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COMPARITIVE ANALYSIS OF PRINT CONTRAST OF WHITE OPAQUE NTR AND GOLDEN OPAQUE NTR PRINTED WITH DRY TONER BASED DIGITAL PRINTING PROCESS

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ABSTRACT

Print contrast may be defined as a method of evaluating and optimizing the density of the ink deposited on the substrate during printing. The ink strength—or print contrast—is determined to take into account the solid ink density, the density of the ink in shadow areas of the image, and the dot gain. Print contrast is calculated by measuring the ink density of a solid area and the ink density in a 75% tint. The print contrast is calculated according to the formula where D_s is the solid area density, and D_t is the tint density. $D_t - D_s / D_s$. This is first of its kind study where NTR is printed and is tested for Print Contrast. This paper will help printers to have a better understanding of Print Contrast of NTR when printed with dry toner based digital printing.

I. INTRODUCTION

Print Contrast is an objective characteristic of printing relating to the amount of shadow detail rendered by the process.⁵³ The value derived from the following formula, correlates 33 relatively well to subjective visual evaluation and terminology such as "flat" (low print contrast) and "punchy" or "contrasty" (high print contrast).⁵⁴ Print Contrast is measured by subtracting the density of the 75% tint region from the density of the solid, and then dividing by the density of the solid as follows: $\text{contrast} = \frac{D_s - D_t}{D_s}$ where D_s equals the density of the solid and D_t equals the density of the 75% tint region. Print Contrast is important to quality reproduction and a useful parameter for production control. Simply, Print Contrast is a convenient way to determine tell how well your shadow areas are printing. Like the middletone, the shadow is also affected by solid ink density, paper, dot gain, etc. If the shadow density is set correctly, the largest printable dot will be imaged as the originals darkest area. All original detail will be reproduced and the halftone will have the maximum amount of contrast achievable with ink and paper. If the shadow is set too low, the shadow dots (specifically the clearest pin points) will be larger than the largest printable dots, resulting in fill-in and loss of shadow detail.⁵⁵ If the shadow is set too high, the largest printable dots will never be attained; the reproduction will look too light and lack contrast.⁵⁶ It is, therefore, the printers goal to achieve the maximum ink density without fill-in. ³⁴ PrintContrast is concerned with the difference between the density of the solid and the density of the 75% tint area. If the difference or range is great, the more contrast achieved. If the difference or range is low, the less contrast achieved. Print contrast is also dependent on the original's keyness. Keyness describes the tonal values in a picture. It is the distribution of the densities between the highlight and shadow.⁵⁷ If the picture has mostly highlights, it is referred to as "high-key." If the picture is mostly shadows it is referred to as "low-key." If the picture has an equal distribution of highlight shadows and middletones, then it is referred to as "normal-key."¹

This study was carried out by using untreated NTR paper and printing it on Dry toner based Digital Printing Machine.

II. RESEARCH METHODOLOGY

My research objective is to analyze critically the dry toner based digital printability of golden and white opaque NTR (Non-tear able) synthetic paper. Therefore in order to study aforesaid research objective both NTR sheets were printed on Xerox Digital Printing machine and testing task of the printed sheets for SID (solid ink density) was carried out at "Galaxy Offset Pvt. Ltd".

Method

Prepress- Master was designed with HD images, text, different quality control patches in CorelDraw software.

Press – All sheets are printed with digital printing process.

As my project title is “Critical analysis of printability of synthetic paper while printed with Digital printing (Dry Toner based)”. During my project time I worked on dry toner based digital printing machine. It’s technical specifications is as below: -

Digital Printing Machine Xerox® Versant® 2100 Press**Technical Specifications****Productivity/Print Speeds**

- Duty Cycle: 660,000
- Average Monthly Print Volume Range: 75,000–250,000
- 100 ppm (8.5" x 11"/A4 letter), 52–300 gsm
- 80 ppm (8.5" x 11"/A4 letter), 301–350 gsm
- 52 ppm (11" x 17"/A3), 52–300 gsm
- 44 ppm (11" x 17"/A3), 301–350 gsm

Image Quality

- 2400 x 2400 dpi VCSEL ROS
- Halftone Screens
 - 150, 175 (EFI only), 200, 300, 600 Clustered Dot
 - 150 (EFI only), 200 Rotated Line Screen
 - FM (Stochastic) Screen

Paper Format/Sizes

- Maximum Sheet Size: 13" x 19.2" (330 mm x 488 mm)
- Minimum Sheet Size: 5.5" x 7.2" (139 mm x 182 mm), tray inserter kit supports 3.9" x 5.8" (98 mm x 148 mm)
- Maximum Print Area: 12.83" x 18.98" (326 mm x 482 mm)
- Maximum Print Image Assurance: 12.48" x 18.98" (317 mm x 482 mm)

III. DATA COLLECTION AND ANALYSIS

The printed sheets were tested and analysed for SID values using a X-Right reflection type spectrophotometer and is represented in tabular form as under

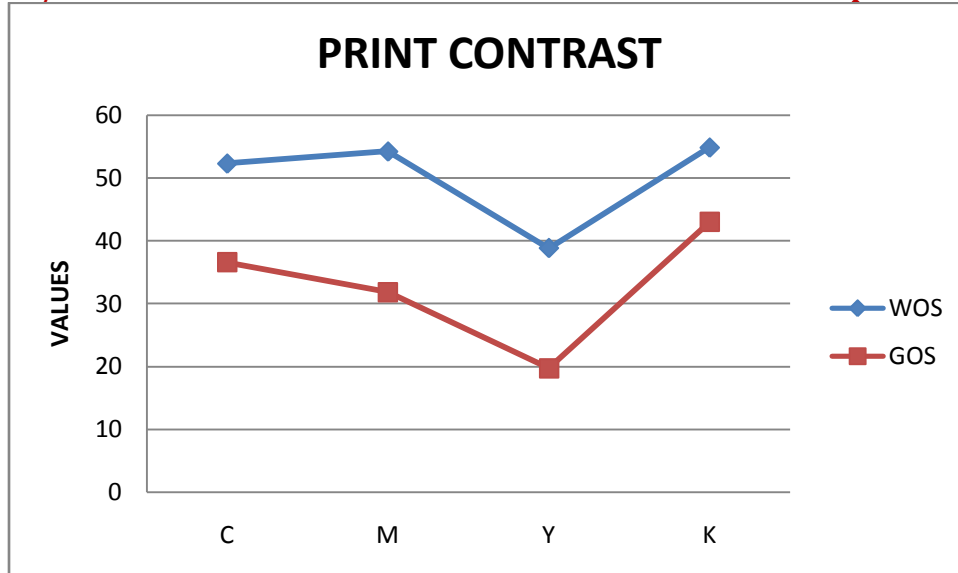
TESTING OF OPTICAL PROPERTIES ON WHITE OPAQUE SHEETS PRINTED WITH DIGITAL PRINTING (DRY TONER BASED)					
SR.NO.	SAMPLE	PRINT CONTRAST			
		C	M	Y	K
1	SAMPLE 1	52.84	49.19	38.46	55.3
2	SAMPLE 2	52.41	49.2	37.97	54.68
3	SAMPLE 3	52.52	48.37	39.37	54.88
4	SAMPLE 4	51.79	49.47	39.68	55.39
5	SAMPLE 5	52.14	50.96	37.65	54.68
6	SAMPLE 6	52.11	49.89	38.99	55.37
7	SAMPLE 7	51.81	49.68	39.38	54.39
8	SAMPLE 8	52.41	50.97	40.69	54.89

9	SAMPLE 9	52.54	49.48	39.35	55.19	
10	SAMPLE 10	52.36	49.29	38.96	54.68	
11	SAMPLE 11	51.52	48.97	37.29	54.59	
12	SAMPLE 12	52.22	49.19	36.79	54.58	
13	SAMPLE 13	52.18	47.87	37.87	53.79	
14	SAMPLE 14	52.83	48.68	39.89	55.77	
15	SAMPLE 15	52.59	47.8	39.65	54.48	
16	SAMPLE 16	52.84	49.18	38.47	55.39	
17	SAMPLE 17	52.38	49.18	37.99	54.79	
18	SAMPLE 18	52.55	48.35	39.36	54.89	
19	SAMPLE 19	51.8	49.48	39.69	55.38	
20	SAMPLE 20	52.16	50.97	37.68	54.67	
21	SAMPLE 21	52.12	49.23	38.99	55.38	
22	SAMPLE 22	51.79	49.24	39.33	54.39	
23	SAMPLE 23	52.42	50.19	40.69	54.89	
24	SAMPLE 24	52.57	49.49	39.38	55.18	
25	SAMPLE 25	52.53	49.3	38.99	54.67	
26	SAMPLE 26	51.59	48.7	37.89	54.59	
27	SAMPLE 27	52.09	49.78	36.77	54.58	
28	SAMPLE 28	52.23	47.87	37.78	53.79	
29	SAMPLE 29	52.81	48.67	39.87	55.79	
30	SAMPLE 30	52.58	47.85	39.68	54.48	
	Average	52.29	49.22	38.82	54.85	

TESTING OF OPTICAL PROPERTIES ON GOLDEN OPAQUE SHEETS PRINTED WITH DIGITAL PRINTING (DRY TONER BASED)

SR.NO.	SAMPLE	PRINT CONTRAST			
		C	M	Y	K
1	SAMPLE 1	36.94	30.99	19.89	41.79
2	SAMPLE 2	36.95	30.98	19.87	41.78
3	SAMPLE 3	36.49	32.68	20	42.74
4	SAMPLE 4	35.86	31.27	19	44.58
5	SAMPLE 5	36.29	31.46	19.28	41.35
6	SAMPLE 6	36.49	31.69	18.97	45.29
7	SAMPLE 7	37.59	32.86	21.39	41.48

8	SAMPLE 8	37.45	32.69	19.29	42.67	
9	SAMPLE 9	37.61	32.16	19.59	42.69	
10	SAMPLE 10	35.83	30.76	19.67	45.58	
11	SAMPLE 11	35.15	31.69	19.26	43.37	
12	SAMPLE 12	37.59	31.48	19.17	42.29	
13	SAMPLE 13	35.58	32.86	21.37	43.52	
14	SAMPLE 14	36.27	32.63	19.19	41.66	
15	SAMPLE 15	36.51	31.49	19.69	43.67	
16	SAMPLE 16	36.98	30.98	19.88	41.79	
17	SAMPLE 17	36.91	30.97	19.89	41.76	
18	SAMPLE 18	36.49	32.63	20	42.87	
19	SAMPLE 19	35.86	31.29	19	44.85	
20	SAMPLE 20	36.27	31.46	19.29	41.96	
21	SAMPLE 21	36.55	31.66	18.99	45.76	
22	SAMPLE 22	37.64	32.88	21.36	41.86	
23	SAMPLE 23	37.44	32.63	19.29	42.89	
24	SAMPLE 24	37.56	32.19	19.48	42.78	
25	SAMPLE 25	35.89	30.76	19.65	45.19	
26	SAMPLE 26	35.17	31.68	19.29	43.37	
27	SAMPLE 27	37.59	31.46	19.49	42.29	
28	SAMPLE 28	35.66	32.89	21.36	43.52	
29	SAMPLE 29	36.29	32.69	19.69	41.68	
30	SAMPLE 30	36.48	31.48	19.68	43.69	
	Average	36.58	31.84	19.73	43.02	



IV. CONCLUSIONS

The average Print Contrast values of White opaque NTR were found to be 52.29 for Cyan, 49.22 for magenta, 38.82 for yellow & 54.85 for Black and the Print Contrast values for Golden opaque NTR were 36.58 for cyan, 31.84 for Magenta, 19.73 for yellow and 43.02 for Black. The Print Contrast values of Cyan Magenta & Black colour on White opaque NTR were found higher than Golden Opaque NTR. The reason for the difference in print contrast values is due to the inherent optical properties of White opaque NTR.

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