

### ABSTRACT

The main function of any printing industry is reproducibility of the original and to produce the exact colour. The offset printing process is a process which deals with maximum number of quality variables amongst all other printing processes. The slight variation in these variables can result in colour difference ( $\Delta E$ ). This paper deals with the study of colour deviation after controlling the Solid ink density and adopting suitable strategies

**Keywords:** Sheet fed-offset, colour difference

### I. INTRODUCTION

The objective of any printing industry is to deliver the work in a timely manner with quality. It is very important to ensure consistency of the print performance in the job. Offset printing with sheet substrate is a process that is widely used in the packaging industry.

Colour is one of the important elements of printing. The colour categories are described by the property of a person's visual perception, such as red, blue, yellow, green, orange or purple. This is the perception of colour, obtained from the stimulation of the conical cells in the human eye by means of electromagnetic radiation in the spectrum of light. The colour categories and their physical characteristics are related to the objects through the wavelength of the light reflected by them. This reflection is controlled by the object's physical properties such as light absorption, emission spectra, etc. Colours can be numerically identified by coordinates in colour space. The difference in colour during printing is a common problem in offset printing.

The colour space has three elements hue, lightness and saturation for colour description. To find a numerical method for calculating these three CIE colour attributes (commission d'Eclairage), conducted various studies on human colour vision and perception. The CIE has set some standards for the colour space "CIE XYZ,  $L^* a^* b^*$  and  $L^* u^* v^*$  to compare the different colour spaces of different viewers and their devices for standard installation. The standards proposed by the CIE are independent of the device and are not produced by viewing the skills of any observer.

### II. RESEARCH OBJECTIVES

Matching press colour with the standard is one of the most important aspects of printing, and if any discrepancy in the colour found than all the output is rejected by the client. The purpose of this research project is:

- To control Colour Variation happening in Sheet-Fed Offset presses on various Mono Cartons by controlling the Solid ink density.

### III. RESEARCH METHODOLOGY

There are two things that are considered under research methodology:-

- Material
- Methods

Materials: - There are various types of paperboard used in this research namely Grey back board, White back board.

Ink: - Sigwerk ink was used during project work.

Methods: -

Pre-press: - The parameters set at this stage must be clearly observed in subsequent processes to achieve the planned object. The highlight of this section is Esko Work Flow. Equipped with a wide range of powerful tools, it is an integrated software package for packaging that provides the best design and graphic designs based on CAD with improved colour management and output control. Complementing Esko Workflow is the screen Dainippon Computer-to-Plate technology undisputedly one of the most revolutionary breakthroughs of our time, which enables direct plate exposing and simultaneously transfer of image profile to CPC console of the Offset machine. Excellent dot clarity and colour consistency for repeated job has become too easy. On other hand, in ink matching lab various tests are carried out like IGT, Roll-Up test etc

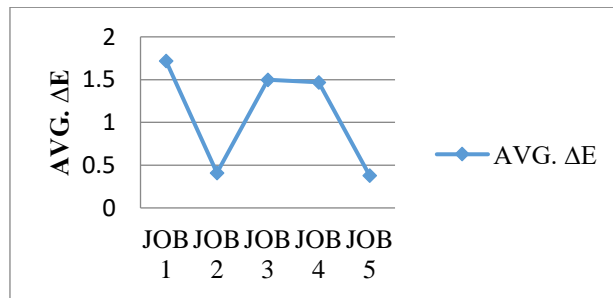
Press: - After that designed job is printed using Speed master CD-74-6+L, and solid ink density is maintained using bench spectrophotometer available in Edelmann Packaging.

Post-press: - :- In post-press at Edelmann India, the set-up here includes two Steinmann Lotus SF Auto Lamination Machines from Switzerland which utilizes solvent free adhesive contributing to a greener environment and delivers a flawless (free of sheet curls) product at a high up to 11,000 sheets per hour.

**IV. DATA COLLECTION AND ANALYSIS**

*Table 1 Colour Difference analysis during printing of Cyan colour*

	SAMPLE 1	SAMPLE2	SAMPLE 3	AVG. ΔE
JOB 1	1.8	1.7	1.71	1.72
JOB 2	0.45	0.33	0.46	0.41
JOB 3	1.26	1.45	1.79	1.5
JOB 4	1.41	2	1	1.47
JOB 5	0.37	0.33	0.46	0.38



*Fig.1. Comparative Analysis of Avg. ΔE of Cyan colour for various samples*

*Table 2 Colour Difference analysis during printing of Magenta colour*

	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVG. ΔE
JOB 1	2	0.96	0.45	1.13
JOB 2	0.37	0.3	0.45	0.37
JOB 3	0.98	0.92	0.46	0.8
JOB 4	1.71	2	1.7	1.8
JOB 5	0.37	0.3	0.45	0.37



Fig.2. Comparative Analysis of Avg. ΔE of Magenta colour for various samples

Table 3 Colour Difference analysis during printing of Yellow colour

	SAMPLE 1	SAMPLE2	SAMPLE 3	AVG. ΔE
JOB 1	1.5	1.3	0.64	1.14
JOB 2	1.43	1.45	1.41	1.43
JOB 3	0.63	0.91	1	0.84
JOB 4	1.72	2	1.7	1.8
JOB 5	1.52	1.31	0.64	1.15



Fig.3. Comparative Analysis of Avg. ΔE of Yellow for various samples

Table 4 Colour Difference analysis during printing of Black colour

	SAMPLE 1	SAMPLE2	SAMPLE 3	AVG. ΔE
JOB 1	0.12	0.35	0.2	0.22
JOB 2	2	1.7	2.03	1.91
JOB 3	0.8	0.61	1.42	0.94
JOB 4	0.13	0.32	0.16	0.2
JOB 5	2.1	1.77	0.54	1.44

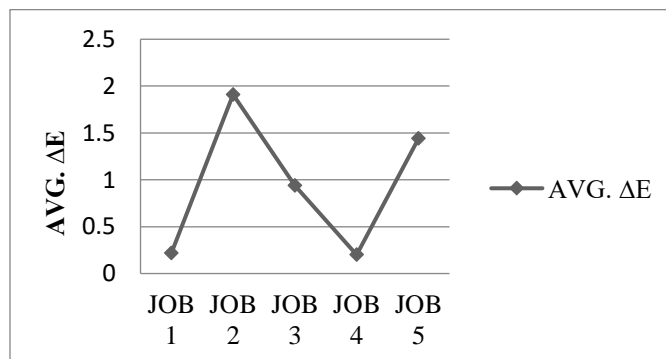


Fig.4. Comparative Analysis of Avg. ΔE of Black for various samples



## V. RESULT AND DISCUSSION

1. The various factors that are responsible for Colour Variation in Sheet-Fed Offset Printing Presses are: Ink tack, Solid ink density, Contact pressure, Alcohol percentage, Page layout, Speed, Mis-registration, Ink film thickness, Dot gain, lighting source. All can be controlled during print run.
2. Colour Difference during printing of Mono-Carton: - Table (1 to 4) shows the colour difference observed while printing different jobs using Sheet-Fed Offset Printing Process. Three samples of each job were taken to measure the degree of Colour Variation happening during printing. From above table readings it is clear that  $\Delta E$  observed is in limits set by UGRA Standards
3. The Colour Deviation while printing can be controlled by maintaining solid ink density with the help of bench Spectrophotometer integrated with Intellitrax software.

## VI. CONCLUSION

Colour difference can be controlled during printing by maintaining solid ink density.

## REFERENCES

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