COMPARATIVE PRINT QUALITY ANALYSIS OF PRIMARY AND SECONDARY PAPERS USED IN SHEET FED OFFSET PRESSES FOR COMMERCIAL PRINT PRODUCTION

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Abstract

The primary aim of this study is to explore various quality control criteria for evaluating the print quality of different types of paper, including primary and recycled paper grades. The research involved collecting samples of these papers and printing them using a standard quality control master test chart. Parameters such as solid ink density, dot gain, print contrast, grayness, and color difference data were compared among these paper varieties. The findings of the study revealed that when it comes to secondary papers, the most crucial quality control parameters to monitor for quality deviations are solid ink density and print contrast. Secondary papers tend to have lower ink absorption capacity, resulting in reduced solid ink density. In contrast, primary papers exhibit superior print contrast and readability compared to secondary papers.

Keywords: Solid Ink Density, Print Contrast, Primary papers, Secondary papers, Print Quality

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INTRODUCTION

While the fundamental principle of offset printing remains consistent, the handling of sheets and rolls varies significantly. The core concept of printing centers around the repulsion between grease and water. A printing plate is composed of sections that attract water and sections that attract ink. The printing image itself is ink-absorbent, while the non-printing areas repel ink and accept water. During each rotation, the printing plate initially encounters dampening rollers, which apply water to the non-printing regions, rendering them unable to accept ink. Subsequently, the plate encounters ink rollers, which apply ink to the ink-receptive areas. The inked images are then transferred from the printing plate to a "blanket" cylinder, typically made of rubber, which, in turn, transfers the images onto paper. This cycle repeats with each revolution, producing fresh prints.

For full-color printing, the same sheet of paper is overprinted four times, each time using a different color in a separate printing unit. The paper is typically stored in a central warehouse and brought to the press in a print-ready size. It is only unwrapped just before printing to minimize the impact of changes in humidity, and the pallet label is retained for reference. Counting tabs are employed to estimate the number of prints but must be removed carefully to prevent damage to the printing blankets. The prepared pallet is then maneuvered into the press and positioned for printing. Modern presses can adapt to various sheet and pallet sizes automatically. A sheet-fed press comprises three main components: the feeder and lay system ensure that sheets are fed into the press one by one in a precise position, while each printing unit contains a plate cylinder, ink and dampening rollers, a blanket cylinder, and an impression cylinder. Each unit is responsible for printing a single color on one side of the paper. In a 4-color press, all four units work together to create a multi-color image on one side of the paper. Color control is maintained using a densitometer or scanner to measure the control strip, providing data to the printer to adjust ink quantities in specific areas. The objective is to match the print as closely as possible to the original or predetermined system data. Sample prints are scanned and compared to the original data, and adjustments are made to achieve a close match to the color model. These settings can then be stored in integrated software or recorded on computer tapes for consistent print runs.

Once the prints closely match the original and color registration is precise, the actual print run commences. Throughout the run, the press operator continually takes sample sheets to monitor and maintain color and registration quality. The printed sheets are folded as required in a separate print-finishing area, such as a three-fold unit, ready to be assembled into the pages of a publication.

Sheet-fed printing involves individual sheets of paper or paperboard being fed into the press one at a time using a suction bar to lift and place each sheet accurately. Lithographic (litho) presses use lithography principles to apply ink to a printing plate, as explained earlier. Sheet-fed offset printing is commonly used for short-run publications, brochures, letterhead, and various commercial printing jobs. In sheet-fed offset printing, each sheet is mechanically registered to ensure consistent reproduction of imagery and alignment on every sheet passing through the press.

Paper is a thin material created by compressing fibers, typically derived from wood, rags, or grasses, into flexible sheets and then drying them. Paper is a versatile material with numerous applications, including writing and printing, packaging, cleaning products, industrial processes, construction, and even as a food ingredient.

RESEARCH OBJECTIVES

Sheet-fed offset printing is a prominent and widely used printing method in contemporary times. It is particularly suited for high-quality printed materials with volume requirements. Numerous advancements have already been made in this printing process, necessitating specific care and attention. The primary goals of this project can be succinctly outlined as follows:

- To pinpoint factors linked to print quality within the realm of sheet-fed offset printing technology.
- To identify the various quality control parameters that are considered when printing on primary and secondary papers using sheet-fed offset presses.
- To compare the print quality in sheet-fed offset presses when working with various types of primary and secondary paper grades.

RESEARCH METHODOLOGY

The above research work will be carried out in the Quality Control laboratory of Department of Printing Technology, GJUS&T Hisar. A test form will be developed with text, picture, and other quality control patches to take care of print quality factors and their measurement. Papers were selected for printing in a sheet fed offset press preferably in a four colour sheet fed offset press.

The surface characteristics of the paper were studied with the related measuring devices in the department paper testing laboratory. After printing on the various kinds of papers, the printed sample were analyzed with densitometer.

DATA COLLECTION AND ANALYSIS

Table.1. Solid Ink Density comparison on primary and secondary papers

	SID, Primary Paper	SID, Secondary Paper
Cyan	1.06	0.86
Magenta	0.82	0.65
Yellow	0.19	0.20
Black	1.49	0.95

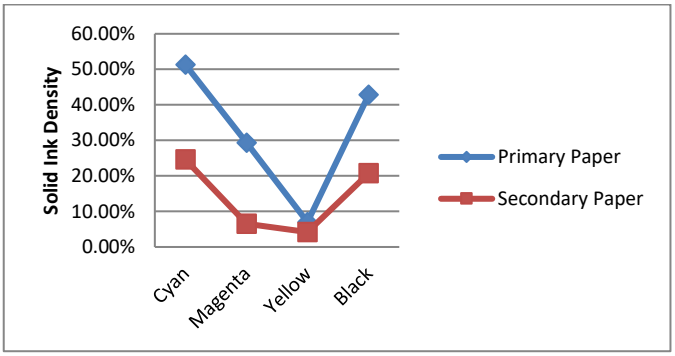

Fig.1. Solid Ink Density Comparison on primary and secondary papers

Table.2. Print Contrast Comparison on primary and secondary papers

	Primary	Secondary
Cyan	51.30%	24.60%
Magenta	29.30%	6.50%
Yellow	0.70%	4.20%
Black	42.80%	20.80%

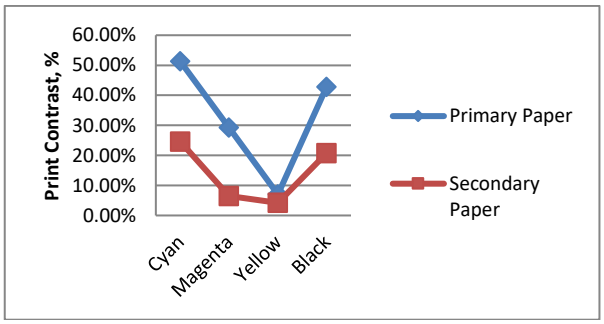

Fig.2. Print Contrast Comparison on primary and secondary papers

RESULT AND DISCUSSION

1. Solid Ink Density Analysis:- Solid ink density on Secondary paper was found .086,0.65,0.20 and 0.95 on Cyan, Magenta, Yellow and Black colour solid patches. The density of yellow is clearly minimum because yellow is least dark colour. On the other hand solid ink density was found 1.07, 0.75,0.16 and 1.44 on solid C,M,Y and K patches on Primary paper. Secondary paper has porous nature resulting into more absorption of ink pigments and vehicles. So ink holdout is minimum on Secondary paper resulting into poor ink density. Primary grade paper has maximum density even compared with matte coated paper might be due to more ink hold out nature of its coating pigments.

2. Print Contrast Analysis: - Print contrast was found 22% between black solid and 75% density areas on secondary paper. The same was found 40% on Primary coated paper. The similar 40% print contrast behaviour was analyzed on matte grade paper. Print contrast is necessary to have better readability. Hence Primary and matte grade paper are more suitable to impart print Primary and better readability.

CONCLUSION

1. To check the quality on secondary, most significant quality control parameters include solid ink density and print contrast.
2. Compared to coated papers, secondary paper can have less ink hold out and hence able to impart less density in solid ink areas.
3. Print contrast and readability is found maximum in case of primary grade coated paper compared to others.

REFERENCES

1. Samani N. (2023). Paper Manufacturing Process: How Paper is Made. Deskera.
2. TGI Corp. (2007). How digital printing works.
3. Thompson, B. (1998). Printing Materials: Science and Technology, Pira International. pp 410-431.
4. Zapka, W. (2017). Handbook of Industrial Inkjet Printing: A Full System Approach.
5. ChaseCorp. (2022). Know the difference: Offset printing vs digital printing.
6. United States Environmental Protection Agency. (2006). Control techniques guidelines for offset lithographic printing and letterpress printing.