,7 -7,0 -30,0
PANTONE 539 C	71,14	83,31	53,41	0	13,4 -6,5 -17,3	13,4 -6,5 -17,3
PANTONE 290 C	0	8,75	0	0,4	84,6 -7,9 -13,1	84,2 -7,4 -13,0
PANTONE 291 C	0	19,86	0	0	79,0 -10,6 -21,9	78,7 -10,6 -21,4
PANTONE 292 C	0	42,32	1,78	0	69,4 -13,0 -34,5	68,7 -13,6 -30,9
PANTONE 293 C	0	84,91	68,98	0	25,8 11,1 -66,5	24,3 5,7 -43,2
PANTONE 294 C	0	100	78,64	5,94	18,8 3,7 -42,5	19,1 3,8 -41,8
PANTONE 295 C	52,05	100	68,34	0	14,8 -1,8 -33,7	15,5 -1,2 -31,4
PANTONE 296 C	77,15	88,56	61,09	0	9,0 -4,3 -13,9	9,0 -4,3 -13,9
PANTONE 2905 C	0	26,16	0	0,44	77,2 -13,4 -23,4	76,5 -12,2 -22,7
PANTONE 2915 C	0	43,71	0,44	0	69,5 -15,9 -33,4	69,3 -16,1 -32,3
PANTONE 2925 C	0	59,09	3,9	0	59,5 -17,2 -45,0	58,9 -17,8 -40,0
PANTONE 2935 C	0	79,91	56,8	0	34,0 -2,2 -64,2	32,7 -4,1 -42,9
PANTONE 2945 C	0	94,38	59,7	0	29,2 -5,8 -52,9	28,7 -6,2 -45,9
PANTONE 2955 C	44,24	100	58,72	0	20,9 -8,2 -34,4	20,9 -8,2 -34,3
PANTONE 2965 C	68,29	94,57	57,27	0	13,2 -7,2 -20,3	13,2 -7,2 -20,3
PANTONE 297 C	0	35,6	0	1,56	74,9 -19,6 -26,8	72,8 -15,0 -24,0
PANTONE 298 C	0	48,84	0	1,02	68,7 -22,5 -35,1	67,3 -19,4 -32,8
PANTONE 299 C	0	60,87	0	0	61,0 -24,3 -44,2	60,9 -23,8 -43,8
PANTONE 300 C	0	83,14	50,12	0	35,8 -9,7 -62,0	34,9 -10,3 -44,7
PANTONE 301 C	6,53	100	55,23	0	27,8 -12,3 -45,3	28,2 -11,7 -43,5
PANTONE 302 C	58,21	92,36	43,48	0	21,5 -13,5 -28,0	21,5 -13,5 -28,0
PANTONE 303 C	73,64	80,73	40,63	0	14,8 -9,1 -15,2	14,8 -9,1 -15,2
PANTONE 7688 C	1,8	55,03	4,84	0	59,2 -13,9 -34,8	59,2 -13,9 -34,8
PANTONE 7689 C	3,88	59,28	4,81	0	55,0 -16,1 -36,4	55,0 -16,1 -36,4
PANTONE 7690 C	10,79	66,51	9,85	0	45,3 -16,9 -37,1	45,3 -16,9 -37,1
PANTONE 7691 C	7,87	75,94	35,97	0	37,5 -13,8 -39,7	37,5 -13,8 -39,7
PANTONE 7692 C	17,27	73,96	44,13	0	33,4 -9,5 -35,7	33,4 -9,5 -35,7
PANTONE 7693 C	35,34	75,08	49,96	0	28,6 -6,9 -32,6	28,6 -6,9 -32,6
PANTONE 7694 C	47,57	75,05	50,69	0	25,9 -6,1 -29,5	25,9 -6,1 -29,5
PANTONE 2975 C	0	19,66	0	2,1	81,7 -16,7 -17,4	78,4 -11,6 -15,1
PANTONE 2985 C	0	42,49	0	2,24	73,0 -23,3 -29,5	69,9 -17,4 -25,9
PANTONE 2995 C	0	59,5	0	1,47	62,5 -27,8 -42,0	61,5 -24,3 -39,0
PANTONE 3005 C	0	83,03	17,57	0	43,9 -21,3 -57,9	43,6 -21,9 -49,4
PANTONE 3015 C	9,67	96,22	22,9	0	35,8 -22,5 -44,6	35,8 -22,5 -44,6
PANTONE 3025 C	55,37	84,84	4,94	0	28,8 -21,5 -30,1	28,8 -21,5 -30,1
PANTONE 3035 C	67,65	77,47	0,45	0	22,6 -17,1 -19,0	22,6 -17,1 -19,0
PANTONE 7695 C	9,82	30,47	0	1,76	65,7 -11,4 -16,3	65,7 -11,4 -16,3

PANTONE 7696 C	13,59	42,43	0	3,26	59,8 -14,6 -17,7	59,8 -14,6 -17,7
PANTONE 7697 C	29,67	48,2	0	1,62	53,0 -14,0 -20,3	53,0 -14,0 -20,3
PANTONE 7698 C	46,27	50,34	0,48	0	45,7 -11,9 -19,9	45,7 -11,9 -19,9
PANTONE 7699 C	51,53	55,65	3,39	0	39,9 -10,9 -20,4	39,9 -10,9 -20,4
PANTONE 7700 C	46,42	64,36	14,58	0	35,8 -11,4 -26,2	35,8 -11,4 -26,2
PANTONE 7701 C	54,14	69,63	3,67	0	32,8 -17,4 -26,6	32,8 -17,4 -26,6
PANTONE 7457 C	0	8,77	0	1,76	85,6 -9,7 -9,3	83,9 -8,0 -8,8
PANTONE 7458 C	1,96	40,62	0	4,14	68,5 -17,0 -19,3	68,5 -17,0 -19,3
PANTONE 7459 C	8,2	53,85	0	3,97	58,1 -20,4 -24,2	58,1 -20,4 -24,2
PANTONE 7460 C	0	100	0	5,88	47,1 -40,8 -48,6	47,1 -40,0 -47,7
PANTONE 7461 C	2,6	70,06	10,18	0	47,3 -19,9 -44,5	47,3 -19,9 -44,5
PANTONE 7462 C	8,43	79,3	48,53	0	32,9 -9,3 -39,4	32,9 -9,3 -39,4
PANTONE 7463 C	62,89	88,59	59,21	0	15,7 -5,5 -24,3	15,7 -5,5 -24,3
PANTONE 304 C	0	19,14	0	3,23	83,0 -19,0 -14,6	78,3 -12,1 -11,8
PANTONE 305 C	0	41,01	0	3,93	75,4 -27,3 -26,2	70,2 -17,7 -21,0
PANTONE 306 C	0	56,95	0	4,17	65,9 -35,1 -38,0	62,7 -25,0 -30,7
PANTONE Process Blue C	1,85	96,64	0	1,07	47,6 -33,4 -53,4	47,6 -33,4 -53,4
PANTONE 307 C	0	100	24,39	4,66	38,4 -29,8 -47,0	38,7 -28,6 -45,0
PANTONE 308 C	52,61	100	0	1,04	31,3 -28,0 -33,1	31,4 -27,8 -32,9
PANTONE 309 C	68,88	80,51	0	4,36	21,0 -18,7 -15,8	21,0 -18,7 -15,8
PANTONE 635 C	0	15	0	2,61	83,6 -16,1 -13,3	80,2 -10,7 -11,3
PANTONE 636 C	0	25	0	3,16	80,1 -20,2 -18,0	76,3 -13,4 -14,8
PANTONE 637 C	0	45	0	4,54	72,5 -27,5 -26,5	68,4 -19,7 -22,1
PANTONE 638 C	0	58,32	0	5	64,0 -33,8 -35,0	61,6 -26,4 -30,1
PANTONE 639 C	0	72,98	0	5,8	53,8 -37,6 -42,6	53,0 -34,6 -40,5
PANTONE 640 C	3,63	91,63	0	3,79	46,5 -35,9 -45,8	46,5 -35,9 -45,8
PANTONE 641 C	0	100	31,05	5	36,7 -28,6 -46,4	37,2 -27,0 -44,0
PANTONE 7702 C	1,15	52,46	0	5,19	63,9 -22,9 -24,7	63,9 -22,9 -24,7
PANTONE 7703 C	1,77	61,59	0	6,67	57,9 -28,1 -29,7	57,9 -28,1 -29,7
PANTONE 7704 C	7,66	69,56	0	5,6	49,0 -30,3 -34,1	49,0 -30,3 -34,1
PANTONE 7705 C	32,19	73,91	0	2,53	41,3 -26,2 -32,9	41,3 -26,2 -32,9
PANTONE 7706 C	40,92	71,55	0	1,69	39,5 -23,8 -30,7	39,5 -23,8 -30,7
PANTONE 7707 C	50,73	69,54	0	1,91	36,3 -21,6 -26,6	36,3 -21,6 -26,6
PANTONE 7708 C	56,44	72,65	0	2,15	31,9 -21,2 -24,4	31,9 -21,2 -24,4
PANTONE 628 C	0	10	0	3,14	85,4 -12,1 -7,1	82,7 -9,3 -6,5
PANTONE 629 C	0	20	0	3,98	80,5 -16,9 -12,1	77,8 -12,8 -10,5
PANTONE 630 C	0	35,68	0	5,83	74,5 -22,0 -17,1	72,1 -17,1 -14,7
PANTONE 631 C	0	52,87	0	8,41	66,1 -27,8 -23,2	64,7 -24,5 -21,4
PANTONE 632 C	1,57	67,46	0	12,65	53,8 -33,9 -29,5	53,8 -33,9 -29,5
PANTONE 633 C	19,02	83,14	0	8,58	41,4 -34,3 -33,0	41,4 -34,3 -33,0
PANTONE 634 C	46,1	96,52	0	3,15	33,8 -30,3 -32,9	33,8 -30,3 -32,9
PANTONE 310 C	0	35	0	5,3	77,7 -27,7 -20,4	72,4 -16,7 -15,0
PANTONE 311 C	0	49,71	0	7,68	71,4 -35,2 -26,9	66,1 -22,9 -20,4
PANTONE 312 C	0	65	0	13,66	60,1 -45,2 -36,1	56,6 -33,7 -27,3
PANTONE 313 C	0	82,49	0	13,71	51,1 -47,5 -40,8	49,6 -41,9 -36,5
PANTONE 314 C	3,87	96,71	0	16,09	44,5 -44,1 -36,2	44,5 -44,1 -36,2
PANTONE 315 C	35,27	92,05	0	17,08	36,3 -36,8 -27,1	36,3 -36,8 -27,1
PANTONE 316 C	63,22	76,22	0	23,89	26,0 -22,6 -13,4	26,0 -22,6 -13,4
PANTONE 3105 C	0	35	0	7,16	77,8 -29,6 -18,0	72,3 -17,4 -12,6
PANTONE 3115 C	0	53,16	0	11,66	69,7 -40,3 -24,9	64,4 -25,4 -18,2
PANTONE 3125 C	0	63,94	0	18,59	61,4 -48,9 -30,3	57,2 -34,3 -23,0
PANTONE 3135 C	0	90	0	26,88	48,7 -53,9 -34,2	47,6 -48,5 -30,9
PANTONE 3145 C	10,68	95,54	0	29,3	41,4 -45,4 -27,1	41,4 -45,4 -27,1
PANTONE 3155 C	41,43	95,49	0	29,3	34,3 -38,8 -22,2	34,3 -38,8 -22,2
PANTONE 3165 C	58,77	86,26	0	30,47	27,7 -30,2 -16,3	27,7 -30,2 -16,3
PANTONE 7709 C	0	46,87	0	11,99	67,3 -23,4 -14,3	67,1 -23,0 -14,1
PANTONE 7710 C	0	60,14	0	19,81	61,1 -36,0 -20,4	59,7 -31,8 -18,6
PANTONE 7711 C	0	69,07	0	28,06	54,0 -44,1 -24,3	53,1 -40,2 -22,7
PANTONE 7712 C	4,79	77,01	0	24	47,6 -40,3 -26,4	47,6 -40,3 -26,4
PANTONE 7713 C	9,57	79,34	0	33,99	44,4 -41,7 -21,1	44,4 -41,7 -21,1
PANTONE 7714 C	16,45	78,01	0	36,99	42,4 -39,5 -18,1	42,4 -39,5 -18,1
PANTONE 7715 C	47,68	75,8	0	35,52	35,4 -31,6 -14,4	35,4 -31,6 -14,4
PANTONE 317 C	0	12,1	0	4,37	86,7 -17,2 -6,3	81,3 -10,7 -4,8
PANTONE 318 C	0	25	0	6,82	81,9 -26,1 -11,4	75,9 -14,9 -8,0
PANTONE 319 C	0	45,88	0	14,05	74,1 -39,1 -17,2	67,4 -23,1 -11,8
PANTONE 320 C	0	80	0	40,84	53,3 -62,5 -24,8	49,1 -48,8 -19,9

PANTONE 321 C	0	86,78	0	43,01	48,4 -56,4 -22,1	47,5 -52,6 -20,7
PANTONE 322 C	16,58	86,63	0	44,52	40,2 -45,4 -16,9	40,2 -45,4 -16,9
PANTONE 323 C	47,8	82,02	0	44,88	33,8 -36,3 -12,6	33,8 -36,3 -12,6
PANTONE 7464 C	0	19,85	0	9,17	79,9 -17,4 -3,0	77,6 -14,5 -2,6
PANTONE 7465 C	0	48,31	0	33,2	70,3 -40,4 -1,8	65,2 -27,0 -1,5
PANTONE 7466 C	0	63,53	0	29,01	61,6 -54,5 -22,9	56,8 -36,1 -16,9
PANTONE 7467 C	0	69,02	0	35	56,3 -59,5 -24,3	52,6 -41,7 -18,6
PANTONE 7468 C	32,1	68,32	0	2,27	43,1 -23,8 -30,8	43,1 -23,8 -30,8
PANTONE 7469 C	47,38	78,05	1,94	0	35,2 -22,5 -32,4	35,2 -22,5 -32,4
PANTONE 7470 C	54,4	72,31	0	5,96	33,1 -23,2 -22,1	33,1 -23,2 -22,1
PANTONE 7471 C	0	28,21	0	11,15	81,5 -31,2 -6,2	74,6 -17,0 -4,4
PANTONE 7472 C	0	46,64	0	23,22	68,6 -29,9 -7,0	66,6 -24,9 -6,2
PANTONE 7473 C	2,39	60,2	0	46,25	56,4 -35,5 -2,5	56,4 -35,5 -2,5
PANTONE 7474 C	20,4	73,05	0	32,57	42,9 -35,5 -18,1	42,9 -35,5 -18,1
PANTONE 7475 C	40,08	50,8	0	20,65	47,5 -17,8 -6,9	47,5 -17,8 -6,9
PANTONE 7476 C	60,61	64,92	0	25,35	30,7 -19,7 -9,9	30,7 -19,7 -9,9
PANTONE 7477 C	64,76	57,66	0	1,81	29,8 -11,5 -13,0	29,8 -11,5 -13,0
PANTONE 5523 C	1,99	8,53	0	3,38	81,1 -8,2 -4,0	81,1 -8,2 -4,0
PANTONE 5513 C	2,83	11,61	0	3,89	78,1 -9,5 -5,1	78,1 -9,5 -5,1
PANTONE 5503 C	4,9	20,26	0	5,2	71,8 -11,8 -6,9	71,8 -11,8 -6,9
PANTONE 5493 C	9,17	30,47	0	7,06	66,0 -13,6 -8,3	66,0 -13,6 -8,3
PANTONE 5483 C	30,06	49,32	0	12,36	52,1 -17,7 -10,8	52,1 -17,7 -10,8
PANTONE 5473 C	55,16	64,22	0	17,9	35,4 -20,6 -12,8	35,4 -20,6 -12,8
PANTONE 5463 C	82,8	69,76	0	2,23	13,5 -10,1 -8,2	13,5 -10,1 -8,2
PANTONE 7716 C	1,36	64,24	0	42,9	54,5 -38,6 -8,7	54,5 -38,6 -8,7
PANTONE 7717 C	5,72	70,82	0	50,68	47,5 -43,3 -8,6	47,5 -43,3 -8,6
PANTONE 7718 C	16,19	78,59	0	49,6	41,8 -43,4 -11,0	41,8 -43,4 -11,0
PANTONE 7719 C	34,22	74,51	0	49,46	39,1 -37,4 -8,5	39,1 -37,4 -8,5
PANTONE 7720 C	47,31	73,32	0	51,73	35,7 -33,6 -5,8	35,7 -33,6 -5,8
PANTONE 7721 C	52,21	70,83	0	43,66	34,2 -28,9 -8,9	34,2 -28,9 -8,9
PANTONE 7722 C	59,89	70	0	41,6	29,6 -24,5 -8,2	29,6 -24,5 -8,2
PANTONE 324 C	0	19,66	0	7,1	82,8 -21,1 -6,7	77,7 -13,8 -5,1
PANTONE 325 C	0	38,72	0	14,75	75,5 -32,4 -9,4	70,4 -20,6 -6,7
PANTONE 326 C	0	59,69	0	36,68	63,3 -48,8 -10,6	58,8 -34,3 -8,6
PANTONE 327 C	0	92,22	0	60,09	45,7 -64,2 -7,0	45,3 -62,1 -6,7
PANTONE 328 C	13,47	91,62	0	58,74	39,6 -53,2 -7,4	39,6 -53,2 -7,4
PANTONE 329 C	34,82	86,13	0	57,42	36,1 -45,7 -6,9	36,1 -45,7 -6,9
PANTONE 330 C	58,91	69,9	0	51,61	30,2 -26,5 -3,8	30,2 -26,5 -3,8
PANTONE 3242 C	0	31,13	0	11,79	80,6 -33,9 -8,0	73,5 -17,8 -5,3
PANTONE 3252 C	0	45	0	20	75,5 -43,9 -10,0	67,5 -23,9 -7,0
PANTONE 3262 C	0	59,23	0	36,03	66,4 -59,3 -12,1	59,2 -33,8 -8,5
PANTONE 3272 C	0	74,88	0	52,65	55,7 -69,9 -14,0	49,8 -50,2 -9,9
PANTONE 3282 C	1,27	87,36	0	57,02	45,7 -57,5 -9,5	45,7 -57,5 -9,5
PANTONE 3292 C	52,79	82,41	0	57,02	31,3 -37,4 -5,3	31,3 -37,4 -5,3
PANTONE 3302 C	61,83	71,49	0	53,47	27,7 -25,6 -3,1	27,7 -25,6 -3,1
PANTONE 3245 C	0	30	0	13,67	82,3 -33,5 -4,8	73,8 -17,9 -3,0
PANTONE 3255 C	0	44,74	0	25	76,4 -46,2 -6,0	67,3 -24,4 -4,0
PANTONE 3265 C	0	55,91	0	37,47	69,5 -59,5 -6,6	61,4 -31,3 -4,4
PANTONE 3275 C	0	65	0	51,93	60,9 -71,1 -6,1	54,5 -42,8 -3,7
PANTONE 3285 C	0	72,69	0	57,24	52,3 -57,9 -4,9	50,1 -50,8 -4,3
PANTONE 3295 C	12,18	81,62	0	60,1	41,8 -50,2 -3,3	41,8 -50,2 -3,3
PANTONE 3305 C	61,22	70,04	0	57,18	28,4 -26,0 -0,8	28,4 -26,0 -0,8
PANTONE 3248 C	0	36,89	0	22,58	75,6 -33,3 -0,2	70,7 -21,1 -0,3
PANTONE 3258 C	0	45,61	0	30	71,7 -39,4 -2,1	66,6 -25,4 -1,7
PANTONE 3268 C	0	62,64	0	54,72	60,2 -55,4 0,2	56,1 -41,0 0,6
PANTONE 3278 C	0	71,16	0	61,48	53,5 -62,8 2,8	50,1 -51,9 2,5
PANTONE 3288 C	3,61	80,99	0	64,62	45,1 -56,5 2,4	45,1 -56,5 2,4
PANTONE 3298 C	35,99	77,96	0	63,99	37,3 -43,4 2,1	37,3 -43,4 2,1
PANTONE 3308 C	65,12	69,47	0	61,67	25,2 -23,4 1,8	25,2 -23,4 1,8
PANTONE 566 C	0	10	0	6,46	84,8 -14,0 0,1	82,3 -10,7 0,1
PANTONE 565 C	0	18,92	0	10	81,3 -19,9 -1,0	77,9 -14,5 -1,0
PANTONE 564 C	0	31,66	0	15,8	75,7 -24,8 -2,3	73,0 -18,7 -2,1
PANTONE 563 C	0	43,59	0	25,77	70,1 -29,2 -2,9	67,7 -24,0 -2,7
PANTONE 562 C	33,46	69,53	0	54,91	40,5 -36,0 -3,2	40,5 -36,0 -3,2
PANTONE 561 C	55,92	68,36	0	55,71	32,8 -27,8 -0,9	32,8 -27,8 -0,9
PANTONE 560 C	71,12	62,69	0	52,82	22,6 -14,6 0,9	22,6 -14,6 0,9

PANTONE 573 C	0	10,7	0	6,39	86,5 -17,2 -0,6	81,9 -10,9 -0,5
PANTONE 572 C	0	17,44	0	9,61	84,3 -21,6 -1,3	78,5 -14,0 -0,6
PANTONE 571 C	0	20,21	0	10	82,3 -24,7 -1,9	77,4 -14,9 -1,7
PANTONE 570 C	0	38,5	0	21,04	74,8 -33,3 -2,5	70,1 -21,4 -2,2
PANTONE 569 C	6,89	73,67	0	58,7	45,9 -47,3 -2,2	45,9 -47,3 -2,2
PANTONE 568 C	38	69,39	0	57,42	39,3 -35,5 -0,5	39,3 -35,5 -0,5
PANTONE 567 C	69,36	65,69	0	55,79	23,2 -17,3 1,0	23,2 -17,3 1,0
PANTONE 559 C	1,72	12,3	0	11,94	78,7 -12,2 4,9	78,7 -12,2 4,9
PANTONE 558 C	2,72	20,6	0	18,96	73,7 -15,0 5,2	73,7 -15,0 5,2
PANTONE 557 C	4,74	31,28	0	28,6	68,1 -17,6 5,6	68,1 -17,6 5,6
PANTONE 556 C	7,66	41,55	0	40,81	62,1 -21,3 7,4	62,1 -21,3 7,4
PANTONE 555 C	40,95	60,85	0	63,18	42,3 -29,4 11,0	42,3 -29,4 11,0
PANTONE 554 C	56,98	62,35	0	64,67	34,2 -24,9 9,2	34,2 -24,9 9,2
PANTONE 553 C	67,2	56,98	0	61,38	27,2 -15,0 7,1	27,2 -15,0 7,1
PANTONE 5595 C	3,71	4,76	0	4,94	81,2 -7,0 3,4	81,2 -7,0 3,4
PANTONE 5585 C	6,31	10,21	0	8,85	74,6 -9,7 2,7	74,6 -9,7 2,7
PANTONE 5575 C	11,37	17,3	0	13,59	68,0 -11,3 2,4	68,0 -11,3 2,4
PANTONE 5565 C	18,39	27,2	0	19,82	61,8 -13,1 2,4	61,8 -13,1 2,4
PANTONE 5555 C	40,12	42,42	0	36	50,0 -15,7 2,6	50,0 -15,7 2,6
PANTONE 5545 C	53,28	50,93	0	44,73	41,0 -17,1 2,8	41,0 -17,1 2,8
PANTONE 5535 C	77,86	63,02	0	55,12	17,5 -12,1 1,2	17,5 -12,1 1,2
PANTONE 5665 C	7,61	3,59	0	4,79	78,4 -5,2 4,4	78,4 -5,2 4,4
PANTONE 5655 C	9,97	4,45	0	6,17	75,1 -6,0 4,5	75,1 -6,0 4,5
PANTONE 5645 C	14,23	6,12	0	8,33	70,8 -6,8 4,8	70,8 -6,8 4,8
PANTONE 5635 C	23,45	8,75	0	11,87	65,9 -7,7 5,3	65,9 -7,7 5,3
PANTONE 5625 C	43,9	20,23	0	28,22	53,3 -9,8 6,6	53,3 -9,8 6,6
PANTONE 5615 C	52,18	30,46	0	38,83	46,4 -10,7 7,4	46,4 -10,7 7,4
PANTONE 5605 C	74,87	56,36	0	57,57	20,9 -11,0 4,3	20,9 -11,0 4,3
PANTONE 5527 C	5,97	3,95	0	2,93	79,7 -4,7 -0,0	79,7 -4,7 -0,0
PANTONE 5517 C	8,32	4,89	0	3,42	76,4 -5,6 -0,3	76,4 -5,6 -0,3
PANTONE 5507 C	14,01	8,22	0	4,47	70,0 -6,9 -0,8	70,0 -6,9 -0,8
PANTONE 5497 C	30,83	15,32	0	7,24	61,1 -8,3 -1,4	61,1 -8,3 -1,4
PANTONE 5487 C	49,32	32,79	0	15	48,3 -10,2 -1,8	48,3 -10,2 -1,8
PANTONE 5477 C	59,47	46,02	0	26,6	36,7 -12,0 -1,6	36,7 -12,0 -1,6
PANTONE 5467 C	76,52	61,28	0	44,22	19,0 -11,2 -1,2	19,0 -11,2 -1,2
PANTONE 621 C	0	4,23	0	4,07	87,9 -6,7 2,4	87,6 -6,5 2,4
PANTONE 622 C	2,21	8,49	0	7,03	80,4 -9,5 2,3	80,4 -9,5 2,3
PANTONE 623 C	4,72	18,57	0	13,72	72,5 -13,1 2,1	72,5 -13,1 2,1
PANTONE 624 C	12,46	34,71	0	26,26	62,0 -16,3 2,1	62,0 -16,3 2,1
PANTONE 625 C	35,84	49,65	0	41,67	49,3 -20,0 2,2	49,3 -20,0 2,2
PANTONE 626 C	57,05	60,7	0	53,05	34,9 -21,9 2,0	34,9 -21,9 2,0
PANTONE 627 C	76,47	66	0	54,66	18,0 -13,8 0,3	18,0 -13,8 0,3
PANTONE 331 C	0	15	0	9,11	86,5 -23,4 -0,5	79,5 -13,2 0,1
PANTONE 332 C	0	25	0	13,38	83,7 -30,9 -1,2	75,5 -16,5 -0,8
PANTONE 333 C	0	41,19	0	25	78,2 -47,4 -1,7	68,9 -22,8 -1,4
PANTONE Green C	0	68,51	0	59,08	57,7 -77,2 0,2	51,7 -48,5 1,0
PANTONE 334 C	0	77,07	0	61,78	51,6 -67,3 0,4	48,6 -55,7 0,5
PANTONE 335 C	9,23	79,07	0	63,42	43,2 -51,6 1,8	43,2 -51,6 1,8
PANTONE 336 C	42,7	75,41	0	62,56	36,2 -39,4 1,8	36,2 -39,4 1,8
PANTONE 337 C	0	25,82	0	18,43	79,9 -27,1 3,8	75,0 -17,4 2,8
PANTONE 338 C	0	36,28	0	26,52	75,9 -35,0 3,6	70,7 -21,3 2,4
PANTONE 339 C	0	59,62	0	56,75	63,4 -53,6 7,6	58,1 -38,8 6,3
PANTONE 340 C	0	72,68	0	69,13	51,8 -65,4 14,6	49,2 -56,4 13,2
PANTONE 341 C	12,72	73,62	0	68,53	43,2 -48,4 10,0	43,2 -48,4 10,0
PANTONE 342 C	42,56	71,83	0	67,74	36,9 -38,6 8,2	36,9 -38,6 8,2
PANTONE 343 C	58,1	66,27	0	63,98	31,9 -26,9 6,3	31,9 -26,9 6,3
PANTONE 7723 C	0	54,52	0	54,36	61,8 -33,6 8,3	61,7 -33,3 8,2
PANTONE 7724 C	1,09	63,95	0	62,53	53,9 -44,6 10,4	53,9 -44,6 10,4
PANTONE 7725 C	2,6	73,45	0	70,54	47,3 -55,1 13,9	47,3 -55,1 13,9
PANTONE 7726 C	9,87	77,09	0	74,64	43,0 -53,7 13,9	43,0 -53,7 13,9
PANTONE 7727 C	29,97	75,19	0	73,69	39,0 -46,2 12,5	39,0 -46,2 12,5
PANTONE 7728 C	41,45	71,69	0	69,22	37,2 -39,4 9,8	37,2 -39,4 9,8
PANTONE 7729 C	55,62	72,41	0	63,1	31,6 -32,0 2,6	31,6 -32,0 2,6
PANTONE 3375 C	0	30	0	21,95	82,2 -38,1 5,2	73,4 -18,9 3,1
PANTONE 3385 C	0	42,18	0	35	77,0 -48,1 7,3	67,9 -24,3 4,3
PANTONE 3395 C	0	59,72	0	58,71	67,5 -66,9 12,3	57,9 -39,8 9,1

PANTONE 3405 C	0	65,07	0	65	59,2 -79,0 19,0	53,6 -48,0 13,1
PANTONE 3415 C	14,15	77,31	0	73,94	41,6 -51,6 12,8	41,6 -51,6 12,8
PANTONE 3425 C	45,73	73,71	0	70,36	35,4 -39,4 9,7	35,4 -39,4 9,7
PANTONE 3435 C	65,1	66,4	0	65,12	26,2 -22,2 5,9	26,2 -22,2 5,9
PANTONE 344 C	0	18,47	0	22,77	81,8 -24,7 12,0	77,4 -15,8 9,4
PANTONE 345 C	0	25	0	28,3	79,9 -29,3 12,5	74,8 -18,2 9,4
PANTONE 346 C	0	38,22	0	42,89	75,0 -37,5 16,2	69,3 -23,7 12,4
PANTONE 347 C	0	68	0	82,3	53,6 -64,2 30,5	51,3 -54,1 26,8
PANTONE 348 C	4,57	71,14	0	87,54	46,6 -54,1 26,1	46,6 -54,1 26,1
PANTONE 349 C	41,97	67,05	0	79,72	38,5 -37,1 19,5	38,5 -37,1 19,5
PANTONE 350 C	62,48	58,62	0	67,6	31,1 -19,6 12,4	31,1 -19,6 12,4
PANTONE 351 C	0	15,98	0	20	84,9 -28,5 13,4	78,6 -15,0 9,3
PANTONE 352 C	0	25	0	29,32	83,3 -35,3 15,1	74,8 -18,3 10,0
PANTONE 353 C	0	29,85	0	34,45	81,6 -39,9 17,2	72,8 -20,2 11,1
PANTONE 354 C	0	64,66	0	80	60,4 -76,6 39,9	53,7 -50,0 28,6
PANTONE 355 C	0	69,59	0	89,3	52,0 -67,0 33,9	50,0 -56,8 29,5
PANTONE 356 C	12,08	71,8	0	94,19	43,2 -51,0 27,3	43,2 -51,0 27,3
PANTONE 357 C	58,38	63,84	0	74,72	32,3 -26,7 15,1	32,3 -26,7 15,1
PANTONE 7478 C	0	19,1	0	18,64	84,5 -29,6 9,3	77,3 -15,6 6,3
PANTONE 7479 C	0	48,21	0	57,51	73,3 -58,6 27,6	64,4 -30,6 17,4
PANTONE 7480 C	0	59,97	0	63,73	66,1 -68,9 24,2	57,4 -41,5 16,4
PANTONE 7481 C	0	62,1	0	73,33	62,9 -72,7 35,9	55,5 -45,9 26,3
PANTONE 7482 C	0	66,69	0	76,9	55,1 -64,3 28,0	52,2 -51,9 24,2
PANTONE 7483 C	55,79	62,61	0	71,17	34,8 -26,5 14,8	34,8 -26,5 14,8
PANTONE 7484 C	56,41	69,46	0	66,23	31,7 -30,5 6,2	31,7 -30,5 6,2
PANTONE 7730 C	6,36	56,08	0	64,35	55,5 -33,3 19,2	55,5 -33,3 19,2
PANTONE 7731 C	9,25	62,76	0	75,29	49,6 -41,2 24,3	49,6 -41,2 24,3
PANTONE 7732 C	16,42	68,76	0	80,75	43,4 -45,4 21,6	43,4 -45,4 21,6
PANTONE 7733 C	34,47	67,88	0	74,08	40,3 -39,1 16,2	40,3 -39,1 16,2
PANTONE 7734 C	53,95	61,88	0	67,27	36,4 -26,2 12,4	36,4 -26,2 12,4
PANTONE 7735 C	61,3	53,74	0	62,85	33,6 -17,3 11,5	33,6 -17,3 11,5
PANTONE 7736 C	62,2	50,74	0	55,45	33,4 -14,8 7,3	33,4 -14,8 7,3
PANTONE 7737 C	1,52	49,28	0	84,26	61,8 -33,5 46,8	61,8 -33,5 46,8
PANTONE 7738 C	0	57,87	0	83,08	59,1 -43,3 40,3	58,4 -41,3 39,0
PANTONE 7739 C	0	61,28	0	83,37	56,1 -46,1 35,6	56,0 -45,7 35,4
PANTONE 7740 C	5,06	60,22	0	82,07	53,1 -40,7 33,4	53,1 -40,7 33,4
PANTONE 7741 C	13,94	57,84	0	79,57	50,5 -34,5 31,1	50,5 -34,5 31,1
PANTONE 7742 C	39,23	53,89	0	75,52	45,6 -25,9 26,6	45,6 -25,9 26,6
PANTONE 7743 C	52,24	53,12	0	69,5	40,6 -21,7 20,0	40,6 -21,7 20,0
PANTONE 358 C	0	14,71	0	43,65	82,7 -25,6 30,9	78,3 -16,5 25,4
PANTONE 359 C	0	19,17	0	50,67	80,8 -29,4 34,6	76,2 -18,4 27,7
PANTONE 360 C	0	44,13	0	69,31	70,7 -43,5 48,9	65,6 -30,1 38,9
PANTONE 361 C	0	55,95	0	86,79	63,1 -50,7 52,9	59,7 -39,1 44,0
PANTONE 362 C	0,64	57,13	0	94,89	58,1 -40,5 46,5	58,1 -40,5 46,5
PANTONE 363 C	10,97	56,27	0	95,64	52,3 -35,2 42,2	52,3 -35,2 42,2
PANTONE 364 C	39,94	53,21	0	92,55	45,2 -26,8 35,8	45,2 -26,8 35,8
PANTONE 7485 C	0	4,38	0	14,02	86,7 -9,4 15,4	86,5 -9,2 15,3
PANTONE 7486 C	0	9,87	0	42,6	85,2 -21,8 33,0	81,1 -14,5 28,6
PANTONE 7487 C	0	26,96	0	59,55	80,7 -42,0 49,0	73,0 -21,8 34,0
PANTONE 7488 C	0	35	0	64,92	77,4 -48,6 56,0	69,7 -25,2 38,2
PANTONE 7489 C	0,96	45,74	0	71,41	64,0 -30,7 39,3	64,0 -30,7 39,3
PANTONE 7490 C	10,88	41,4	0	69,82	58,7 -24,0 36,0	58,7 -24,0 36,0
PANTONE 7491 C	41,33	18,84	0	70,11	53,5 -13,3 37,2	53,5 -13,3 37,2
PANTONE 365 C	0	8,54	0	48,48	85,6 -20,8 38,6	82,0 -14,3 34,5
PANTONE 366 C	0	10,82	0	55	83,5 -24,8 43,9	80,2 -16,0 36,9
PANTONE 367 C	0	17,19	0	61,16	80,0 -30,9 52,0	76,4 -18,8 41,9
PANTONE 368 C	0	42,22	0	85	69,9 -40,3 63,0	66,5 -29,9 53,4
PANTONE 369 C	0	50,84	0	100	61,8 -38,8 59,9	61,9 -35,7 55,3
PANTONE 370 C	19,8	44,71	0	100	53,8 -26,7 50,2	54,0 -26,0 48,6
PANTONE 371 C	59,28	32,23	0	84	39,1 -12,9 32,7	39,1 -12,9 32,7
PANTONE 372 C	0	4,43	0	45	89,7 -18,8 42,0	85,7 -11,4 37,5
PANTONE 373 C	0	5,67	0	53,04	88,8 -21,8 47,5	84,0 -13,0 41,7
PANTONE 374 C	0	7,01	0	57,15	87,3 -25,6 54,5	82,8 -14,1 44,8
PANTONE 375 C	0	25,86	0	84,98	78,9 -40,5 77,3	72,6 -23,4 63,3
PANTONE 376 C	0	37,43	0	96,49	70,2 -37,2 73,4	68,1 -27,6 62,8
PANTONE 377 C	12,18	35,61	0	100	59,2 -25,2 60,5	59,7 -23,3 56,0

PANTONE 378 C	60,13	23,69	0	91,32	39,4 -11,3 36,0	39,4 -11,3 36,0
PANTONE 580 C	0,33	6,99	0	28,62	83,3 -11,9 22,0	83,3 -11,9 22,0
PANTONE 579 C	0,53	9,2	0	35,58	81,1 -13,5 24,1	81,1 -13,5 24,1
PANTONE 578 C	0,5	10,93	0	39,92	79,9 -14,6 25,4	79,9 -14,6 25,4
PANTONE 577 C	1,38	16,49	0	53,44	75,7 -17,3 30,7	75,7 -17,3 30,7
PANTONE 576 C	9,95	37,98	0	69,26	60,4 -22,7 37,6	60,4 -22,7 37,6
PANTONE 575 C	38,45	37,61	0	74,91	50,8 -18,4 34,3	50,8 -18,4 34,3
PANTONE 574 C	62,38	31,49	0	68,05	36,5 -10,5 22,0	36,5 -10,5 22,0
PANTONE 5807 C	5,44	1,1	0	13,84	83,1 -4,9 18,6	83,1 -4,9 18,6
PANTONE 5797 C	8,07	1,75	0	21,72	79,5 -5,8 21,9	79,5 -5,8 21,9
PANTONE 5787 C	11,88	2,37	0	31,41	75,4 -6,5 24,6	75,4 -6,5 24,6
PANTONE 5777 C	27,61	3,48	0	50,74	66,3 -7,8 30,6	66,3 -7,8 30,6
PANTONE 5767 C	43,17	4,76	0	62,15	57,2 -8,4 34,6	57,2 -8,4 34,6
PANTONE 5757 C	56,09	8,67	0	72,6	46,1 -8,5 35,4	46,1 -8,5 35,4
PANTONE 5747 C	70,68	32,93	0	81,54	27,5 -7,9 21,6	27,5 -7,9 21,6
PANTONE 5875 C	7,05	0	0,34	19,51	82,2 -3,5 24,1	82,2 -3,5 24,1
PANTONE 5865 C	9,77	0	0,28	25,68	79,6 -3,8 26,3	79,6 -3,8 26,3
PANTONE 5855 C	14,81	0	0,47	31,55	75,3 -3,6 26,9	75,3 -3,6 26,9
PANTONE 5845 C	29,09	0	0,61	44,82	68,9 -3,8 31,3	68,9 -3,8 31,3
PANTONE 5835 C	39,47	0	1	56,05	62,7 -3,8 34,8	62,7 -3,8 34,8
PANTONE 5825 C	52,19	0	1,41	65,13	53,8 -3,3 37,5	53,8 -3,3 37,5
PANTONE 5815 C	69,47	0,39	0	68,04	33,8 -2,4 25,9	33,8 -2,4 25,9
PANTONE 5803 C	8,88	1,6	0	11,44	79,1 -4,7 14,6	79,1 -4,7 14,6
PANTONE 5793 C	13,42	2,9	0	19,44	73,8 -6,1 17,0	73,8 -6,1 17,0
PANTONE 5783 C	23,94	3,52	0	30,11	68,2 -6,6 18,7	68,2 -6,6 18,7
PANTONE 5773 C	41,27	5,48	0	46,48	58,4 -7,6 22,0	58,4 -7,6 22,0
PANTONE 5763 C	52,09	9,4	0	57,28	50,0 -8,3 24,2	50,0 -8,3 24,2
PANTONE 5753 C	59,1	15,87	0	64,26	41,8 -8,8 24,6	41,8 -8,8 24,6
PANTONE 5743 C	68,91	35,3	0	69,01	29,0 -8,5 18,1	29,0 -8,5 18,1
PANTONE 7492 C	2,97	6,34	0	49,72	79,6 -12,4 35,8	79,6 -12,4 35,8
PANTONE 7493 C	6,12	4,56	0	32,37	77,6 -9,2 23,7	77,6 -9,2 23,7
PANTONE 7494 C	11,6	12,53	0	34,97	68,9 -12,0 16,8	68,9 -12,0 16,8
PANTONE 7495 C	28,13	11,46	0	70,07	61,0 -12,9 45,0	61,0 -12,9 45,0
PANTONE 7496 C	35,53	28,16	0	97,79	53,6 -17,4 50,1	53,6 -17,4 50,1
PANTONE 7497 C	57,29	0	3,1	36,47	48,1 0,1 16,3	48,1 0,1 16,3
PANTONE 7498 C	60,92	14,3	0	63,92	40,1 -7,9 23,7	40,1 -7,9 23,7
PANTONE 7744 C	7,36	5,05	0	85,45	74,3 -12,7 71,2	74,3 -12,7 71,2
PANTONE 7745 C	15,26	4,9	0	82,04	68,7 -11,5 63,1	68,7 -11,5 63,1
PANTONE 7746 C	32,49	4,77	0	76,19	62,2 -10,2 52,3	62,2 -10,2 52,3
PANTONE 7747 C	41,68	6,9	0	75,73	56,7 -10,3 46,4	56,7 -10,3 46,4
PANTONE 7748 C	50,11	7,2	0	71,16	52,1 -9,2 39,5	52,1 -9,2 39,5
PANTONE 7749 C	56,18	4,49	0	66,8	47,4 -6,9 32,6	47,4 -6,9 32,6
PANTONE 7750 C	60,76	4,75	0	63,99	42,2 -6,0 27,0	42,2 -6,0 27,0
PANTONE 379 C	0	2,35	0	59,09	89,6 -13,6 59,9	88,1 -10,1 57,2
PANTONE 380 C	0	3,29	0	67,37	87,7 -16,5 72,4	86,1 -11,5 68,4
PANTONE 381 C	0	5,6	0	88,18	84,4 -20,2 85,1	82,5 -14,5 80,9
PANTONE 382 C	0	8,11	0	93,84	82,0 -21,5 85,0	80,5 -16,3 80,6
PANTONE 383 C	12,93	7,11	0	100	68,6 -14,2 74,7	68,9 -13,3 70,8
PANTONE 384 C	39,85	3,18	0	100	59,4 -9,8 64,9	59,8 -9,1 61,6
PANTONE 385 C	58,46	0	0,51	79,42	47,0 -4,1 42,9	47,0 -4,1 42,9
PANTONE 386 C	0	1,4	0	57,98	91,2 -12,4 60,4	89,6 -8,9 57,9
PANTONE 387 C	0	2,17	0	68,88	89,6 -16,0 78,2	87,7 -10,3 73,8
PANTONE 388 C	0	2,54	0	73,49	89,0 -17,1 82,1	87,0 -10,8 77,3
PANTONE 389 C	0	5,04	0	100	85,2 -21,6 94,3	83,1 -14,2 88,1
PANTONE 390 C	4,5	8,21	0	100	74,0 -17,3 85,8	74,7 -15,2 77,2
PANTONE 391 C	40,46	1,42	0	100	60,4 -8,6 67,7	60,8 -7,7 63,6
PANTONE 392 C	55,07	0	0,48	100	50,6 -5,0 54,5	50,7 -4,9 53,5
PANTONE 587 C	0	2,14	0	43,81	89,1 -9,0 42,1	89,1 -8,9 42,0
PANTONE 586 C	0	2,64	0	53,77	88,1 -10,3 48,9	88,0 -10,1 48,8
PANTONE 585 C	0	3,42	0	57,89	86,7 -11,4 52,6	86,6 -11,2 52,5
PANTONE 584 C	0	4,86	0	65,18	83,8 -13,3 61,2	83,8 -13,2 61,1
PANTONE 583 C	4,23	8,56	0	90,37	74,8 -15,4 72,4	74,8 -15,4 72,4
PANTONE 582 C	44,96	2,98	0	92,15	57,1 -8,4 56,8	57,1 -8,4 56,8
PANTONE 581 C	65,31	0	0,04	77,93	39,0 -3,3 34,4	39,0 -3,3 34,4
PANTONE 393 C	0	0,54	0	55,53	92,0 -9,6 57,5	91,1 -7,7 56,3
PANTONE 394 C	0	0,99	0	68,42	90,7 -11,9 78,4	89,6 -8,8 76,2

PANTONE 395 C	0	1,21	0	75,46	90,1 -12,7 84,8	89,0 -9,2 82,2
PANTONE 396 C	0	2,89	0	100	86,9 -15,1 98,9	86,2 -11,5 93,0
PANTONE 397 C	12,13	1,83	0	100	73,6 -10,4 85,4	74,1 -9,1 78,7
PANTONE 398 C	30,93	0,2	0	100	66,5 -7,7 75,0	66,8 -7,0 71,1
PANTONE 399 C	39,21	0	2,27	100	60,2 -4,3 68,7	60,7 -3,9 64,0
PANTONE 3935 C	0	0,27	0	61,28	91,5 -8,5 67,1	91,2 -7,6 66,5
PANTONE 3945 C	0	0,53	0	86,39	90,0 -9,0 92,2	89,8 -8,4 91,8
PANTONE 3955 C	1,26	0	0	100	88,1 -8,3 104,0	88,5 -7,5 97,7
PANTONE 3965 C	1,68	0	0,2	100	87,1 -7,5 103,3	87,6 -7,0 96,5
PANTONE 3975 C	17,76	0	3,32	100	68,4 -2,4 79,5	68,9 -2,0 73,8
PANTONE 3985 C	41,95	0	5,33	100	56,7 -0,7 61,0	56,8 -0,7 59,8
PANTONE 3995 C	63,18	0	5,22	79,28	39,5 -0,2 35,3	39,5 -0,2 35,3
PANTONE 600 C	0,3	0	0,08	32,29	92,1 -5,5 38,7	92,1 -5,5 38,7
PANTONE 601 C	0,6	0	0,02	39,25	91,5 -6,0 43,6	91,5 -6,0 43,6
PANTONE 602 C	0,73	0	0,01	51,23	90,9 -6,7 53,0	90,9 -6,7 53,0
PANTONE 603 C	1,74	0	0,11	65,48	88,5 -7,0 70,6	88,5 -7,0 70,6
PANTONE 604 C	2,36	0	0,47	75,59	86,6 -6,4 80,4	86,6 -6,4 80,4
PANTONE 605 C	4,15	0	1,39	96,93	82,1 -4,6 88,2	82,1 -4,6 88,2
PANTONE 606 C	8,13	0	3,74	100	74,3 -1,1 88,4	74,9 -0,7 80,9
PANTONE 607 C	1,51	0	0,24	32,07	90,0 -5,0 37,0	90,0 -5,0 37,0
PANTONE 608 C	2,2	0	0,14	43,64	88,7 -5,8 44,9	88,7 -5,8 44,9
PANTONE 609 C	2,77	0	0,16	52,04	87,5 -6,2 50,8	87,5 -6,2 50,8
PANTONE 610 C	4,25	0	0,32	63,33	84,5 -6,3 62,4	84,5 -6,3 62,4
PANTONE 611 C	7,15	0	0,86	77,15	79,9 -5,6 73,8	79,9 -5,6 73,8
PANTONE 612 C	13,15	0	2,64	100	72,0 -3,0 79,9	72,2 -2,9 77,5
PANTONE 613 C	23,52	0	4,8	100	64,7 -0,4 75,4	65,2 -0,1 69,6
PANTONE 461 C	1,84	0	0,92	33,17	88,5 -3,5 36,4	88,5 -3,5 36,4
PANTONE 460 C	2,97	0	1,36	47,45	85,7 -3,3 45,1	85,7 -3,3 45,1
PANTONE 459 C	4,39	0	1,97	59,09	82,3 -2,7 54,0	82,3 -2,7 54,0
PANTONE 458 C	5,72	0	2,27	62,72	80,1 -2,4 57,0	80,1 -2,4 57,0
PANTONE 457 C	19,46	0	6,89	84,65	65,9 2,0 64,5	65,9 2,0 64,5
PANTONE 456 C	36,1	0	6,48	77,9	59,6 0,8 52,9	59,6 0,8 52,9
PANTONE 455 C	62,86	0	10,15	76,49	39,2 1,5 33,0	39,2 1,5 33,0
PANTONE 614 C	4,54	0	0,57	26,73	84,9 -3,7 29,9	84,9 -3,7 29,9
PANTONE 615 C	6,74	0	0,62	34,36	82,4 -3,9 33,3	82,4 -3,9 33,3
PANTONE 616 C	9,05	0	0,72	40,02	80,1 -4,0 35,6	80,1 -4,0 35,6
PANTONE 617 C	16,07	0	1,24	56,69	73,4 -3,9 43,7	73,4 -3,9 43,7
PANTONE 618 C	31,85	0	2,19	68,7	65,1 -3,2 51,0	65,1 -3,2 51,0
PANTONE 619 C	39,82	0	3,12	77,33	60,0 -2,5 53,2	60,0 -2,5 53,2
PANTONE 620 C	51,48	0	4,58	85,19	51,8 -1,1 50,7	51,8 -1,1 50,7
PANTONE 7751 C	10,55	0	3,41	64,95	74,3 -0,8 55,1	74,3 -0,8 55,1
PANTONE 7752 C	8,36	0	6,19	80,18	73,0 2,7 68,6	73,0 2,7 68,6
PANTONE 7753 C	13,66	0	8,9	82,93	67,6 4,2 64,8	67,6 4,2 64,8
PANTONE 7754 C	37,12	0	11,16	78,76	57,2 3,6 50,9	57,2 3,6 50,9
PANTONE 7755 C	51,71	0	8,81	72,01	50,5 1,7 40,3	50,5 1,7 40,3
PANTONE 7756 C	59,8	0	5,72	63,79	43,7 0,4 29,4	43,7 0,4 29,4
PANTONE 7757 C	63,47	0	4,07	62,53	39,9 -0,2 25,7	39,9 -0,2 25,7
PANTONE 7758 C	7,82	0	1,38	84,32	78,4 -4,8 77,7	78,4 -4,8 77,7
PANTONE 7759 C	13,76	0	2,16	92,9	72,4 -3,6 75,1	72,4 -3,6 75,1
PANTONE 7760 C	48,19	0	3,26	75,1	55,3 -2,1 46,9	55,3 -2,1 46,9
PANTONE 7761 C	58,42	1,18	0	65	47,1 -4,7 32,5	47,1 -4,7 32,5
PANTONE 7762 C	60,48	13,41	0	62,18	40,8 -7,8 22,9	40,8 -7,8 22,9
PANTONE 7763 C	63,85	8,22	0	56,48	37,9 -5,4 18,2	37,9 -5,4 18,2
PANTONE 7764 C	66,87	4,85	0	57,04	35,1 -4,1 17,7	35,1 -4,1 17,7
PANTONE 7765 C	18,48	0,75	0	79,62	71,9 -7,5 66,5	71,9 -7,5 66,5
PANTONE 7766 C	26,42	0	0,66	80,91	68,6 -5,7 64,6	68,6 -5,7 64,6
PANTONE 7767 C	33,36	0	1,92	74,85	64,4 -3,8 55,7	64,4 -3,8 55,7
PANTONE 7768 C	50,25	0	4,46	69,19	53,4 -0,7 41,3	53,4 -0,7 41,3
PANTONE 7769 C	60,75	0	9,53	63,94	42,0 1,9 27,9	42,0 1,9 27,9
PANTONE 7770 C	64,81	0	4,34	56,28	38,3 0,4 20,6	38,3 0,4 20,6
PANTONE 7771 C	72,13	0,56	0	47,63	31,2 -1,2 14,0	31,2 -1,2 14,0
PANTONE 4545 C	5,83	0	1,92	18,86	81,6 -0,6 22,9	81,6 -0,6 22,9
PANTONE 4535 C	8,26	0	2,08	26,47	79,1 -0,7 26,0	79,1 -0,7 26,0
PANTONE 4525 C	12,53	0	2,77	35,26	74,8 -0,0 28,5	74,8 -0,0 28,5
PANTONE 4515 C	24,26	0	4,02	48,86	67,5 0,7 32,4	67,5 0,7 32,4
PANTONE 4505 C	41,92	0	8,36	64,43	56,5 2,3 38,3	56,5 2,3 38,3

PANTONE 4495 C	50,31	0	11,41	70,84	51,0 3,2 39,8	51,0 3,2 39,8
PANTONE 4485 C	65,05	0	18,87	71,85	35,0 4,5 27,5	35,0 4,5 27,5
PANTONE 454 C	8,81	0	1	10,43	79,8 -1,5 16,1	79,8 -1,5 16,1
PANTONE 453 C	13,47	0	1,23	15,15	75,5 -1,4 18,1	75,5 -1,4 18,1
PANTONE 452 C	25,97	0	1,71	31,73	69,1 -1,5 23,1	69,1 -1,5 23,1
PANTONE 451 C	40,61	0	2,59	49,03	60,9 -1,4 28,5	60,9 -1,4 28,5
PANTONE 450 C	67,5	0	18,4	68,45	32,5 4,2 23,9	32,5 4,2 23,9
PANTONE 449 C	70,09	0	14,11	65,87	30,5 2,9 20,6	30,5 2,9 20,6
PANTONE 448 C	73,24	0	8,73	58,23	28,2 2,1 15,7	28,2 2,1 15,7
PANTONE 7499 C	0	0	1,56	16,95	91,1 -1,1 26,5	90,8 -1,3 26,4
PANTONE 7500 C	3,22	0	2,64	17,13	84,3 1,0 22,8	84,3 1,0 22,8
PANTONE 7501 C	4,49	0	3,47	19,89	81,2 2,3 23,4	81,2 2,3 23,4
PANTONE 7502 C	8,33	0	4,83	33,24	75,9 3,8 27,6	75,9 3,8 27,6
PANTONE 7503 C	31,75	0	4,83	45,54	63,7 1,8 27,8	63,7 1,8 27,8
PANTONE 7504 C	43,27	0	19,16	41,89	52,9 8,9 19,4	52,9 8,9 19,4
PANTONE 7505 C	53,3	0	35,51	58,9	43,9 11,3 24,3	43,9 11,3 24,3
PANTONE 468 C	3,41	0	3,77	17,11	82,5 3,2 21,8	82,5 3,2 21,8
PANTONE 467 C	5,64	0	5,77	30,6	77,4 5,2 26,8	77,4 5,2 26,8
PANTONE 466 C	9,48	0	9,68	42,72	71,2 7,2 30,5	71,2 7,2 30,5
PANTONE 465 C	14,69	0	16,16	56,71	64,8 9,7 36,3	64,8 9,7 36,3
PANTONE 464 C	47,29	0	49,82	76,49	43,7 18,9 36,6	43,7 18,9 36,6
PANTONE 463 C	57,58	0	47,94	71,78	37,3 14,7 29,2	37,3 14,7 29,2
PANTONE 462 C	66,05	0	35,46	62,74	31,8 8,2 20,2	31,8 8,2 20,2
PANTONE 7506 C	0	0	3,56	14,74	88,5 3,7 22,8	87,8 3,3 22,6
PANTONE 7507 C	0	0	6,49	33,19	87,2 10,3 34,3	83,8 7,3 32,6
PANTONE 7508 C	2,27	0	10,73	43,38	77,6 10,4 35,2	77,6 10,4 35,2
PANTONE 7509 C	4,16	0	19,17	57,49	71,3 14,1 42,4	71,3 14,1 42,4
PANTONE 7510 C	8,66	0	35,12	68,81	62,7 19,3 49,0	62,7 19,3 49,0
PANTONE 7511 C	14,63	0	43,41	80,35	56,5 21,6 51,8	56,5 21,6 51,8
PANTONE 7512 C	28,49	0	52	92,04	49,4 24,3 50,3	49,4 24,3 50,3
PANTONE 719 C	0	0	8,13	19,78	83,3 10,0 24,0	82,9 9,6 23,7
PANTONE 720 C	0,67	0	13,78	35,42	78,3 13,8 30,2	78,3 13,8 30,2
PANTONE 721 C	2,29	0	23,3	50,61	72,3 17,8 36,7	72,3 17,8 36,7
PANTONE 722 C	7,54	0	41,41	67,72	61,4 23,5 46,3	61,4 23,5 46,3
PANTONE 723 C	17	0	50,85	84,31	52,7 26,5 50,7	52,7 26,5 50,7
PANTONE 724 C	42,23	0	59,38	100	41,4 27,5 46,5	41,7 26,9 44,5
PANTONE 725 C	54,66	0	62,65	100	34,9 25,2 37,3	35,0 25,1 37,0
PANTONE 475 C	0	0	6,86	12,48	86,0 10,3 19,2	84,2 8,9 18,3
PANTONE 474 C	0	0	9,49	17,41	83,5 13,0 22,4	81,8 11,6 21,4
PANTONE 473 C	0	0	12,76	24,6	81,4 15,5 25,7	79,8 13,8 24,7
PANTONE 472 C	0	0	32,24	51,96	71,9 24,4 37,2	71,8 24,3 37,2
PANTONE 471 C	11,68	0	57,08	83,93	51,7 34,1 49,4	51,7 34,1 49,4
PANTONE 470 C	28,9	0	56,84	78,86	47,2 28,7 41,4	47,2 28,7 41,4
PANTONE 469 C	61,5	0	56,14	72,82	31,6 17,4 25,2	31,6 17,4 25,2
PANTONE 726 C	2,32	0	7,61	18,98	80,2 8,4 21,8	80,2 8,4 21,8
PANTONE 727 C	3,67	0	10,82	28,25	76,1 10,6 24,6	76,1 10,6 24,6
PANTONE 728 C	6,61	0	18,24	41,76	69,8 13,2 29,0	69,8 13,2 29,0
PANTONE 729 C	17,08	0	34,2	59,96	58,9 17,0 35,3	58,9 17,0 35,3
PANTONE 730 C	35,74	0	47,26	75,94	48,9 20,0 41,2	48,9 20,0 41,2
PANTONE 731 C	57,18	0	58,66	100	34,5 21,0 38,0	34,7 20,7 36,8
PANTONE 732 C	64,26	0	61,83	100	27,9 19,4 30,7	28,1 19,1 29,7
PANTONE 4685 C	2,56	0	5,61	10,69	81,7 7,1 16,0	81,7 7,1 16,0
PANTONE 4675 C	3,24	0	7,05	12,85	79,6 8,2 16,8	79,6 8,2 16,8
PANTONE 4665 C	6,82	0	13,76	27,98	71,7 11,4 22,1	71,7 11,4 22,1
PANTONE 4655 C	11,37	0	23,13	37,61	65,0 14,1 23,8	65,0 14,1 23,8
PANTONE 4645 C	23,4	0	35,38	53,07	56,8 16,7 28,0	56,8 16,7 28,0
PANTONE 4635 C	42,14	0	48,25	67,33	46,3 19,5 32,7	46,3 19,5 32,7
PANTONE 4625 C	70,9	0	60,32	69,44	22,6 15,5 17,3	22,6 15,5 17,3
PANTONE 7513 C	1,72	0	12,67	11,01	78,2 14,0 14,6	78,2 14,0 14,6
PANTONE 7514 C	3,86	0	22,47	30,18	71,2 17,1 22,8	71,2 17,1 22,8
PANTONE 7515 C	8,15	0	34,73	46,94	63,5 20,3 28,5	63,5 20,3 28,5
PANTONE 7516 C	37,65	0	57,56	76,96	44,2 27,0 37,4	44,2 27,0 37,4
PANTONE 7517 C	50,42	0	62,88	85,05	37,1 27,7 35,6	37,1 27,7 35,6
PANTONE 7518 C	60,5	0	42,32	32,16	36,9 12,7 10,0	36,9 12,7 10,0
PANTONE 7519 C	65,7	0	25,45	41,73	33,7 6,9 12,1	33,7 6,9 12,1
PANTONE 4755 C	4,08	0	4,68	4,81	80,5 6,6 8,8	80,5 6,6 8,8

PANTONE 4745 C	6,67	0	7,65	7,43	75,6 8,5 10,4	75,6 8,5 10,4
PANTONE 4735 C	11,36	0	12,31	13,11	69,3 10,4 13,1	69,3 10,4 13,1
PANTONE 4725 C	22,33	0	23,8	21,45	60,8 13,6 14,6	60,8 13,6 14,6
PANTONE 4715 C	40,39	0	41,17	43,43	49,8 16,6 18,2	49,8 16,6 18,2
PANTONE 4705 C	54,07	0	55,03	57,88	38,3 20,6 20,1	38,3 20,6 20,1
PANTONE 4695 C	65,99	0	60,63	63,19	26,7 18,3 16,3	26,7 18,3 16,3
PANTONE 482 C	3,29	0	4,51	6,43	81,8 6,1 11,2	81,8 6,1 11,2
PANTONE 481 C	4,84	0	7,06	9,03	77,5 8,1 12,8	77,5 8,1 12,8
PANTONE 480 C	8,49	0	11,52	16,96	71,6 10,3 16,2	71,6 10,3 16,2
PANTONE 479 C	23,25	0	33,7	40,38	57,5 16,3 21,0	57,5 16,3 21,0
PANTONE 478 C	57,82	0	60,8	66,75	32,8 23,1 22,6	32,8 23,1 22,6
PANTONE 477 C	63,45	0	57,7	63,19	29,6 17,9 18,3	29,6 17,9 18,3
PANTONE 476 C	70,65	0	49,05	57,19	25,5 11,0 13,0	25,5 11,0 13,0
PANTONE 7527 C	4,84	0	1,15	3,75	84,3 -0,0 7,4	84,3 -0,0 7,4
PANTONE 7528 C	10,69	0	3,13	4,99	76,1 2,8 8,4	76,1 2,8 8,4
PANTONE 7529 C	18	0	3,99	7,42	70,3 3,4 9,6	70,3 3,4 9,6
PANTONE 7530 C	33,42	0	5,95	12,44	62,2 4,1 11,2	62,2 4,1 11,2
PANTONE 7531 C	56,53	0	13,58	32,91	45,4 5,5 13,5	45,4 5,5 13,5
PANTONE 7532 C	64,09	0	19,66	47,16	35,9 6,1 14,5	35,9 6,1 14,5
PANTONE 7533 C	74,64	0	30,61	54,64	24,7 5,7 12,1	24,7 5,7 12,1
PANTONE 7534 C	6,65	0	1,25	4,17	82,2 0,0 8,1	82,2 0,0 8,1
PANTONE 7535 C	18,82	0	1,82	8,25	72,0 0,1 11,3	72,0 0,1 11,3
PANTONE 7536 C	32,12	0	2,32	13,13	65,7 0,2 13,1	65,7 0,2 13,1
PANTONE 7537 C	24,26	2,15	0	4,36	69,8 -3,2 4,5	69,8 -3,2 4,5
PANTONE 7538 C	36,87	3,2	0	5,67	62,9 -3,8 4,3	62,9 -3,8 4,3
PANTONE 7539 C	46,69	0,67	0	2,88	59,4 -1,3 3,2	59,4 -1,3 3,2
PANTONE 7540 C	66,94	14,57	3,89	0	33,4 -0,6 -3,7	33,4 -0,6 -3,7
PANTONE 427 C	5,31	0,53	0,09	0	84,4 -0,9 -1,1	84,4 -0,9 -1,1
PANTONE 428 C	8,94	1,37	0,16	0	79,5 -1,3 -2,1	79,5 -1,3 -2,1
PANTONE 429 C	25,35	2,63	0,25	0	69,0 -1,8 -3,1	69,0 -1,8 -3,1
PANTONE 430 C	46,89	6,54	0,86	0	55,4 -2,6 -5,5	55,4 -2,6 -5,5
PANTONE 431 C	59,26	17,08	2,05	0	42,6 -2,9 -7,0	42,6 -2,9 -7,0
PANTONE 432 C	70	44,03	9,23	0	25,7 -2,8 -7,7	25,7 -2,8 -7,7
PANTONE 433 C	80,88	55,51	37,07	0	14,3 -1,9 -6,4	14,3 -1,9 -6,4
PANTONE 420 C	8,98	0	0,24	0,47	80,7 -0,4 0,4	80,7 -0,4 0,4
PANTONE 421 C	20,67	0,19	0	0,46	73,1 -0,7 0,3	73,1 -0,7 0,3
PANTONE 422 C	35,02	0,76	0	0,05	66,2 -0,8 -0,7	66,2 -0,8 -0,7
PANTONE 423 C	47,86	1,58	0,09	0	58,2 -1,0 -1,1	58,2 -1,0 -1,1
PANTONE 424 C	58,45	1,53	0,14	0	48,0 -0,6 -0,3	48,0 -0,6 -0,3
PANTONE 425 C	65,52	5,97	1,29	0	36,9 -1,0 -1,9	36,9 -1,0 -1,9
PANTONE 426 C	84,76	40,57	11,77	0	15,8 -0,8 -2,3	15,8 -0,8 -2,3
PANTONE 441 C	7,58	3,18	0	2,26	79,1 -3,6 -0,3	79,1 -3,6 -0,3
PANTONE 442 C	19,18	4,77	0	2,82	69,6 -4,6 -1,2	69,6 -4,6 -1,2
PANTONE 443 C	31,12	7,31	0	3,28	63,6 -5,2 -1,9	63,6 -5,2 -1,9
PANTONE 444 C	52,11	12,38	0	3,74	51,1 -5,3 -2,4	51,1 -5,3 -2,4
PANTONE 445 C	65,4	17,9	0	3,53	36,5 -4,2 -2,1	36,5 -4,2 -2,1
PANTONE 446 C	71,7	25,34	0	8,76	28,5 -3,7 -0,3	28,5 -3,7 -0,3
PANTONE 447 C	77,31	19,08	0	14,32	23,9 -2,3 1,6	23,9 -2,3 1,6
PANTONE 413 C	16,17	0	0,02	2,83	75,5 -1,3 4,7	75,5 -1,3 4,7
PANTONE 414 C	30,56	0,12	0	3,5	69,0 -1,5 5,3	69,0 -1,5 5,3
PANTONE 415 C	43,95	1,2	0	4,63	60,5 -2,1 5,2	60,5 -2,1 5,2
PANTONE 416 C	54,1	1,11	0	5,47	52,8 -1,8 5,5	52,8 -1,8 5,5
PANTONE 417 C	61,86	2,42	0	10,01	43,0 -2,1 5,4	43,0 -2,1 5,4
PANTONE 418 C	68,14	4,39	0	14,25	34,9 -2,2 4,9	34,9 -2,2 4,9
PANTONE 419 C	95,35	27,78	0,6	0	13,4 -1,0 0,4	13,4 -1,0 0,4
PANTONE 400 C	10,73	0	1,76	3,16	77,5 1,0 5,0	77,5 1,0 5,0
PANTONE 401 C	24,24	0	2,25	3,92	69,7 1,3 5,7	69,7 1,3 5,7
PANTONE 402 C	37,94	0	2,87	4,55	62,5 1,6 5,9	62,5 1,6 5,9
PANTONE 403 C	48,93	0	3,38	5,42	55,9 1,8 6,1	55,9 1,8 6,1
PANTONE 404 C	57,02	0	4,51	9,37	47,2 2,3 6,8	47,2 2,3 6,8
PANTONE 405 C	61,73	0	4,78	10,21	41,7 2,3 6,3	41,7 2,3 6,3
PANTONE Black C	89,04	3,68	1,98	0	17,1 1,3 2,5	17,1 1,3 2,5
PANTONE 406 C	10,18	0	2,66	2,6	76,8 2,5 3,7	76,8 2,5 3,7
PANTONE 407 C	21,19	0	3,68	3,22	69,5 3,5 4,2	69,5 3,5 4,2
PANTONE 408 C	40,98	0	5,62	3,69	59,1 4,4 3,9	59,1 4,4 3,9
PANTONE 409 C	51,67	0	7,84	4,6	51,7 4,8 4,5	51,7 4,8 4,5

PANTONE 410 C	58,04	0	11,65	6,88	44,6 5,5 4,8	44,6 5,5 4,8
PANTONE 411 C	65,46	0	15,51	7,47	35,8 5,7 4,4	35,8 5,7 4,4
PANTONE 412 C	81,99	0	12,73	1,82	20,3 4,2 2,7	20,3 4,2 2,7
PANTONE 434 C	6,04	0	3,2	1,11	80,3 4,1 1,0	80,3 4,1 1,0
PANTONE 435 C	11,55	0	4,15	0,92	74,1 5,3 0,4	74,1 5,3 0,4
PANTONE 436 C	27,97	0	6,89	1,11	64,8 6,8 0,4	64,8 6,8 0,4
PANTONE 437 C	57,26	0	17,84	2,24	44,9 8,5 1,3	44,9 8,5 1,3
PANTONE 438 C	68,46	0	29,08	3,81	31,3 7,8 2,6	31,3 7,8 2,6
PANTONE 439 C	76,03	0	27,96	4,59	24,3 6,3 3,1	24,3 6,3 3,1
PANTONE 440 C	82,44	0	12,53	2,29	20,0 4,2 2,9	20,0 4,2 2,9
PANTONE Warm Gray 1 C	4,32	0	1,64	2,38	84,5 1,2 4,0	84,5 1,2 4,0
PANTONE Warm Gray 2 C	8,07	0	2,08	2,94	79,6 1,7 4,7	79,6 1,7 4,7
PANTONE Warm Gray 3 C	12,77	0	2,49	3,38	75,1 2,0 5,1	75,1 2,0 5,1
PANTONE Warm Gray 4 C	18,53	0	2,84	3,72	71,4 2,3 5,4	71,4 2,3 5,4
PANTONE Warm Gray 5 C	26,9	0	3,27	4,05	67,6 2,6 5,5	67,6 2,6 5,5
PANTONE Warm Gray 6 C	31,86	0	3,55	4,16	65,1 2,7 5,4	65,1 2,7 5,4
PANTONE Warm Gray 7 C	42,27	0	4,43	4,92	59,0 3,1 5,8	59,0 3,1 5,8
PANTONE Warm Gray 8 C	48,24	0	4,93	5,88	55,1 3,4 6,1	55,1 3,4 6,1
PANTONE Warm Gray 9 C	52,51	0	6,13	7,27	51,3 3,6 6,2	51,3 3,6 6,2
PANTONE Warm Gray 10 C	56,04	0	7,69	9,23	47,3 3,9 6,4	47,3 3,9 6,4
PANTONE Warm Gray 11 C	60,25	0	9,83	11,86	42,5 4,1 6,7	42,5 4,1 6,7
PANTONE Cool Gray 1 C	3,89	0	0,6	0,84	86,7 -0,1 1,0	86,7 -0,1 1,0
PANTONE Cool Gray 2 C	6,26	0	0,54	0,73	83,4 -0,1 0,8	83,4 -0,1 0,8
PANTONE Cool Gray 3 C	8,61	0	0,47	0,45	80,8 -0,1 0,4	80,8 -0,1 0,4
PANTONE Cool Gray 4 C	14,05	0	0,34	0,08	76,2 -0,2 -0,2	76,2 -0,2 -0,2
PANTONE Cool Gray 5 C	20,74	0,24	0,42	0	72,6 -0,2 -0,5	72,6 -0,2 -0,5
PANTONE Cool Gray 6 C	28,14	0,85	0,7	0	68,9 -0,2 -1,1	68,9 -0,2 -1,1
PANTONE Cool Gray 7 C	38,49	1,41	0,96	0	63,1 -0,2 -1,4	63,1 -0,2 -1,4
PANTONE Cool Gray 8 C	46,77	2,14	1,32	0	57,6 -0,2 -1,8	57,6 -0,2 -1,8
PANTONE Cool Gray 9 C	54,66	3,31	1,85	0	50,2 -0,2 -2,4	50,2 -0,2 -2,4
PANTONE Cool Gray 10 C	60,33	4,75	2,48	0	42,9 -0,2 -2,8	42,9 -0,2 -2,8
PANTONE Cool Gray 11 C	64,7	9,61	3,5	0	36,4 -0,3 -3,1	36,4 -0,3 -3,1
PANTONE Black 2 C	85,42	1,56	0	46,21	19,4 0,3 9,8	19,4 0,3 9,8
PANTONE Black 3 C	88,71	45,2	0	36,65	14,9 -4,1 2,7	14,9 -4,1 2,7
PANTONE Black 4 C	89,34	0	15,22	49,57	16,2 4,1 8,1	16,2 4,1 8,1
PANTONE Black 5 C	78	0	48,61	3,12	19,9 10,1 1,4	19,9 10,1 1,4
PANTONE Black 6 C	90,6	71,15	52,52	0	7,9 -1,9 -7,0	7,9 -1,9 -7,0
PANTONE Black 7 C	79,24	0	0,53	0	24,2 1,3 2,9	24,2 1,3 2,9
PANTONE 2337 C	0	0	14,22	7,24	83,1 20,5 12,5	79,7 16,6 11,0
PANTONE 2338 C	1,31	0	27,54	11,14	73,0 22,8 12,9	73,0 22,8 12,9
PANTONE 2339 C	0	0	41,06	18,74	71,7 36,5 17,7	69,4 31,3 16,0
PANTONE 2340 C	3,21	0	54,58	25,69	59,1 40,2 14,7	59,1 40,2 14,7
PANTONE 2341 C	12,78	0	51,56	27,97	54,7 31,1 13,8	54,7 31,1 13,8
PANTONE 2342 C	11,27	0	60,1	30,25	50,8 40,1 13,1	50,8 40,1 13,1
PANTONE 2343 C	21,43	0	60,07	18,4	47,7 36,9 8,0	47,7 36,9 8,0
PANTONE 2344 C	0	0	48,15	46,12	67,3 43,6 31,0	65,0 36,9 27,7
PANTONE 2345 C	0	0	52,65	49,18	67,3 59,7 35,4	62,4 41,3 27,6
PANTONE 2346 C	0	0	58,01	46,5	64,1 67,2 31,7	59,3 47,3 24,5
PANTONE 2347 C	0	0	79,15	100	49,4 75,1 67,2	49,2 65,7 56,9
PANTONE 2348 C	0	0	62,46	60,64	57,6 58,2 36,5	56,3 52,2 33,9
PANTONE 2349 C	3,35	0	70,39	100	47,8 59,4 59,9	48,4 56,9 54,6
PANTONE 2350 C	11,44	0	83,25	94,95	40,4 57,0 43,5	40,4 57,0 43,5
PANTONE 2351 C	0	10	49,01	0	60,3 34,4 -18,2	58,9 28,7 -12,6
PANTONE 2352 C	0	13,98	57,13	0	54,4 40,8 -20,1	53,2 34,0 -13,9
PANTONE 2353 C	0	12,2	62,98	0	51,8 55,6 -23,2	49,9 42,1 -12,5
PANTONE 2354 C	0	33,93	64,72	0	43,9 36,2 -21,0	43,7 34,9 -19,8
PANTONE 2355 C	0	44,71	95,83	0	32,0 57,0 -28,8	31,2 50,0 -23,0
PANTONE 2356 C	12,94	44,19	100	0	25,4 52,5 -23,2	26,4 46,9 -21,0
PANTONE 2357 C	59,88	4,37	93,91	0	22,7 39,6 -8,4	22,7 39,6 -8,4
PANTONE 2358 C	14,67	2,45	5,9	0	68,3 5,3 -4,3	68,3 5,3 -4,3
PANTONE 2359 C	41,55	8,65	21,36	0	50,1 7,6 -7,6	50,1 7,6 -7,6
PANTONE 2360 C	33,49	17,41	18,37	0	51,5 4,8 -11,4	51,5 4,8 -11,4
PANTONE 2361 C	27,26	32,83	29,97	0	48,1 4,9 -15,9	48,1 4,9 -15,9
PANTONE 2362 C	39,97	26,25	27,54	0	45,6 5,2 -12,7	45,6 5,2 -12,7
PANTONE 2363 C	46,31	32,48	35,77	0	40,5 5,9 -13,2	40,5 5,9 -13,2
PANTONE 2364 C	52,72	16,89	39,04	0	39,6 9,4 -9,0	39,6 9,4 -9,0

PANTONE 2366 C	0	52,59	50	0	49,4 18,3 -51,1	46,4 9,6 -28,9
PANTONE 2367 C	0	61,72	63,19	0	37,1 23,5 -54,4	35,3 14,4 -33,2
PANTONE 2368 C	0	61,99	64	0	37,1 27,6 -61,9	34,7 15,0 -33,3
PANTONE 2369 C	0	65,73	67,59	0	32,6 27,6 -64,6	30,7 15,3 -35,6
PANTONE 2370 C	0	75	83,77	0	24,1 28,8 -58,8	22,5 20,4 -40,2
PANTONE 2371 C	0	78,83	100	0	18,3 42,1 -63,5	17,0 29,4 -43,2
PANTONE 2372 C	0	83,19	94,53	0	18,2 26,3 -50,4	17,5 23,4 -44,2
PANTONE 2373 C	18,12	34,6	13,3	0	53,9 -0,4 -18,3	53,9 -0,4 -18,3
PANTONE 2374 C	34,17	51,85	37,29	0	39,8 0,2 -21,8	39,8 0,2 -21,8
PANTONE 2376 C	51,53	44,47	23,02	0	38,2 -0,3 -15,7	38,2 -0,3 -15,7
PANTONE 2377 C	52,6	59,23	24,09	0	33,8 -5,8 -21,3	33,8 -5,8 -21,3
PANTONE 2378 C	52,53	58,07	45,61	0	30,3 0,5 -20,8	30,3 0,5 -20,8
PANTONE 2379 C	61,5	49	33,17	0	28,9 0,2 -13,9	28,9 0,2 -13,9
PANTONE 2380 C	65,3	61,48	49,53	0	21,1 0,2 -15,9	21,1 0,2 -15,9
PANTONE 2381 C	0	49,09	16,97	0	59,5 -2,6 -43,2	57,9 -4,8 -30,8
PANTONE 2382 C	0	60,45	15,55	0	53,9 -10,5 -50,5	52,8 -11,8 -38,2
PANTONE 2383 C	0,1	64,6	33,65	0	46,1 -8,7 -38,8	46,1 -8,7 -38,8
PANTONE 2384 C	0	77,81	45,97	0	37,7 -10,4 -44,3	37,7 -10,4 -43,6
PANTONE 2386 C	0	62,41	49,36	0	44,0 5,3 -54,9	42,1 1,4 -35,3
PANTONE 2387 C	0	65	53,7	0	41,3 7,2 -61,4	39,1 2,1 -36,8
PANTONE 2388 C	0	73,06	60,26	0	33,5 7,0 -63,2	32,2 2,5 -40,5
PANTONE 2389 C	6,39	49,91	0	0,21	61,2 -17,1 -30,2	61,2 -17,1 -30,2
PANTONE 2390 C	12,72	63,05	5,5	0	48,0 -16,7 -34,4	48,0 -16,7 -34,4
PANTONE 2391 C	18,19	63,68	0	2,71	48,9 -23,0 -29,9	48,9 -23,0 -29,9
PANTONE 2392 C	48,88	62,03	1,23	0	40,1 -16,0 -24,8	40,1 -16,0 -24,8
PANTONE 2393 C	0,7	71,25	0	2,81	53,4 -31,0 -44,5	53,4 -31,0 -44,5
PANTONE 2394 C	1,65	80,47	0	0,79	50,7 -30,8 -50,7	50,7 -30,8 -50,7
PANTONE 2396 C	0	68,01	0	19,84	55,1 -40,0 -27,6	54,4 -37,7 -26,1
PANTONE 2397 C	0	58,46	0	24,69	65,4 -45,4 -18,6	60,5 -31,4 -14,3
PANTONE 2398 C	0	56,1	0	31,25	66,8 -46,2 -10,8	61,7 -30,4 -8,3
PANTONE 2399 C	0	67,12	0	48,25	58,8 -67,7 -13,7	53,2 -43,7 -8,2
PANTONE 2400 C	0	61,52	0	50	61,9 -55,5 -2,7	57,0 -39,0 -1,5
PANTONE 2401 C	0	57,26	0	41,63	61,4 -36,1 -3,3	60,2 -33,1 -3,0
PANTONE 2402 C	0	69,48	0	56,92	54,2 -62,1 -4,2	51,2 -48,5 -3,2
PANTONE 2403 C	0	93,23	0	58,71	46,4 -67,7 -9,9	45,2 -61,5 -8,9
PANTONE 2404 C	8,69	9,81	0	20,55	72,9 -10,6 11,7	72,9 -10,6 11,7
PANTONE 2406 C	17,56	25,97	0	31,42	62,3 -13,9 7,9	62,3 -13,9 7,9
PANTONE 2407 C	29,17	37,9	0	43,33	55,3 -16,5 9,1	55,3 -16,5 9,1
PANTONE 2408 C	39	52,07	0	60,23	46,8 -23,0 13,8	46,8 -23,0 13,8
PANTONE 2409 C	56,75	42,97	0	58,49	40,1 -14,5 13,4	40,1 -14,5 13,4
PANTONE 2410 C	60,84	45,78	0	61,14	35,8 -14,3 13,3	35,8 -14,3 13,3
PANTONE 2411 C	67,74	64,61	0	84,63	24,1 -20,8 15,6	24,1 -20,8 15,6
PANTONE 2412 C	0	45	0	48,98	76,2 -51,1 17,6	66,2 -27,7 11,9
PANTONE 2413 C	0	55	0	53,05	66,3 -44,6 8,1	61,5 -33,3 6,9
PANTONE 2414 C	0	57,58	0	59,75	66,3 -56,1 16,7	59,3 -37,6 12,9
PANTONE 2416 C	0	60	0	60,36	62,1 -59,1 15,4	57,5 -40,9 11,3
PANTONE 2417 C	0	60,69	0	63,32	57,2 -43,3 15,4	56,9 -42,2 15,1
PANTONE 2418 C	0	89,81	0	92,89	45,2 -75,4 22,8	44,4 -72,1 22,1
PANTONE 2419 C	11,78	71,78	0	66,31	44,2 -46,7 8,1	44,2 -46,7 8,1
PANTONE 2420 C	0	55,5	0	65	69,0 -65,8 36,2	60,5 -36,4 23,1
PANTONE 2421 C	0	55,75	0	100	64,8 -60,5 69,8	59,4 -39,4 51,5
PANTONE 2422 C	0	62,29	0	88,18	58,7 -62,3 46,4	55,2 -47,2 37,3
PANTONE 2423 C	0	64,42	0	95	58,5 -74,5 53,2	53,5 -50,4 38,7
PANTONE 2424 C	0	58,78	0	100	56,8 -53,6 60,7	57,3 -43,3 47,9
PANTONE 2426 C	0	70,85	0	100	48,2 -68,5 43,7	49,2 -58,5 34,6
PANTONE 2427 C	51,66	66,95	0	100	34,0 -37,6 28,3	34,7 -34,9 25,2
PANTONE 3514 C	0	0	13,06	100	79,0 14,4 91,8	78,1 11,6 85,5
PANTONE 3596 C	2,83	0	8,73	34,05	78,4 8,8 29,5	78,4 8,8 29,5
PANTONE 3547 C	9,51	0	27,02	89,03	64,0 14,8 64,5	64,0 14,8 64,5
PANTONE 3588 C	0	0	40,17	79,49	73,1 38,2 71,9	68,5 27,5 63,2
PANTONE 3564 C	0	0	50,72	100	62,0 49,5 94,1	62,9 38,1 68,5
PANTONE 2428 C	1,44	0	43,22	80,78	65,5 29,1 60,9	65,5 29,1 60,9
PANTONE 2429 C	7,44	0	58,56	93,83	52,8 38,7 54,9	52,8 38,7 54,9
PANTONE 2430 C	3,45	0	23,56	41,67	71,2 17,4 29,7	71,2 17,4 29,7
PANTONE 2431 C	1,54	0	36,97	62,87	68,3 25,0 46,5	68,3 25,0 46,5
PANTONE 2432 C	1,19	0	41,75	59,97	66,8 28,8 41,8	66,8 28,8 41,8

PANTONE 2433 C	1,25	0	49,79	62,41	62,7 36,1 41,0	62,7 36,1 41,0
PANTONE 2434 C	0	0	51,41	57,24	63,4 41,4 35,3	62,9 39,8 34,4
PANTONE 2435 C	8,31	0	51,24	55,24	56,7 31,7 28,6	56,7 31,7 28,6
PANTONE 2436 C	11,73	0	62,19	66,07	48,8 40,4 33,9	48,8 40,4 33,9
PANTONE 2437 C	0	0	12,87	20,69	81,7 16,1 23,7	79,8 14,1 22,5
PANTONE 2438 C	0,33	0	29,94	34,69	72,8 23,2 26,2	72,8 23,2 26,2
PANTONE 2439 C	7,59	0	40,25	36,45	62,3 23,9 21,6	62,3 23,9 21,6
PANTONE 2440 C	16,43	0	20,4	10,77	63,9 13,6 10,1	63,9 13,6 10,1
PANTONE 2441 C	25,6	0	46,04	42,35	53,0 22,4 19,5	53,0 22,4 19,5
PANTONE 2442 C	31,77	0	54,41	47,09	48,1 26,9 19,0	48,1 26,9 19,0
PANTONE 2443 C	42,6	0	68,25	83,08	36,8 36,4 34,1	36,8 36,4 34,1
PANTONE 3544 C	2,22	0	11,7	10,95	78,0 13,1 14,5	78,0 13,1 14,5
PANTONE 2444 C	1,95	0	24,18	11,58	73,4 20,5 13,4	73,4 20,5 13,4
PANTONE 3519 C	0,37	0	28,25	4,32	74,4 24,6 5,7	74,4 24,6 5,7
PANTONE 3572 C	0	0	35,95	11,75	76,4 40,0 15,8	71,4 28,5 12,6
PANTONE 2445 C	0,46	0	45,6	14,66	66,5 35,4 12,7	66,5 35,4 12,7
PANTONE 2446 C	3,57	0	44,17	12,2	64,2 31,2 10,4	64,2 31,2 10,4
PANTONE 2447 C	16,05	0	48,91	13,67	54,7 28,1 8,3	54,7 28,1 8,3
PANTONE 2448 C	0,51	0	59,19	60,01	57,9 47,7 33,9	57,9 47,7 33,9
PANTONE 3556 C	0	0	67,49	74,03	55,4 69,7 51,6	53,1 57,5 45,6
PANTONE 3516 C	0	0	71,67	100	51,2 64,5 60,0	50,9 62,0 58,2
PANTONE 3546 C	0,83	0	97,7	94,61	44,6 72,6 50,9	44,6 72,6 50,9
PANTONE 3517 C	4,7	0	100	93,35	40,4 73,7 48,5	41,1 68,3 45,8
PANTONE 3523 C	56,58	0	69,5	55,33	30,2 32,2 13,7	30,2 32,2 13,7
PANTONE 2449 C	73,77	0	65	50,56	19,6 17,8 7,0	19,6 17,8 7,0
PANTONE 3568 C	0	0	10	0	84,7 17,2 -2,6	82,8 15,4 -2,1
PANTONE 3595 C	0	0	15,91	0	82,0 23,1 -4,1	79,7 19,5 -2,1
PANTONE 2450 C	0	0,32	67,1	0	53,6 62,8 -2,7	53,4 61,5 -1,8
PANTONE 3527 C	0	3,82	65	0	53,5 65,1 -15,5	52,1 52,4 -6,4
PANTONE 3582 C	0	2,88	53,39	0	61,1 43,1 -8,9	60,5 40,1 -6,3
PANTONE 2451 C	9,44	0	67,8	4,31	47,2 51,9 1,0	47,2 51,9 1,0
PANTONE 2452 C	4,41	0	72,3	5,92	47,7 60,0 3,3	47,7 60,0 3,3
PANTONE 2453 C	0	11,01	31,62	0	66,8 19,7 -17,9	65,5 16,5 -13,6
PANTONE 3520 C	0	19,24	46,32	0	59,8 32,1 -28,7	57,3 21,8 -16,4
PANTONE 3559 C	0	41,87	61,74	0	45,1 37,8 -35,7	43,5 27,5 -23,1
PANTONE 3593 C	0	32,52	51,38	0	53,6 28,6 -30,7	51,7 20,8 -20,5
PANTONE 3575 C	0	36,12	49,19	0	54,5 27,2 -37,0	51,8 17,6 -21,9
PANTONE 3543 C	0	25	34,61	0	63,0 19,4 -31,5	60,4 12,2 -18,9
PANTONE 3515 C	0	62,1	100	0	23,5 50,4 -44,0	23,1 40,4 -33,7
PANTONE 3558 C	0	31,62	18,03	0	65,1 5,5 -30,2	63,6 2,9 -22,6
PANTONE 3555 C	0	65,48	90,79	0	24,4 35,3 -40,8	23,9 31,8 -35,7
PANTONE 3583 C	0	66,15	90,32	0	24,8 37,9 -46,8	23,7 30,9 -36,1
PANTONE 3574 C	2,86	58,54	66,29	0	34,0 20,1 -29,8	34,0 20,1 -29,8
PANTONE 3566 C	0	67,69	85,33	0	24,5 26,5 -37,3	24,4 26,2 -36,8
PANTONE 3535 C	0	73,9	100	0	18,9 43,3 -57,6	18,2 31,8 -41,2
PANTONE 3542 C	0	80,39	99,97	0	17,7 34,1 -53,8	16,6 28,7 -43,8
PANTONE 3506 C	0	67,09	50,89	0	40,0 0,1 -48,6	39,1 -1,5 -38,5
PANTONE 3590 C	0	65	57,51	0	37,7 7,6 -44,0	37,0 5,6 -36,3
PANTONE 3584 C	0	73,38	67,99	0	27,6 10,2 -40,1	27,5 10,1 -39,6
PANTONE 3591 C	0	92,6	88,5	0	18,5 19,0 -53,9	17,7 16,2 -45,9
PANTONE 3597 C	4,69	80,21	69,63	0	23,9 7,8 -39,3	23,9 7,8 -39,3
PANTONE 3581 C	9,27	79,32	72,72	0	22,4 9,9 -37,8	22,4 9,9 -37,8
PANTONE 3524 C	53,79	66,48	69,43	0	18,8 11,6 -24,1	18,8 11,6 -24,1
PANTONE 3577 C	1,18	29	1,31	0	72,8 -10,1 -23,8	72,8 -10,1 -23,8
PANTONE 3545 C	0	53,82	0	5,02	68,7 -34,9 -33,0	64,4 -23,9 -26,5
PANTONE 3551 C	0	69,21	0	20	57,7 -54,5 -36,8	53,6 -38,7 -27,2
PANTONE 3538 C	0,35	69,51	0	0,9	54,7 -28,6 -48,2	54,7 -28,6 -48,2
PANTONE 3553 C	1,26	100	18,66	0	39,9 -25,1 -52,3	40,0 -24,6 -51,3
PANTONE 2454 C	30,63	58,43	0,44	0	48,5 -17,0 -28,0	48,5 -17,0 -28,0
PANTONE 3526 C	34,64	17,46	0	1,98	59,1 -7,1 -8,3	59,1 -7,1 -8,3
PANTONE 2455 C	1,96	25,99	0	13,71	73,1 -16,0 -1,0	73,1 -16,0 -1,0
PANTONE 3533 C	0	35	0	18,1	79,8 -37,8 -3,2	71,6 -20,0 -2,2
PANTONE 3534 C	0	65	0	48,09	61,2 -64,8 -10,8	54,6 -41,9 -6,3
PANTONE 2456 C	1,95	59,04	0	46,03	57,4 -34,6 -1,6	57,4 -34,6 -1,6
PANTONE 3560 C	0	67,35	0	50	56,8 -60,8 -10,5	53,0 -44,4 -7,3
PANTONE 3557 C	8,69	80,8	0	43,88	44,0 -45,4 -16,2	44,0 -45,4 -16,2

PANTONE 3541 C	0	85,62	0	42,13	50,0 -61,6 -24,7	47,8 -51,9 -21,0
PANTONE 2457 C	10,55	22,55	0	20,66	66,7 -13,4 4,4	66,7 -13,4 4,4
PANTONE 2458 C	13,04	43,1	0	40,33	58,7 -20,4 5,7	58,7 -20,4 5,7
PANTONE 2459 C	0	50,77	0	44,97	65,1 -33,5 4,8	63,6 -29,9 4,6
PANTONE 2460 C	1,06	45	0	21,56	66,4 -23,5 -5,9	66,4 -23,5 -5,9
PANTONE 2461 C	4,54	60,41	0	36,44	55,2 -32,1 -8,7	55,2 -32,1 -8,7
PANTONE 2462 C	21,72	46,76	0	30,62	54,6 -19,4 -1,8	54,6 -19,4 -1,8
PANTONE 2463 C	50,27	34,71	0	18,05	47,2 -10,7 -1,0	47,2 -10,7 -1,0
PANTONE 2464 C	0	41,41	0	60	70,4 -33,7 30,5	67,4 -27,3 26,8
PANTONE 2465 C	39,14	64,22	0	86,16	40,5 -36,1 26,1	40,5 -36,1 26,1
PANTONE 3522 C	0	79,89	0	100	46,9 -69,1 32,0	46,7 -66,1 30,1
PANTONE 3536 C	0	100	4,34	96,52	39,4 -78,1 18,9	39,8 -73,0 18,4
PANTONE 3500 C	21,47	84,75	0	93,05	37,6 -57,9 19,9	37,6 -57,9 19,9
PANTONE 3537 C	61,52	81,85	0	100	24,8 -39,1 16,3	25,1 -38,0 15,2
PANTONE 2466 C	62,79	57,39	0	35,42	31,2 -15,2 -3,1	31,2 -15,2 -3,1
PANTONE 3570 C	0	12,49	0	100	80,3 -30,2 91,7	77,6 -18,8 79,8
PANTONE 3507 C	0	14,86	0	95	78,6 -27,8 83,1	76,4 -19,7 75,2
PANTONE 3561 C	0	38,84	0	87,38	71,4 -44,3 74,0	67,9 -28,1 57,0
PANTONE 3501 C	0	55,43	0	98,86	62,7 -49,4 60,2	59,7 -39,0 51,2
PANTONE 3529 C	0	59,8	0	93,38	59,7 -54,6 50,4	56,8 -44,4 43,1
PANTONE 3539 C	0,41	60,22	0	96,99	56,1 -44,8 44,4	56,1 -44,8 44,4
PANTONE 3508 C	44,07	41,57	0	80,95	47,4 -19,2 35,0	47,4 -19,2 35,0
PANTONE 3599 C	4,43	0	4,6	37,7	79,6 3,7 32,7	79,6 3,7 32,7
PANTONE 2467 C	14,96	0	19,71	42,51	63,6 11,8 25,7	63,6 11,8 25,7
PANTONE 2468 C	39,24	0	43,11	55,17	49,4 17,6 24,3	49,4 17,6 24,3
PANTONE 2469 C	45,01	0	52,79	63,82	43,8 21,7 27,8	43,8 21,7 27,8
PANTONE 2470 C	39,65	0	15,92	40,96	55,5 8,0 20,0	55,5 8,0 20,0
PANTONE 2471 C	31,09	0	16,67	20,33	59,4 10,0 14,0	59,4 10,0 14,0
PANTONE 2472 C	64,75	0	49,57	64,74	30,5 13,1 19,9	30,5 13,1 19,9
PANTONE 2473 C	9,34	0	4,06	0,09	75,9 5,6 -1,0	75,9 5,6 -1,0
PANTONE 2474 C	22,71	0	5,17	4,84	67,4 5,2 6,6	67,4 5,2 6,6
PANTONE 2475 C	33,43	0	16,72	9,09	58,6 10,4 7,7	58,6 10,4 7,7
PANTONE 2476 C	53,01	0	22,2	5,68	47,7 10,1 4,3	47,7 10,1 4,3
PANTONE 2477 C	59,49	0	30,95	13,95	40,1 10,2 6,6	40,1 10,2 6,6
PANTONE 2478 C	71,71	0	47,65	3,2	25,3 11,5 1,3	25,3 11,5 1,3
PANTONE 2479 C	78,39	0	16,25	16,93	22,7 4,4 5,0	22,7 4,4 5,0