

COURSE ON PACKAGING

PACKAGING FOR EXPORTS

At present India is exporting a variety of commodities both industrial and consumer products, to all parts of the world. During the past couple of years, the share of consumer products in our exports has shown a phenomenal increase. In addition to the increased interest towards traditional commodities, much efforts is now being made in developing and introducing new products through new exporters on new markets.

It is needless to mention that the development of exports depends heavily amongst other factors, on the quality of the products exported as well as the packaging pattern to preserve its quality in as fresh a condition as when produced. Packaging plays a very important role in the developments of exports. Therefore, a great deal of attention has to be developed to this aspect.

It is not uncommon to find that some of our products are being received at the destination in an indifferent condition. This results in rejections or under-valuation affecting our export earnings. It is, therefore necessary that the package used for the purpose should be adequate and functional. In order to be able to compete in the highly sophisticated and discriminating markets abroad, the consumer packages should be well dressed and should have a distinctive feature of their own.

Domestic vs. Export packaging design

Highly promotional packaging design, as an active ingredient in competitive marketing, may not always be so important for the distribution of goods in the domestic Markets of developing countries like ours. However, when export of the same products is considered, these products enter into the world markets facing severe competition from a large number of experienced rival producers.

The emphasis that is currently being placed on increasing exports of non-traditional goods imposes even heavier and urgent demands on the packaging designers and manufacturers. Packaging that adequately serves the domestic market requirements need to be considerably revised when the product is exported, particularly to industrialised countries. The need arises primarily for the following.

- i. The product is transported longer distances, the packages is subjected to greater strains, and is handled more times, when exported as compared to domestic distribution.
- ii. Freight and handling costs becomes a large component of the product cost; delivered to the final retailer destination.
- iii. Type of handling varies. Most of the manual handling of the product occurs in developing and under-developed countries where labour cost is comparatively cheaper, whereas, usually mechanised handling is being adopted by the developed countries.
- iv. The variation in climatic conditions, not only in the exporting and importing countries but also on the long way of distribution. To give an instance, the climatic conditions at Kuwait which shows that temperature varies during summer from 50° C to 84°C, in winter the lowest temperature recorded at 4°C. Period of high humidity at 100 percent has been recorded 30°C. There is violent sand and dust storms and these dust deposits can be highly corrosive on humid days.
- v. The nature of the retailing outlet in which the product will be finally sold, and the preferences of the consumer who will finally buy the product are likely to be considerably different from those obtaining in developing countries.

These factors call a thorough review of the export package to meet the changed condition more effectively.

Need for creative approach

Experience has taught us one lesson- that the job is not easy and requires for more creative approach. Advancement of production and packaging should go hand in hand with marketing and distribution. No longer can we ignore the call for improving the standards of our packaging – be these for industrial or consumer goods.

Basically improvements are needed:

- a. To minimise the incidence of losses in transit due to mechanical and environmental hazards.
- b. To enhance product value.
- c. To achieve greater speed in handling and deliveries.
- d. To protect them from pilferage, adulteration.

- e. To confer better convenience on the consumer and
- f. To establish a meaningful communication with the consumers etc.

The hazards may be lowered if we adopt pollicisation and use inter-model containers. The other important exporters should consider:

- 1) The package must confirm to the buyer's order and laws of the importing country
- 2) The package should preferably be easily disposable or easily recyclable for importing countries.
- 3) Packages should be amenable to easy examination the customs.

Package should be provided with easy handling facilities in addition to proper international marketing for handling.

Improvement of packaging standards

With regard to packaging standards to meet the international requirements, it is necessary to improve the domestic standards. In the existing situation in the country, it may not be possible to have two standards, one for internal trade and other for export from the point of view of national economy. This is particularly so, in the case of mechanised and mass production. Therefore, every sphere of packaging industry in India should strive hard to raise our standards to international levels at the earliest.

Packaging techniques for export promotion

From our long list of export items, we found many of these may well be exported in bulk and will probably not be involved in packaging at all. Such products as iron ores, iron and steel, oilcakes, raw hides and skins etc. may well be able to travel without much in the way of packaging, purely utilising the transport vehicle as the holders. However in many fields packaging will obviously enhance the value of goods concerned. It should be noted that efficient packaging is a vital necessity and without it the reputation of not only the product but also of the company and the nation can suffer and good will be lost.

It is important that our exporter should adopt scientific packaging methods suited to countries to which the goods are exported.

Package not uniformity with the trend in developed countries may be given a wrong handling treatment at importing countries. For example, use of wooden boxes where fibreboard is common, misleads handlers regarding the nature of cargo contained.

In the international field, graphics design for packaging can be highly important in the promotion of the sale of the goods. It is necessary for the exporters to collect information on the preferences and prejudices of the people of the various countries where export markets are contemplated. This could possibly be done through the commercial attaches at various Indian embassies in strategic parts of the world.

The small scale industries contribute a large amount to the total export from India and while packaging for all these items must primarily be both adequate and functional, it should also have a good 'carry home' facility. If irrespective of the nature of the goods, this packaging carried a common distinctive design or symbol relating to India in an appropriate manner; it could also assist very much in the promotion of other India skills and goods.

EXPORT PACKAGING FOR HANDICRAFTS

In view of the social and economic background of the small scale and cottage industries producing handicrafts, the following observations regarding packaging and marketing of the products can be made:

- ❖ Individual cottage industries producers cannot be expected to assess understand and comply with the packaging, marketing and distribution requirements of the often highly sophisticated export markets.
- ❖ They cannot be expected to possess knowledge even about the basic of packaging technology and promotions.
- ❖ They are not in a position to make use of even the most simple equipments and tools for packaging due to economic restraints.
- ❖ They will have difficulties in obtaining packaging materials at competitive prices mainly because of the very small quantities required.

Another factor important from a national point of view should not be forgotten. This is public relations value of displaying and marketing handicrafts typical of the producing country in industrialized markets. Unless handicrafts meet stringent quality and packaging requirements, however serious damage might be done to the producing country's image, especially in cases where simultaneous efforts are being made to introduce manufactured industrial products on the world market. Expensive measures over a long period of time might be required to upgrade an already established primitive artisan or low quality country image. The transformation of the image of the Japanese industry after Second World War is a good and successful example of this. Hong Kong, Singapore and Korea are all in various stages of this process right now. Quality packaged handicrafts products and packaging obviously have an important role to play in this context.

This text deals specifically with packaging both for the domestic and international export marketing handicrafts. Emphasis is however put on packaging for exports since it is evident that the problems in this area are the most difficult. Study of the highly competitive markets on the industrialized world leads to the general observation that packaging of goods from developing countries is often inadequate. This observation is valid whether packaging is considered from a purely technical point of view protection structural design or from a promotional point of view graphics sales appeal or both. Present levels of packaging are very widely from one developing country to another depending mainly upon the degree of industrialization. Up to a point it is easy to adopt the demand for and supply of packaging materials to the quality requirements of domestic consumption. However the need will arise for products to be exported in order to balance foreign trade often in the early stages of the development of a country's economy. When this happens, quality requirements for packaging suddenly rise.

Even if exports are directed only to neighbouring developing countries packages will have to withstand additional strains of transportation often under severe conditions. If they are directed to highly sophisticated industrialized market the handicrafts and their packages will have to compete at a level where quality requirements are very difficult to meet. The product may be of excellent quality but it will never achieve customer acceptance unless it is at least adequately packed.

Technically advanced and highly promotional packaging design may not always be so important for the distribution of goods in the domestic markets of developing countries. However when export of the same product is considered, packaging becomes more important element in the marketing mix. People involved in package planning have difficulty in assessing the difference between domestic packaging design and design of export packaging. This can usually be attributed to in experiences of the needs and requirements of their customer abroad. It is therefore very important to convince all those involved, at all levels from government officials and export promotion bodies to company executives and the man on the factory floor of the need for technically adequate and promotionally effective export packaging.

Turning to the specific needs of export packaging for handicrafts industry products, the following observations can be made:

1. Judging from most reports and surveys on marketing of handicrafts there seems to be unanimous agreement about the necessity to conduct export trade in these commodities on a C.I.F. basis rather than F.O.B pricing. There are several reasons for this one being an expectation of higher prices from new customers who do not bother or simply do not know how to deal with importing F.O.B experienced importers of handicrafts products are familiar with the required procedures and are at the same time paying the lowest prices.

Switching over to trade based on C.I.F pricing will automatically bring packaging into focus. Exporters will in their own interest have to pay more attention to shipping volumes and weights thereby also getting an opportunity to improve their packaging and their competitive position in the world market.

2. As container shipments and other types of unit loads become more popular for sea and air transport handicrafts exporters must become aware of the advantages and limitations of these new handling methods and adapt their export packaging accordingly. The possibilities to use full container loads from one or several cooperating exporters to the same consignee opens up new dimensions in business practices freight and insurance negotiations as well as reductions in packaging costs. In order to take maximum

economic advantages of these possibilities from the start it will however be necessary to have two different types of export packaging until the heavier and more expensive packages required for transport of break bulk cargo can be completely abandoned on favour of fully containerized transport.

3. As packaging technology, materials handling and distribution system become more mechanized and complicated, handicrafts producers should have basic knowledge and information about current packaging requirements on a continuing basis. Indigenous packaging materials might well find useful, practical and economical applications in export trade in the future but the exporters need to be aware of matters like disposal and pollution problem in the target markets which are becoming more important if not dominant in industrialized societies today.

4. A particular problem in connection with handicrafts is need to pre pack for the convenience of both retailers and ultimate consumers. Many handicrafts do not lend themselves easily to pre packaging, but even those that do are often poorly presented to the buying public. One important aspect in this context is that handicrafts products as gift items do not only compete between themselves for the attention of the customers, they also compete with high quality industrially manufactured products usually presented in sophisticated promotional gift packages. Many importers therefore have to undertake pre packaging operation themselves at labour rates which may be 30 to 40 times more than they are in the producing countries. In case where pre packaging has already been done by the producers the quality of the materials used and the presentation is often not comparable with the quality of the handicrafts themselves. There is also a need to convey more information about the origin of the products, their traditional or ethnic background how they are produced etc. In most instances these messages can be conveyed to the consumers in an efficient and economic way, utilizing the communication potential of the consumer package.

An understandable objection to the above proposals is that the costs of packaging are increased. In most cases, however these additional costs can be absorbed by increasing prizes accordingly since the handicrafts will be easier to handle and display will be more attractive

to the final consumer. A decisive influencing factor will probably be the accelerated move by non-food items into the supermarkets and the change of more and more department stores into the self service operations. Handicrafts and other cottage industry products consequently have to follow these new distribution patterns in order to survive in the world markets.

In general handicrafts can be classified in to 12 subgroups relating to their raw materials as shown in table 1. Handicrafts can also be divided into two groups, according to their principal packaging requirements as shown in table 2.

In order to decide the sequence and type of unit packaging necessary handicrafts can also be classified by their size weight and physical strength as shown in table 3. Chasing basis, standardize box and crate size, develop indigenous packing materials for example for cushioning.

5. Provide trained and experienced staff for the packaging operations and loading of containers.
6. Provide machinery and other equipments for cooperative use such as packing tables, shrinks, stretch, skin and blister packing, corrugated box making equipment best sellers for plastic films and marketing and labelling equipment.
7. Provide advice and services on packaging construction and graphic design of both transport and consumers packages secure and necessary supplies and perform the packing operations or alternatively give advice to those exporters who prefer to carry out the packing operation themselves.
8. Assist exporters in matters related to documentation insurance, estimation of C.I.F and F.O.B and customs procedures.
9. Assist exporters in negotiating freight rates, secure shipping space, consolidating shipments and loading of containers.
10. Provide visiting handicraft buyers with facilities for consolidated container shipments from a number of exporters to the same consignee.

When considering the advantages of cooperation between small scale producers, the necessity to standardize packaging cannot be overemphasized. For example, many specialty food products manufactured on a cottage industry basis are packed in glass. Since the initial costs of making special sizes and shapes of glass bottles and jars are extremely high, only stock items provided by the glass producers should be used. Individual branding in this case should be achieved by the design of the labels, not by the shapes and size of the bottles and jars. Bottle and jar caps are items which can be easily purchase done a joint basis to save cost. The same principle can be applied to a number of different packaging materials and especially to those with high initial costs for each other. Generally speaking the use of packaging should be made aware of the basics of purchasing techniques to be able to carry out meaningful discussions with their suppliers about ways to reduce their cost of packaging. A minimum requirement is to know how much an increased quality affects the unit price and what savings might be achieved by changing packaging specifications to suit supplier's machinery and raw material sizes.

One major marketing outlet for handicrafts product is the tourist trade. When deciding what type of packaging should be used in this case, the first essential is to analyse what specific requirements the buyers / tourists have. Many tourist purchases intended as gifts. Space and weight restrictions, however put limitations on the kind of package which can be used. The quality of the packaging materials must be in proportion to the value of the gift itself. Cheap looking packages will be thrown away even before the items are stuffed into the suitcase. Sometimes tourists make larger purchases which have to be packed and sent home. In this case the seller should know the extra cost of packaging and freight to avoid unpleasant surprise for the purchaser when the parcel arrives. An important outlet for tourist sales in airport shops. Passengers would often be willing to purchase handicrafts during their brief stays in the transit lounges. A major consideration in this case is the speed with which the transaction can be performed. Pre packaging of handicrafts could reduce sales staff work and so speed up the sales process.

TABLE – 1**CLASSIFICATION OF HANDICRAFTS & MAIN POINTS TO BE CONSIDERED IN PACKAGING**

CLASSIFICATION	EXAMPLES	PREPARATION OF PRODUCT FOR PACKAGING	FACTORS FOR CONSIDERATION IN PACKAGING
Textiles	Linen, Table cloth, Embroidery, Printed cotton, Carpet, Doll	Drying removing dust	<ul style="list-style-type: none"> - Protection from mould and insect damages - Protection from discolouration by light - Keeping dust out - Transparency
Wood	Carvings table, Table wares, Screen, some products are painted	Cleaning drying	<ul style="list-style-type: none"> - Protection from scratching - Protection from moisture, microbes and insects. - Preservations of Aroma - Cushioning for delicate products against compression and impact damage. - Protection from discolouration by light
Lacquer ware	Table ware, decorations	Cleaning	<ul style="list-style-type: none"> - Similar to wood, especially protection of surface lustre.
Stoneware	Stoneware, Marble etc decoration	Cleaning	<ul style="list-style-type: none"> - Stone articles are fragile and heavy - Some are very expensive depending on their artistic value.
Jade, ivory and Jewellery	Carvings, personal ornaments	Cleaning	<ul style="list-style-type: none"> - Fragile and very expensive
Imitation ornaments and jewellery	Imitation personal ornaments gems	Cleaning dust and fingerprints	<ul style="list-style-type: none"> - Require presentation packaging for sales promotion as well as transport packaging to protect fragile contents. - Resist pilferage.
Metal	Bronze sculpture, silver ware, Pewter products, decorations	Cleaning dust and fingerprints	<ul style="list-style-type: none"> - Protection from tarnishing and corrosion(Air moisture and salt water) for some products - Protection from pressure causing distortion.
Glass	Flower vases, Decorations	Cleaning	<ul style="list-style-type: none"> - Fragile - Impact between articles is as damaging as impact from outside.
Straw	Basket, Fan, Bamboo decoration etc.	Cleaning drying	<ul style="list-style-type: none"> - Soft, easily squashed. - Protection from moisture.
Leather	Handbag decorations	Cleaning drying	<ul style="list-style-type: none"> - Regulation of in pack moisture - Levels to keep products flexible - Protection from discolouration and staining.
Paper	Lamp cover fan	Cleaning drying	<ul style="list-style-type: none"> - Soft, easily squashed - Protection from light and water
Shells	Dish, Decoration	Cleaning	<ul style="list-style-type: none"> - Fragile, and heavy - Compartments needed within pack.

TABLE – 2**CLASSIFICATION OF HANDICRAFTS ACCORDING TO THEIR NEED FOR MOISTURE PROTECTION**

HANDICRAFTS REQUIRING MOISTURE PROOF PACKAGING AND, IN SOME CASES PHYSICAL PROTECTION	HANDICRAFTS REQUIRING PACKAGING FOR PHYSICAL PROTECTION ONLY
METAL PRODUCT	GLASS PRODUCTS
TEXTILE PRODUCTS	CERAMICS
LEATHER PRODUCTS	LACQUER WARE
PAPER PRODUCTS	SHELL PRODUCTS
GRASS PRODUCTS	

TABLE - 3

Method and sequence of packaging operations according to the weight.

Dimensions and physical strength of handicraft products.

WEIGHT & DIMENSIONS	PHYSICAL STRENGTH	MOISTURE PROOF PACKAGING	PACKAGING FOR PHYSICAL PROTECTION ONLY
LESS THAN 500GR. ONE DIMENSION 10CM OR LESS	STRONG FRAGILE DELICATE/VALUABLE	1-5 1-3-5 1-4-5	2-5 2-3-5 2-4-5
500-1000GR. ONE DIMENSION 10CM OR LESS	STRONG FRAGILE DELICATE/VALUABLE	1-5 1-3-6 1-4-6	2-5 2-3-6 2-4-6
1000 TO 2000GR. ALL DIMENSIONS EXCEEDING 10CM	STRONG FRAGILE DELICATE/VALUABLE	1-6 1-3-6 1-3-4-6	2-6 2-3-6 2-3-4-6
MORE THAN 2000GR.	STRONG FRAGILE DELICATE/VALUABLE	1-7 1-3-7 1-3-4-7	2-7 2-3-7 2-3-4-7

TABLE - 4

**PACKAGING FUNCTIONS AND MATERIALS LISTED ACCORDING TO THE USUAL SEQUENCE OF THEIR USE IN THE
PACKAGING OPERATION**

SEQUENCE IN THE PACKAGING OPERATION	PACKAGING FUNCTION / MATERIAL USED
1	Barrier: PE Film – HDPE more than 0.02mm in thickness LDPE more than 0.03mm in thickness Others – bituminized / Kraft paper, paraffin waxed paper, PE/Kraft paper, PVC film etc.
2	Wrapping Materials: Tissue paper Thin Kraft paper Transparent film if transparency necessary
3	Soft cushioning Materials : Plastic film with entrapped air bubbles Plastic film air cushion Single faced corrugated board Paper cuttings Wood wool
4	Stiff cushioning materials: Plastic foam cushioning materials PS, PE Polyurethane Wood wool Pads of corrugated fibreboard Paper cuttings
5	Light – duty box materials: Paper board, more than 350g/m ² in basic weight E Flute corrugated fibreboard Plastic and other materials are also applicable
6	Medium – duty corrugated fibreboard box materials: Single-wall corrugated fibreboard more than 8kg/cm ² in bursting strength
7	Heavy – Duty corrugated fibreboard box materials: Double – wall corrugated fibreboard more than 10kg/cm ² in bursting strength

Function – packaging

Outline

1. **Packaging**
 - An integral part of production
 - Part of physical distribution
 - A tool for marketing

2. **Function of package**
 - Contain
 - Preserve
 - Protect
 - Present
 - Dispense

3. **Package is selected in accordance with the product characteristics. Packaging characteristics of a product are:**
 - i. **Physical**
 - a) Physical state
 - b) Weight
 - c) Stability
 - d) Rigidity
 - e) Surface Finish

 - ii. **Physicochemical**
 - Effect of
 - a) Moisture
 - b) Oxygen
 - c) Mould – Bacteria, Fungi
 - d) Ambient Factors (other than a-c)

4. **Package is selected taking into account the nature of protection needed.**

5. **Other attributed of a package are:**
 - a. Easy to open
 - b. Easy to close
 - c. Easy to dispose of
 - d. Easy to dispense
 - e. Easy to recycle
 - f. Easy to identify
 - g. Pilfer-proof
 - h. Instruct
 - i. Eye appeal
 - j. Warm

6. **When designing the pack the following are also broke in mind.**
 - a. Process of manufacture of the product
 - b. Machinery used for packaging operations
 - c. Machine ability of the materials
 - d. Scale of operation

7. From the point of view of storage handling and transportation the package should be:

- a. Easy to handle
- b. Provided with handling facilities like lifting hooks
- c. Amenable to quick examination of contents
- d. Easy to stack

8. The packages for shipment are designed taking into account the hazards of the journey

- a. Drop
- b. Vibration
- c. Impact
- d. Compression
- e. Rolling
- f. Environment
- g. Other – but minor hazards like tear torsion etc

9. Packaging can be evaluated for their export worthiness transport through simulated test in a laboratory

10. Packaging materials available in India are:

- a. Black plate (mild steel plate)
- b. Tinplate tin coated on steel plate
- c. Tin free steel
- d. Aluminium container sheet
- e. Aluminium foil
- f. Aluminium slugs for manufacture of collapsible tubes
- g. Paper – poster paper, Kraft paper, brown paper for packaging and wrapping coated paper

Specialty papers: Tissue parchment, greaseproof, glassine, coated paper (wax)

- h. Paperboard - pulp
 - Duplex
 - Triplex
 - Grey
 - Mill
 - Solid
 - Corrugated
 - Moulded
- i. Plastic: Ethylene –
 - High molecular high density
 - Low density
 - Linear low density

- Shrinkable film
- Tape (of HD)
- Polypropylene – Homopolymer
- Shrinkable films
- Poly vinyl chloride – compounds
- General purpose
- High impact
- Polyester – for film
- For bottles (chips)
- j. Cellulose film (regenerated)
- k. Glass – tube
- Bottles
- Vials
- Ampoules
- Wood and plywood
- Jute/cotton textile
- Laminates of paper/poly/foil/cellulose /jute/nylon/
- PVDC

11. Some specialty packages are as follows:-

- i. Aerosols of aluminium and tinplate
- ii. Strip packaging using laminates/coating
- iii. Blister packaging – using foil & PVC and paperboard
- iv. Skin packaging – using PVC
- v. Multiwall sacks – of paper
- vi. Shrink packaging – using polyethylene PVC and PP shrink film
- vii. Polyethylene and PP woven sacks
- viii. Fibre drums – using paper and metal or wooden ends
- ix. Composite containers – of tinplate / paper
- x. Stretch wrapping - tinplate/plastic

12. New developments of:-

- i. Automatic strapping and scaling using PP straps
- ii. PBT (polyester) bottles – stretch blow moulded
- iii. Leak proof composite – containers using paper & foil
- iv. Multilayer plastics – three to five layer
- v. Cast PP film
- vi. Metalized BOPP and cellophane
- vii. Expanded use of stand up pouches
- viii. Edible oil packaging in pouches of plastics

- ix. Linear low density polyethylene film
- x. Tetra pack and tetra brick (frooti / amul)
- xi. Laminated collapsible tubes
- xii. Testing aluminium collapsible tubes
- xiii. Thermoformed packages of processed foods
- xiv. Formed containers for food – e.g yoghurt ice cream
- xv. Pad printing on plastic containers
- xvi. “Twist on Twist – off” cap of tinplate for glass bottle – 4lug finish
- xvii. Containers for fast food – P.S Moulded

Packaging requirements for exports

Factors influencing packaging design and choice of packaging materials are as follows:-

- a. Product characteristics – Dimension, weight, surface finish. Fragility, rigidity, susceptibility to damage due to moisture and gases etc.
- b. Consumer requirements – product identification, product dispensing method, language and graphics.
- c. Target market – Type of buyers – household, industrial product quantity bought at a time, methods of merchandising-self service stores, through salesman.

Buyer's perception of quality – parameters he uses to determine quality of the products.

Packaging must match value concept of the buyer. A high value product like handicrafts items – should be packed in a package which the buyer will be proud to carry and possess.

- d. Statutory law of the importing country – labelling requirements on unit containers, marking needs for shipper, type of containers acceptable, safety features needed for handling and dispensing.
- e. Handling, storage and transportation – handling – manual or by machine.

Storage – open or covered. On pallets or direct on the shippers.

Transportation – multimodal using different types of road vehicles, ships – break-bulk type of (containers) cellular type, aircrafts, and railway wagons of different types.

Strength of the package particularly shipping containers must be adequate to withstand the rigors of the journey.

Shippers must be designed to withstand mechanical hazards like impacts due to dropping, vibration in vehicles, and compression during storage, rolling during handling etc. it must also be protected from

climatic hazards like rain water, high humidity, low and high temperature, variation in the pressure etc.

- f. Contemporary packaging system should be used as the buyer has an option to buy from international competitors. New packaging form and techniques should be used e.g. stretch blown light weight plastic (PVC, PP, PET) bottles. Lined and coated carton systems, skin, blister packages, shrink wrapping, stand up pouches, multilayer plastic pouches and bottles, collapsible laminated tubes, in situ cushioning system, pilfer evident closure systems etc.

By –

Mr. A.A. joshi, iip.

FUNCTIONS – PACKAGING

OUTLINE

1. Packaging – An integral part of production part of physical distribution a tool for marketing.

2. Functions of a package
 - contain
 - Preserve
 - Protect
 - Present
 - Dispense

3. Package is selected in accordance with the product characteristics. Packaging characteristics of a product are:
 - i. Physical
 - a. Physical state
 - b. weight
 - c. stability
 - d. rigidity
 - e. surface finish
 - ii. Physic–chemical
 - **effect of**
 - a. Moisture
 - b. Oxygen
 - c. Mould-bacteria, fungi
 - d. Ambient temperature

4. Package is selected taking into account the nature of protection needed.

5. Other attributes of a package are:
 - a. Easy to open
 - b. Easy to close
 - c. Easy to dispose of
 - d. Easy to dispose
 - e. Easy to recycle
 - f. Easy to identify
 - g. Pilfer-proof
 - h. Inform
 - i. Eye appeal
 - j. Warm

6. When designing the pack of the following are also borne in mind:
 - a. Process of manufacture of the product
 - b. Machinery used for packaging operations
 - c. Machine ability of the materials
 - d. Scale of operation

7. From the point of view of storage, handling and transportation, the package should be:
 - a. Easy to handle
 - b. Provided with handling facilities like lifting hooks
 - c. Amenable to quick examination of contents
 - d. Easy to stack

8. The packages for shipment are designed taking into account the hazards of the journey:
 - a. Drop
 - b. Vibration
 - c. Impact
 - d. Compression
 - e. Rolling
 - f. Environment
 - g. Other- but minor hazards like tear, tension etc.

9. Packages can be evaluated for their export worthiness; transport worthiness though simulated tests in a laboratory.

10. Packaging materials available in India are:
 - a. Black plate (mild steel plate)
 - b. Tinsplate, (tin coated on steel plate)
 - c. Tin free steel
 - d. Aluminium container
 - e. Aluminium foil
 - f. Aluminium slugs for manufacture of collapsible tubes
 - g. Paper
 - Poster paper
 - Craft paper
 - Brown paper for packaging and wrapping
 - Coated paper

Speciality papers – Tissues
Parchment

Greaseproof
Glassine
Coated paper: wax

h. Paper board – Pulp
Duplex
Triplex
Grey
Mill
Solid
Corrugated
Moulded

h. Plastics – polyethylene – High molecular high density
High density
Low density
Linear low density
Shrinkable film
Tape (of HD)

Poly propylene	–	Homopolymer – copolymer
Poly vinyl chloride	–	Compounds
Polystyrene	–	General purpose
	--	High impact
Polyester	–	for film
		For bottles (chips)

i. Cellulose film (regenerated)

j. Glass – tubes
-- Bottles
-- Vials
-- Ampoules

k. Wood and plywood

l. Jute/cotton textile

m. Laminates of paper/PE/Foil/Cellulose/PP/ Nylon/PVC/PET/
coatings – PVDC, ionomer, EAA, EVA.

11. Some speciality packages are:

a. Aerosols of aluminium and tinplate

- b. Strip packaging using laminates/coatings
- c. Blister packaging – using foil & PVC and paperboard
- d. Skin packaging – using PVC
- e. Multiwall sacks – of paper
- f. Shrink packaging – using polyethylene, PVC and PP shrink films
- g. Polyethylene and PP woven sacks
- h. Fibre drums – using paper and metal or wooden ends
- i. Composite containers – of tinplate/paper
- j. Stretch wrapping – tinplate / plastic

12. New developments are:

- a. Automatic strapping and sealing using PP straps
- b. PET & PVC bottles – stretch blow moulded
- c. Leak proof composite containers using paper and foil and plastic films
- d. Multilayer plastics – three to five layers
- e. Cast PP film
- f. Metalized BOPP and cellophane
- g. Expanded use of stand up pouches
- h. Edible oil packaging in pouched of plastic
- i. Tetra pack (frooti) and Tetra brick (Amul butter)
- j. Laminated collapsible tube
- k. Nesting aluminium collapsible tubes
- l. Thermoformed packages of processed foods
- m. Formed containers for foods – e.g. yoghurt, ice creams
- n. Pad printing on plastic containers
- o. Twist on Twist off cap of tin plate for glasses bottle – 4 lug finish
- p. Containers for fast foods – P S moulded

DEVELOPMENTS AND PROSPECTS FOR QUALITY PACKAGING FOR VALUE ADDITION IN RURAL PRODUCTS

*M.D. KOLI**

1. Introduction

India has a very high cultural heritage and a large variety of rural including handicrafts products are manufactured all over the country. Important products are described below:

2. Product range:-

- ❖ Coir
- ❖ Grass sticks
- ❖ Jute
- ❖ Sabai grass
- ❖ Palm leaf engraving
- ❖ SISM fibre
- ❖ Screen printed PMM leaf
- ❖ Handlooms
- ❖ Appliqué
- ❖ Clottier flower
- ❖ Embroidery
- ❖ Soft toys
- ❖ Readymade garments
- ❖ Bell Metm
- ❖ Brass
- ❖ Copper ware
- ❖ Iron
- ❖ Dhokra casting
- ❖ Filigree
- ❖ Tribal jewellery
- ❖ Clay pottery
- ❖ Ceramics
- ❖ Terracotta

- ❖ Bamboo products
- ❖ Woodcraft
- ❖ Stone carvings
- ❖ Horn crafts
- ❖ Paddy crafts
- ❖ Leather goods
- ❖ Paper Mache
- ❖ Patti painting
- ❖ Processed forest produce

Indian institute of packaging (IIP) was established in 1966 under administrative control of ministry of commerce, government of India. It has regional centres at Calcutta, Delhi and Madras (now Chennai). As a premier institute in packaging, it provides consultancy, training, education, testing and information services in packaging to the various industries. The institute has been conducting training programmes on packaging of Handicraft items at different centres in the country in collaboration with Development Commissioner of Handicraft office for last few years.

Though the Handicraft produced by artisans have a very high aesthetic value and reflect the rich cultural heritage most of the products are produced from natural materials such as wood, clay, marbles, pottery etc. These products are produced with lot of manual inputs of artistic nature and therefore have a high value addition component owing to their nature, and due to the materials from which these products are fabricated, handicraft products are very delicate and susceptible to chipping, abrasion, breaking, and get damaged easily during handling, storage, and transportation. As a result through these products are in great demand both in domestic market as well as in export market many a times these products do not reach the markets in their prime condition and even with a very minor damage the value of the product is lost and the product becomes unsalable.

One of the reasons for loss and damage is unscientific packaging adopted, though the crafts man use packaging methods and materials to the best of their ability. It is necessary to provide them inputs such as basic principles of packaging involved and the options of packaging materials available or protecting the products from and damage.

These are not favoured in overseas market owing to strict pollution control regulations. Unless we gear ourselves to bring about the necessary changes

by offering product which do not pollute but still ensure safety of the product, we may run the risk of losing the export market.

3. Mode of Transport

The filled packages in case of above mentioned product items are found to be transported by rail all over the country.

In case of export the packages are found to be transported by part load containers by sea transport. Sometimes these are sent by air transport also.

4. Nature and Extent of Damage

In case of handicraft items made from machine, terracotta, plaster of Paris, and soft stones etc. The damage in the form of chipping, breakage etc. is found to the extent of 40-50 percent.

In case of other items the damaged is reported to the extent of 10-20 percent. This damage relate to climatic hazards as well as mechanical hazards occurring during storage, transporting, and handling.

5. Towards Improving Packaging Methods

Taking into consideration the type of market requirement export local or upcountry despatches of the various types of product items, one should adopt the following newer packaging concepts.

- (a) Adequate cushioning in the form of expanded polystyrene (EPS) hand fabricated contour cut fitments which protect fragile items from shock impacts and vibration. Outer corrugated boxes / cartons along with cushioning fitments. The top / bottom flaps of the boxes should be closed with BOPPV tape.
- (b) One should consider an air bubble cushion film or 2-3 mm thick polyethylene foam (PE foam) to wrap individual product items such as glass items, or paper machine items which need surface protection.

Further these items can be packed inside the box as mentioned above.

(c) One should consider 2- - ply corrugated fibre board liner of an appropriated grammage/substance to wrap individual product item such as brass articles or other metal articles.

Further an appropriate number of product items can be packed inside outer box as mentioned above.

(d) A few product items like cloth flower, brass wares, copper wires, iron wares, and jewelers' items can be packed by using skin/ blister packaging system is one of the modern systems in the country.

The advantage of this packaging system is the products can be seen through the crystal clear PVC film –

- No damage from dirt and dirt
- Achieve more sales appeal

(e) A few rural product items like embroideries, readymade garments, coir products and leather goods can further be bundle wrapped or shrink wrapped using LDPE shrink film. The machine is now available in the country.

The advantages of shrink packaging system are:

- No unit cartons/packs are required
- No contamination of dust and dirt on the products packed
- The product items can be seen through the pack
- Further an appropriate number of bundle wraps can be packed inside CFB box.

(f) Some important coir mats/product can be packed inside a pre – printed LDPE/PP polyester carry bags. For more sales appeal one can consider graphic art design on the outer surface of carry bags.

(g) Other aspect needing careful attention is design of graphics or printing on the outer surface of the packs. The coloured and art work selected should be in harmony with trade requirements so that desired result such as sales promotion, image building etc. are obtained.

It is felt that this exposure on packaging to the handicraft industry would have a snowball effect and will help the industry to adopt and experiment

similar methods and materials of packaging for other products as well. The exercise may prove to be a model for development of packaging for a number of handicraft products.

The advantage which will accrue to the trade and industry will be in terms of safety of the products and high customer satisfaction. This will ensure better return to the artisans for their efforts. The improved packages would also help in value addition, and better realization, of value in domestic and export markets.

On the other hand by adopting appropriate packaging system we may enhance the export market share significantly and there for earn a substantial foreign exchange. In addition, it is hoped that this exercise may go a long way in encouraging the handicraft industry and generate tremendous employment in the rural sector, which is the need of the hour.

CORRUGATED BOARD

OUTLINE

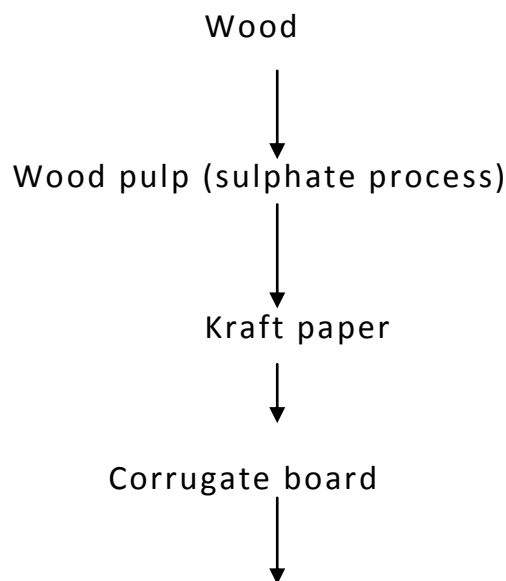
1. The Material:

Board consisting of one or more sheets of fluted paper stuck to a flat sheet of paper or board between liners usually Kraft. This has the following classification:

- a. Single face corrugated
- b. 3- ply corrugated
- c. 5- ply corrugated
- d. 7- ply corrugated

(Usually not used in thickness above 7-ply)

Clearly the material is manufactured from paper as an alternative to wood. The origin, however, is wood as under:



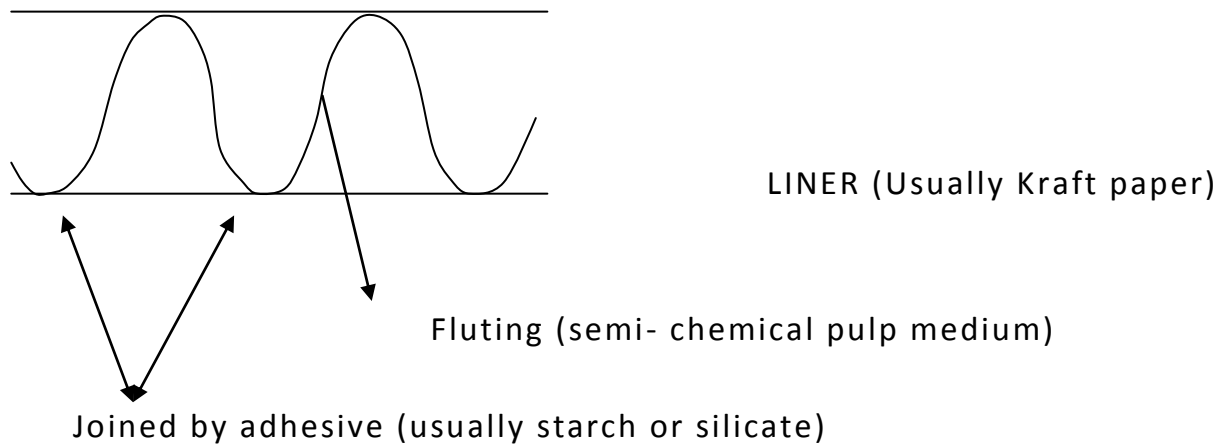
Recyclable to paper pulp & back to board

It is important to note that wood when converted into paper provides a material which is weaker but still a material which gives a greater area of packing material and if used as an alternative it proves economic.

As a correctly the box (package) made from a corrugated board has to be poor is strength –

2. Components of Corrugated Board:

The three components are – a) Liner b) Fluting c) Adhesive



3a. Liners:

Kraft paper of above 80 gsm/sq.m. (gsm) up to 225 is used. Preferably the outmost liner used for a box should be of the maximum grammage.

Their functions are to:

- I. Resist hazards like puncture, burst, abrasion, tear etc.
- II. Properly hold the fluting medium when once combined
- III. Resist moisture or water either outside or inside depending on the nature of product packed
- IV. Be amenable to printing

Waterproof paper such as bitumen, sandwiched, poly-coated or wax coated are also used for liners.

3b. Fluting:

Paper obtained from semi-chemical pulp process are used which provide good rigidity to the board. But in India mostly Kraft paper is used. Its function is to:

- a. Provide necessary cushioning desired
- b. Provide rigidity to the board

- c. Contribute to resistance to bending under stress particularly after converting into a box
- d. The grammage of fluting medium may be in the region of 80-150gsm.

3c. Adhesive:

Usually starch based adhesives are used for joining the outer liner (This has a relation to printing). Sodium silicate (near to neutral) also are used. The silicate can give a rigid board but they can render the box brittle or lead to de-lamination depending upon the humidity.

4. Board Manufacture:

The board is manufactured from paper rolls as received from the mills. As corrugations are parallel to the width of paper rolls the width of corrugated board is limited.

The width of the board determines the height of the box, plus flaps are restricted by the maximum width available. Operational speed can be about 150 ft. /min. in India.

5. Box Manufacture:

The three stages in box manufacture are:

- I. Slitting and scoring (this trims and creases the board)
- II. Slotting (the flaps are formed in this operation)
- III. Joining (ends are joined this will be across the length of board)

Proper slitting and scoring ensure accuracy in dimension and avoids ruptured board.

Slotting should be proper and of right dimension to ensure gaps, are avoided when box is closed.

D. The dimension from the top of the inner flaps at the base to the bottom of the inner flaps at the top

Tolerance +/-2 mm (even 1.5 mm possible)

6. Printing

Normally the outer liner is pre-printed. Boards are also printed on 'Printer Slotters'. When printing is done after the boards are made, care is taken to ensure flutes are not damaged.

7. Closing the Box

The box duly erected has to be closed at one end before filling. The other end is closed after filling.

- I. Stitching or stapling – Container flaps are fastened with metal stitches or staples.
- II. Gummed paper taping – when sealing with paper tape, it is recommended to tape all outer seams, including centre and end seams. The tape on the centre seal is usually extended over the end panels of the box to increase the tape strength.
- III. Gluing – This method of securing the flaps with liquid adhesive is very satisfactory of boxes that do not have to be opened and resealed. More than 50 percent of area of contact should be firmly glued.
- IV. Twines and straps – sometimes twines or straps are tied around the box to close it. Generally these modes are used more as an extra reinforcement than as a direct closure. The closure performs three major functions which are inter-related.
 - a. Assisting the retention of the contour of the shipping containers.
 - b. Resisting adequately the hazards of handling and transportation.
 - c. Preventing the entry of foreign matter such as dust, moisture etc.

8. Box Design

The ISI has published a standard (IS: 2771) for corrugated boxes. This can at best be used as a guideline. Depending upon the nature contents and the journey intended this can be modified to achieve economics. The weight carrying capacity and strength requirements as per the standard are given on the next page.

TABLE 1: REQUIREMENTS FOR CORRUGATED FIBRE BOARD BOXES

Type of board	Maximum mass contents	Maximum combined internal dimension (L+W+D) (MM)	Maximum strength of the board (KGF/CM2)
Single wall and double wall	5	635	6
	8	750	8
	10	1025	10
	15	1275	12
	20	1525	13
	30	1650	15
	40	1775	21
Double and triple wall	15	1275	10
	20	1525	12
	30	1650	14
	40	1775	17
	55	1900	24
	75	2150	29

Note 1: boxes shall be made with single dimension exceeding 50 percent of the same of the permitted combined dimensions.

Note 2: For each 10 percent reduction in mass of contents below the maximum permitted for a case the combined dimensions shown in the table may be increased by percent.

Note 3: If a box is required for export or special use it may be advisable to equate the board details given in the table to reduced mass of content or reduced maximum combined dimensions.

9. Flute Selection

Four types of flutes are common. They have been standardized on the basis of flute height and number of flutes is per unit length of board. They are:

Flute	corrugation per meter	Height of corrugation (Exclusive of liner)
'A' flute (board)	105 to 125	4.5 to 4.7 mm
'B' flute (narrow)	150 to 185	2.1 to 2.9 mm
'C' flute (medium)	120 to 145	3.5 to 3.7 mm
'E' flute (Micro)	290 to 320	1.1 to 1.5 mm

In India jumbo flute using higher grammage liner and fluting has been made with a flute height of above 7 mm and about 20 flutes /30 cm.

The broader the flute the better the cushioning and resistance to bending. The narrower the better the resistance to flat crush (the column is supported at number of points).

10. Some other important consideration:

- I. Bursting strength or puncture resistance: this is reflective of the paper /board quality – the higher the better.
- II. Moisture Content: The board as received should have moisture below 10 – usually between 8-10. The higher the moisture content the poorer will be the strength.
- III. Compression Strength: Where the nature of the product is such that it needs protection instead of acting as an over-wrap the empty box itself should be able to withstand the total compression load which may act on the filled box while in a stack.
- IV. Flute Direction: should be along the height of box.

11. Recent Development:

Development in the field has all aimed at:

- a. Coast Reduction: by joining solid board with single face corrugated board wherever possible.
- b. Increasing its ability to carry greater loads

- I. By sandwiching in between corrugated boards. A paper honey comb structure using silicate OR A hessian liner using bitumen. Imparting to it the ability to sustain a very severe impact.
- II. By laminating to the outer liner a layer of hessian using bitumen.

CUSHIONING MATERIALS AND THEIR APPLICATIONS

1. INTRODUCTION

Cushioning is that part of packaging which protects the article from damage due to shock and vibration. During transportation a package may be subjected to vibration over wide range of frequencies and undergo jolts of varying force and duration. A cushioning material selected for the purpose may also have to minimize the movements of the item, prevent abrasion of surfaces, barriers, over sharp projection, absorbs liquids that are spilled from broken unit containers and sometimes act as heat insulators. However, protection of goods from shock is the most important function of a cushion. The main functioning is cushioning materials in a package can be listed as follows:

2. FUNCTION OF CUSHIONING MATERIALS

2.1 Shock protection requirement is the first consideration in selecting cushioning materials. Sufficient cushioning material should be used to dissipate the shock which may be transmitted through the blocking of the product.

2.2 Protection of delicate and highly finished surface against abrasion, surface of the product which may be damaged by wooden blocking, container surfaces or other store is the container are protected by cushioning. Surface finish protection is usually accomplished with thinner applications of cushioning materials than are generally required for shock protection, as the purpose is merely to have the cushioning act as a buffer. Paper backed materials are often used for surface protection.

2.3 Protection of small projection on articles.

2.4 Protection of grease-proof and water-proof barriers at point of contact with solid blocks or braces to prevent rupture or severe abrasion of the barrier.

2.5 Protection of moisture vapor, barriers at points of contact with sharp edges of the article itself, packing materials or container. Sharp corners of projections which could rupture the barriers or even the container. Cover with cushioning material so that the cushioning material rather than the sharp edges of the store are in contact with the barriers or rather wrappers.

2.6 Filling of void space in the container

2.7 Other secondary purpose if any, like absorbs liquids that are spilled from broken unit containers and also act as heat insulators in some cases.

3. SELECTION OF CUSHIONING MATERIALS

The selection of the cushioning medium for a given application will be confined to only a few materials, as not all the cushioning materials have the requisite properties.

Knowledge of the destination of the shipment is also necessary in choosing the proper cushioning material as some of them lose their property with the environmental changes, e.g. rubber and rubber bonded materials become so rigid or brittle as to render them practically useless for shock protection at extremely low temperature. Thus if it is known that a shipment is destined for region of extremely low temperatures, these materials would be eliminated at the outset. Delicate items which are very susceptible to damage through handling require usually resilient cushioning materials. Cushioning materials for heavy weight item must be dense and firm. While choosing cushioning materials following factors must be considered.

3.1 Resistance to the product against damage by shock.

3.2 Weight on bearing surface of the item to be cushioned. When too much weight is concentrated on a cushioning material. It compresses to such a degree that it does not absorb the impact and shock energy. Cushion, therefore must be sufficient to allow for compression under the weight of the article.

- 3.3 Shape of the surface to be cushioned.
- 3.4 Shock absorbing capacity of the cushioning material, including the effect of moisture there on.
- 3.5 Susceptibility of the material to corrosion due to moisture absorbed by hygroscopic properties of cushioning material.

When the cushioning material has been selected, the next step is to determine as to how it should be used. Before the correct thickness of cushioning material can be specified for a given application, it is necessary to know certain things about the articles is being packed such as its dimensions, its weight and some measure of its fragility. The symbols “g” is used to denote the fragility factor or the pull of gravity and is defined as the forces imposed upon all item, using the static weight of the item as the basic force to measure the degree of shock of vibration sustained on impact. The article that can withstand a maximum for equal to 50 times its own weight has a fragility factor of 50 “g” s one that can withstand a force 100 times, its own weight has a fragility factor of 100 and so on.

4. PROPERTIES OF CUSHIONING MATERIALS

The chemical and physical properties of cushioning materials are many and may display both desirable and undesirable characteristics. These characteristics vary in important for different application. What might be highly desirable in one application may be detrimental in another. For instance moisture absorbency is not desirable when packaging corrodible metal items, while it is required for packaging liquids. In important characteristic properties of the cushioning material to be considered while selecting are as follows:

4.1 RESILIENCE:

Resilience is the ability of the cushioning material to undergo deformation on application of a load and the ability to recover rapidly and almost completely on removing the load.

4.2 COMPRESSION SET

Compression set is the permanent deformation of the material due to either the static load on the system for to repeated transit

compression. In mathematics compression set can be defined as the difference between the original thickness of the cushioning material and the thickness of the same material after having been released from compression under a standard load for a given period of time expressed as a percentage of original thickness. Cushioning material having high compression set creates free moving space in the container.

4.3 RATE OF RECOVERY

The time taken by the cushioning material to return to its original shape after compression is known as rate of recovery. Some materials have a rapid rate of recovery due to the spring back action. This may result in damage to the product. At the same time, it should not take too long a period to come to its original shape.

4.4 CUSHION FACTOR

It can be defined as the ratio of the maximum stress to the total energy absorbed/unit volume of the material. Cushioning material having lower cushioning factors require less volume.

4.5 CREEP:

Creep can be defined as the gradual deformation of a cushioning taking place over period of time.

4.6 DAMPING

Damping is the periodic oscillation of a material before it comes to rest. A resilient cushioning material after being compressed and during its recovery should come to its original thickness without any oscillations.

4.7 CORROSION:

The corrosive effect of some cushioning materials is undesirable when packaging items with critical surfaces. When this cannot be avoided, item must be shielded from such material by a neutral wrap or liner. Cushioning material with a high acidic or basic content must be enclosed within water-proof or water-vapor proof barriers. The corrosive nature of the cushioning material is normally measured by the Hydrogen ion concentration-PH.

4.8 HYGROSCOPICITY:

Hygroscopic cushioning materials will have less cushioning value or cushioning factor at high moisture content than at lower moisture content. For this reason when such materials are used they must be protected against long exposures to high humidities by a sealed water-proof barrier. When this is not possible the use of non-hygroscopic materials which respond less rapidly to moisture change, should be used. Most material when wet will cause corrosion of contacting metal surfaces. In such instances grease-proof or water vapor barriers are recommended between cushioning materials and the product.

4.9 MICRO BIOLOGICAL PROPERTIES:

Fungus resistance of some materials is low and allows the growth of mould, mildew and other fungi. Many materials can be treated to inhibit such growth. However, such treated materials are often very corrosive to metal surfaces and must be isolated from them.

4.10 DUSTING:

Which often results from the disintegration of the bonded fibre structure materials and these detached particles can work into crevices and critical working parts of the product.

4.11 ABRASIVE CHARACTERISTICS:

The abrasive characteristics of some materials are factors which must be considered when protecting precision surfaces such as the lenses of optical instrument. Some cushioning materials are soft-textured and generally can be placed in contact with easily marred surfaces. Coarse textile material should not be used on such surfaces.

4.12 PERFORMANCE AT LOW TEMPERATURES:

Low temperature performance of certain cushioning material makes them suitable for use in high altitude transport in shipment to cold regions because they remain relatively soft and resilient.

4.13 DENSITY:

Density is another important property of cushioning materials, which limits its usage due to its weight contributing to the tare weight of a package and naturally increasing the cost of transport. Although some materials have a relationship between the density and its cushioning factors, the correlation between them is not generally applicable.

4.14 OTHER CHARACTERISTICS:

Other properties which should be considered in choosing the cushioning materials are fire resistance or flammability and the possibility of the materials causing health hazards to the personnel during application. Liquid absorbing capacity may be required for cushioning bottle with liquid products.

5. CLASSIFICATION OF CUSHIONING MATERIALS

Cushioning material are available mainly as granular materials, with bulk fibres, matted fibres'-textures, cellular structures and moulded or formed structures. They are mainly made of cellulose materials or foamed plastics. There are also special cushioning devices which are metal springs, fibres straps and rubber shock mounts.

Cushioning materials can broadly by classified into three basic categories as (1) space fillers (2) resilient cushioning materials and (3) non-resilient and rigid cushioning materials, based on their uses and properties.

Space fillers are mainly used to fill the voids in packages as dunnage to prevent reorientation of the items and sometimes to absorb liquid product spilled from the broken unit containers.

Resilient cushioning materials are used to protect packaged items from damage due to repeated shocks. Materials falling in this group have good compressibility and must be able to return to their original condition after each shock. They should be able to absorb shock energy without exerting too much force on the item. The force displacement curve of the resilient cushioning materials fall into three groups as liner, tangent and anomalous type (fig 1

Protecting packaged items from a single server shock as is experienced in an air dropping. These materials absorb shock by the collapse of their structure and cannot return back to their original shape after the shocks. The force Dis-placement curve of these materials face in the collapse of their structure and then increases very fast. They have low compression set for normal loads and have little or no resilience. However, they are resilient if they are used below their crushing force. They are normally used to cushion items intended for air dropping.

6. SPACE FILLERS

6.1 GRANULATED MATERIALS

6.1.1 Ground cork: cork is made from the outer bark of the Holm oak. Holm oak is an evergreen species *QUERCUS SUBBER* which grows mainly in Spain. It is tough light and elastic. Because of these properties it is mainly used as space filling cushioning material. it has fairly low bulk density and has a high compression set and fair resilience and good damping characteristics. It has high dusting characteristics and can contaminate the unprotected items.

6.1.2 Saw dust and coir pith: These are cellulosic materials and are cellular in structure and granular in form. They have fair resilience, but have good damping properties. They are highly absorbent, corrosive and have poor resistance. Their dusting characteristics are very high.

6.1.3 Kieselguhr: This is a fine white siliceous powder containing the remains of algae used as space filler, particularly around tins of liquid chemicals as it is non-inflammable and inert and will readily float on most liquids.

2. FIBRES AND STRIPS IN BULK FORM

6.2.1 Paddy straw and dry grass: straw and dry grass:

Straw and hay are cheap loose cushioning materials used to fill voids. They absorb water and are corrosive in nature. They are abrasive and have high dusting characteristics. A disadvantages of these materials is that on becoming wet they lose their cushioning property and provide good medium for the growth of fungal and bacteria. They have high compression set and their resilience is poor. They have good damping characteristics, low density and poor fungus resistance.

6.2.2 Woodwool: (excelsior) IS: 1707-1960: This material consists of thin pliable narrow shaving of wood. It provides a loose cushioning suitable for nesting individual stores or interposing between and around a number of stores where its moisture retaining and other contaminating properties are tolerable, e.g. in the packaging of crockery and glassware. As wood-wool absorbs water, it should be used inside a waterproof barrier. A disadvantage in the use of this material is that it tends to break into dust when handled repeatedly. Wood-wool pads may be used when its direct contact with the stores packed is not desirable.

As per Indian standard IS: 1707-1960, the wood-wool shall be manufactured from coniferous timbers only namely fir, deodar, and cypress, Spruce, chirr and blue pine. Wood should be thoroughly sound and dry, practically free from knots and cross grain. The moisture content limit as specified is between 8 and 20% at not less than 1.5 mm and not more than 3 mm, thickness not more than 0.33mm, length not less than 250 mm, in at least 75% supply. Strands less than 125mm, in length shall not exceed 10% including dust and small piece less than 25 mm, dust and small piece under 25 mm, in length in each bale shall not exceed 5% of the total weight of the bale.

Wood-wool may be employed as a cushioning material in losses form or bonded into slabs or moulded with resin or latex in a range of densities. The cushioning performance of this material is depended on the package density and its moisture content which in turn is affected by the relative humidity. The main advantage is the high energy absorption and its ability to fill spaces around irregularly shaped items.

It is hygroscopic and has high water absorption, low corrosive effect and fair density characteristics , low resilience, fair compression set, fair

damping ,fair creep, operating temp, ranging from 10 deg.C , 45 deg.C fair mold resistance and linear load deflection characteristics.

6.2.3 Paper shaving (IS:43560) : Paper shavings known as paper wool are cheap general purpose cushioning materials and provide good protection to light weight, bulky and delicate articles, e.g. electric bulb, confectionary and biscuits. They are used for (i) to mitigate shock (ii) to protect surfaces from abrasion (iii) to position an article in a container and prevent re-orientation of the object. These are moisture absorbent and should be used inside waterproof barrier, due to acidic nature corrodible to metallic surface. Paper cuttings, are manufactured from any variety of papers excluding newsprint.

According to the IS: 4356 the length at least 50% of the cuttings shall be 25 cm. or above. Amount of cuttings less than 12 cm. In length shall be less than 5% the width of the cutting shall be between 3 mm and 10 mm. The thickness of the cutting shall not be more than 0.12 mm. The limit of moisture content is 10%.

6.2.4 Creped cellulose wadding: Creped cellulose wadding is used in packaging to perform:

i. Surface protection: The soft open issues of cellulose wadding prevents scratching and etching of fine surfaces by absorbing microscopic dust particles into open pores of the wadding.

ii. Cushioning: Because of its goods resilience, light weight and low cost creped cellulose wadding is used as a cushioning material to protect delicate products from shock.

iii. Dunn age: Creped cellulose wadding is used primarily to race and cushion irregularly shaped objects and prevent item from moving during shipment. A creped cellulose wedding is generally supplied in two grades. (i) Water absorbent grade (ii) water resistant grade, water absorbent grade will absorb 16-12 time's water in weight.

Water resistant wadding is normally used in cases. Where a non-hygroscopic material is needed, wadding treated with water resistant resin is designed to absorb less than three times its weight in water.

6.2.5 Extruded or shredded from plastics: These are normally made from expanded polystyrene and have very low density, good resilience and low compression set and good water resistance and no dusting. They are non-corrosive and fungus resistant, but are very expensive.

6.2.6 Corrugated fibre board: Single face corrugated board which performs a combined wrapping and cushioning function has broadcast commercial application. The wrappability is increased by pre-scoring the sheet in a criss-cross or other pattern. Most applications of single face corrugated fiber board are for odd shapes, sizes and packaging is generally manually and individually performed from either a roll or pre-cut sheets.

7. RESILIENT COUSHIONING MATERIALS:

7.1 Bonded fibre materials:

7.1.1 Rubberized hair: This material is manufactured from animal fibre usually consisting of about 80% horse hair and 20% horseman. Horse tail or cow tail, bonded with rubber latex. This is available in flat sheet and mountings. To give greater flexibility and a wider range of static loadings the following three systems have been developed.

(i) Atlas Module: a large number of small modulus are formed to gather on thin sheet of high density rubberized hair, thus any number of modulus can be from the sheet to suit a particular need. Corner blocks, and conforming moulds can also be constructed by suitable cuttings.

7.1.2 Rubberized coir: This material consists of vegetable fibers bonded with latex and is available in sheet or moldings in a range of densities. It is neutral and is less corrosive. In addition it has low moisture content and low water absorption, low dust and can be treated with fungus resistance chemicals. As a cushioning media it has good resilience, low compression set, fair damping and load/deflection characteristics tangent type. This material is widely used for providing cushion to light engineering goods such

as typewriters, calculators, etc. and also for fragile equipment such as radios and sophisticated electronic equipments.

7.2 Polyurethane foams: This is formed by polymerized and simultaneous expansion of an isocyanate and hydroxyl compound. Available in sheets or moulding and in a range of densities from $1\frac{1}{2}$ lb/ft³. There are two general types of flexible polyurethane. Foam (i) based on polyester and (ii) based on polyethene.

Polyurethane foams are non-hygroscopic have low corrosive effect, good mould resistance, low dusting, stable to temperature ranging between 10 deg.C to 55 deg .C. susceptible to damage by ultra violet light. Regarding its cushioning properties it has good resilience, good damping, low creep, low compression set, and its load/ deflection characteristics are anomalous type. It has the capacity to absorb water.

Density or grade	1.0-4.0 lb/ft ³
Max. deflection	10%
Peak load	5lb/in ²
Cushion factor	1.9-3.0

3 Expanded polyethylene: This is a non-intercommunicating cellular material formed by expanding polymers by various methods. Expanded polyethylene is flexible and useful cushioning materials. It is resistant to common acids, alkalis and solvents and slightly attacked by conc. HNO₃.

It is non-hygroscopic , non-water absorbing, non-corrosive and has excellent mould resistant ,no dusting and stable to temperature ranging between -20 deg.C to 70 deg. C, resistant to common acid, alkalis and solvent. As regards its cushioning properties it has fair resilience, good dimpling. Low creep, fair compression set, and its load/deflection characteristic is anomalous type.

Density or grade	2 ^{1/2} 1 b/ft ³
Max. deflection	60%
Peak load	36 1 b/in ²
Cushion factor	2-3

7.4 Expanded polystyrene (flexible): This material is formed by the polymerization of styrene beads which are subsequently expanded by a carefully stream heating process. The final expansion of the styrene usually takes place in a mould contoured to the required shape. Slabs are made flexible by compressing it to about 20% of its original thickness and then allowing recovering. Their main advantage is lightness and comparatively high allowable static loading. It is generally recommended to protect items having fragility factors in the range of 40 to 70 g.

But is not recommended for items having fragility factors in the range of 20to 30 g. It is readily attacked by the fumes of solvents. It can be colour if required as well as made fire retardant and is available both as slab stock and moulds.

It is non-hygroscopic, poor water-absorbent, good mould resistant, low dusting, stable to temperature ranging from -30 deg. C to 70 deg. C, resistant to acid and alkaline but aromatic, aliphatic, and chlorinated hydrocarbons affect it. It has low corrosive effect. Regarding its cushioning characteristics. It has fair resilience, good damping, low creep, fair compression set. Its load/deflection characteristics are of anomalous type.

Density or grade	1-7 1b/ft ³
Max. deflection	60%
Peak load	70 1 b/in ²
Cushion factor	3.5 – 5.0

7.5 Rubber- closed cell expanded rubber: Cellular rubber, in which the cells are non-intercommunicating made from masticated raw-rubber. Each grade of density has distinguishing colour; normal grade contains little free sulphur, sunlight affect cushioning property.

It is non-hygroscopic and has very low water absorption, low corrosive affect good mould resistance, low dusting, temperature range -55 deg. C, resistanting acid, alkali, but susceptible to ultra violet light, aliphatic and aromatic hydrocarbons. Chlorinated solvents. It has good resilience, fair damping, low creep, fair compression set, fair efficiency and its load/deflection characteristics in nearly liner.

Density or grade	10-4 lb/ft ³	16-20 lb/ft ³	26-32 lb/ft ³	12-14
Max. deflection	50%	50%	50%	50%
Peak load	20 lb/in ²	35 lb/in ²	50 lb/in ²	30 lb/in ³
Cushion factor	3.5-4.5	3.5-4.5	3.5-4.5	3.5-4

6 Rubber – open cell:

- (i) Sponge rubber: is cellular rubber in which the cells are all inter-communicating or partly so made from masticated raw rubber in a range of densities.
- (ii) Latex foam: is cellular rubber in which the cells are all inter-communicating or partly so, made directly from liquid rubber latex in a range of densities. Both are useful commercial one trip cushioning materials, but tend to age quickly.

They are non-hygroscopic, non- corrosive, and have high water absorbing capacity. It has a good mould resistance. Low dusting and temperature range -40 deg.C to 45drg. C. Resistant to alkalis, dilute acid and oxygenated solvents but susceptible to alphabet and aromatic hydrocarbons chlorinated solvents and sunlight.

They have fair resilience, low damping, low creep, low compression set, and load/deflection characteristics curve in nearly linear.

	sponge	latex
Density or grade	25-30 lb/ft ³	1.5 lb/ft ³
Tax. deflection	-	60%
Peck load	-	1.5 lb/in ²
Wool felt (IS:1719)	-	4-5

7- Felts:

Pressed felt: There are two types of felt:-

- (I) Pressed felt
- (II) Pressed felt is made by closely felting or inter-locking fibres to form a material of even texture and uniform composition without warp or wett.
- (iii) Needle-loom felt: made by punching one or more layers of animal and /or vegetable fibres on to a woven base or interplay usually hessian. Both felts can give shock protection; usually application is to prevent abrasive sensitive surfaces from becoming damaged by rubbing against the container.

It is hygroscopic, water absorbent, can be made low corrosive, no dusting range of temperature is – 11 deg, C. to 55 deg, C, low resilience. Fair damping fair creep and fair compression etc.

7.8 Spring and shock amount: springs can be used either under tension or under compression when used for suspension of an item. They will be under tension but when used as shock mounts they are under compression. Rubber plugs are also used as shock mounts like springs. Their force replacement curves are linear and they rebound with all the energy by which, they are compressed and absorbed. Their natural frequency should be low so that they can isolate the vibrations.

8. NON-RESILIENT CUSHIONING MATERIALS

8.1: Mould pulp containers: These types of containers can be defined as article moulded from a mixture of water and any type of fibers material capable of being treated by normal paper making process. This raw material used can broadly is classified into two main classes:-

(I) Moisture in varying proportions of virgin mechanical and chemical wood. Pulp either with or without the addition of water proofing, hardening, coloring of other materials.

(ii) Waste paper pulps either with or without the addition of material as below:

Pressure mounded containers are used in very large quantity of packing and projecting electrical and engineering components. For the projection of highly finished machine parts and for inter-departmental transit during manufacturing.

Polyurethane foam (rigid): This is formed by polymerization and simultaneous expansion of an isocyanate and hydroxyl compound. Available in rigid sheets and moldings in a range of densities from 1 to 6 lbs/ft³.

Polyvinyl chloride foam: This is an expanded thermoplastic material composed of vinyl chloride available in sheet in a range of densities from 2-4 lbs/ft³. This is similar to expanded polystyrene (flexible) shape. When the material is used without pre-compression it acts as a non-resilient cushion if loaded sufficiently.

Paper-honeycomb structure: A sheet material made of strips of paper bonded to each other such that when the end strips are pulled apart they form hexagonal cells at right angles to the direction of pull. Available in a range of cell sizes from $\frac{1}{2}$ in. its main advantages is its exceptional lightness .It is widely used for parachute dropping.

FIGURE 1
TANGENT TYPE

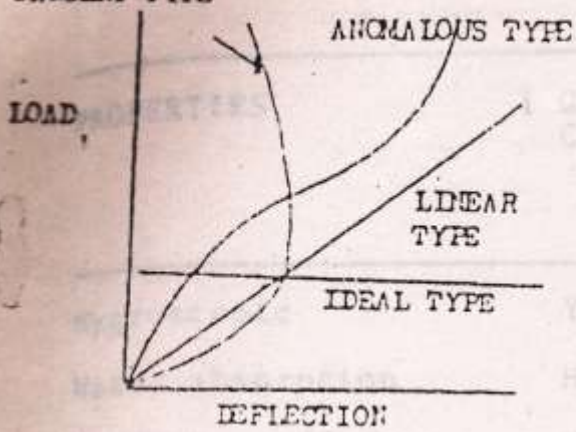


FIGURE 2

GOOD QUALITY RUBBERISED HAIR

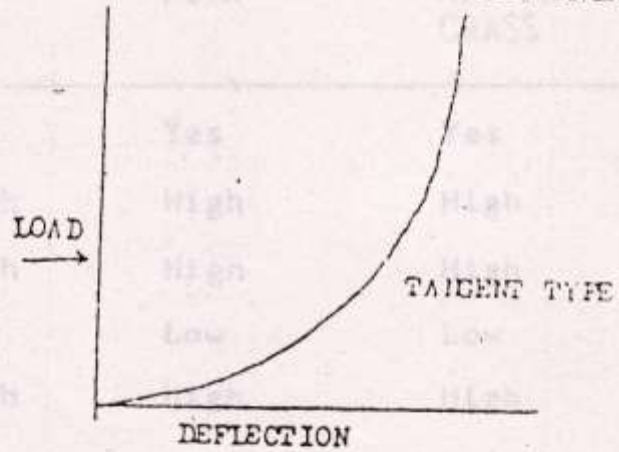


FIGURE 3
OPEN CELL STRUCTURE PLASTICS
RUBBERISED COIR

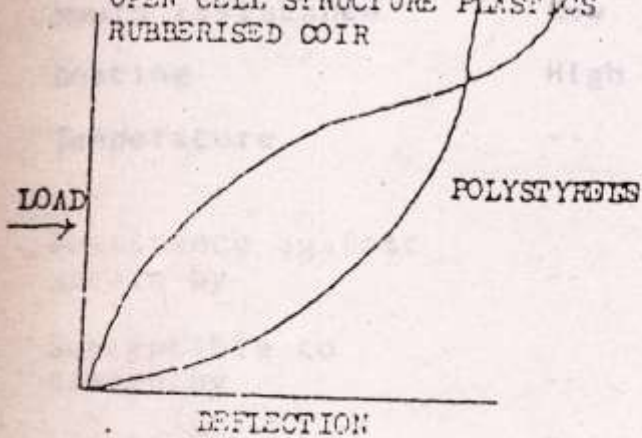
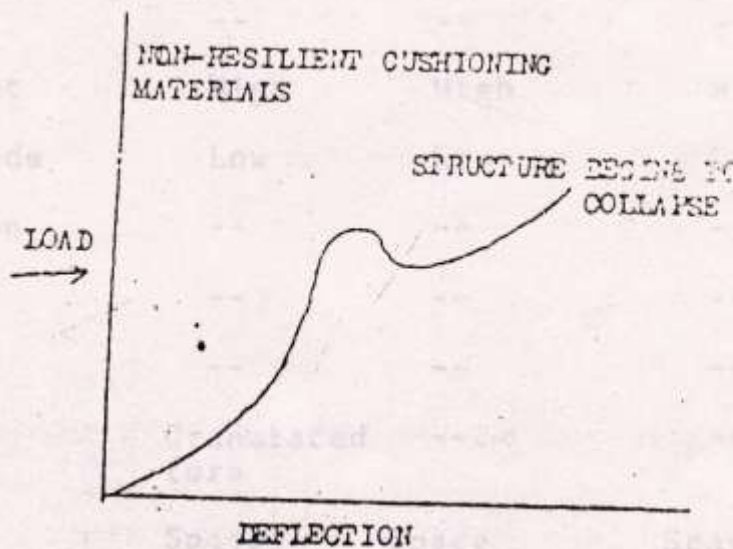


FIGURE 4

NON-RESILIENT CUSHIONING MATERIALS



CUSHIONING MATERIALS

PROPERTIES	1.GROUND CORK	2.SAW DUST AND COIR PITH	3.PADDY STRAW AND DRY GRASS	4.WOODWOOL
Hygroscopic	Yes	Yes	Yes	Yes
Water absorption	High	High	High	High
Corrosive effects	High	High	High	Low
Mould resistance	Low	Low	Low	Fair
Dusting	High	High	High	Fair
Temperature	---	--	---	-10°c. 45°c
Resistance against attack by	---	---	---	---
Susceptible to damage by	---	---	---	---
Resilience	Fair	Fair	Low	Low
Damping	High	High	High	Fair
Creep	---	---	---	Fair
Compression set	High	High	High	Fair
Density or grade	Low	Low	Low	6 lb/ft ³
Max.deflection	---	---	---	50%
Peak load	---	---	---	35 lb
Cushion factor	---	---	---	4.5
Form available	Granulated form	--	--	In loose slab for
Used as	Space filler	Space filler	Space filler	Space filler
LOAD/deflection characteristics	---	--	---	Near linear

PROPERTIES	5.PAPER SHAVINGS	6.CELLULOSE WADDINGS	7.MOULDED PULP	8.CORRUGATED EL
Hygroscopic	yes	no	yes	yes
Water absorption	high	low	high	High
Corrosive effects	high	low	high	High
Mould resistance	Low	nil	low	Low
Temperature	--	--	--	--
Resistance against attack by	--	--	--	--
Susceptible to damage by	--	--	--	--
Resilience	low	fair	low	Fair
Damping	high	low	--	Low
Creep	--	--	--	--
Compression set	fair	low	--	Low
Density or grade	Low	low	--	Fair
Max.deflection	--	--	--	--
Peak load	--	--	--	--
Cushion factor	--	--	--	--
Form available	--	--	Molded form	In sheets mould, wrapper cut pad
Used as	Against abrasion mitigate shock prevent re-orientation	Surface protection dunnage	--	Wrapped die cup
LOAD/deflection characteristics	--	--	--	--

PROPERTIES	9.PAST	10.PAPER HONEY-COMB	11.RUBBERISED HAIR	12 RUBBERISED COIR
Hygroscopic	YES	YES	YES	YES
Water absorption	HIGH	RIGHT	FAIR	LOW
Corrosive effects	CAN BE MADE LOW	CAN BE MADE LOW	LOW	CAN BE MADE LOW
Mould resistance	--	LOW	GOOD	GOOD
Dusting	LOW	LOW	LOW	LOW
Temperature	-10° TO °35	--	-10° TO 70°	--
Resistance against attack by	--	--	--	-
Susceptible to damage by	---	--	--	--
Resilience	LOW	LOW	RESILIENT UPTO CRUSHING POINT	GOOD
Damping	FAIR	low	Fair	Fair
Creep	FAIR	--	Low	Low
Compression set	FAIR	low	Low	Low
Density or grade	--	--	I 4 1b/ft ³ ii 6 1b/ft ³ iii 9 1b/ft ³	--
Max. deflection	--	--	I. 60 II. 60% III. 90% IV. 60% V. 60%	--
Peak load	--	--	I 6 1b/in ² li 11. 1b/in ² lii 18 1b/in ² Iv 11 1b/in ² V 11 1b/in ²	--
Cushion factor	--	--	I) 4-4.5 ii)4-4.5 iii)3.3-3.8 iv)2.3-2.8 v)3-3.3	---
Form available	ROLLS	In sheet	Die sheet	Sheets
Used as	SHOCK PROTECTION AGAINST ABRASION	Non-resilient cushion	Resilient Cushioning material	Resilience Cushioning material
LOAD/deflection characteristics	--	--	Tangent type	Tangent type

PROPERTIES	13 RUBBER CLOSED CELL	14 RUBBER-OPEN CELL	15 POLYURETHANE FOAM	16 EXPAPOLYTHYLEN
Hygroscopic	NO	NO	NO	NO
Water absorption	VERY LOW	HIGH	HIGH	HIGH
Corrosive effects	CAN BE MADE LOW	CAN BE MADE LOW	LOW	NONE
Mould resistance	GOOD	GOOD	GOOD	EXCELLENT
Dusting	LOW	LOW	LOW	NILL
Temperature	-55° TO .45°C	-40 TO .45°C	-10 TO -55°C	-20 TO .70°C
Resistance against attack by	ALKALIES, ACIDS OXYGENATED SOLVENT	ALKALIES, ACIDS OXYGENATED SOLVENT	--	COMMON ACIDS, ALKALIE & SOLVENT
Susceptible to damage by	ULTRAVIOLET LIGHT ALIPHATIE AND AROMATIC HYDROCARBONS CHLORINATED SOLVENTS	ALIPHATIC & AROMATIC HYDROCARBONS SUNLIGHT CHLORINATED SOLVENT	ULTRA VIOLET	CON.HT
Resilience	GOOD	FAIR	GOOD	FAIR
Damping	FAIR	LOW	GOOD	GOOD
Creep	LOW	LOW	LOW	LOW
Compression set	FAIR	LOW	LOW	FAIR
Density or grade	I)10-40 1B/FT ³ II) 16-20 1BFT ³ III) 26-32 1B/FT ³	I)25-30 1B/FT ³ II)15 1B/FT ³	--	I)1.0-4 1B/FT ³ II)3.0-15 1B/FT ³
Max.deflection	I)50% II)50% III)50%	I) II)60%	I)80% II)--	60%
Peak load	I)20 1B/IN ² II)35 1B/IN ² III)30 1B/IN ²	I)– II)15 1B/IN ²	I)51 1B/IN ²	36 1B/FT ²
Cushion factor	I)3.5-4.5 II)3.5-4.5	I)– II)4-5	I)1.9-3.0 II)--	2-3
Form available	IN SHEET & MOULDED FORM	--	IN SHABS	IN SHEET FORM
Used as	RESILIENT CUSHIONING MATERIAL	RESILIENT CUSHIONING MATERIAL	RESILIENT CUSHIONING MATERIAL	RESILIENCE CUSHIONING MATERIAL
LOAD/deflection characteristics	LINEAR	NEARLY	ANOMALOUS	ANOMALOUS

PROPERTIES	17 EXPANDED POLYSTYRENE	18 RUBBER SHOCK MOUNTS	19 METAL
Hygroscopic	NO	NO	NO
Water absorption	VERY LOW	VERY LOW	NIL
Corrosive effects	LOW	CAN BE LOW	--
Mould resistance	GOOD	GOOD	EXCELLENT
Dusting	LOW	NIL	NIL
Temperature	-30 TO 70°C	-40 TO -70°C	-60 TO 100°C
Resistance against attack by	DIL.ACID & CON. ALKALIES	--	--
Susceptible to damage by	AROMATIC, ALPHATIC AND CHLORINATED HYDRO CARBON	--	--
Resilience	FAIR	FAIR	GOOD
Damping	GOOD	CAN BE HIGH	CAN BE ADDED
Creep	LOW	LOW	NIL
Compression set	FAIR	LOW	VERY LOW
Density or grade	11 1B/FT ³ 7 1B/FT ³	LOW	VERY LOW
Max.deflection	60%	UPTO 100%	50-80%
Peak load	70 1B/IN ²	--	VARIES
Cushion factor	3.5-5.0	2-5	2-5
Form available	IN SLAB & MOULDING	--	-
Used as	RESILIENT, SPACE FILLER NON-RESILIENT	RESILIENT	RESILIENT
LOAD/deflection characteristics	ANOMALOUS	BI-LINEAR	VARIES

SOLID FIBERS BOARD BOX AS A TRANSPORT PACK

Much has been talked about corrugated fibre board. Comparatively, I feel, solid fibre board has still remained a less discussed subject in our country. But, as a matter of fact, solid fibre board has got every right to enjoy a status equal to one corrugated fibre board does. As an intermediate or transport pack solid fibre board boxes are really excellent and in certain occasions they might be termed unpatrolled.

A. What is solid fibre board? How is it processed?

It is a laminate of one or multiple layers of mill board and craft-paper while sodium-silicate and dextrin are used as adhesives. For lamination of mill board to mill board. Sodium –silicate is used: while lamination of top liner of craft paper is laminated both at the top and bottom. In automatic lamination machines, mill board and craft plies. In feel from, are first combined together with the help of adhesive in “adhesive application zone”, then the composite board is pressed and subsequently dried in the “dryer zone”. After drying, which is a partial drying, the board is made into sheets of desired size. At this stage, solid fibre board retains moisture content 12-13% and this is the ideal moisture content because when these sheets would be converted into boxes, at the pressure of creasers and barb ends cracks might develop, which may be explicit at the stage of forming of the boxes.

Solid fibre board, because of its top layer of craft paper, is printable and for the printing, flexi-printing process is the most ideal one. If required, screen printing is also employed depending on the desired printing effect. Solid fibre board boxes with multicolour printing effect, is an excellent medium for transport-packing of a number of commodities e.g. soaps and detergents, cosmetics, light engineering products, glass wares. Confectioneries are to be marketed inside the country or abroad.

B. Combination board – what is it?

Solid fibre board combined with a two-ply corrugated board is called combination board. This board has got a unique combination of various essential properties of a transport pack viz.

- (i) High puncture resistance
- (ii) Good cushioning effect

(iii) High compression resistance

Because of all these qualities, boxes made of combination board can be utilized for packing of heavy fragile objects, light engineering products with highly polished surface and certain delicate parts and packaging of certain food stuff which is brittle in nature etc. These boxes also offer the advantage of appreciably good stacking height.

C. Solid fibre board with moisture / water proof inner or outer lining.

It is also possible to impart either an inner or outer moisture/water proof lining to the solid fibre board by laminating a Kraft liner to the board with bitumen. Boxes made with this type of board are able to safeguard such goods that need protection against moisture and water e.g. food products, highly corrosive materials, match boxes etc.

D. Solid fibre board with Hessian lining

It is also possible to combine one layer of Hessian cloth with solid fibre board with the help of bitumen. This type of board holds extraordinary resistance to puncture and moisture. It also has got very high bursting strength. Boxes made out of it are generally used as an export pack for engineering goods. Solid fibre boards, available in terms of their grammage and number of plies, can be subdivided in the following classes.

TABLE

The following chart shows the physical characteristics of various types of solid fibre board.

Class no.	Details of plies	Total Grammage
1.	One ply of Kraft paper at top One ply of mil board at bottom	500 to 550
2.	Two plies of Kraft paper – one at top and one at bottom. One ply of mill board in between	550 to 700
3.	One ply of Kraft paper at top Two plies of mill board at bottom	800 to 950
4.	Two plies of Kraft paper – one at top and one at bottom. Two plies of mill board in between	850 to 900
5.	One ply of Kraft paper at top. Three plies of mill board at bottom	1100 to 1200
6.	Two plies of Kraft paper – one at top and one at bottom. Three plies of mill board in between	1300 to 1450
7.	One ply of Kraft paper at top. Four plies of mill board at bottoms	1550 to 1650
8.	Hessian/lining bituminized with Kraft paper at top. Solid fibre board of class no. 5 or 7 at bottom	1800 to 2200

Class no 1 and 2 of solid fibre board are generally termed as carton board.

Class no.	Substance (g/m ²)	Thickness	Bursting strength (kg/cm ²)	Puncture resistance
1.	500 to 550	0.85-0.94	4.5-5.0	35-45
2.	550 to 700	0.85-1.12	5.0-6.3	45-55
3.	800-950	1.36-1.61	6.5-7.8	70-90
4.	850-900	1.45-1.55	6.0-7.2	800-100
5.	1100-1200	1.87-2.00	8.5-9.5	125-175
6.	1300-1400	2.20-2.40	9.5-10.0	180-225
7.	1550-1650	2.60-2.80	10.5-11.5	225-275
8.	1800-2200	3.00-3.70	12.5-15.0	300&above

- (i) Higher bursting strength if required may be achieved by using superior grades of mill board and Kraft paper.
- (ii) For all the above classes of solid fibre board, requirements of 30mm cob test value is 120 (max).

Conclusion

Solid fibre board box with its appealing multicolour printing and adequate physical strength properties has already earned prestigious position in the domain of transport packaging. Cost wise also it has got the capacity to compete with corrugated fibre board boxes because mill board, which is much cheaper than Kraft paper, is the major constituent. From sufficient and WVTR point a view also solid fibre board has been found to be superior to corrugated fibre board. Doubt of many people that solid fibre board is prone to fungus attack has also been uprooted with the proportion of anti fungus chemicals e.g. S.S.A., santobrite etc. with the adhesive and incorporation of copper chromites in the mill paper itself. So there is no reason why solid fibre board which has remained a less discussed subject would trail behind.

PACKAGING OF ACCESSORIES AND SPARES SKIN BLISTER AND SHRINK PACKAGING

Until recently, packaging has been considered a minor element in the marketing mix for a product in our country. The two traditional packaging concerns of manufacturers are product protection and economy. The manufacturer wants packaging that will protect the product during the long passage from the factory through the distributors to the final customer. At the same time he wants to keep packaging cost down because packaging is still viewed in many quarters in our country as a straight forward cost without any substantial marketing consequences. Other packaging objectives are convenience and promotional function.

Developing the package for a new product requires a large number of decisions, in which representatives from marketing and production participate along with other technical specialities. The first task is to establish what the packaging should basically “be” or “do” for the particular product, Should be the main function of the package to be offer superior product protection, introduce a novel dispensing method, and suggest certain qualities about product or the company or something else? Once the packaging concept is defined, a cost of further decision have to be made on the other elements of the package design, size, shape, materials, colour text, brand name etc. each element present a large number of options. The packaging elements also must be guides on decision on pricing, advertising and other marketing elements.

Once the packaging concept has been defined and decisions have been made about the various elements, one has to look for the suitable packaging machinery to produce the most efficient package considering the nature of the product, type of protection required, mode of distribution and other aspects like economics, convenience, presentation, identification and easy disposability.

BLISTER PACKAGING

Blister packaging is a mode of semi rigid packaging. A blister pack is a combined construction of heat formed transportation bubble or blister,

usually shaped to follow the contour of the articles being contained, sealed to a suitable backing card to completely encapsulate the said article or articles and designed primarily as a preventive package to combat pilferage in our system of open store selling.

In blister packaging, the mould with the suitable size of cavities is brought into contact with plasticised PVC film thereby the PVC film forms blisters of required sizes and shapes by vacuum forming. The product is then put in these blisters manually and stuck to pre printed; pre laminated adhesive coated cardboard on a separate sealing machine.

Why use a blister pack machine?

The blister packs are ideal for point of sale promotion and have tremendous sales appeal as the product can be clearly seen through the blister packs. The blister packs are safe and hygienic. These packs have high flavour retention properties. They also eliminate moisture absorption and reduce water vapour transmission rate. What is more, products packed by blister pack machine are economical and easy to handle and dispense.

Blister pack machine offers a wide packaging range and has several advantages as mentioned below:-

1. From bulk tablets the finished blister packs, the process is fully automatic and continues motion. Thus reduces wear and tear as well as the noise level.
2. The machine guarantees the lowest waste, maximum PVC film and aluminium foil usage and no distortion of preheated PVC film.
3. The machine is convenient to handle and change over from one package size to another is quick and efficient.
4. Advantage in storage due to smaller size of bulk packs and consequent reduction in cost.

5. Other advantages include low power consumption and easy temperature control, maintenance and access to all moving parts.
6. The following equipments are available as extra optional accessories:
 - ❖ Number device for printing lot numbers (embossing type)
 - ❖ Rotary code printer for superior flexi printing (coding device)
 - ❖ Vacuum drums for alternative pack sizes
 - ❖ Blanking tool for alternative pack sizes
 - ❖ Automatic photo electrical control for registration of pre-printed backing.
 - ❖ Semi or fully automatic feed systems, depending on product
 - ❖ Conveyor belt or other arrangements for carrying finished blister packs to cartooning unit.

Above all, it is much more economical to produce packs on blister pack machine and to store them.

SKIN PCKAGING:-

The product is arranged manually on the pre-printed pre-laminated adhesive coated and perforated cardboard. The PVC film of suitable gauge is heated up by electric elements and brought in contact to the cardboard with product thereof, when the vacuum forming takes place by suction. The PVC film sticks to the laminated chipboard and the product is skin packed according to its size and shape, and that the product does not move. If required, the chipboard can also be decorated to ease the selling of the product in retail.

WHY ANYONE USE SKIN PACKAGING MACHINE?

The skin packaging has many advantages as given below:-

- ❖ With the skin packaging you can be sure the packaging is airtight and hygienic and the product has improved dust and moisture protection.
- ❖ The transit damage is much reduced because shifting of the product is prevented.
- ❖ The need for cushioning inserts is reduced, hence there is reduced space required for storage of packaging materials and less volume or weight to pay for.
- ❖ When the skin packs arrive at its destination, it can be inspected easily and there is less packaging material for disposal.
- ❖ Skin packaging also puts packaging costs and freight costs.
- ❖ Above all, it makes your product look attractive. It helps your customer to see more in your product than meets the eye. He sees better image of your company. That means he thinks about you people are insist on reliability, efficiency and high standard.

SHRINK PACKAGING:-

The product is wrapped in shrinkable polythene or PVC film and the ends sealed with the help of sealer. The film is shrinking by hot air circulating in the shrink tunnel to form a snug, tight fitting wrap around the pack, thereby preventing movement within the pack, and any consequent damage to the product. The process is done in 4 stages wrapping, heat sealing, shrinking and cooling.

Why use a shrink wrap system?

The shrink packaging has the following advantages:-

- ❖ Contour fit: shrink a film readily conforms to odd shapes and large sizes.

- ❖ Neat appearance: Tightening the film eliminates looseness and wrinkles, enhancing product appearance.
- ❖ Improved see-through display: product could easily be seen.
- ❖ Immobilization: shrink films can keep one or more products in place, protecting against movement that might cause scuffing or breakage.
- ❖ Innovation: shrink film lend themselves at the pioneering of new or improved packages. For example: a shrink wrap provides:-
 - a. Improved product identification with reduced labelling costs.
 - b. Reduction in floor areas required for transporting and warehousing of the packed product.
 - c. Reduction of labour at the store level due to more rapid product identification and faster container opening.
 - d. Elimination of damage in opening.

Above all shrink packaging is most suitable these days for bulk packaging. In years to come, bulk packaging will also adopt a technology called "Stretch Film Technology". Stretch film is a name given to PE film which can be cold stretched in the longitudinal and transverse directions without the application of heat and which when stretched round a pack maintains a tension for a long period. The stretch film is wrapped round a package under some form of mechanical strengthens. The name is therefore more closely related to the packaging technique than to the packaging material.

The packaging industry in India should take advantage of the above new developments in unit packaging. Skin packaging and blister packaging which offer tremendous sales appeal and greater protection to smaller products either by unitising or immobilising them inside the package and the industry should also switch over to bulk packaging using shrink technology, containerisation and pollicisation to suit modern material handling methods.