

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****PERSPECTIVES OF TOTAL QUALITY MANAGEMENT & WASTAGE
REDUCTION IN CORRUGATION PRINTING****Arohit Goyat^{*1}, Sangita Yadav² & Bakshinder Kaur³**^{*1}Assistant Professor, Department of Printing Technology, GJUS&T, Hisar (Haryana)²Assistant Professor, Department of Printing Technology, SITM, Rewari (Haryana)³M. Tech. (Print & Graphics Communication), SITM, Rewari (Haryana)

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ABSTRACT

Packaging plays a very important role in the country's economy. Till recently only the western world, more particularly the developing countries cared about proper packaging. However, now an even developing country like India have changed their outlook towards packaging and in the last few years increasing stress has been laid on improved and proper packaging. In fact, today, packaging is as important as the contents. Corrugated boards were first produced in India in early fifties. Since then the production of corrugated boards has increased steadily. Corrugated boxes have replaced wooden boxes & crates in many applications. Today, about 80 % of all shipments in the world are being made in fibre board boxes. In India, about 60 % of the packaging is being done with corrugated fibre board boxes.

Keywords: amenities, stability etc.**I. INTRODUCTION**

Corrugated Kraft Paper Board Box, technically called Corrugated Fibre Board Box is the most popular shipping container, now- a – days. The box is manufactured from corrugated board which consists of 3 or more layers of Kraft paper. The Middle fluted layer is pasted with two flat parallel sheets of paper. The boxes find their number of applications in the packaging of chemicals & drugs, tobacco, engineering goods, canned & bottled goods products, lamps, electrical appliances, glassware etc.

A Few facts about corrugated boxes:

- Corrugated boxes were invented in china in the 15 th century and patented in England in 1856.
- It was originally used as the lining in tall hats. It was only in 1871 that it was patented as a shipping material.
- These boxes are fully recyclable and biodegradable.
- Old corrugated cardboard boxes are the most recycled product by weight. Since 1960, the recycling values of old corrugated boxes have increased by 305 percent.
- The amount of corrugated boxes that is generated in one year can equal to a weight of 29.7 million tones .That means that there is 195 pounds per person of corrugated boxes manufactured per year.
- A monumental amount of corrugated box is recycled every year. Over 22.76 million tones go for recycling and have a recycling rate of 76.6 percent.
- Recycling a corrugate box 75 % less energy than making a new one.
- But this product becomes totally useless from fully recyclable if it is contaminated by oil or water.
- Another fact about the corrugated box is that this medium has usually has more recycled content than linerboard..
- It is also the third largest product disposed of by weight.
- Its landfill volume is 26.3 million cubic yards.This makes it the second largest item in landfill by volume.
- The largest amount of waste products of corrugated boxes comes not from the factories, but from departmental stores and large markets.

- The wt. of the corrugated boxes has reduced by 10 to 15 % in the last decade due to linerboard light weighting..

Corrugated Box

Corrugated cardboard is generally used to make packing or shipping containers. Though there are various other types of cardboard boxes available, corrugated boxes are the most suitable for maintaining the safety of the object it is carrying, especially for long distance shipping purposes. This is because they are made of corrugated paper, manufactured from fibre and is sandwiched by cardboard. This setup makes it very sturdy and ensures the delivery of the articles that it is carrying with zero damage. While some corrugated boxes are made out of plastic, the majority is limited to paper.

Corrugated boxes confirm safety and protection of product being shipped. It also offers durability, cost effectiveness, lightness, strength and recyclability which make it an ideal choice for merchandising and marketing of goods with ease. They are also known to have a good

Stacking strength. Stacking strength refers to the pressure that is formed during stacking. The stacking strength of the corrugated box also plays a vital role in providing crush resistance and product protection.

Paper weight

Usually the weight of the paper is specified in the terms of grams per square meter (gsm). In the manufacture of standard carton, the paper used is generally of 125 gsm to 150 gsm. If the box is used for heavy duty purposes such as export, paper weighing 300 gsm is used.

Outer liner

The paper outside the box is called the outer liner paper. Typically the outer liner paper is generally made up of virgin craft paper. But these days, the composition also contains about 12 % of recycled material.

Inner liner

Inner liner paper is the one which is used on the inside of the box. It is completely made up of recycled material, virgin board, a mixture of newspaper waste and more as such. Though this may not seem as appealing and strong as the outer liner paper but it has an advantage of reducing the weight of the box considerably, being environment friendly and fully recyclable.

Type of flutes used in corrugated Boxes:-

Board corrugation of flutes refers to s shaped arches or waves of the corrugated box, present between the boards. These flutes, which run parallel to the surface of the corrugated board play a vital role in giving the box its strength and rigidity. In addition to this, flute also help in regulating temperature within the box.

B FLUTE:

- It has a thickness of 1/8 “.
- It has 40 – 50 flutes per foot.
- It gives the second highest arch size.
- It provides greater crush resistance and stacking strength.
- It is generally used in the packing of canned goods and displays.

C FLUTE:

- It has a thickness of 11/64 “
- It has 39 – 40 flutes per foot.
- It forms a medium between type A flute and type B flute.
- It is the most common type of flute used in corrugated boxes.
- This type of flute also exhibits good cushioning, stacking and printing properties.
- It is used in the packaging of furniture, glass and diary.

E FLUTE:

- It has a thickness of 1/16 “
- It has 94 flutes per foot.

- It makes the board extra thin in turn reducing its weight and size.
- It imparts the best crush resistance.
- It is an excellent choice for printing purposes , making it a good choice for die cut custom boxes.

Types of Corrugated Boxes

The factors that are considered while planning the design of the corrugated are shocks caused due to shipping hazards, tremor, humidity, compression and if things become worse , the corrugated box must survive fire. Besides being fitting protection for the product that has to hold, a corrugated box has to be designed in a cost effective manner, should meet the customer requirements, logistical wants and machine necessities.

The shape in which the corrugated box is manufactured is based on its end use. But on a large scale, here are the types of boxes that are generally used in packaging and shipping industries.

Slotted boxes

Slotted box is one of the most commonly used types of corrugated box in the industry. Its types include the half slotted box, regular slotted box, etc. A slotted box is used for the packaging and shipping of a wide variety of materials. It is also a very resourcefully designed product as during its manufacturing process, there is a minimal waste production. They are usually made from one piece of corrugated board which is glued, stitched or taped. The design of the slotted type of the corrugated box is the most efficiently in many the cases. The shipment of these boxes is in a flat manner and can be used as soon as delivered.

Self Erecting boxes

Self erecting boxes , or widely known as auto bottom boxes have an added security and safety due to the folding and locking mechanism made out of flaps at the lower end of the box. They are recognized for their strength and sturdiness. Also, they are condensed and can be used easily for storing requirement. They most suitable for assembly lines as they are effortlessly put together and also beneficial for conveyor systems with top seating automatic tapers.

Folder boxes

Folder type of corrugated boxes of box is made from an individual piece of corrugated cardboard that gives it a continuous and level bottom. The side walls are linked to the ends of corrugated cardboard at the end .To boost the design of the box ,handles , locks and display panel are added according to the customer`s needs. They are at the large detached corrugated boxes that are used to pack huge or unevenly shaped parts.

Rigid boxes

Bliss style boxes as rigid boxes are also known are among of the most robust and hard-wearing packing materials. It contains of 3 Portions – two end pieces and a body that are pasted or sewed together. The flaps that are used to make the joints can be on the end pieces, the body or both. They typically have six or more linkages and upon being stuck down, they make a very firm and durable frame.

Telescopic boxes

Telescope boxes are one of those few types of corrugated boxes that are unique and one of a kind .Few examples of telescope boxes are, the full telescope design container, the design style container, etc. Telescope types of corrugated boxes are widely used in industries. They involve 2 parts the cover and a detached bottom. This is also referred to as the body on which the cover usually comfortably fits or `telescopes ` the box. The cover ranges nearly two – thirds of the depth of the box. Telescope boxes are largely used in the packaging of shoes, watches, jewelry, etc.

Type of printing methods for corrugated Box

There are various types of printing methods that are employed on the corrugated box to get the desired output, they include:

Flexo Line

This one of the most primary techniques used for printing on corrugated. It is a cost effective printing method to get basic graphics on the surface of the corrugated box. This is used to print the company or package content using simple line art and text using 1-3 colors.

***Flood Coated***

It is used for retail application; Flood coating allows 100 % coverage of color thereby providing a greater visual impact. Die costs are nil as a flood cost can be applied using print plates .

Flexo process

This process is utilized for the printing of higher end graphics by means of 4 Process colors. Since there is a use 4 plate, the overall expense also goes up. The four colors used provide a greater visual impact .AN added advantage to Flexo process is that photo quality image can be used for printing on the corrugated box.

Label Laminate

This is done by gluing printed sheets to the corrugated box. You can get a glossy finish at a reasonable cost as well. Label lamination gives the box a professional look and also offers up to 100 % coverage .It can give you a high quality finish.

Screen Printing

This is another method of making graphic intensive print on the corrugated box. This is the most effective printing method for short run quantities. The size limitations are large and more than four colors can be used for printing.

Litho Laminate

It is similar to label laminate but the printed surface in the case of litho laminate is a part of the corrugate box. The end result of both litho lamination and label lamination is the same.

Preprint

It can be used to apply impactful graphics of high quality but requires a significant investment from he client. It gives a similar result as flexo printing and is largely used in food and beverage industry.

Advantages of Corrugated Fibre Board Boxes:

There are various advantages of corrugated Boxes,

- Light in weight
- These provide protection to the content from Dust, dirt & moisture.
- These are conveniently stored in folded condition when not in use, thus saving storage space.
- It can be attractively printed , thus advertising
- These are easy to fabricate.
- These are available throughout the year
- Expedites production due to one line conveyor packing.
- These are re- usable.
- No strapping necessary
- Desired in export market.
- Eliminated dependency on natural wood.
- By lining , lamination or coating , they can be made water resistant and resistant to other adverse conditions.

Applications

Corrugated fibre board boxes are being used for the packing of industrial as well as consumer goods. They are used for packing of chemicals , drugs , tobacco , engineering goods , canned and bottled goods such as whisky , Beer, Soda, Drinking Water ,Ketchups , food , electrical appliances , confectionary , textiles , fruits , vegetables , potteries , footwear , glassware's and other fragile items , medical instruments , photographic equipments and a number of other products.

Some other applications are;

1. Automobile Components
2. Apple, Cherry, grapes etc.
3. Biscuits
4. Breweries
5. Cashew nut industry

6. Cigarettes
7. Engineering items and consumer durable like refrigerators, TV's, Air Coolers, fans etc.
8. Electronic products
9. Frozen fish
10. Footwear's
11. Glassware , crockery ware
12. Hosiery & readymade garments
13. Match boxes
14. Milk products & other food items
15. Pharmaceuticals
16. Rubber & rubber products
17. Soaps & Cosmetics
18. Stationary items
19. Tea & Coffee
20. Toys

II. RESEARCH OBJECTIVE

The Objective of this study is to improve the quality of Corrugated boxes by Implementing TQM Process and reduce the wastage of Kraft paper & Corrugated boards by using different techniques in “Asian Group of Industries, Baddi”.

III. RESEARCH METHODOLOGY

The whole Study include Total Quality management system that is build in a corrugation industry by use of quality management tools and techniques , methods and procedures that are referred to as quality improvement initiatives. The following methodology will be adopted during the study;

1. Study of different techniques & processes used for Implementing TQM in Corrugation Printing.
2. Study of paper & board wastage reduction techniques in Corrugation Printing.
3. Some jobs of the “Asian Group of Industries , Baddi ” during project work will be selected in which Paper & Board wastage is more & the study will be conducted on each selected job.
4. Data Related to Quality management & Wastage Reduction Will be Collected during the study.

IV. FUTURE & SCOPE

This research focuses on to the quality management & waste reduction in corrugation printing in “Asian Group of Industries”. In all these methodologies, when check list gets adopted number of wastage depending upon the job and machine availability. This preliminary result can be used and in future check point suggestions incorporated in the printing section may be indicative for other organizations. They may be 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 check point helps to reduce the wastage of paper & board with proper quality control & quality management. The study may be concluded in a manner that, if all suggestion were implemented for reducing wastage & improving quality will implemented then a positive result will achieved

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