

# Paper Conversion for Packing .

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Gone are the days when people in our country used plantain leaves, old newspapers, rags and such other materials for packing purposes. With the developments of industries and growing competition, there arose a need for finding out a suitable packaging material that would be functional, convenient to handle, eye-appealing, light in weight and durable. Paper, by virtue of its versatility, opacity, printability was found most suitable to meet the demands of the sophisticated market. Utility of paper was greatly enhanced by its ease of conversion by a number of economical converting techniques. It can be sewed, glued, stapled, taped, joined with water and solvent based adhesive and given heat sealable properties upon coating. Various grades can be creased, scored, die-cut, folded or otherwise shaped. Hence paper enjoys the most dominating share in the packaging field, inspite of the stiff competition poised to it by other materials. As per the planning commissions report, the total projected demand for paper based packaging materials in 1976

would be 6,50,000 tons and this is expected to step up further to 10,00,000 tons by 1980.

There are host of varieties of papers available in the country, e.g. kraft paper, the strongest and cheapest is available in MG & MF finishes, sack kraft paper, Bleached papers, grease proof and glassine papers, vegetable parchment papers, printing papers, tissue papers, pouch papers etc. The pace of development in speciality papers has closely followed development in the field of paper conversion. In order to meet various packaging needs, paper can be converted into specific requirements. The 'Conversion' of paper, generally consists of steps to modify its nature and functional qualities and to make it suitable for specific end-uses. Paper, if used only for printing or writing purposes will leave little scope for the development of the pulp and paper industry. It is the conversion of paper which has found new horizons and thus contributed to the developments of the Industry.

Paper could be converted for packaging by a number of processes :

**Printing :** Paper is the material for which the major printing processes were developed. No other material matches the reproduction quality of high-grade paper. Rapid improvements in paper technology are leading to superior quality of

printing, at relatively low cost. The versatility of paper making makes it possible to produce paper with specific printing characteristics—strength to withstand stress and strain, good formation, dimensional stability, ink receptivity, softness and compressibility. Because of the easy adaptability of paper, the marketer, or packager can either subtly or boldly convey the sales message of his product. It is a package relations created by means of typography, colours, illustrations and other design elements that help to bridge the gap between the product and the consumer. What counts is the salesmanship, showmanship and the expression of packaged goods personality. Paper facilitates these most. The most common processes of printing paper for packaging are :

**1. Rotogravure :** Printing done by copper cylinders which are etched and the printing areas are recessed slightly below the non printing areas. The printing cylinder dips into the reservoir of ink and as it rotates against a flexible blade called 'doctor blade', the peripheral surface is wiped clean, leaving ink only in the recessed printing areas. The paper to be printed is passed between the doctored cylinder surface and a resilient impression cylinder, when most of the ink in the recess-

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ses is lifted out and transferred to the paper.

**2. Letter-Press :** Printing done by means of printing blocks made of copper or zinc; the non printing areas of the block are recessed below the printing areas. Thus when ink is applied to the printing unit by means of a roller, only the printing areas come in contact with the roller and take ink from it. Similarly only the printing areas touch the paper to be printed and transfer ink.

**3. Flexography :** The principle of this process is also 'Relief' as in case of letterpress, but the difference is that the printing is done by rubber stereotypes, which are mounted on the plate cylinder. The rubber roller picks up the ink from the ink-tray and transfers it to the Anilox roller, which further transfers the metered ink to the stereotypes.

**4. Lithography :** Although both printing and non-printing areas are at the same level relative to the inking roller, and both make contact with it, the non printing areas must be so treated chemically that they do not pick up any ink. In this process the printing plate selectively picks up the ink and transfers the impression to the blanket cylinder, further from which it is transferred to the paper.

Printed paper *Labels* are widely used in packaging industries and helps the consumer to identify the products, get the necessary information regarding the ingredients, directions of use, manufacturers name etc. and act as a silent

salesman. The printed labels may be gloss finished, embossed, or otherwise modified without difficulty. Paper, amenable to such beautiful printing, leads to another end use—'Wrappers'. The wrapper is a sheet of paper usually formed around the contour of the product or primary package. It may be a direct wrap, an over wrap, or the bundling wrapper for multiple units. Gift wraps are usually gloss coated papers, printed with attractive colours, or glassine papers sometimes embossed. The metallised papers & coloured tissue papers, also add to the list of these fancy wraps.

The second phase in paper conversion for packaging is—'Coatings'—coatings on paper form both a functional and an inseparable partnership with or without supporting materials. The basic purpose of coating paper is to provide protection against-water vapour, gases, odour, greases and chemicals. The material functions of coating impart-heatsealability, visual appeal, scuff resistance and release properties.

A common method of classifying coated paper is by method of application :

**1. Waxed Papers :** Paraffin wax is heated to a molten state and deposited on the paper by immersion, roll coating or various other methods then cooled until solid. If a limited quantity of wax is applied to a relatively porous base paper at high temp. and the waxed paper wound up hot, the wax will saturate the sheet leaving

little or no wax on the surface, resulting in 'Dry-Waxed' paper. Similarly, a 'Wet Waxed' paper is manufactured by waxing at lower temperature, followed by chilling the wax film prior to winding cold off the waxes. In this case, most of the wax remains on the surface as a continuous film. The common uses of waxed papers are for packing of soaps, bread, confectionery etc.

**2. Hot Melt Coatings :** Include all formulations of wax and modifiers which may be polythene powder, micro-wax, ethyl cellulose cyclised rubber, butadiene-styrene copolymers etc. Hot melt coatings are characterised by extremely strong heat seals, superior barrier properties, more durability and better gloss. Some of the uses of hot melt coatings is for packaging of Biscuits.

### **3. Dispersion & Solvent Coated Papers**

A resin or resin formulation is dissolved in a solvent or dispersed as an emulsion, then roll coated or sprayed on to the paper, and the volatile liquid removed by drying. Anti corrosive papers for packaging blades, needles and other engineering goods fall in this category.

### **4. Extrusion Coated Papers**

Polythene or any other thermoplastic granules are fed into the extruder which has a long heated, horizontal barrel where the resin is melted. A rotating screw inside the barrel not only mixes the melt to a homogenous consistency, but also pushes it out to the end off

the barrel through a flat slit die. The molten polythene comes out of the die as a thin cast film and lands flat on top of the paper which is passing in between two nipped rollers (one of them chilled). Due to the pressure and chilling action of the two rollers of the laminator, the hot polythene film firmly bonds and solidifies on to the substrate which is then wound up. Extrusion coated papers are widely used for unit packaging of detergents, food products, pharmaceutical tablets, and various other items.

### Laminations

Another form of converting paper is by way of lamination. Lamination is the combining together of two or more plies of the same or different substrate to form a single complex with considerably improved characteristics. There is no universal paper that is a barrier to all conditions. A single material like paper may be incapable of fulfilling all the packaging requirements for a given product. The combined structure thus provides additional properties to the laminated paper. For instance paper is laminated to Aluminium foil to impart barrier and decorative properties. Laminated paper board is an example for added bulk and strength. Similarly multiple ply laminates of paper with other substrates like cellophane, polythene etc. are produced to meet the specifications for impermeability to gases, moisture, greases, as well as for strength and heat sealability. Paper in any form of lamination imparts good folding endur-

ance, reasonable heat-resistance, body and stiffness for a smooth performance on the converting and packaging machines. Bonding of paper to other substrates is effected by one of the five methods—

**1. Wet Laminations**—Employs a water based adhesive which is applied to one web of material which is then immediately combined to the second ply. The 'wet' combined plies are then passed through a drying tunnel where the water is evaporated through one of the plies.

**2. Dry Laminations**—In this system solvent adhesive is used and is applied to one ply of material which is then passed through a drying tunnel to evaporate the solvent. The 'dry' adhesive coated web is then pressed against the second ply of material to accomplish a bond. Here, two non-porous plies may be combined.

**3. Wax Laminations** : Is a process by which molten wax is applied to one ply of material, then combined with the second ply over cooled pressure rollers. Since this system employs no solvents, no drying tunnel is required.

**4. Extrusion Laminations** : During the process of extrusion coating as described earlier, a second substrate can also be released from an auxiliary unwind stand and passed through the nipped chill and pressure rolls, with the molten polythene sandwiched in the middle, resulting in extrusion lamination.

**5. Heat Lamination** : is restricted when one of the plies is a thermoplastic film, and is snapped

on to the second ply which is heated by means of a hot roller so that the film melts slightly in the nip and both the plies are bonded under pressure.

Water proofing properties can be incorporated in the paper by sandwiching bitumen in between two layers of kraft papers. These are called '*Bitumen Laminated Papers*.' These may further be reinforced with jute or cotton yarn. The purpose of laminating is to increase thickness, rigidity, and impart grease resistance properties.

### Paper Bags and Multiwall Sacks :

A very common conversion of paper in India is bag making. A packager finds many advantages in bags for retail products. Their light weight and compactness make them economical in shipping and storage. They are readily disposable. With a sealed closure, they are tamper proof, thus preventing pilferage. As a merchandising tool, bags choose opacity or transparency, depending upon the paper used. For artistic designing, the bag industry supplies multi colours printing.

Through constant efforts by bag manufacturers and users to utilise new developed materials, *Multi-wall Paper Sacks* are gaining popularity in the country. They are made from 2 to 6 plies of tubular walls of sack kraft paper. The sacks are of two main types a. Open mouth type, the bottom of which is closed by pasting or sewed and the top kept open ready for filling. b. Valve type,

with both top and bottom closed and a valve kept at one corner through which the product can be filled by an automatic filling machine. These sacks are used to pack fertilisers, chemicals, cement, sugar, flour etc. They can be easily handled, palletised, and stacked to great heights, thus saving storage space. The products are well protected against sifting or puffing. The sacks pour well and empty clean. They can be printed on both sides and favourably with the cost of almost all types of containers.

#### **Paper Boxes & Containers**

**Corrugation of Paper :** The corrugated board consists of one corrugated member glued to one flat liner, resulting in a single faced board. These corrugated boards when further converted into cartons and boxes provide the required cushioning effect for packaging fragile items. The other distinct advantage as compared to its rigid counterparts is its being extremely light in weight. The corrugated boxes can also be printed and made water resistant. The problem of closing the corrugated boxes is well solved by another end-use of kraft paper, *The Gummed Tapes*. These tapes require moistening with water before its application. They have three major applications in the packaging industry sealing, reinforcing and banding. The tapes provide

excellent protection against handling and shipping hazards.

**2. Solid Fibre Board :** For master packaging the solid fibre board could be used. The solid fibre board is a lamination of various plies of Mill board, lined with strong kraft paper. It has a good puncture resistance and is quite suitable for packing heavy materials.

**3. Fibre Drums :** Fibre drums are straight sided cylindrical shipping containers, made of kraft paper and mill board/chip bound which is convolutely wound without joints. They vary in capacity 3/4 to 70 gallons. It is ideal for packing powdered and granular products.

#### **4. Composite Containers :**

As the name suggests, the composite container is composed of a variety of materials. They are usually multi paper bodies, rigid, having metal ends. Optional features for added protection include moisture resistant barriers, provided by lining of paraffin, glassine, parchment or anticorrosive papers. These containers are usually used in packaging of dry products like chemicals, spices, biscuits, baking powder, glucose etc.

#### **5. Liquid-Tight Containers :**

Paper containers for milk are likely to be a development in our country in the near future. It is the result of successful marriage

of paper with polythene. Polythene linings are available both on the inside and outside walls of the strong kraft paper, with another layer of printed waxed paper on the outer side. (Tetra Pack). The advantage of the paper containers over glass bottle are obvious—easier to handle and open, no breakages or chipping of bottles low cost, more hygienic, easily disposable, lighter in weight and amenable to better printing.

We are all aware that paper, though such vital commodity is very much in short supply and thus has put the conversion and packaging industry, virtually out of gear. The last six/eight months have witnessed a spirally increase in paper prices and even then there is an acute shortage. This situation has thrown a challenge to the very existence of the packaging industry. All this will ultimately have a detrimental effect on the food, pharmaceuticals, export, defence, confectionery, soap and other consumer industries, which use paper converted packaging materials. As it is, our packaging standards as compared to the International standard are very low. If this shortage continues then the conditions will be still worse and will slacken the sinews of India's industrial, educational and cultural progress, which will harm the country's interest in a larger way.