STUDY OF SHEET-FED PRESSES FOR OPTIMUM UTILIZATION OF PRINTING SUBSTRATES

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ABSTRACT: Sheet-fed litho is commonly used for printing of short-run magazines, brochures, letter headings, and general commercial (jobbing) printing. In sheet-fed offset, "the printing is carried out on single sheets of paper as they are fed to the press one at a time". Sheet-fed presses use mechanical registration to relate each sheet to one another to ensure that they are reproduced with the same imagery in the same position on every sheet running through the press. Different types of printing substrates we can use in sheet-fed offset printing for production. Coated, Un-coated & Polypropylene (PP) substrates are considered during our research work. Coated paper has a glossy or matte finish. Coated paper is generally very smooth and can be either very shiny (high gloss) or have a subtle shine (matte). Uncoated paper is more absorbent of ink than a coated paper, like its namesake, uncoated paper does not have a coating. It is generally not as smooth as coated paper and tends to be more porous. Polypropylene (PP) sheet is an Universal Versatile Material, excellent print surface, which can be directly fed into Offset Printing. Screen Printing & Digital Printing.Aim of this study is to reduce the consumption and influence of printing substrates with the optimum utilization of printing substrates and explore the possible ways of optimum utilization of the printing substrates used in different sheet offset presses for different type of jobs. In this different type of printing substrates is study which are used in printing industries, different jobs of the "*Manohar Filaments Sheet-fed Offset Press" Sonipat****" were taken into consideration. During project work jobs consuming moderate type of printing substrates were selected and the study was conducted on each selected job.***
Keywords; Sheet-fed Offset Process, Printing Substrate, Wastage Reduction

I. INTRODUCTION

OFFSET PRINTING

It is a commonly used printing technique in which the inked image is transferred (or "offset") from a plate to a rubber blanket, then to the printing surface. When used in combination with the lithographic process, which is based on the repulsion of oil and water, the offset technique employs a flat (Plano graphic) image carrier on which the image to be printed obtains ink from ink rollers, while the non-printing area attracts a water-based film (called "fountain solution"), keeping the non-printing areas ink-free. The modern "web" process feeds a large reel of paper through a large press machine in several parts, typically for several meters, which then prints

MODERN OFFSET PRINTING

One of the most important functions in the printing process is prepress production. This stage makes sure that all files are correctly processed in preparation for printing. This includes converting to the proper CMYK color model, finalizing the files, and creating plates for each color of the job to be run on the press. Offset lithography is one of the most common ways of creating printed materials. A few of its common applications include: newspapers, magazines, brochures, stationery, and books. Compared to other printing methods, offset printing is best suited for economically producing large volumes of high quality prints in a manner that requires little maintenance. Many modern offset presses use computer-to-plate systems as opposed to the older computer-to-film work flows, which further increases their quality.

ADVANTAGES OF OFFSET PRINTING COMPARED TO OTHER PRINTING METHODS INCLUDE:

- Consistent high image quality. Offset printing produces sharp and clean images and type more easily than, for example, letterpress printing; this is because the rubber blanket conforms to the texture of the printing surface;
- Quick and easy production of printing plates; longer printing plate life than on direct litho presses because there is no direct contact between the plate and the printing surface. Properly developed plates used with optimized inks and fountain solution may achieve run lengths of more than a million impressions; cost. Offset printing is the cheapest method for producing high quality prints in commercial printing quantities;
- Ability to adjust the amount of ink on the fountain roller with screw keys. Most commonly, a metal blade controls the amount of ink transferred from the ink trough to the fountain roller. By adjusting the screws, the operator alters the gap between the blade and the fountain roller, increasing or decreasing the amount of ink applied to the roller in certain areas. This consequently modifies the density of the color in the respective area of the image. On older machines one adjusts the screws manually, but on modern machines the screw keys are operated electronically by the printer controlling the machine, enabling a much more precise result.

DISADVANTAGES OF OFFSET PRINTING COMPARED TO OTHER PRINTING METHODS INCLUDE:

- Slightly inferior image quality compared to rotogravure or photogravure printing;

- Propensity for anodized aluminum printing plates to become sensitive (due to chemical oxidation) and print in non-image–background areas when developed plates are not cared for properly;
- Time and cost associated with producing plates and printing press setup. As a result, very small quantity printing jobs may now use digital offset machines.
- Every printing technology has its own identifying marks, as does offset printing. In text reproduction, the type edges are sharp and have clear outlines. The paper surrounding the ink dots is usually unprinted. The halftone dots are always hexagonal though there are different screening methods.

II. PRINTING SUBSTRATES

Substrate is a term used in a converting process such as printing or coating to generally describe the base material onto which, e.g. images and text will be printed. Base materials include:

- Coated Paper
- Uncoated Paper
- PP sheets

PAPER

Paper is a thin material produced by pressing together moist fibers of cellulose pulp derived from wood, rags or grasses, and drying them into flexible sheets. It is a versatile material with many uses, including writing, printing, packaging, cleaning, and a number of industrial and construction processes.

The pulp papermaking process is said to have been developed in China during the early 2nd century AD, possibly as early as the year 105 A.D. by the Han court eunuchCaiLun, although the earliest archaeological fragments of paper derive from the 2nd century BC in China. The modern pulp and paper industry is global, with China leading its production and the United States right behind it.

COATED PAPER

Coated paper is paper which has been coated by a compound or polymer to impart certain qualities to the paper, including weight, surface gloss, smoothness or reduced ink absorbency. Various materials, including Kaolinite, calcium carbonate, Bentonite, and talccan be used to coat paper for high quality printing used in packaging industry and in magazines. The chalk or china clay is bound to the paper with synthetic viscofiers, such as styrene-butadiene latexes and natural organic binders such as starch. The coating formulation may also contain chemical additives as dispersants, resins, PE: to give water resistance and wet strength to the paper,or to protect against ultraviolet radiation. Types of coating-

- Gloss paper has a high sheen and a shiny finish. The higher the gloss coating, the greater reduction in ink absorption and therefore, more vivid color and definition. You also get more light reflection which can interfere with readability.
- Satin is a nice compromise as it is less shiny than gloss finish and more lustrous than matte finish. The outcome is a sharp image with vibrant colors with a hint of polish.
- Matte coating does not appear glossy, but has a flat finish. Because of the coating, the ink still lays on top, again, giving images a vivid appearance while maintaining a muted varnish.

UNCOATED PAPER

Uncoated paper is more porous and will therefore soak up a lot more of the ink. Because of its sponge-like nature and the ink sinking into the paper instead of sitting on top of it, printed images tend to have a softer, slightly less defined, and warmer appearance. An uncoated sheet is a favored choice for stationary, business cards, brochures, invitations and books. Uncoated paper is available in variety of surface textures–the most common being wove/smooth, linen and laid.

- Wove/Smooth has no particular manufactured texture. It has a smooth feel, however, there are varying degrees of "smoothness". The percentage of cotton fiber used in making the paper along with the amount of pressure applied are factors in how "smooth" a wove sheet of paper will feel.
- Linen looks and feels like you might imagine from the name, like linen fabric. It has a consistent and fine crosshatch texture to it.
- Laid has a more obvious texture than linen, but again is using horizontal and vertical lines to convey a more hand-crafted appearance and feel.

DIFFERENCE BETWEEN COATED AND UNCOATED PAPER

Coated Paper: Coated paper has a glossy or matte finish. Coated paper is generally very smooth and can be either very shiny (high gloss) or have a subtle shine (matte). Either way, coated paper will have a great effect on the appearance and usefulness of the printed item. Coated paper is more resistant to dirt, moisture and wear. It also makes the printed material more shiny. That is why it is generally used in the printing of magazines, book covers, glossy photos and art books. Coating restricts the amount of ink that is absorbed by the paper and how the ink bleeds into the paper. This is desirable for sharp and complex images as the ink stays on top of the paper and will not wick or bleed reducing the sharpness of the printed material. This same property can be unattractive for the back of business cards as the coated paper does not take well to pen ink or pencil and many people like to write on the back of business cards.

Uncoated Paper: Generally more absorbent of ink than a coated paper, like its namesake, uncoated paper does not have a coating. It is generally not as smooth as coated paper and tends to be more porous. Uncoated paper is generally used for letterhead, envelopes and printed material that is aiming for a more prestigious or elegant look. College and University booklets, real estate brochures and menus for elegant restaurants are generally printed on uncoated paper to give them a prestigious feel.

POLYPROPYLENE (PP) SHEET

Polypropylene (PP),Sheet is an Universal Versatile Material, excellent print surface, which can be directly fed into Offset Printing. Screen Printing & Digital Printing. This PP sheets

are generally used in Garment/Product/Rack Tags, Packaging Boxes, Gift/Promotional Products, Diary coves, Files/Folder, Vacuum Forming, Food container and many more.

Specifications

- Thickness - 0.10mm to 0.25mm
- Color - Transparent and Translucent Clear and Multi Colour
- Surface Finish : Both side gloss, Single side gloss
- Size- Width - Minimum 350mm and maximum 1000mm x Length Rolls or Sheets as per requirement.
- Thickness - 0.25mm, 0.30mm to 1.60mm
- Color - Translucent, Transparent, Opaque, Natural and Various Colors
- Surface Finish -Matt / Matt , Gloss / Matt, Crossline& various Surfaces available
- Size- Width - Minimum 350mm and maximum 1000mm x Length Rolls or Sheets as per requirement..
- Wide Color Range - Natural, White, Black, Royal Blue, Red, Yellow, Green, Pink, Orange, Purple & etc.

KEY FEATURES

- High Demand in Garment Industries for Tags & Boxes.
- Being Food Grade material by its natural property it has no effect on Food packaging.
- Environment Eco - friendly & Recyclable.
- Due to Various Surfaces & being Both Sides Corona Treated Offset, Screen & Foil Printing is Possible.
- Excellent Hinge property for Boxes and other Clamp Shell Boxes.
- Wide Color and Surface Finish range.
- Good Resistance to Acids, Alkalies, Grease and Oil.

III. RESEARCH OBJECTIVE

The objective of this study is to reduce the consumption of printing substrate along with the optimum utilization of printing substrate and explore the possible ways of optimum utilization of the printing substrate used in sheet-fed offset processes in "Manohar Filaments, Pvt. Ltd. Barhi, of Sonipat"

IV. RESEARCH METHDOLOGY

The whole study has been divided in 3 sub parts to utilization of printing substrate improve sheet-fed offset works along with the cost, efficiency, consumption and influence of utilization of printing substrate used in sheet-fed offset presses

The following methodology will be adopted during the study.

- Study of different printing substrate used in printing industries.
- Study of the printing substrate used in different sheet-fed offset work along with the cost, efficiency, consumption.
- Different jobs of the " Sheet-fed Offset Presses" during project work consuming moderate amount of printing substrate will be selected and the study will be conducted on each selected job.
- Data collection will be done during the study

V. DATA COLLECTION & ANALYSIS

MANOHAR FILAMENTS OFFSET PRINTING PRESS, SONIPAT

Name of Machine : CD 102 Heidelberg
No. of Units : 6 color + 1 coater
Machine Speed : 13000 impressions per hours
Change over time of job on machine : 30 min.
Per day minimum production approx. : 104,000 sheets
Copies wastage during production (per job) :20-25% approx.

Table -1: DATA OF PRINTING ON UNCOATED PAPERAT MANOHAR FILAMENTS OFFSET PRINTING PRES, SONIPAT FOR THE MONTH OF FEBRUARY, 2017

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	24 days	CD 102 Heidelberg	958,116	51,544

FIGURE – 1QTY. OF PRINTED SHEETV/sWASTAGE OF SHEET

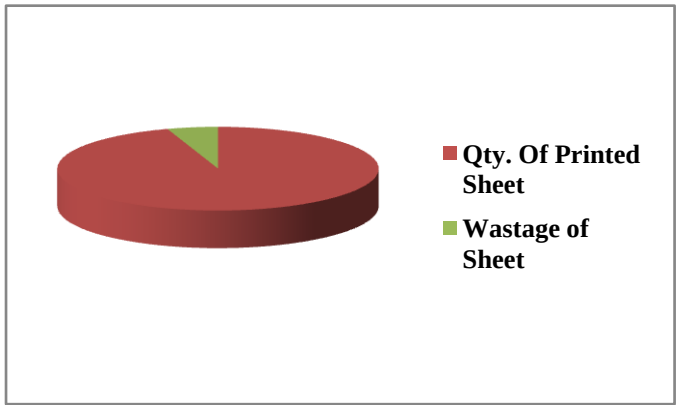


Table -2: DATA OF PRINTING ON COATED PAPER AT MANOHAR FILAMENTS OFFSET PRINTING PRES, SONIPAT FOR THE MONTH OF MARCH, 2017

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	27 days	CD 102 Heidelberg	9,35,200	81,224

FIGURE – 2 Qty. OF PRINTED SHEETv/sWastage of sheet

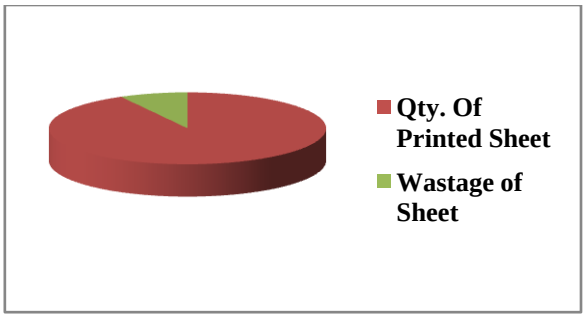
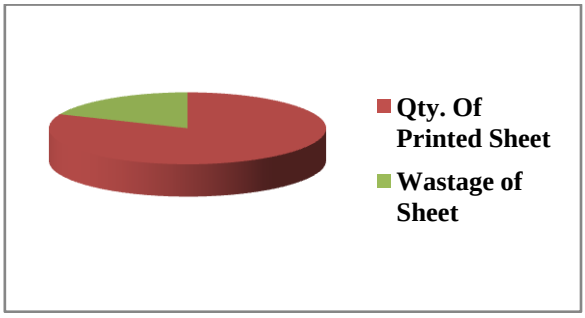


Table- 3: DATA OF PRINTING ON PP SHEETS AT MANOHAR FILAMENTS OFFSET PRINTING PRESS, SONIPAT FOR THE MONTH OF APRIL, 2017

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	25 days	CD 102 Heidelberg	191,200	43740

FIGURE – 3 Qty. OF PRINTED SHEETv/sWastage of sheet



LIST OF SUGGESTION
Name of Press
Date: - Name of supervision:-
Check list for SHEET FED OFFSET machine
Please Tick (√ /x) For Each Job

Sr. No	Check Point	Job 1 (√ /x)	Job 2 (√ /x)	Job 3 (√ /x)	Wastage of Sheets (approx.)
1.	Speed of Machine.				
2.	Type of printing substrate in In feed unit at start of Machine.				
3.	Function of printing unit.				
4.	Suitable grade of printing substrate for respective jobs.				
5.	Preparation of job for Machine.				
6.	Printing time for printing substrate				
7.	Proper amount of work dampening unit & inking unit.				
8.	Apply substrate according to printing job				
9.	Water ratio proper according to printing substrate.				
10.	Machine speed setting according to job and substrate.				
11.	Printing time for printing substrate.				

VI. RESULT & DISCUSSION

Table- 4; DATA OF MAY MONTH FOR UNCOATED PAPER SUBSTRATE AFTER IMPLEMENTION OF SUGGESTION POINT CHECK LIST

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	27 days	CD 102 Heidelberg	10,55,716	51,740

FIGURE – 4 Qty. OF PRINTED SHEETv/sWastage of sheet

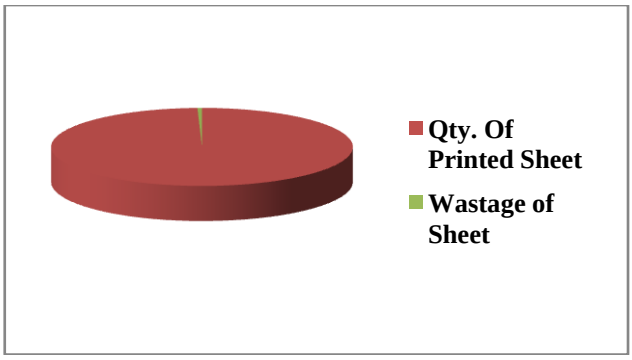


Table: 5- DATA OF MAY MONTH FOR COATED PAPER SUBSTRATE AFTER IMPLEMENTION OF SUGGESTION POINT CHECK LIST

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	27 days	CD 102 Heidelberg	9,35,200	78,437

FIGURE – 5 Qty. OF PRINTED SHEETv/sWastage of sheet

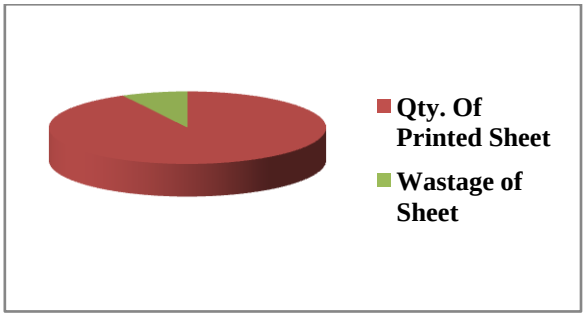
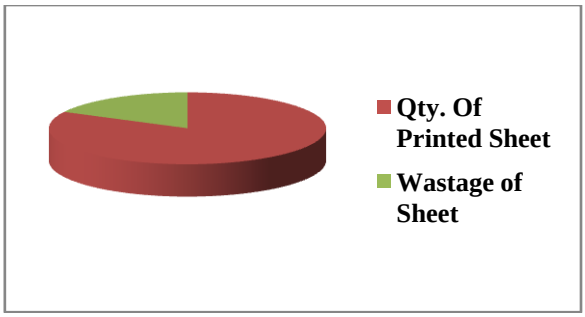


Table: 6- DATA OF MAY MONTH FOR PP SHEETS PRINTING AFTER IMPLEMENTION OF SUGGESTION POINT CHECK LIST

Sr. No	Types of printing	No. of days	Machine name	Qty. of Printed Sheet (approx.)	Wastage of Sheet (approx.)
1.	Sheet fed offset	27 days	CD 102 Heidelberg	2,07,850	44,035

FIGURE – 6 Qty. OF PRINTED SHEETv/sWastage of sheet



VII. CONCLUSION & FUTURE SCOPE

This research focuses on optimum utilization of printing substrate and explore the possible ways of optimum utilization of the printing substrate used in sheet fed offset processes of "Manohar Filament Sheet-fed Offset at Sonipat".In all three cases when check list get adopted number of wastage goes down by approx. 12-15% and consumption of printing substrate goes down by approx. 400-600 sheets depending up on the job and machine availability. These preliminary results can be used in future. Check point suggestion incorporated in printing section on sheet fed offset 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 points help to reduce the consumption of printing substrate along with optimum utilization of printing substrate. The study may be concluded in a manner that, if all suggestion were implemented in matter of practice on printing Section / sheet fed offset Machine, consumption of printing substrate will go done along with controlled / minimized wastage and it helps to cost reduction and make our production cost effective or increase productivity.However researcher feels that limited facilities or infrastructure was available in city like Sonipat. The result may vary depending upon the type of Machine/Technology, and skills of Man power.

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