

Analysis of Print Contrast in Line and Round Dot Shapes of Halftone for Print Quality on Dry Toner Electrophotography Digital Press

²N. Sharma, ³R. Mehta & V. Saini*¹

*¹M.Tech Scholar, Department of Printing Technology, GJUS&T, Hisar (Haryana)

²Assistant Professor, Department of Printing and Packaging Technology, CUH, Mahendergarh (Haryana)

³Assistant Professor, Department of Printing Technology, GJUS&T, Hisar (Haryana)

ABSTRACT

Electrophotography is a NIP (Non-Impact Printing) process. This printing process is most commonly used printing process in now a day. The electrophotography printing is based on the halftones. These halftones are available in different dots shapes like Diamond, Elliptical, Square, Line, Round etc. In this research paper, we compare the print quality bases on print contrast of different dot shapes like Line and Round. The sheets were printed with different halftone dots shapes like Line and Round with the help of dry electrophotography printing process.

Keywords: Electrophotography, Non-Impact, Halftone Dot, Halftone Dot Shapes, Print contrast, Diamond, Elliptical, Square, Line, Round.

I. INTRODUCTION

The xerography or Electrophotography introduced by Chester Carlson in 1938 in New York City. The electrophotography printing process is done in five steps that start from (1) charging a photo receptor belt or drum with a corotron or scorotron.; (2) exposure with light a laser beam is used; (3) development the latent image is converted in the real image with the help of the series of black and colored toner cartridge; (4) Transfer the toner on substrate Corotrons rollers are used to transfer the toner on the photoreceptor to the paper electrostatically using the opposite charge of toner; (5) fusing the image on substrate and last step is (6) cleaning of the photoreceptor drum or belt. Halftone is the reprographic system that recreates continuous tone imagery using the dots, differing either in size or in dispersing, in this manner producing an inclination like impact. "Halftone" can likewise be used to refer explicitly to the picture that is created by this procedure. This propagation depends on an essential optical illusion: the small halftone dots are mixed into smooth tones by the human eye.

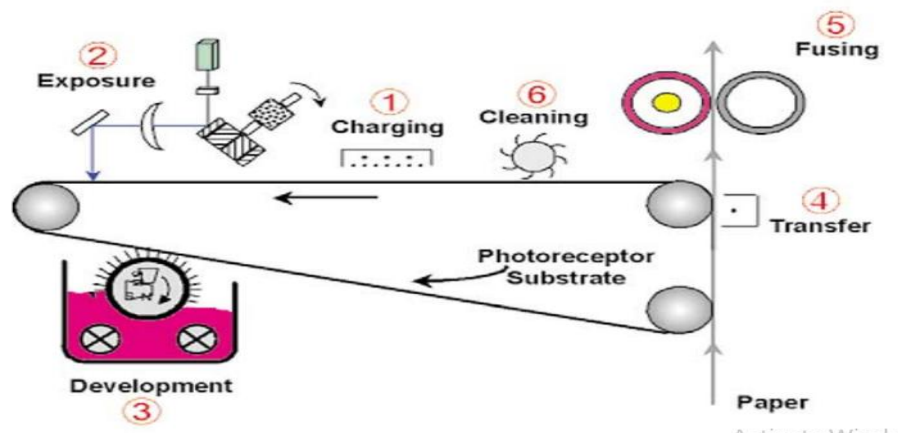


Fig. 1 Schematic diagram of the monochrome xerographic process.

A photoreceptor belt is uniformly charged in step (1). An image is written on this belt by a laser in step (2), thereby generating a charge image on the belt. This charge image is converted into a powder image of toner on the belt in the development step (3). This powder image is transferred to a sheet of paper in the transfer step (4) and subsequently fused to the paper in step (5). Residual toner on the photoreceptor is cleaned off in step (6) and the process repeats.

Print Contrast: - A strategy for assessing and upgrading the thickness of the ink kept on the substrate and printing. It is determined by estimating the ink thickness of a strong territory and the ink thickness in a tint.

Dt-DS/DS

Where DS is solid area density and Dt is the tint density.

II. RESEARCH OBJECTIVE

To study & analyze the effect of different halftone dots (line and round) on print quality factor of Print Contrast in multi-color Dry Electrophotography digital press.

III. RESEARCH METHODOLOGY

The master chart is with the help of suitable tools and images according to the requirement of the research. The sheet was printed with dry toner electrophotography with different dot shapes (line and round). The sheet is printed in the “Xerox® Versant® 80 Press” Dry Toner Electrophotography with suitable conditions and used coated paper.

3.1 Specification of Xerox® Versant® 80 Press: -

Speed	Up to 80ppm
Media Weight	52gsm to 350gsm
Media Sizes	Up to 13” * 19.2”
Duty Cycle	460000
Dimensions	860mm(W) * 831mm(D) * 121mm(H)
Weight	295kg
Copy with single-pass duplex scanning	200 images per minutes
Media Types	Coated, Uncoated, Tabs, Envelops etc.



Fig. Master Chart

IV. DATA COLLECTION AND ANALYSIS

Data collection is the main work of the research. The whole research was carried out at **Shree BalaJee Graphic, Hisar**. The 200 sheets were printed with dry electrophotography printing process of the different dot shapes (Line and Round) and first 100 sheets of the line dot shape and last 100 sheets of round dot shape. Data collection is based on every 5th sheet which is printed by dry electrophotography. The data collected by the x-rite spectrophotometer and the Print Contrast measured on the 70%, 50% and 20%. After the collection of data, we analyze the data with the help of charts and tables.

4.1 Print Contrast

Print Contrast is measured of black, yellow, cyan and magenta color at 70%, 50% and 20%.

Table.4.1 Print Contrast in Line and Round Dot Shapes at 70%

Print Contrast (70%)				
	K	Y	C	M
LINE	76	64	59	55
ROUND	75	64	55	53

Table.4.2 Print Contrast in Line and Round Dot Shapes at 50%

Print Contrast (50%)				
	K	Y	C	M
LINE	85	80	74	73
ROUND	85	79	72	72

Table.4.3 Print Contrast in Line and Round Dot Shapes at 20%

Print Contrast (20%)				
	K	Y	C	M
LINE	85	96	89	91
ROUND	85	92	89	90

4.2 Data Analysis

The data obtained from 200 printed sheets and take 5th sheet for measuring the Print Contrast and analyze the data with the help of graphs.

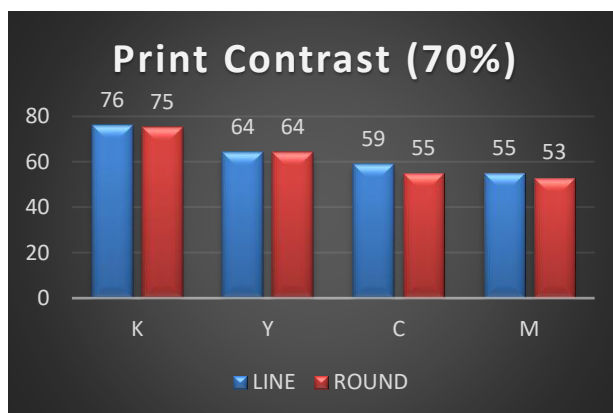


Chart.1 Print Contrast at 70%

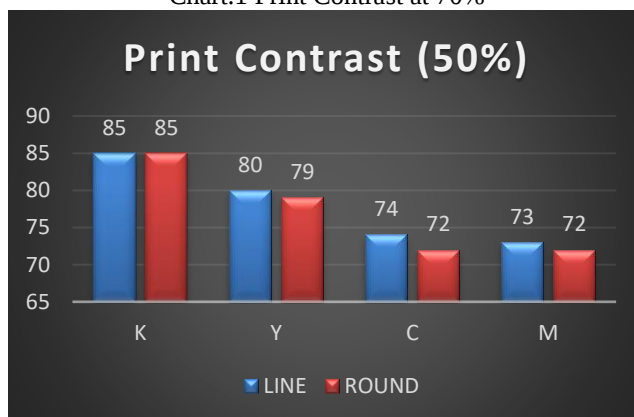


Chart.2 Print Contrast at 50%

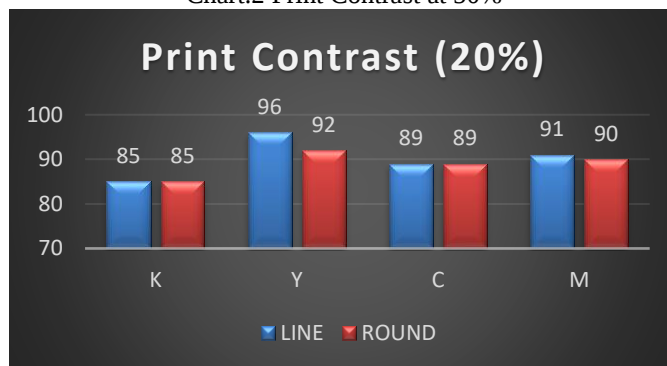


Chart.3 Print Contrast 20%

V. RESULT AND DISCUSSION

Chart.1 shows that print contrast of black (K) color is near about similar at 70% of line dot and round dot shape. The print contrast of yellow (Y) color is same at 70% of line dot and round dot shape. The print contrast of cyan (C) color is high of line dot shape at 70% as compared to round dot shapes. And the print contrast of magenta (M) color is near about similar at 70% of line dot and round dot shape.

Chart.2 shows that print contrast of black (K) color is same at 50% of line dot and round dot shape. The print contrast of yellow (Y) color is near about similar at 50% as of both dot shapes. The print contrast of cyan (C) color is near about similar at 50% of both dot shapes. The print contrast of magenta (M) color is near about similar at 50% of both dots.

Chart.3 shows that print contrast of black (K) color is same at 20% of both dot shapes. The print contrast of yellow (Y) color is high of line dot shape at 20% as compared to round dot shapes. The print contrast of cyan (C) color is same at 20% of both dot shapes. The print contrast of magenta (M) color is color is near about similar at 20% of both dot shapes.

VI. CONCLUSION

In this research we found that the different halftone dot shapes affect the print quality of the printed sheets. In the print contrast of line and round dot shapes the value of c, m, y, k is different at 70%, 50% and 20%. The print contrast of black color maximum at 70% as comparison to yellow, magenta and cyan color in both dot shapes. The print contrast of black color is maximum at 50% as comparison to magenta, yellow and cyan color in both dot shapes. The print contrast of yellow is maximum at 20% as comparison to black, cyan and magenta color in both dot shapes.

REFERENCES

1. Damodar M. Pai and B. E. Springett; "Physics of electrophotography" Reviews of Modern Physics; Vol. 65, No. 1, January 1993.
2. Emmett Ientilucci, 1994; "Fundamentals of Xerography" February 22, 1994, "Elsevier Science", Page number 1005-1023.
3. Fig. no. 1, Emmett Ientilucci, 1994; "Fundamentals of Xerography" February 22, 1994, "Elsevier Science", Page number 1007.
4. Charles B. Duke a, *, Jaan Noolandi b, Tracy Thieret c; "The surface science of xerography", ELSEVIER; page no. 1005-1023.
5. Oittinen, P., AL-Rubaiey, H., Sipi, K. And Vikman, K.; "Research on Paper-Ink-Process Interactions in Electrophotographic and Ink Jet Printing", International Conference on Digital Production, Printing and Industrial Applications; page no. 327-330, 2001.
6. Vince Cahill; "Introduction to Digital Printing Technology", 2003.
7. Seung-Jin Ryu, Hae-Yeoun Lee, Dong-Hyuck Im, Jung-Ho Choi, Heung-Kyu Lee; "Electrophotographic Printer Identification by Halftone Texture Analysis", 2010.
8. Vikas Sindhu, MDU, Rohtak; "A Review on Image Halftone Processing", Journal of Information, Knowledge and Research in Electronics and Communication; ISSN 0975-6779; Vol. 2, No. 2, page no. 914-919, 2013.
9. Mahzar Namedanian, Daniel Nystrom, Paula Zitinski Elias, and Sasan Gooran; "Physical and optical dot gain: characterization and relation to dot shape and paper properties", International Society for Optical Engineering; January 2014.
10. Vikas Jangra, Abhishek Saini, Anil Kundu; "Relationship of solid ink density and dot gain in digital printing" International Journal of Engineering and Technical Research; ISSN: 2321-0869, Volume-2, Issue-7, July 2014.
11. Rossitza Sardjeva, Todor Mollov; "Study of Color Quality Uniformity in Digital Dry Toner Electrophotographic Printing", International Journal of Modern Communication Technologies & Research; ISSN: 2321-0850; Volume-2, Issue-9, September 2014.
12. Aman Bhardwaj, Krishan Kumar; "Effect of paper gloss on solid ink density printed with digital printing process", International Journal for Technological Research in Engineering; ISSN: 2347 - 4718 Volume 3, Issue 10, June-2016.
13. Ivan Pinčjer, Dragoljub Novaković, Uroš Nedeljković, Nemanja Kašiković, Gojko Vladić; "Impact of Reproduction Size and Halftoning Method on Print Quality Perception", Acta Polytechnica Hungarica; Vol. 13, No. 3, page no. 81-100, 2016.
14. Masayuki Kawasaki, Masaya Ishisak; "Investigation into the Cause of Print Mottle in Halftone Dots of Coated Paper: Effect of Optical Dot Gain Non-uniformity", Pulp & Paper Research Laboratory.