

THE MACHINE, MAN, METHOD & MATERIAL MODEL FOR WASTAGE REDUCTION

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ABSTRACT: *The Indian paperboard packaging industry is growing at a rapid rate. Paperboard carton packaging is the need of the hour. Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale and use. Paperboard packaging found wherever goods are produced, distributed, marketed and used. Folding box board is one of the important types of paperboard which used in packaging. The used of folding boxboard carton is widespread because of the ability of this packaging format to satisfy the function of protection, utility, and motivation. Folding box board packaging are found in many places, such as supermarkets, traditional street market, shops and departmental stores as well as for mail order, fast food, dispensing machines, hospital, military, education and sport. These product packages attract the customer if the printing done on these package in good condition. Printing plays an important role in making the Folding box carton attractive. If any problem found related to printing it gives the bad effect on product package sales. These problems produce due to substrate, machine and improper working system, etc. With the help of this study it is found that the folding boxboard waste can be reduced if take great care on all these. The good printing quality attracts the customer and helps in increasing the sales of product.*

Keywords: *Folding box board packaging, printing problem, paperboard waste control*

I. INTRODUCTION

Paperboard carton packaging is the need of the hour. Paperboard plays an important role in the packaging industry. Paperboard is a thick paper based material. Paperboard packaging found wherever goods are produced, distributed, marketed and used. Paperboard packaging are found in many places, such as supermarkets, traditional street market, shops and departmental stores as well as for mail order, fast food, dispensing machines, hospital, military, education and sport. No manufacturer can ignore the importance of packaging as storage transportation, distribution, display and sales of product require good packaging. Carton is the name of certain types of containers typically made from paperboard. These are the medium sized boxes. These play important role in providing protection, information to product, display and sale. Paperboard used in carton packaging are divided into various sub grades such as Folding boxboard, White lined chipboard, Solid bleached board, Solid unbleached board, Liquid packaging board, Kraft board and Laminated board. Folding boxboard (FBB) - Folding boxboard is typically

made of three, or in some case four, plies. Basic weight for folding boxboard is 160 - 450 g/m². Folding boxboard is a paperboard grade which is made up of multiple layers of chemical and mechanical pulp. This grade is made up of mechanical pulp in between two layers of chemical pulp. The top layer is of bleached chemical pulp with an optional pigment coating.

II. RESEARCH OBJECTIVES

Every research work has to be focused on certain parameters & their consequences. Accordingly various aspects related with these parameters are to be studied from various angles. These concrete areas of focus need elaboration from time to time. Hence, this study is based on the following research objectives:

- To study in detail about folding boxboard carton manufacturing process
- To analyse the best practices used for reduction in wastage of folding box board in carton manufacturing process.
- Find out the future scenario of folding boxboard carton packaging in India

III. RESEARCH METHODOLOGY

This is a case study of ITC Limited during January - April, 2012; one of the main packaging converters in India situated in Tiruvottiyurs, Chennai. In this study, the focus is to know the manufacturing process and optimization of waste reduction of folding box board in packaging industry during printing on sheet - fed printing machine by observing the process on Heidelberg Speed master - xl - 105 manufacturing machine .

Manufacturing process

Manufacturing process play an important role in making the good quality carton of folding box board. The folding box board carton manufactured with the help of three sections. These are:

Pre - Press Section

In Pre - Press department, we encounter all the operations, come before printing. Prepress is the term used in the printing industries for the processes and procedures that occur between the creation of a print layout and the final printing. The prepress procedure includes the manufacture of a printing plate, image carrier or form, ready for mounting on a printing press, as well as the adjustment of images and texts or the creation of a high - quality print file. Computer to plate (CtP) is an imaging technology used in offset printing process. The computer to plate method of producing printing

plates eliminates films from the production process, thus reducing costs and shortening production times. In computer to plate systems, digitally controlled imaging systems create the printing image pixel per pixel on the printing plate.

Press Section

Common printing process for folding boxboard is sheet - fed offset. Offset printing is an indirect lithographic printing technology. In the offset printing process the printing and non printing areas of the plate are practically on one level. The image area and non image area is separated by chemically. The ink applies on the image area. The dampening system covers the non-printing areas of the printing plate with a thin film of dampening solution. The sheet fed press consists of different unit that complete the actual process; feeder unit, printing unit, inking/dampening unit, and the delivery unit.

Post - Press

In the post - press all those operation comes which done after printing.

The following were the factors due to which waste generated during printing on machine:

Machine

- Man
- Method
- Material

Machine problems

Feeding unit

- Cause-static problem, damage suckers, improper setting of air blowers, board wavy form and improper setting of double sheet detector.
- Solution- clean the antistatic equipment, maintain temperature at required level, check suckers timely, set the air blowers properly before start the job and set the double sheet detectors acc. to board thickness.

Dampening unit

- Cause - techno-trance problem and rollers problem.
- Solution-clean the techno- trance and adjust the ph, conductivity, and IPA value at required level, change dirty filter, close the techno-trance properly, used the glazer timely on rollers as recommended by the suppliers.

Delivery Unit

- Cause-over shoot problem, logistic problem, dust problem, bolts problem and pile board problem.
- Solution-make proper setting of the suction belt, clean the sensor with soft cloth on delivery unit, checks all the bolts and change damaged bolt, remove the pile board carefully.

Man problems

- Cause - At feeding unit and delivery unit improper working system
- Solution-provide training timely and make proper management system on production department.

Method problems

- Cause-Run more than usual sheets at starting time in

make - ready, improper check the feeding unit before start the job, Printing defects-scum, hickey and emulsification, Uncontrolled temperature and humidity

- Solution-Run less sheets at starting time in make - ready, Check the feeding unit before start the job, Printing defects- check these defects carefully, Closed doors, check all air conditioners and clean properly for control the temperature and humidity

Scum problem - Scum occurs when non - image areas of the plate begin to accept ink, it result unclear print out. The scum problem makes the print, unclear which give bad effect on print quality.

Cause - dirty techno - trance, glazed rollers, improper temperature and humidity and improper ink and water balance

Solution - clean the techno - trance and adjust the ph, conductivity, and ipa value, used the glazer timely on rollers recommended by the suppliers, maintain proper temperature and humidity, make proper ink and water balance on machine.

Hickey problem - A hickey is any particle that sticks to the blanket or plate and transfers an imperfection to the printed page.

Cause - fluffs remover improper work, dust particles on plate, blanket, inking unit and feeding unit.

Solution - checked the fluffs remover and clean it properly, clean the plate and blanket with good quality plate cleaner solution, clean carefully inking and dampening unit.

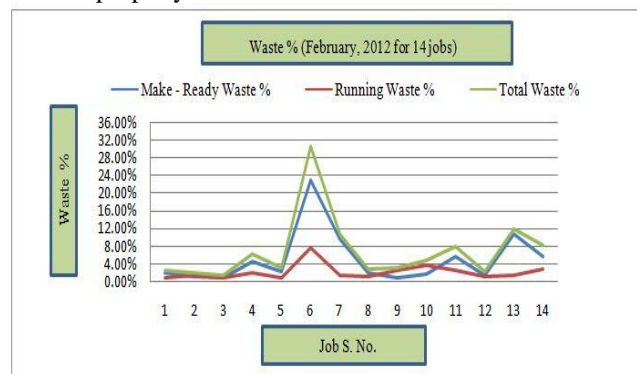
Emulsification problem - Emulsion is a mixture of ink and dampening solution. In this process, Dampening solution is distributed evenly throughout the ink in small droplets.

Cause - improper temperature and Glazed rollers

Solution - Maintain the temperature and used the glazer timely on rollers recommended by the suppliers.

Material problems

- Cause-Damage sheets, Paperboard static, Uncover pile board, Paperboard wavy form
- Solution-check the damage sheets properly and remove damaged sheets, cover pile board properly, Paperboard static - jogging sheets, control temp. Clean antistatic equipment, Paperboard wavy form - maintain room humidity and cover the pile board properly.



Graph 1 - Waste % (February, 2012 for 14 jobs)



Graph 2 - Waste % (March, 2012 for 15 jobs)

IV. RESULTS AND DISCUSSION

Paperboard packaging - An eco-friendly method provides a number of advantages in storage, distribution, marketing, protection and preservation of thousands of consumer goods. It includes packaging for a wide variety of consumer goods such as foods, beverages, dairy products, medicine, cosmetics and other items. The paperboard carton packaging plays an important role in the Indian packaging industry. The demand of paperboard packaging is increasing due to the following factors:

Eco - friendly packaging, consumer friendly, easy to dispose material, recoverable, recyclable and reusable, tremendous flexibility in terms of size shape properties, government supports, Indian economy experiencing good growth prospect, change in consumer attitude, improved literacy rate aware about health consciousness, growth of young buyers (in the age group of 05 - 14 years) is the key factor, change in human lifestyle, fast conversion of rural India into urban society, change in food habits increase the demand for packed food stuffs, lack of time resulting into the increase of demand for 'ready - to - eat - food.

Following problems were found during printing on cartons:

- Feeding unit problems - static problem, faulty suckers, irregular setting of air blowers, board wavy form , absence of worker at feeding unit during pile change
- Make - ready problems - run more than usual sheets, waste sheets may not be reused
- Delivery unit problems - over shoot, logistic, self design high bolt damage
- Printing defects problems - scum, hickey & emulsification

Following were the average waste of printing jobs recorded in the month of February & March, 2012

The average waste % for the month of February, 2012 for fourteen jobs were:

Make - ready waste	:	5.08 %
Running waste	:	2.10%
Total waste	:	7.18 %

The average waste % for the month of March, 2012 for fifteen jobs were:

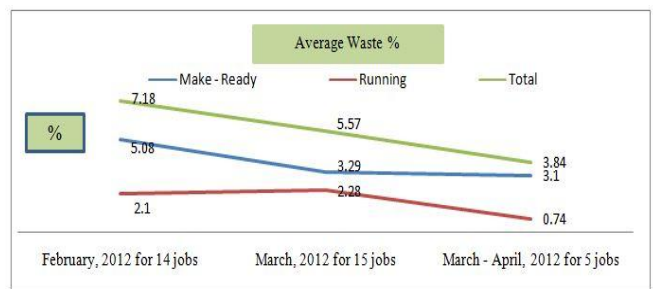
Make - ready waste	:	3.29%
Running waste	:	2.28%
Total waste	:	5.57 %

During training time it was analyzed that paperboard waste can be minimized by standard working procedure on machine, maintaining the machine in proper condition; and controlling the temperature and humidity for press room. Following action plans were implemented to achieve better results in waste minimization,

1. Clean all the units of machine properly like - feeding units, delivery unit, inking unit, dampening unit and inking unit.
2. Change the damaged suction belt.
3. Proper setting of suction belt.
4. Clean the techno - trance and adjust the pH, conductivity and IPA value.
5. Change the techno - trance filter.
6. Change the leakage pipe.
7. Checked and cleaned all the air conditioners.
8. Closed all the doors of production room.
9. Repaired the leakage of sub - dampening solution tank.
10. Checked the feeding unit before starting the job and proper setting of air blowers, suckers, double sheet detector and antistatic equipment.
11. Minimum waste sheets for registration purposes.
12. Used the new sheets with waste sheets to curv wastage.
13. Again used the waste sheets for color matching purposes.
14. Uniform waste sheets removal after any machine stoppage.

Feasibility for above mentioned action plans were tested for five jobs (March - April, 2012) in which the average waste was reduced as follows:-

Make - ready	:	3.10 %
Running time	:	0.74%
Total waste	:	3.84%.



Graph 3 - Average waste of printing jobs

The graphical representation depicts the average waste % for the month of February, 2012 for fourteen jobs, the average waste % for the month of March, 2012 for fifteen jobs and the average waste % for the month of March - April, 2012 for five jobs.

V. CONCLUSIONS

Paperboards packaging plays an important role in Indian packaging industry. There are number of factors due to which the Paperboard wastes occur during printing in press room such as printing defects, paperboard and ink problem, machine problem, as well as external factors such as

atmospheric humidity, and room temperature. The paperboard waste minimized during manufacturing process by proper alignment and suitable covering of paperboard, proper conditioning of machine and maintaining temperature and humidity at required level in the production room. The average waste % for the month of February, 2012 for fourteen jobs was 7.18 % (make - ready waste 5.08 % and running waste 2.10 %). In the month of March, 2012 the average waste % for fifteen jobs was reduced to 5.57 % (make - ready waste 3.29 % and running waste 2.28 %). Afterwards, with the implementation of certain action plans, the average waste was reduced to 3.84 %. (make - ready waste 3.10 % and running waste 0.74 %). Hence, the wastage reduction was optimized by standard action plans.

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