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Packaging Industry is one of the fastest growing sectors of all industries in industrially advanced countries and its significance and essentiality is increasingly being realised in India. In spite of strides made by polythene, FVC etc. plastic films, about sixty per cent of world's packaging materials still consist of paper and its derivatives. Paperboards of all types, chromo and glazed poster paper and kraft paper constitute the core of materials required in the packaging industry.

The supermarket system of retailing food and general stores, modern methods of consumer merchandising and innovations such as coin-operated vending machine have been responsible in western countries for the tremendous growth of the versatile paperboard packages. Folding box board has been fashioned into literally hundreds of different structural styles of boxes, containers and display cartons. Paperboard cartons have been found ideal containers for detergents, frozen foods, ready-made garments and hosiery items, machinery components, cosmetics, etc. Attractive designs printed in several colours contribute to the carton salesappeal. A recent advancement is to build into the folding box more and more functional properties including mold inhibitors, insect repellent, rust resistant agent, etc.

The necessity of functional and protective packaging paper and board for exports, agro-industrial products and an extensive range of consumer goods has enhanced the importance of close co-operation between the paper and board manufacturer, the convertor and the packer to provide customer satisfaction to the ultimate consumer. It has become vital that the paper mills and convertors should work very closely to resolve each other's difficulties and to give the end user what he wants at the price he can afford to pay. The Indian printing and conversion industry appears to have reached a

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Paper and Board for Packaging Industry

stage where the speed and efficiency of printing and conversion are increasingly being affected by the quality of indigenous paper and board. If the planned growth of paper packaging industry is to be maintained and if India is to compete in world markets, it is vital that paper makers should come to the help of packaging industry. The objective of this paper is to review briefly the paper and board quality factors that affect the efficiency of high speed and automatic printing and conversion processes and also have a bearing on the quality of the finished packages.

SUBSTANCE

The international standard for substance variation is $\pm 5\%$ and this has also been accepted as the standard by the ISI. But from our experience we find that a substantial proporation of paper and board produced in India does not conform to the specified tolerance. The functional performance of the final package suffers if the substance is below the specified level and the convertor suffers a loss if the substance is on the plus side. What is more important is uniformity of substance throughout the web. However, the point I wish to make is that we have seen several good lots of paper and board where the substance is within a remarkability close range. It is not therefore outside the process capabilities of Indian paper mills to produce paper and board of uniform substance. A rigid quality control is all that is apparently required. Even a warning label that a particular lot of board is likely to have variations over and above the specificed limits would help the convertor. The suspect lot can then be used for less critical end uses.

CALIPER

Uniformity of caliper in board is very important because excessive variations in thickness reduce the printing speed and cause uneven printing, specially for halftone jobs, which results in rejections. The conversion stage is also adversely affected by caliper variations specially for carton meant for machine packing. In automatic cutting and creasing machines the pressure between the die and the material is adjusted to such fine tolerance limits that even a slight variation in caliper can make a lot of difference in quality of the finished product.

In India today there is a distinct shift towards automatic machines packing of consumer goods. These high speed packing machines into which cartons are fed as either blanks or glued and collapsed state work to very rigid tolerances. To the board maker it may appear somewhat distant target but variations in board caliper do in fact mean frequent production hold-ups and rejections at the carton filling and sealing stage.

FORMATION

A uniform sheet structure which in turn is dependent on the degree of fibre dispersion is one of the most desired quality of paper and board from the standpoint of offset printing. Nonuniform formation results in variation in board stiffness which gives rise to producton hold-ups because of jamming on high speed automatic conversion lines. It also gives rise to colour variation through the run on printing machines. The denser portions of board are more receptive to the printing ink, particularly if large solid prints are involved. Areas of poor formation cause the print to appear patchy. This is an area where there is a lot of scope for improvements. Here again the least that can be done is to put a caution label on substandard lots.

CURL

The paper or board sheet must have no curl and waviness so that it can be fed into the printing machine evenly for proper print registration. A high degree of flatness is specially im-

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portant for offset printing as buckling or fanning out problems are encountered if the paper is not entirely flat.

DIMENSIONAL STABILITY

Paper and board for packaging requires high degree of dimensional stability. Paper makers must therefore take all possible precautions in setting their manufacturing conditions so that the board, especially if it is going to be used for offset printing, should have good dimensional stability. All good printers would normally condition the board in order to adjust the moisture equilibrium but that alone is not enough. The board must inherently have the highest possible dimensional stability. This is essential if misregistration is to be avoided in offset printing where sometimes as many as nine different colours are required to be rigistered in position in successive stages.

SURFACE FINISH

The surface finish affects printing as well as the ultimate appearance of the carton. More and more packers of consumer products are showing their preference for lifelike designs in order to provide appropriate sales appeal for their products. This in turn is giving rise to more and more demand for board with smoother and brighter surface finish. In all fairness it must'be said that some Indian paper mills have been successful in producing board with surface finish as good as imported board. Unfortunately, there is not enough consistency and the surface apperance and quality vary a great deal. Some of the common defects include difference in brightness, hairline cracks on the surface which show up on printing felt marks, low opacity of the liner, shade variations within the lots, etc.

PICK VALUE

Another hazard in litho printing connected with the surface (including the back) is the low pick value. All board mills should equip themselves for the Dennison Wax pick test and regularly check the pick value of their produce. It has often happened that the tack of the printing ink pulls out tiny bits from h board due to its low pick value. This can cause serious produciton problems if the board surface bit thus picked rolls over a few times and causes permanent damage to the blanket.

FOLDING PROPERTIES

Board mills in Japan and Europe produce a special quality of duplex board called bending box board. As a matter of fact, such box board is more popular than any other variety of board because particular attention is paid to the bending quality of the board. During automatic carton manufacture the board is first fed into cutting and creasing platen and carton blanks are detached. These blanks must withstand severe folds and must not crack at creases during the subsequent gluing on high speed gluing machines or during the stitching operation. Gluing machines are normally run at high speeds, in some cases as high as 1,20,000 cartons per hour. Unless the folding characteristics of the board are satisfactory it is not possible to make good cartons on a high speed conversion equipment.

INK ABSORBENCY

With the exception of one or two board mills, the paperboard produced in India is too absorbent. In some cases the board is so bad that not only is the print unattractive but also it gives no gloss when varnished and it is unsuitable for waxing. The ideal absorbency level which would suit printing. varnishing and waxing would be with a K & N value around 45. It should, however, be noted that it is risky to reduce absorbency in order to improve varnishability or waxability without a corresponding increase in the back pick values and a reduction in fluff on the back side as otherwise there is a danger of ink setting off and subsequent sticking of printed sheets.

FLUFF

One of the problems which deserves serious attention from paper technologists in India is accumulation of fluff on the blanket and printing plate with the use of indigenous board in offset printing. The efficiency of litho printing can be vastly improved if a solution can be found to the fluff problem. Flu-

ffing is caused by fibres or pulp debris consisting of fine fibres and surface sizing material loosely held on to the surface of the board. The seriousness of fluff problem can be assessed from the fact that using indentical printing machines, the average production in India is only about a third of what is obtained in European countries. Many times it becomes necessary to stop the machine after about every 500 sheets run in order to clean fluff off the blanket and printing plate. Apart from loss in production the quality of job suffers due to frequent stoppage resulting in colour variations and fine halftone jobs getting filled in print.

The fluff originates from 3 sources, i.e. the surface, the back and the edge. The convertor can control the edge fluff by trimming the board sheets on all four sides. However, he has no way to control the surface or the back fluff. In our experience we have come across two types of fluff. One is hard and abrasive fluff which takes the grains off the printing plate. The other is soft fluff which gets on to the blanket and makes the print appear rough. We tried various methods to prevent the interference of fluff with printing, in some cases even by sealing the board surface. So far we have not been able to overcome these difficulties because the origin of fluff is apparently the board itself and the problem can possibly be resolved by none other than board mills.

WHITENESS/BRIGHTNESS

Whiteness is profoundly desirable for board meant for display cartons. What is more important, however, is consistency and uniformity of surface brightness. In order to get good brightness the pulp is sometimes bleached beyond permissible levels. This results in persistent cracking of the surface. For box board this should never be resorted to. It would be far better to maintain a uniform colour and brightness even if it is at a some what lower level. Generally speaking, indigenous boards have much lower brightness than boards produced abroad. Efforts should be made to use more efficient bleaching agents which can give higher brightness in a shorter bleaching time.

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STRENGTH PROPERTIES OF PAPER

Considerable quantities of poster paper are used in India for the manufacture of laminates in combination with polythene and similar other films including aluminium foil. For example, paper/ polythene laminate is used to a large extent for the manufacture of sachets meant for packing non-soap detergent powders. The most important property for the paper required for such laminates is high tensile strength so that the laminate may not snap during subsequent high speed automatic filling and sealing operation. Only one paper mill in India is so far able to meet the tensile strength specifications for such machine glazed poster paper. As suggested earlier the possibility of empolying more efficient bleaching agents should be investigated as that should improve the strength properties of paper to some extent.

FUTURE DEVELOPMENTS

The availability of certain special grades of paper and board essential to good packaging is an important factor which needs serious consideration if the packaging industry is to grow in India in its own right and play a significant role in the national economy. Some of the progressive paper mills in India should examine the possibility of the indigenous manufacture of these special papers and boards. Two examples of such basic packaging materials are furnished underneath :—

a) Vegetable Parchment

To the best of the writer's knowledge and belief, no paper mill in India is manufacturing vegetable parchment paper which is made by passing a sheet of waterproof paper (an absorbent sulphate or suphite sheet) through a sulphuric acid bath. The parchmentisation makes the paper more compact and thinner. The paper gains in strength properties and becomes grease and oil resistant. Vegetable parchment is extensively used as a protective wrapper for butter, margarine and several other food products.

b) Board for Milk Cartons

Special purpose boards with high resistance to milk or grease are

not available indigenously. Such special food board should have liquid, moisture or vapour resistance, good bending qualities and extra strength. The board may be hard sized with a surface suitable for colour printing and it should be produced under sanitary conditions so that the paper board may be used for direct contact with foods.

The paper technologists, of course, have their own difficulties and limitations of raw material and equipment. No attempt has been made in this paper to consider the paper makers problems in meeting the requirements listed above. However, closer collaboration and exchange of information between paper makers and convertors should help in understanding each other's problems and to overcome them in the interest of all-round improvements and progress.

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