

Comparative Print Quality Analysis of Screen Printing and Liquid Ink Based Digital Printing Machines

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Abstract: Screen printing and digital printing are most suitable printing process for printing on shorter run jobs at current time. Aim of this paper is to comparatively analyse the quality of screen printing and liquid ink based digital printing process on basis of quality parameters such as solid ink density, hue error, greyness and print sharpness. A test chart consisting of high quality images and quality control strip was printed in local market with the help of both above processes and prints were tested to analyse print quality.

Keywords: Screen Printing, Liquid Toner based Digital Printing, Solid Ink Density, Hue Error, Greyness, Print Sharpness

Introduction

Quality has been the matter of serious concern among printers. At one hand screen printing is one of the cheapest printing process in terms of initial investments, on the other digital printing came with personalization options with good print quality. Both printing processes are suitable for short run. So to compare printing quality among both printing processes is the need of the hour. A number of quality control parameters are existing today like solid ink density, dot gain, print contrast, hue error, greyness, sharpness etc. which are helpful to evaluate quality of printing. [1],[2],[3].

Research Objectives

Print quality in different printing processes requires different kind of attention. Objective of project work is:

1. To compare print quality of different paper varieties printed with screen printing and liquid ink based digital printing presses.

Research Methodology

Experimentation and comparison work was performed in the research work. The printing of the test sheets was carried out in on screen printing machine on the other hand multi-colour liquid toner based digital presses were available in the local market for printing work. Gloss coated, matte coated and uncoated paper stocks were taken and sample sheets were printed with the help of printing machine and liquid toner based printing machines. Finally gloss coated, matte coated and uncoated printed paper stocks are analyzed to check various quality control parameters. The printing work of the project was carried out in local market

with a master developed specially designed for the above purpose. Epson liquid toner printer was used to print with digital medium. Three types of paper; one coated gloss, coated matt, and uncoated papers were identified and taken into consideration for printing. 20 sheets were collected from each of the above speed and the same was repeated for the three types of paper. X-Rite Exact spectrodensitometer was used to check the Solid Ink Density, Hue Error and Greyness. Print sharpness was analysed with visual standard observer method.

DATA COLLECTION AND ANALYSIS

Table.1. Solid Ink Density Analysis

	SCREEN PRINTING			LIQUID TONER BASED DIGITAL PRINTING		
	Gloss Paper	Matte Paper	Uncoated Paper	Gloss Paper	Matte Paper	Uncoated Paper
C	44.4	42.8	44.5	35.3	35.3	38.3
M	49.1	55.9	44.5	57.9	59.8	66.4
Y	6.7	6.7	6.3	16.1	15.6	17.3
K	21.1	36.1	25.5	48.8	33.1	6.7

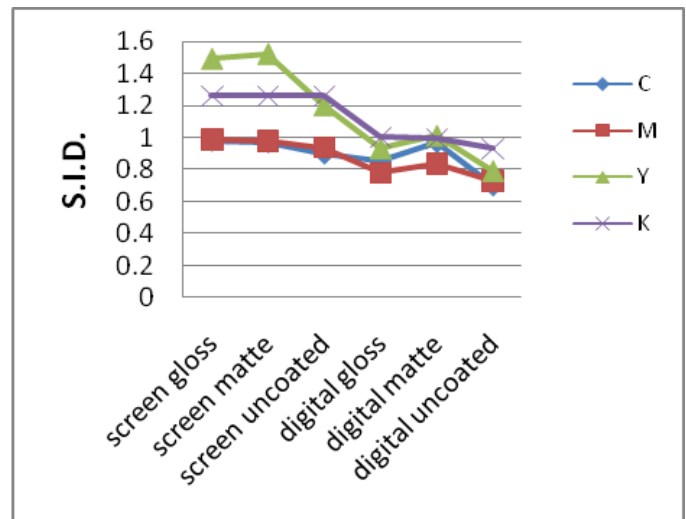


Fig.1. Solid Ink Density Analysis

Table.2. Hue Error Analysis

SCREEN PRINTING			LIQUID TONER BASED DIGITAL PRINTING			
	Gloss Paper	Matte Paper	Uncoated Paper	Gloss Paper	Matte Paper	Uncoated Paper
C	0.98	0.97	0.9	0.85	0.97	0.7
M	0.99	0.98	0.94	0.78	0.84	0.73
Y	1.49	1.52	1.2	0.93	1.01	0.79
K	1.26	1.26	1.26	1	0.99	0.93

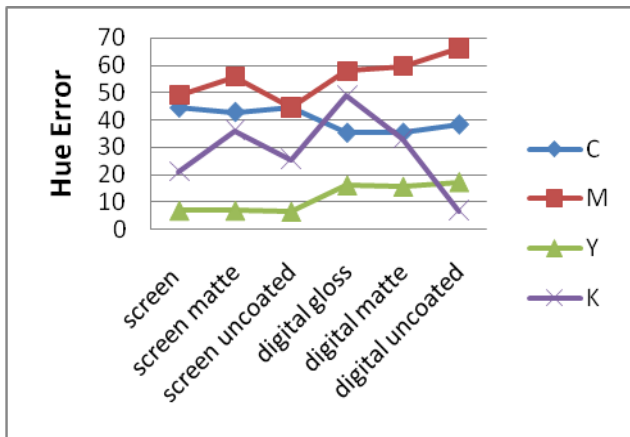


Fig.2. Hue Error Analysis

Table.3. Grayness Analysis

SCREEN PRINTING			LIQUID TONER BASED DIGITAL PRINTING			
	Gloss Paper	Matte Paper	Uncoated Paper	Gloss Paper	Matte Paper	Uncoated Paper
C	45.1	45.9	46.6	19.6	24.6	22.3
M	29.2	31.4	29.5	28.7	28.6	30.3
Y	6.3	4.4	10.1	1.5	4.3	4.8
K	98.2	98.6	98.3	97.7	94.1	98.7

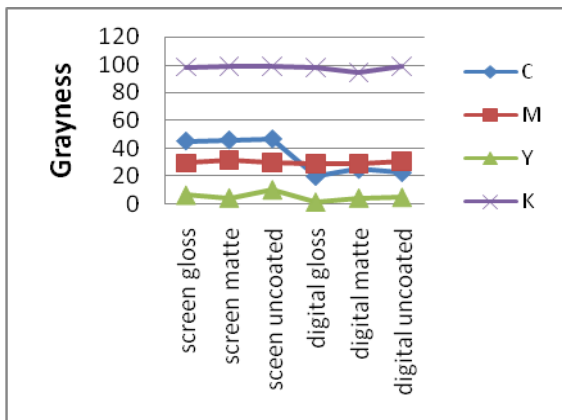


Fig.3. Grayness Analysis

Table.4. Print Sharpness Analysis

Observer	Screen Printing			Liquid Toner Based Digital Printing		
	Gloss	Matte	Uncoated	Gloss	Matte	Uncoated
1	6	7	3	7	6	8
2	5	6	2	8	7	9
3	6	6	3	7	6	9
4	7	7	3	7	7	7
5	7	8	3	7	6	7
6	6	8	4	7	6	7
7	6	8	5	6	6	7
8	6	8	4	7	6	7
9	6	7	3	7	6	7
10	5	6	3	7	6	6
Avg.	6	7.1	3.3	7	6.2	7.4

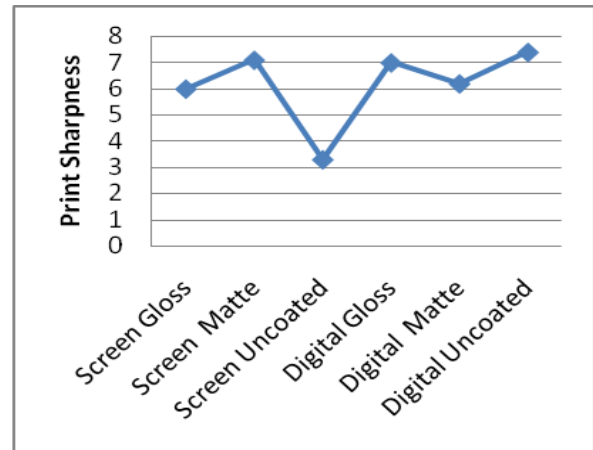


Fig.4. Print Sharpness Analysis

RESULTS AND DISCUSSIONS

Solid Ink Density Analysis

Optimum solid ink density on print is the need of the hour for printing technocrats. Solid ink density is decided by type of paper to much extent. Solid ink density was found maximum in case of screen printing on gloss coated paper as shown in table1 and figure 1. The reason might be very thick layer of around 80 microns in case of screen printing. In case of liquid toner based printing the solid ink density was found less.

Hue Error Analysis

Hue Error is the evaluation of the larger impurity portion of an ink. Hue error was found maximum in Magenta color in both printing processes as shown in Table 2 and Fig. 2. But in case of screen printing process, hue error was found maximum. Yellow ink showed minimum hue error in both printing processes.

Greyness Analysis

Greyness was found more in screen printing process compared to digital printing process. Black colour showed maximum grayness compared to other colors. Yellow showed minimum grayness among all colors. The reason behind more grayness in Screen printing is the greater amount of ink being applied in case of screen printing.

Print Sharpness

Digital uncoated paper showed maximum sharpness. Sharpness of screen printing process was found less compared to digital printing, might be due to squeeze pressure being applied on stencil. Uncoated paper in screen printing process was least sharp.

Conclusion

1. SID of Screen Printing process is more than liquid toner based digital printing process.
2. Hue error of screen printing process is more than that of liquid toner based digital printing process.
3. Greyness in ink is more in case of screen printing process.
4. Print sharpness is more in liquid toner based digital printing process compared to screen printing process.

References

- i. Ole Norberg, Patrik Westin, Siv Lindberg, Marianne Klama and Lars Eidenval (2001) "A Comparison of Print Quality between Digital and Traditional Technologies", *DPP2001: International Conference on Digital Production Printing and Industrial Applications*, page no. 380-385
<http://www.ami.imaging.org/site/PDFS/Papers/2001/DPP-0-252/4762.pdf>
- ii. Robert Chung and Matthew Rees (2007) "A Survey of digital and offset print quality issues" *Rochester Institute of Technology RIT Scholar Work*
<http://scholarworks.rit.edu/cgi/viewcontent.cgi?article=1049&context=books>
- iii. George NubarSirnonian (2003) "Comparative Study Between Different Digital and Offset Litho Printing Systems" *DESIDOC Bulletin of Information Technology*, Vol. 23, NO 1. January 2003, pp. 43-55
<http://publications.drdo.gov.in/ojs/index.php/djlit/article/view/3590/2002>