



# PRINT WASTAGE ANALYSIS OF NARROW-WEB FLEXOGRAPHIC PRINTING PRESSES ON THE BASIS OF MOST FREQUENTLY OCCURRING PRINTING DEFECTS

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## ABSTRACT

Flexography printing process is one of the prominent printing presses to print on flexible substrates. It is cheaper printing process because of low image career preparation coast. With the introduction of photo-polymer plates and automatic print quality monitoring systems, flexography has become a substitute of Gravure printing process for average quality print products. A number of technological advancements are coming forth in the field of flexography, still a number of defects may occur which may increase the machine waystage and hamper the print production. Objective of this paper is to identify and analyse various printing defects happening in Narrow flexographic printing presses and finding the remedial measures to avoided the same. The study was carried out on Mark Andy p5 Narrow flexographic press available in the local market. Print defect data was collected on daily basic for consecutive three months by observation method. The results indicated that gear marks, dot gain and pin holes are the most frequently occurring defects, which are contributing to approximately 2.20 % of the wastage. Other printing defects such as misregistration, print missing, filling, halo and mottle are minor and least frequent which are contributing to approximately 1.8 % of the wastage.

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**KEYWORDS:** - Flexography printing press, printing defects, flexible printing, substrate, pin hole, mottle, print mossaing, dot gain.

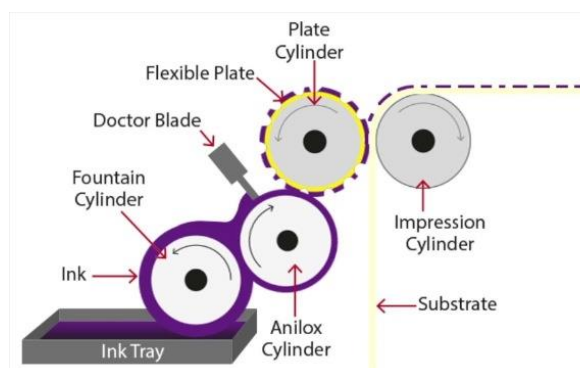
**DOI NUMBER:** 10.48047/NQ.2022.20.19.NQ99402 **NEUROQUANTOLOGY 2022; 20(19): 4382-4387**

## INTRODUCTION

Flexography printing process is a high-speed printing process which is commonly used for print on flexible and packaging material i.e., labels, plastic films, foils and corrugation boards. Flexography printing process is either

use to print on non-porous substrates like metal and glass. The flexography printing process (liquid ink, flexible plate and high speed etc.) is liable to various printing defects which is required to be quantified with suitable methods (Adams, 2001).





**Figure 1. Principle of Flexography printing process** (Adams, 2001)

Flexography printing process is a direct contact printing process in which the image carrier is a flexible or photo-polymer plate having the image area in relief form and non-image area in recess. To generate image area on the image carrier photo-polymer plate are exposed by negative film. In the flexography printing process liquid inks used, the inks may be water-based, solvent-based, or UV-curable, depending on the application and substrate. Water based inks are eco-friendly on the other hand solvent-based ink are helps in quality increase. Anilox roller transfer the ink from fountain roller to plate cylinder and a doctor blade is mount which wipe of the excess ink from the anilox roller, and from plate cylinder the is transferred to the substrate with the help of impression cylinder (Bear, J.H., 2020).

Flexography printing process is a high speed and have ability to print on wide range of substrates or materials, so the application of the flexography printing process is also wide i.e., flexible substrates, corrugated boards, plastic films, foil, and even non-porous surfaces like metal and glass.

#### **RESEARCH OBJECTIVE**

The aim of this paper is though the light on the different printing defects that occur in high-speed production-based flexography printing presses. The data of these printing defects was collected from the Mark Andy p5 Narrow flexopress over a period of three months, and a day-to-day analysis was conducted. The findings shows that the gear marks, dot gain and pin holes are the most occurring printing defects. There are some of printing defects during production which are least occurring and having minor impacts on the production i.e., misregistration, print

missing, filling, halo and mottle. At the end the finding revealed that approximately 3% to 5% of print waste was resulted due to various printing defects observed during the project work

#### **RESEARCH METHODOLOGY**

Flexography printing press, is a popular printing technique which is used to print on the wide range of printing substrates or used in the packaging and decorative industries. Flexography printing press involves image area in relief form on a flexible or photo-polymer image carrier, liquid ink applying on the image area which is then transfer onto the substrate by direct contact. Visit was arranged in Mark Andy p5 Narrow flexo printing press to record the most or least occurring defects and their impact on the total production. Some of the most frequent defects are; Gear Marks- Gear marks are typically caused by irregularities in the gears or cylinders involved in the printing press. Dot Gain- Dot gain refers to the increase in the size of halftone dots during the printing process. In flexography it can be caused by Plate (material and thickness), Anilox roller characteristics, Ink characteristics, Substrates absorption, Printing pressure and Impression setting etc.

Pinholes- Pinholes are tiny, unwanted voids or gaps in the printed ink film, resulting in small unprinted spots on the substrate. They can negatively impact the overall print quality and appearance of the final product.

And the lest frequent defects are; Misregistration- It also known as colour registration error or colour shift that occurs when the various colour separations or printing plates are not aligned correctly during the printing process. As a result, the different

colours do not line up precisely, leading to overlapping or gaps between colours and a distorted final image.

**Print Missing-** This defect was occurred when certain elements or portions of the printed image are not present on the final printed product. This can result in blank or unprinted areas on the substrate, affecting the overall appearance and quality of the print.

**Filling-** In flexography filling defect is refers to a printing defect where certain areas of the printed image or text are not adequately filled with ink, resulting in incomplete or weak print coverage. Filling defects can negatively impact the overall print quality and appearance of

the final product, especially if they occur in important design elements or text.

**Halo-In flexography,** the "halo defect" refers to a printing issue where a light-coloured or white halo appears around the edges of printed elements, such as images or text. This halo effect is caused by the unintended spread of ink beyond the intended boundaries of the printed image.

**Mottle-"mottle"** refers to a printing defect characterized by uneven or blotchy ink coverage on the printed surface. It appears as irregular patterns of lighter and darker areas in the printed image, similar to a marbled or speckled effect.

## DATA COLLECTION & ANALYSIS

**Table 1. Printing defects and wastage data for consecutive three months**

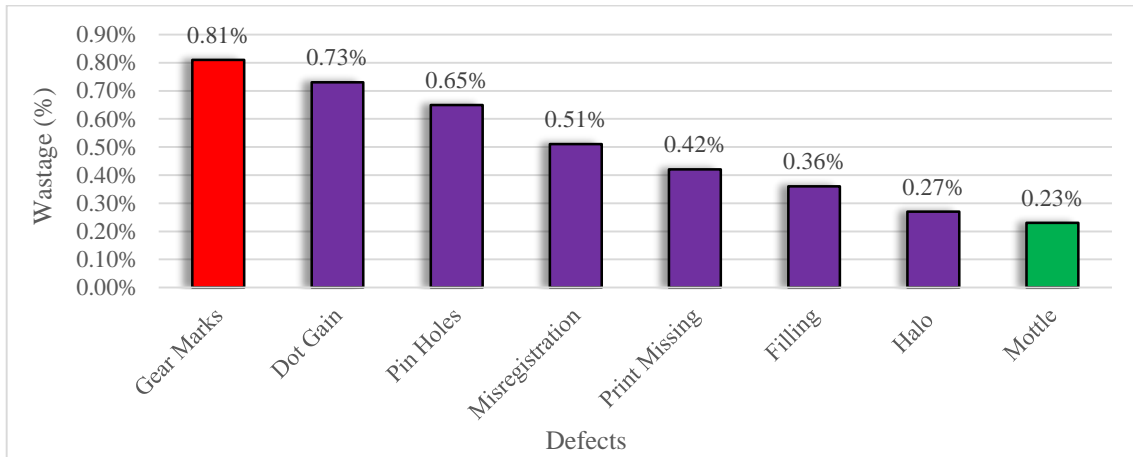
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Defects	M-I		M-II		M-III	
	TP = 5851578 Meters		TP = 5649347 Meters		TP = 5793854 Meters	
	Wastage	Wastage %	Wastage	Wastage %	Wastage	Wastage %
<b>Gear Marks</b>	47397.78	0.81%	44064.90	0.78%	46350.83	0.80%
<b>Dot Gain</b>	42716.51	0.73%	44629.84	0.79%	44033.29	0.76%
<b>Pin Holes</b>	38035.25	0.65%	35025.95	0.62%	36501.28	0.63%
<b>Misregistration</b>	29843.04	0.51%	29941.53	0.53%	31866.19	0.55%
<b>Print Missing</b>	24576.62	0.42%	25422.06	0.45%	22596.03	0.39%
<b>Filling</b>	21065.68	0.36%	19772.71	0.35%	22016.64	0.38%
<b>Halo</b>	15799.26	0.27%	14123.36	0.25%	16222.79	0.28%
<b>Mottle</b>	13458.62	0.23%	15253.23	0.27%	15064.02	0.26%
<b>Total</b>	<b>232892.80</b>	<b>3.98%</b>	<b>228233.61</b>	<b>4.04%</b>	<b>234651.08</b>	<b>4.05%</b>

In flexography Different type of defects which are occurred during the production and effect on the total production. Table 1 is representing the data collection of wastage because of the most and least occurred defects during the production in flexography printing press for three months representing with M-I, M-II and M-III. Total production (TP) was measured in Meters and for first month the total production was 5851578 Meters in 31 days. 5649347 Meters and 5793854 Meters was the total production for M-II and

M-III (2<sup>nd</sup> month and 3<sup>rd</sup> month) respectively. Most and least occurring defects are representing in the table 1 i.e., gear marks, dot gain, pin holes, misregistration, print missing, filling, halo and mottle. In these some of the defects are most occurred and having the huge impact on the total production. Most occurred defects had the approximately more than 60% weightage of the total wastage. On the other hand least occurred defects had approximately less than 40% weightage of the total wastage.





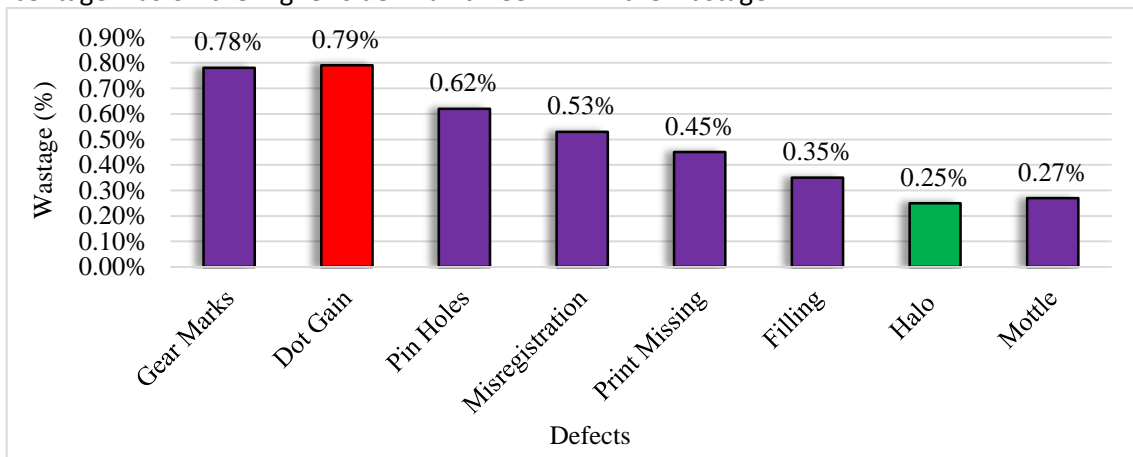
**Figure 1. Printing defects and wastage analysis for Month-I**

As per the data collected which was shown in table 1 it was observe that mainly three defects had a large impact on the total production in all months continuously i.e., gear mars, dot gain and pin holes. In M-I (had 31 days) it was observed that the total wastage was 232892.80 Meters which was the approximately 3.98% of the total production and in this wastage the highest weightage was 47397.78 Meters which was approximately 0.81% of the total production was because of gear marks. Most occurred defects wastage percentage was on the higher side in all three

months. Least occurred defects had less impact on the total production.

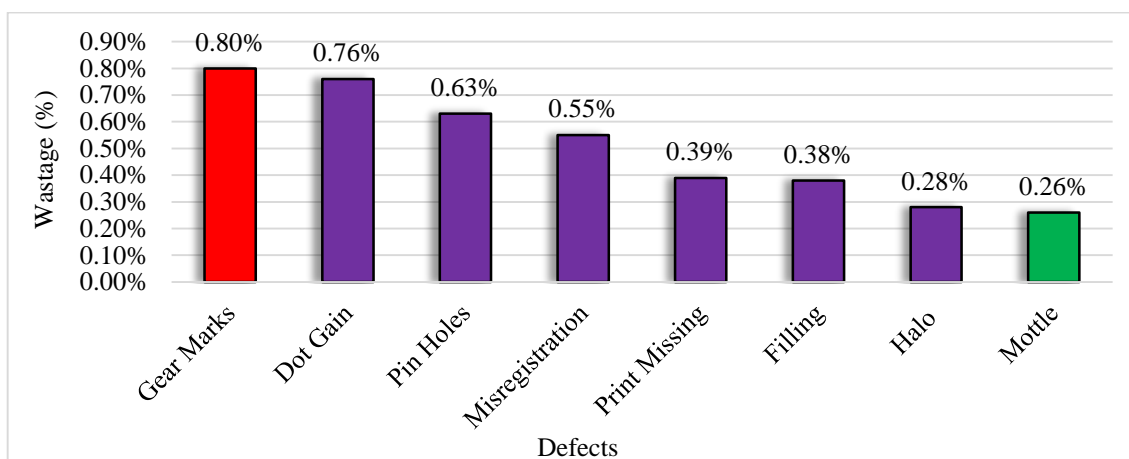
Figure 1 representing the percentage of defects occurred during the production at flexography printing press for M-I (month 1). It was found that gear marks, dot gain and pin holes are the most occurred defects which had the higher percentage of wastage. Gear marks had 0.81% wastage of the total production which was highest (represented with red bar in figure 1). Mottle was found least occurred and had lower percentage of the wastage.

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**Figure 2. Printing defects and wastage analysis for Month-II**

For M-II (month 2) the data represented in figure 2. Highest percentage wastage of the total production was represented with red bar i.e., 0.79% because of the dot gain. Dot gain was most occurred defect during the production.



**Figure 3. Printing defects and wastage analysis for Month-III**

Figure 3 represent the wastage analysis for M-III (Month 3) and it was found that gear marks defect effects the total production which was a most occurred defect on the other hand mottle impact least of the total production which was a least occurring defect during the production.

### RESULTS & DISCUSSION

During the production it was found that there are some most frequently occurring and some are least frequently occurring defects. Most frequently occurring defects impact the total production more as compare to the least occurred defects. The most occurred defects i.e., gear marks, dot gain and pin holes impact the total production by approximately 2.19% and the least occurred defects i.e., misregistration, print missing, filling, halo and mottle effect the total production by approximately 1.80%.

### CONCLUSION

Some of the points which are concluded on the basis of the result and discussion;

1. The overall print wastage in gravure printing press was found 6.11% taken as average of three consecutive months.
2. Gear marks, dot gain and pin holes are found to be most frequently occurring defects in Flexography Printing Press which resulted to approximately 2.19% wastage.
3. Mis-registration, print missing, filling, halo and mottle are found to be least frequently occurring defects in

Flexography Printing Press which resulted approximately 1.80% wastage.

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