RESEARCHERID
THOMSON REUTERS

[Goyat * *et al.*, 7(1): January, 2018]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

INVESTIGATIONOF WEB-FED GRAVURE PRINTING FOR OPTIMIZATION OF JOB CHANGE OVER TIME

Arohit Goyat*[1], Nishan Singh[2] & Sarita Sharma[3]

[*1]Assistant Professor**,** Department of Printing Technology**,** GJUS&T, Hisar (Haryana)
[2]Assistant Professor**,** Department of Printing Technology**,** SITM, Rewari (Haryana)
[3]M. Tech. (Print & Graphics Communication),SITM, Rewari (Haryana)

DOI: 10.5281/zenodo.1135964

ABSTRACT

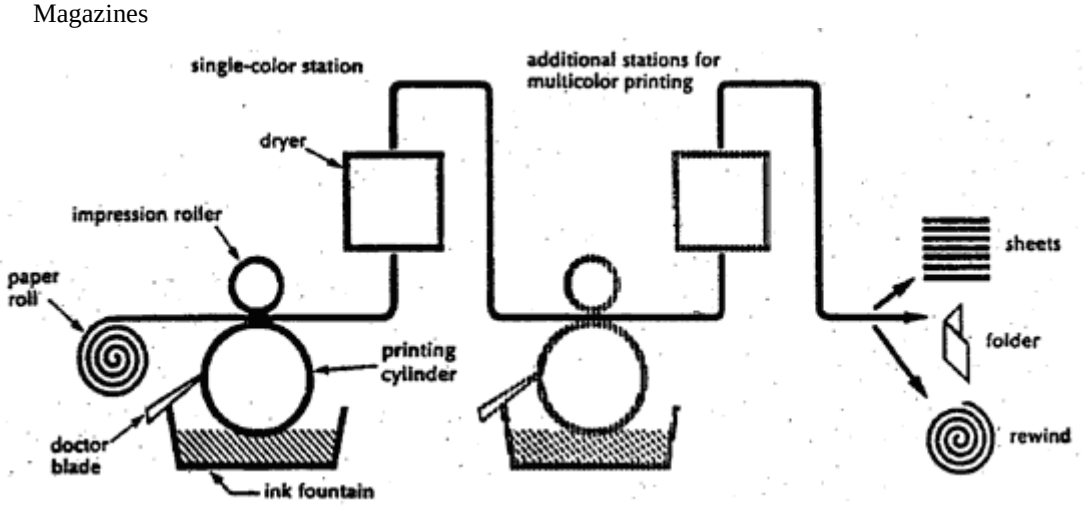
Gravure printing technique is used for long run printing with sharper, fine and clear images. It is generally used for high-volume printing of packaging, wallpaper, and gift-wrap's using fast-drying inks. Although not widely used, gravure printing also finds application in printing magazines, greeting cards, and high-volume advertising print campaigns**.** Gravure printing Process is a form of intaglio printing. The technique uses a depressed or sunken surface for formation of the image. The image area consists of honey comb shaped cells that are etched or engraved into a copper cylinder. The undetached area of the cylinder represents the non-image or unprinted areas. The cylinder generally rotates in a bath of ink called the ink pan. With the turning of cylinder, extra ink gets wiped off the cylinder due to a steel doctor blade. Image is formed due to the direct transfer of the ink to the substrate (paper or any other material) while it passes between the plate cylinder and the impression cylinder.

I. INTRODUCTION

Gravure printing is an example of intaglio printing. It uses a depressed or sunken surface for the image. The image areas consist of honey comb shaped cells or wells that are etched or engraved into a copper cylinder. The unetched areas of the cylinder represent the non-image or unprinted areas. The cylinder rotates in a bath of ink called the ink pan.

Typical gravure printed products include:

- Food packaging
- Wall paper
- Wrapping paper
- Furniture laminates
- Paneling
- Greeting cards
- Magazines



ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

Gravure Process Flow Diagram

As the cylinder turns, the excess ink is wiped off the cylinder by a flexible steel doctor blade. The ink remaining in the recessed cells forms the image by direct transfer to the substrate (paper or other material) as it passes between the plate cylinder and the impression cylinder.

The major unit operations in a gravure printing operation are:

- Image preparation
- Cylinder preparation
- Printing
- Finishing

Web Fed Gravure

There are several types of web presses used in gravure printing, including publication presses, packaging presses, product presses, label presses, and folding carton presses. The printing process is basically the same regardless of which press is used.

Packaging Gravure

Packaging rotogravure presses are used for printing folding cartons as well as a variety of other flexible packaging materials. In addition to printing, packaging gravure presses are equipped to fold, cut, and crease paper boxes in a continuous process. Packages are usually printed on only one side, so the number of print stations is usually about half that required for publication gravure presses. However, in addition to printing stations for the four basic colors, packaging gravure presses may employ printing stations for the application of metallic inks and varnishes as well as laminating stations designed to apply foils to the paper substrate prior to printing.

Packaging gravure presses are designed with the accurate cutting and creasing needs of the packaging material in mind. However, image quality is generally less important in packaging printing than in most other types of printing and, subsequently, receives less emphasis.

The chemicals used in packaging gravure are similar to those used in publication gravure. However, the inks used in packaging gravure are largely alcohol- and not toluene-based (GATF 1992b). Water-based inks are being successfully used for lower quality, non-process printing on paper and paperboard packaging and for printing on non-absorbent packaging substrates such as plastics, aluminum, and laminates (Tyszka 1993). Use of water-based inks is expected to increase; however, problems still limit their use at press speeds above 1,000 feet per minute (Buonicore).

Image Preparation

Image preparation begins with camera-ready (mechanical) art/copy or electronically produced art supplied by the customer. Images are captured for printing by camera, scanner, or computer. Components of the image are manually assembled and positioned in a printing flat when a camera is used. This process is called stripping. When art/copy is scanned or digitally captured, the image is assembled by the computer with special software. A proof is prepared to check for position and accuracy. When color is involved, a color proof is submitted to the customer for approval.

Cylinder Preparation

The gravure cylinder is composed of a steel or aluminum base, is copper plated and then polished to a predetermined diameter. Precise diameter of gravure cylinders in a set is critical. Any variances in diameter, as little as 2 thousandths of an inch can significantly affect the print registration. These cylinders are extremely sensitive to scratches and abrasions. Extreme care is taken when handling and storing the cylinders.

Web Gravure Printing

The Doctor Blade and Impression Cylinder

The doctor blade is a simple device used to shear the ink from the surface of the plate cylinder. Pressure is applied to the doctor blade to assure uniform contact along the length of the cylinder. The blades must be angled

to cut the surface of the ink, but pressure and angle must be carefully adjusted to prevent premature wear on the cylinder. The doctor blade also oscillates back and forth to prevent a flat surface being worn into the cylinder.
The rubber coated impression roll brings the substrate in contact with the engraved cylinder resulting in proper ink transfer. The impression roll also acts to adjust the tension between print units and helps move the substrate through the press.

The impression roll is made of a tubular sleeve coated with a rubber compound. The cover material is determined by the press conditions. Typically the coating is made of natural rubber, neoprene, nit rile or polyurethane. These impression rolls are typically purchased from an outside vendor rather than made on site.

Gravure Inks - Solvent Based, Water Based
Gravure inks are fluid inks with a very low viscosity that allows them to be drawn into the engraved cells in the cylinder then transferred onto the substrate. In order to dry the ink and drive off the solvents or water, which essentially replaces most of the solvent, the paper is run through Gas fired or electric fired driers. The ink will dry before the paper reaches the next printing station on the press. This is necessary because wet inks cannot be overprinted without smearing and smudging. Therefore, high volume air dryers are placed after each printing station.

The solvent-laden air from the dryers is passed through either a solvent recovery system or solvent vapor incinerator. A typical recovery system uses beds of activated carbon to absorb the solvent. Saturated beds are regenerated by steam. The solvent laden steam is then condensed and the water and solvent separate by gravity. Greater than 95 percent of the ink solvents can be recovered using this process (Buonicore). The solvents can either be reused or destroyed by incineration.

Water based inks, especially used for packaging and product gravure, require a higher temperature and longer drier exposure time in order to drive off the water and lower vapor pressure constituents. As mentioned subsequent sections, Flexo and Gravure inks are very similar and the constituents are essentially the same. Again, a pollution control device may be needed.

Gravure Press Design and Equipment
Web-fed gravure presses account for almost all publication, packaging, and product gravure printing. These presses are generally custom manufactured machines designed for a specific range of products. The typical press is highly automated and consists of multiple print units. The printing mechanism in a rotogravure press consists of a gravure cylinder and a smaller, rubber clad impression cylinder.

Other types of gravure presses in commercial use today are sheet-fed, intaglio plate, and offset gravure. These types of presses are used primarily for special printing applications.

Improving Changeover Times
The old adage of “time is money” is a pretty cut and dried concept in the package printing and converting business. If a press isn’t running, then it isn’t generating any value.
One the biggest hang ups in the printing process stems from changeovers not happening fast enough. Whether its dies, plates or a full job is being changed over, a quick and efficient process can help keep equipment in motion.

II. RESEARCH OBJECTIVE

- The objective of this study is to reduce the consumption of job change over time along with the optimum utilization of job change over time and explore the possible ways of optimum consumption of the job change over time used in gravure printing processes in **“Huhtamaki PPL Ltd” Rudrapur”**

III. RESEARCH METHODOLOGY

The whole study has been divided in 3 sub parts to consumption of job change over time improve web-fed gravure printing works along with the cost, efficiency, consumption of time and influence of utilization of job change over time used in web-fed gravure printing presses

The following methodology will be adopted during the study.

1. Study of different web-fed gravure printing machine used in printing industries.
2. Study of the job change over time used in different web-fed gravure printing work along with the cost, efficiency, consumption of time.
3. Different jobs of the " web fed gravure printing presses" during project work consuming time of job change over time will be selected and the study will be conducted on each selected job.

Data collection will be done during the study

IV. FUTURE & SCOPE

This research focuses on optimum consumption of job change over time and explores the possible ways of optimum utilization of the job change over time used in web-fed gravure processes. In "**Huhtamaki PPL Ltd" Rudrapur.**In all three cases when check list get adopted number of wastage job change over time depending up on the job and machine availability. These preliminary results can be used in future. Check point suggestion incorporated in printing section on web-fed gravure machine after consultation with various press authorities may be indicative for other presses. They may modify, increase or decrease the factors to be considered.

To implement the suggestions properly we generate a check list in form of table to check the different factors before all jobs to be handled on particular Machine on daily printing. And the check point helps to reduce the consumption of job change over time along with optimum consumption of job change over time. The study may be concluded in a manner that, if all suggestion were implemented in matter of practice on web-fed gravure presses Machine, consumption of job change over time will go done along with controlled.

However researcher feels that limited facilities or infrastructure was available in city like Rudrapur. The result may vary depending upon type of Machine/Technology, and skill man power.

V. REFERENCES

[1] Essence, the design studio.
[2] http://pneac.org/images/Header_Top.png.
[3] PACKAGE PRINTING For Printers and Converters of Labels,flexible Packaging and Folding carton By - Cory Francer
[4] Retrospective evaluation of occupational exposure to organic solvents: questionnaire and job exposure matrix BY - Benedicte Stengel Paola Pisani Jean-Claude Limasset Jean Bouyer Franco Berrino
[5] Method of presetting printing machines BY - Martin Mayer, Nikolaus Pfeiffer
[6] Quick change system for a press BY - Christopher Delwiche, Joseph Bero, Gregory Ginnow
[7] Is the relationship between cognitive ability and job performance stable over time? BY - Kevin R. Murphy
[8] General factors of affective temperament and their relation to job satisfaction over time BY - WatsonDavid, SlackAnn, Keltner
[9] Method of presetting printing machines BY - Martin Mayer, Nikolaus Pfeiffer
[10] Angled doctor blade arrangement for gravure press BY -John A. Weeks
[11] Density measurement, colorimetric data, and inspection of printed sheet using contact image sensor BY - AsaZiv
[12] Evaluation of innovative ink feed systems for the flexographic and gravure printing industries BY - Carlos M. Nunez &G.W. Deatherage
[13] Ink stability during printing BY - Andrea Frimova, Alexandra Pekarovicova
[14] Process for attaining a production-run state in a web-fed rotary printing machine BY - Martin Endisch, Bernhard Feller, Josef Gottling

CITE AN ARTICLE

Goyat, A., Singh, N., & Sharma, S. (n.d.). INVESTIGATIONOF WEB-FED GRAVURE PRINTING FOR OPTIMIZATION OF JOB CHANGE OVER TIME. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, *7*(1), 192-195.