

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES
PACKAGING: GROWING IN ALL DIRECTIONS
(A Case Study of Janus Packaging Pvt. Ltd., Baddi)

Amaranand

M. Tech. (Print & Graphics Communication), GJUS&T, Hisar (Haryana)

ABSTRACT

Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale and use. Carton is the name of certain types of containers typically made from paperboard which is also sometimes known as cardboard. Many types of cartons are used in packaging. Sometimes a carton is also called a box. Cartons can be made from many materials: paperboard, various plastics or a composite. Some are "food grade" for direct contact with foods. Many cartons are made out of a single piece of paperboard. Depending on the need, this paperboard can be waxed or coated with polyethylene to form a moisture barrier. This may serve to contain a liquid product or keep a powder. Prepress is the term used in the printing and publishing 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. In today's prepress shop, the form of delivery from the customer is usually electronic, either a PDF or application files created from such programs as Adobe In Design or Quark X Press. Press sections in packaging industry cover all the operation occurs between prepress and post press section. We use different varieties of board for printing, high quality of ink by which we print and different printing process to print. Postpress is a crucial part of any printing process even though it takes place after the actual printing, since it determines the final look, shape and feel of your printed product.

Keywords: Packaging, Pre-press, Press, Post-press.

I. INTRODUCTION

Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale and use. Carton is the name of certain types of containers typically made from paperboard which is also sometimes known as cardboard. Cartons can be made from many materials: paperboard, various plastics. Depending on the need, this paperboard can be waxed or coated with polyethylene to form a moisture barrier. This may serve to contain a liquid product or keep a powder.

Sections in Packaging Industry:-

There are three main sections in Packaging industry:-

- 1) Prepress
- 2) Press
- 3) Postpress

1) Prepress: - Prepress is the term used in the printing and publishing 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. In today's prepress shop, the form of delivery from the customer is usually electronic, either a PDF or application files created from such programs as Adobe In Design or QuarkXPress.

Recent Trends in Prepress:-

A) ArtPro Software:- ArtPro is a full-featured packaging preproduction editor offering unique technologies and dedicated tools focused on major pre-press pain points (e.g. graphics alignments, trapping, distortion, screening, barcodes etc). If we want to drastically reduce the cost of errors and increase the efficiency of preproduction department, ArtPro is used.

B) Esko software: -Esko Software Suite 7.5 is the world's most complete set of integrated packaging preproduction software tools. It features a wide range of powerful tools for structural design, graphic design; one-up editing, sheet layout, workflow management and collaboration, color management and output control. Artios CAD is the world's most popular structural design software for packaging. Artios CAD is the ideal product for all corrugated and folding carton designers.

2) Press: -Press sections in packaging industry covers all the operation occurs between prepress and postpress section. We use different varieties of board for printing, high quality of ink by which we print and different printing process to print.

Recent Developments in Press section of Packaging industry:-

A) Folding Box Board: -FBB is a paperboard grade which is made up of multiple layers of chemical and mechanical pulp. This grade is made up of mechanical in between two layers of chemical pulp. The top layer is of bleached chemical pulp with an optional pigment coating. This is a low density material with high stiffness and has a slightly yellow.

B) Solid Bleached Board: -Solid Bleached Board is a virgin fibre grade of paperboard. This grade is made purely from bleached chemical pulp and usually has a mineral or synthetic pigment coated top surface in one or more layers as well as a coated reverse side. It is a medium density board with good printing properties for graphical and packaging end uses and is perfectly white both inside and out. It can easily be cut, creased, hot foil stamped and embossed.

C) UV ink: -UV-curable inks as a green technology that is preferable to conventional solvent-based ink systems. The Packaging Industry has been adopting UV- curing inks and coatings because they emit little no VOC (volatile organic compound) solvents reducing worker exposure to hazardous substances and environmental pollution.

D) Metallized printing: - Packaging has acquired specialization for producing metallic effect on printed objects. We can print on non-absorbent surface like foil laminated boards & plastic sheets with the help of UV inks. Metallic effect printing gives a lustrous feel to the carton and other printed materials which gives a high aesthetic appeal and strong attraction at market.

3) Postpress: - Postpress is a crucial part of any printing process even though it takes place after the actual printing, since it determines the final look, shape and feel of your printed product.

Recent developments in Postpress section of packaging industry:-

A) Abrasive Coating: -Abrasive coating is done with the help of screen printing. In this, screen is made of that particular area in which we want to do abrasive coat. After that, coating mineral is placed on the screen and pressure is applied with the help of the squeeze. Now, adhesive bond is used to hold the mineral coating on paperboard.

B) Drip-Off coating: -The "Drip-off" coating technology is a special coating application method which creates matt-gloss effects comparing to the result if gloss coating is applied with a photopolymer plate on matte paper. This special coating effect is possible because of the properties of specially formulated oil based overprint Varnishes and specially formulated water based high gloss coatings. It appears if the coating materials get applied wet-on-wet over printing inks, printed on absorbent substrates like paper, board, label paper etc. This method is not possible on plastic materials.

C) Spot UV: -Spot UV is a high-gloss finish applied to a specific area of print. Spot UV coating can be applied 'online' or 'offline'. The main drawback of Spot UV is related to cost. Prices increase according to complexity, rather than the amount of space the varnish covers. The other drawback is time that will add to the standard turnaround quoted.

II. RESERCH 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 the recent developments happening in Packaging Industry.
- To counter the problems faced by Packaging Industries in the context of its recent developments.
- To explore the future possibilities in the field of Packaging Industry.

III. RESEARCH METHODOLOGY

The main aim of the study is to know the manufacturing process of carton by observing the process and organizational flow by training on carton printing machine.

Prepress: -During the 1990s, computer-aided prepress techniques began to supplant the traditional dark room and light table processes, and by the early 2000s the word prepress became, synonymous with digital prepress. Immediately before the mainstream introduction of computers to the process, much of the industry was using large format cameras to make emulsion-based (film) copies of text and images.

Artios CAD Software: - This is the world's most popular structural design software for packaging design of folding carton as well as corrugated boxes.

Features of Artios CAD:-

- No. of multiple ups can be made automatically by dragging the cursor.
- Paper/Board specification can be added.
- In bill material feature, we can do costing.
- There is no. of carton styles present in software. We can update it according to our creativity.
- It gives specific no. to CAD which we design automatically. With search option, we can find out any CAD.
- In carton log feature, there is automatic update of carton related totally features (e.g. customer name, board grain).

Problems occurred in Prepress section of Packaging Industry:-

- Dot gain and dot loss is the major problem in prepress section. We use tonal value curves to control it.
- In die cutting job, we have to give 2mm extra gap to eliminate die cutting margin problem.
- Overprint problem occurred; we remove it by using black color.

Press: -We use different varieties of board for printing, high quality of ink by which we print and different printing process for printing. There are different types of board used in carton packaging industry.

Problems occurred in Press section of Packaging Industry:-

Scumming: - In this problem, ink comes on non-image area.

Remedy:

- Check and control press room condition.
- Set fountain pH between 5.0-5.5 & Conductivity between 900-1200 siemens.
- Use ink having stable water take up profile.

Hickeys: - A hickey is any particle that sticks to the blanket or plate that transfers an imperfection to the printed page. Usually they are a dot with a ring around it or an unprinted void surrounded by printing. If they are left uncontrolled, they cause us massive amounts of waste.

Postpress: - In Postpress section, we can do abrasive coating, spot UV coating and glitter coating with the help of screen printing process on Maestro 102A. Screen printing is also a stencil method of print making in which a design is imposed on a screen of polyester or other fine mesh, with blank areas coated with an impermeable substance, and ink is forced into the mesh openings of the mesh by the fill blade or squeegee and onto the printing surface during the squeegee stroke.

Problems occurred in Postpress section of Packaging Industry:-

- Embossing and Debossing misregistration is the major problem occurred in Postpress section.
- During lamination, lamination wrinkle and delaminate problem occurred.
- Cutting size for label should not be more than 0.5 mm.
- In UV coating, patches problem occurred.
- Fibers tear and air bubble problems occurred during lamination.
- In Blister coating, coating GSM on board should not be more than 6 micron.

IV. RESULTS AND DISCUSSION

Packaging Industry play an important role for enhancing quality at minimum cost. There is no. of recent developments happening in packaging industry which helps in increasing productivity.

The recent developments noted in packaging industry are:

(A) Prepress section

- Artios CAD Software
- Visualizer
- Soft proofing
- Ugra certification

Benefits:-

- With the help of Artios CAD, we can design no. of multiple ups automatically by dragging the cursor.
- Paper/Board specifications can be added in Artios CAD software.
- With design check tool, we can see more than one hair line while designing carton CAD.
- Soft proofing improved turnaround time and increased savings by eliminating printing and production of proofs.
- Ugra gives the guaranty of quality & also provide consistent job repetition.
- Visualizer helps in saving both time and money by confirming designs instantly and correctly.

(B) Press section

- UV ink
- Versatile ink
- Folding Box Board (FBB)
- Solid Bleached Board (SBB)
- Metalized Printing

Benefits:-

- With the help of UV inks, we can print on non - absorbent substrate like metalized films.
- Versatile inks are transparent so that they are popular for printing on metallized paper. These inks are benzophenone - free.

(C) Postpress section

- Abrasive coating
- Drip-off coating
- Blister coating
- Glitter coating
- UV coating
- Pearl coating
- Spot UV
- Die - cutting
- Laser die cutting machine

Benefits:-

- When consumable costs are seemingly rising continually, drip-off coating is a way of reducing costs without compromising quality.
- The 'drip-off' coating is a fraction of the price and is also water based, making this a much more 'green' process.
- In laser die cutting process, the design of cutting is completed in the computer & all parameters for die board making is automatically generated by the software.
- The UV coating allows the carton to resist smudging and marking and allows it to maintain a professional, high quality appearance due to an extremely hard finish.
- UV coating provides both chemical and abrasion resistant to product.
- Spot UV coating provides instant visual impact to product.
- UV coatings are free of solvents and do not emit volatile organic compounds or VOCs when cured.

Problems faced by packaging industry:-

A no. of problems were faced by Janus packaging industry during the training tenure like colour variations, dot gain, overprint, piling, delamination, mottling, ink rub off, scumming, sheet curl after varnishing, cracking of coating during drying, air bubble problem during lamination of metalized film on board etc. These problems were countered by:

- Set fountain pH between 5.0-5.5 & Conductivity between 900-1200 siemens.
- If paper fibres, reduce tack of ink.
- Soften ink with reducer or slow ink-drying with anti-oxidant.
- Reduce impression cylinder squeeze.
- Check blanket hardness and packing.
- Check compatibility of ink with substrate.
- Heavy ink coverage in the fold area should be avoided.
- Adjust rollers to proper setting, replace if necessary.
- Use ink having stable water take up profile.
- Squeeze pressure to be maintained during production as per board thickness.

Past, Present & Future of Packaging Industry:-

- Paperboard cartons and corrugated fibreboard boxes were first introduced in the late of 19th century.
- In 1952, Michigan State University became the first university in the world to offer a degree in Packaging Engineering.
- Packaging advancements in the early 20th century included Bakelite closure on bottle and panel on cartons, increased processing efficiency and improved food safety.
- Several types of plastic were developed to improve performance and functionality into packages.
- In 2010, Indian packaging industry was US \$14 billion with growth rate of 12% per annum.
- Indian packaging industry is currently US \$18.8 billion with growth rate of 15% per annum. In the next five years, the sector is expected to triple to around \$ 60 billion.

- The net profit of the packaging industry spurted 104.5 percent during Q3 FY08, against a growth of 29.5 percent in the December '06 quarter.
- World packaging industry has been growing at a rate of 3 - 5% per annum.
- The large growing middle class, liberalisation and organised retail sector are the catalysts to growth in packaging.
- More than 80 percent of the total packaging in India constitutes rigid packaging. The remaining 20 percent comprises flexible packaging.
- Plastic packaging represents a large and diversified market estimated to be worth some US\$152 billion on a global basis.
- Rigid packaging industry is growing at about 13% per annum. Within the industry, there is migration to plastic.

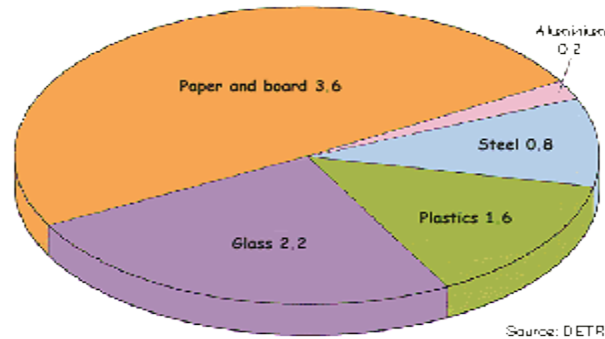


Fig. 01 - Packaging materials

Figures are in millions of tonnes. It totals 8.4 million tonnes.

This pie-chart shows the different materials (Paper and board, glass, plastics, steel and aluminium) used for packaging household, commercial and industrial purpose.

V. CONCLUSIONS

With the rapid development of world economy, the demands of packaging cartons and packaging boxes have been increasing. At the same time, there are more and more customized small orders with higher quality requirements but shorter lead time. Therefore, the traditional manual processing methods of carton making industry for making carton cannot fulfil such demands and will be eliminated eventually. However, the application of advanced techniques has brought new opportunities for colour printing, packaging and carton making industry. In prepress section, Artios CAD is used for designing of CAD of folding carton. With design check tool in Artios CAD, we can see more than one hair line in CAD of folding carton. With the help of Artios CAD, we can design no. of multiple ups automatically by dragging the cursor. In press section, substrates & sophisticated machines make the production work smooth and hasslefree. In post press section, we do drip-off coating, abrasive coating, pearl coating etc. The 'drip-off' coating is a fraction of the price and is also water based, making this a much more 'green' process. Currently, laser die cutting machine is widely used in packaging industries for making die. Different types of coating are done on cartons that give aesthetic look to our product. By doing the case study of Janus Packaging Pvt. Ltd., we have concluded that by the application of recent techniques, we can achieve higher print quality at lower cost with maximum production efficiency. Packaging is the need of the hour. Packaging industry will expand in future & consequently it will enhance its market share.

REFERENCES

1. <http://www.Google.com/> "packaging"/ retrieved on 2/11/2011.
2. <http://www.wikipedia.com/> "board and ink"/ retrieved on 12/11/2011.
3. http://esko.com/ArtPro_prepress+packaging/ "prepress software"/ retrieved on 25/11/2011.
4. <http://en.wikipedia.com/wiki/> "press definition"/ retrieved on 30/1/2011.

5. March Love/ "The Development of Embossing in Steel Rule Cutting Dies"/from <http://www.fsea.com>/retrieved on 6/12/2011.
6. Ramani Narayan/ "Biodegradable Plastics"/from <http://www.msu.edu>/retrieved on 8/12/2011.
7. Beth Simpson, Pamela Tazik, Gary Miller and Paul Randall/ "Waste reduction evaluation of soy based ink at sheetfed offset printer"/from <http://www.greenpressinitiative.org>/retrieved on 9/12/2011.
8. Nick Church/ "Developments in modified - atmosphere packaging (MAP) and related technologies"/from <http://www.nufs283.pasta.wikispaces.com>/retrieved on 12/12/2011.
9. James M. Rennes/ "Drying systems for paperboard coating"/from <http://www.tappi.org>/retrieved on 13/12/2011.
10. <http://packagingdesignanddevelopment.com>/ "post press development" /retrieved on 2/1/2012.
11. <http://forum.egpersia.com/esko-software-suite/> "prepress software" / retrieved on 12/2/2012.
12. <http://www.pneac.org/result/> "spot UV" /retrieved on 16/2/2011.
13. http://www.schaffnermfg.com/coated_abrasive.html/ "abrasive coating" / retrieved on 18/2/2012.
14. <http://www.en.wikipedia.org/> "SBBconstruction" / retrieved on 15/3/2012.
15. <http://www.en.wikipedia.org/> "FBBconstruction" / retrieved on 15/3/2012.
16. <http://www.offsetprintingtechnology.com/> "piling"/retrieved on 19/4/2012.
17. <http://www.technologystudent.com/> "box material"/retrieved on 22/4/2012.
18. <http://www.ugra.ch/pso-certification.pdf>/ "ugra certification"/retrieved on 23/4/2012.
19. <http://www.inkd.com/> "prepress checklist"/retrieved on 26/4/2012.
20. <http://www.fujifilms.com/> "eco-friendly fountain solution for offset printing"/retrieved on 2/5/2012.
21. <http://www.packagingconnection.com/> "metalized films and dyne level"/retrieved on 6/5/2012.
22. <http://www.eupia.org/> "UVink"/retrieved on 8/5/2012.
23. <http://www.global-print.org/> "global printing market"/retrieved on 18/5/2012.
24. <http://www.packaging-films.com/> "packaging films"/retrieved on 26/5/2012.
25. <http://www.lec.com/> "benefits of ugra"/retrieved on 28/5/2012.
26. <http://www.printingforless.com/> "embossing"/retrieved on 28/5/2012.
27. <http://www.flowprinting.com/> "glitter coating in printing"/retrieved on 29/5/2012.
28. <http://www.packtest.com/> "scuff tester image"/retrieved on 29/5/2012.
29. <http://www.oakhillscarton.com/> "folding carton image"/retrieved on 31/5/2012.
30. <http://www.icad.com/> "Artios cad image"/retrieved on 1/6/2012.
31. Sam V. Nablo/ "Recent developments in radiation curing in USA"/from <http://www.sciencedirect.com>/retrieved on 14/6/2012.
32. J. Lange, Yves Wyser/ "Recent innovations in barrier technologies for plastic packaging"/from <http://www.online.library.wiley.com>/retrieved on 15/6/2012.
33. Bruce Duncan, Richard Mera, Doug Leatherdale, Mark Taylor and Russell Musgrove/"Techniques for characterizing the wetting, coating and spreading of adhesives on surfaces"/from <http://www.npl.co.uk>/retrieved on 15/6/2012.
34. Gecevskas, V. & Panjan, P./ "Light cardboard production process and cutting tool life improvement"/from <http://www.maja.uni-mb.si>/retrieved on 18/6/2012.
35. S. Adamopoulos, E. Martinez, D. Ramirez/ "Characterization of packaging grade papers from recycled raw materials through the study of fibre morphology and composition"/from <http://www.gnest.org>/retrieved on 18/6/2012.
36. Robert Fergesen/ "Maximizing UV Coating Quality with Roller"/from <http://www.fergesen.com>/retrieved on 18/6/2012.
37. Pandurang B. Daphalapurkar and Madhura P. Mahajan/ "Effect of emulsification in offset printing"/from <http://www.ascentjournal.com>/retrieved on 19/6/2012.
38. G. A. Wokocho/ "Impact of Packaging Industries on Environment in Rivers State"/from <http://www.eurojournals.com>/retrieved on 19/6/2012.
39. Scott Pratt/ "Temperature Control for Computer to Plate Technology"/from <http://www.thermo.com>/retrieved on 19/6/2012.
40. Masayuki Kawasaki, Masaya Ishisaki/ "Investigation into the cause of Print mottle in halftone dots of coated paper: Effect of optical dot gain non - uniformity"/from <http://www.tappi.org>/retrieved on 20/6/2012.

