Using color management systems to adjust the ink Keys at the litho offset sheet feed printing machine

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introduction :

Using color management systems in order to obtain uniform color production along all stages of printing production which allows: Increasing the quality of the print production. Increasing quality consistency. Time/money savings in prepress through decreased retouching of images and remaking of proofs. Time/money savings in printing through faster color ok in make-ready. The study is to find The impact of using color management systems which can be applied through all print production stages from prepress till the press stage. Adjusting ink zones on the printing machine is considered to be one of the most important factors that affect the quality of the printed color which can be an affecting factor in producing the dot gain phenomenon, and also decrease the print waste percentage. The research have been established through a number of experiments and measurements recorded in each of the extent of change.

Research problem:

Deficiencies in the use of the color management system in order to improve colorimetric properties of the printed product during the print production on the litho offset sheet feed printing machine.

Aim of the research:

Studying the impact of using color management system to adjust the ink zones of the sheet feed litho offset printing machine during the printing process.

DOI: 10.12816/0044832

ملخص البحث :

استخدام نظم إدارة الألوان من أجل الحصول على إنتاج لونى موحد طوال مراحل الإنتاج الطباعى والتي تؤدى الى زيادة جودة الإنتاج المطبوع.

توفير الوقت / المال في عمليات ما قبل الطباعة من خلال انخفاض إعادة الرتوش والتصحيحات اللونية للصور وإعادة البروفات الملونة لاكثر من مرة. توفير الوقت / المال في الطباعة من خلال الحصول على أسرع فرخ طباعى مقبول .

الدراسة هي لتحديد مدى تأثير استخدام أنظمة إدارة الألوان التي يمكن تطبيقها من خلال جميع مراحل إنتاج الطباعة من مرحلة ما قبل الطباعة حتى مرحلة الطباعة. ويعتبر ضبط مفاتيح الحبر على ماكينة الطباعة من أهم العوامل التي تؤثر على جودة اللون المطبوع الذي يمكن أن يكون عاملا مؤثرا في ظاهرة النمو النقطى، وأيضا تقليل نسبة الهادر من المطبوع .

وقد تم عمل الدراسة البحثيه من خلال عدد من التجارب والقياسات المسجلة فى مقارنة بين استخدام ادارة اللون وعدم استخدامها .

مشكلة البحث :

تكمن مشكلة البحث فى القصور في استخدام نظام إدارة الألوان من أجل تحسين الخصائص اللونية للمنتج المطبوع أثناء الإنتاج الطباعى على ماكينة الليثو اوفست ذات التغذية بالفرخ

الهدف من البحث:

دراسة تأثير استخدام نظام إدارة الألوان لضبط مفاتيح الحبر أثناء الإنتاج الطباعى على ماكينة الليثو اوفست ذات التغذية بالفرخ .

الكلمات المفتاحية : إدارة الألوان – طباعة الأوفست – مفاتيح الحبر – ملفات ICC .

Theory:

all devices – scanners, digital cameras, monitors, and printers – reproduce colors differently. There are even differences in the way individual printers of the same model manage color. Many variables affect color, including your ink and paper type.

Color Management – is a way to set up your environment (called a workflow) to allow all these devices to speak the same language so you can get accurate and predictable results. The ultimate goal is to match the colors of the image displayed on your monitor with the ones produced by your printer .(1)

Figure 1

We use Color Management software to create profiles for all devices. A profile provides a description of each device's color gamut – the range of reproducible color.

Figure 2

You use these profiles in your workflow, and the result is an accurate translation from one device to the next, giving you consistent, predictable color.

If you really want to understand how things work we need to start with some basics. When color reproduction was first becoming a science it was determined that all the colors visible to the average person could fit into a twisted horseshoe-shaped graph affectionately know as the *xyY Chromaticity Diagram*.(2)

This diagram (FIGURE 1) represents the way we see and accurately
indicates the uneven sensitivity we have to all of the colors. It's also convenient as we can count on this space to stay the same regardless of how it's viewed or imaged with any device. In fact, because of the lack of dependence on any other factors we call it *device-independent*.

As more technologies evolved it became apparent that measurement systems and computers needed a better balance of information, so the spacing between colors was shaped to become more consistent and even. We call this space L*a*b*, or simply *Lab* (FIGURE 2).

Technically a* represents the red/green axis, b* represents the yellow/blue axis, and a straight line going right through the center corresponds to L or the lightness.
Lab is a great place for scientists, but it's also the space that's hidden in all of our computers. So we're going to look at a few images the way our computers do.(3

Monitor display VS Printing

- The monitor produces the color you see on-screen with light while the printer produces color with pigment. The set of colors, or gamut, you can produce with light is not identical to the set you can produce with pigment. Thus there are colors you can produce on a monitor and not on a printer, and vice-versa.
- The monitor uses three primary colors of light (red, green, blue) to produce all the colors you see on-screen. It mixes different amounts of each of the primaries to produce a particular color. An on-screen color is specified as three numeric values, the first describing the amount of red, the second the amount of green, and the third the amount of blue light to use to create the color. Thus these are often referred to as RGB (Red Blue Green) colors.
- The printer uses three primary colors of ink (cyan, magenta, yellow) and black to produce all the colors it prints.

- The set of colors you can produce with light (the RGB gamut) is larger than the set of colors you can produce with pigment (the CMYK gamut). Thus monitors can produce more colors than printers. There is a significant overlap between the two gamuts however, and, in those cases, the problem becomes how to match a color that it **is** possible to create with either light or pigment, on different physical devices.(4)

Representation and control of color in physical devices:

The difficulty with physical devices is that none are stable enough to ensure a consistent representation of a given color. Physical devices for our purposes are monitors and printers.

- **Monitors** The same color can vary across monitors due to factors such as the phosphor specification, the calibration, and the age of the individual monitor. Even on the same monitor the color can change as the monitor ages or loses its calibration. The set of colors a monitor can display (its gamut) can also vary across monitors.

-**Printers** The same color can also vary across printers or on the same printer due to factors such as the inks a printer uses, the amount of ink in the printer at the time you print, and the physical properties of the paper on which you print.(5)

Practical part:

Material and machines :

Material:

- Plates : Ipagsa CTP Thermal Plates Electra Excel 1030X790 mm
- Developer : Ipagsa Thermal Plates Developer
- Ink : Hartmann Lith
- Blanket : Perfect Dot
- Paper : Glossy Paper Class 1- 135 gm
  Matt Paper Class 3- 200 gm

Machines:

- Apple Mac Pro With Apple cinema Display 27 inch
- Proofing Printer Plotter Epson 9800

- X-rite i1 For Calibration the Display and the Proofing Machine – and make ICC profile for the Printer
- CTP Heidelberg Supra Sitter VLF with interpolator HDX 125+
- RIP Unit Dell Power Adg 320 with prinect Prepress manager 2016
- Prinect Metashooter 2016 for the CTP control
- Heidelberg CD102-5 With in press control
- X-rite Exact
-Prinect Pressroom Manager 2016

The experiment:

The researchers have printed the test shown in figure (3) first without using color management systems and then by using color management systems and they measured the impact of using the color management systems on the ink zones of the printing machine, dot gain range, printed dot size, L a b values, ink density, and then making comparison between the ISO values and the values before using color management systems and after using them and the results were as follows:

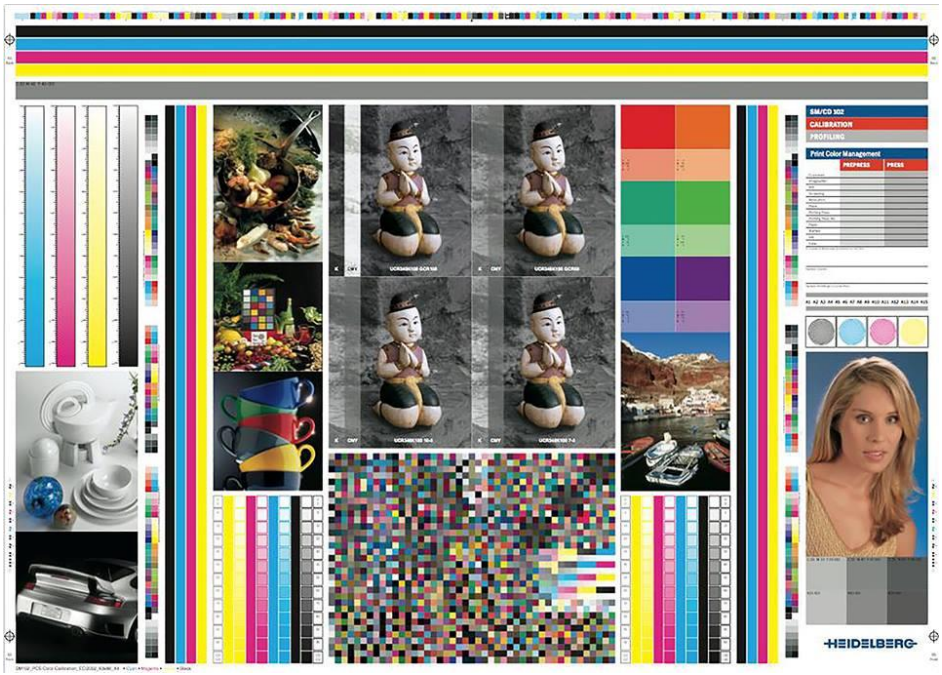

Figure (3) the printed test

Results :

Ink zones before & after color management :

Ink Zones		1	2	3	4	5	6	7	8
Cyan	Before	0%	0%	5%	19%	18%	21%	19%	26%
	After	0%	0%	3%	14%	14%	18%	14%	22%
Magenta	Before	0%	0%	7%	37%	24%	25%	19%	26%
	After	0%	0%	5%	33%	21%	20%	20%	24%
Yellow	Before	0%	0%	6%	24%	29%	21%	19%	26%
	After	0%	0%	4%	20%	27%	17%	17%	22%
Black	Before	0%	0%	5%	19%	23%	28%	19%	7%
	After	0%	0%	4%	18%	20%	25%	25%	3%
Ink Zones		9	10	11	12	13	14	15	16
Cyan	Before	15%	23%	32%	34%	28%	39%	31%	35%
	After	13%	21%	28%	29%	25%	34%	27%	32%
Magenta	Before	20%	33%	47%	34%	28%	39%	30%	29%
	After	17%	31%	41%	24%	26%	31%	27%	28%
Yellow	Before	19%	41%	35%	24%	28%	39%	31%	29%
	After	17%	39%	34%	22%	24%	31%	28%	26%
Black	Before	49%	48%	41%	34%	28%	39%	33%	32%
	After	45%	43%	38%	26%	24%	30%	29%	25%
Ink Zones		17	18	19	20	21	22	23	24
Cyan	Before	21%	29%	21%	19%	18%	11%	19%	32%
	After	19%	27%	19%	21%	12%	7%	15%	28%
Magenta	Before	34%	43%	35%	19%	31%	34%	35%	19%
	After	30%	41%	32%	36%	28%	30%	31%	16%
Yellow	Before	31%	42%	36%	19%	29%	38%	28%	17%
	After	27%	39%	32%	32%	26%	35%	25%	14%
Black	Before	29%	46%	36%	19%	38%	31%	33%	21%
	After	28%	40%	33%	32%	33%	29%	29%	16%
Ink Zones		25	26	27	28	29	30	31	32
Cyan	Before	4%	9%	12%	15%	19%	6%	0%	0%
	After	2%	21%	11%	11%	13%	3%	0%	0%
Magenta	Before	27%	23%	20%	21%	25%	10%	0%	0%
	After	21%	31%	18%	17%	22%	7%	0%	0%
Yellow	Before	27%	21%	26%	28%	29%	9%	0%	0%
	After	23%	21%	34%	25%	25%	5%	0%	0%
Black	Before	25%	20%	27%	29%	28%	7%	0%	0%
	After	23%	22%	38%	25%	25%	3%	0%	0%

Dot gain before & after color management :

Value	Standard Dot Gain	Machine Before Adjust	Machine After Adjust
40%	16%	25%	18%
80%	14%	22%	17%

Dot area before & after color management :

Tonal Value	Standard Reading	Before Adjust	After Adjust
1%	1.4%	3%	1.6%
2%	3.2%	5%	3.3%
3%	4.5%	7%	5%
4%	5.6%	8%	6.8%
5%	8.2%	9%	9%
6%	9%	10%	10%
7%	11%	13%	11.5%
10%	15%	16%	16.%
20%	33%	36%	34%
30%	44%	49%	45.5
40%	56%	65%	58%
50%	67%	80%	69%
60%	73.2%	88%	76%
70%	83%	94%	86%
80%	94%	100%	97%
90%	98%	100%	98.6%
93%	98.6%	100%	99.3%
94%	99.2%	100%	99.5%
95%	99.5%	100%	99.7%
96%	99.6%	100%	99.8%
98%	99.7%	100%	99.8%
99%	99.8%	100%	100%

Values of LAB color & Density:

Cyan	Density	L	A	B	Delta E
Before	1.06	47.26	-42.05	-53.19	1.82
After	1.27	55.42	-34.10	-49	
Magenta	Density	L	A	B	Delta E
Before	1.12	39.22	58.05	-5.23	1.74
After	1.29	48	70.3	-3.40	
Yellow	Density	L	A	B	Delta E
Before	1.02	77.38	-7.08	79.12	1.33
After	1.22	90.70	79.12	89	
Black	Density	L	A	B	Delta E
Before	1.10	14.09	0.12	1.12	1.46
After	1.52	21.30	1.70	2.30	

Recommendations:

Using color management systems leads in raising the printed quality reaching the ISO values.

Conclusion :

Using color management system helped in improving the accuracy of adjusting the ink zones of the printing machine leading to print the four printing colors density and Lab values close to the ISO values.

In which the dot gain for the printed dot 40% increased by 18% while the ISO standard is 16%, and in the printed dot area 80% increased by 17% while the ISO standard is 14%.

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