

Legal requirements of packaging materials and product information

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Introduction

- Most of the packaging related regulatory initiatives are concerned to the Product quality, Public Health and Hygiene, Safety, Export Promotion, Transportation and Consumer protection.
- Packaging needs to communicate clearly all the mandatory information about the product to the consumer. Wrong information given on the package could mislead the consumer.
- The packaging must communicate the way to handle the package or the product. This helps in protecting the consumers from accidents that could occur while opening the pack or during disposal, as in the case of glass bottles.
- The international markets has made various packaging rules and regulations mandatory. Therefore, packaging for exports should comply with global norms to match with international standards.

Cont.

- Government of India has instituted various laws and regulations. All these legislations are classified into two types i.e. Compulsory and Voluntary Standards.
- To ensure product quality and provide safety to the consumer, it is important to regulate manufacturing, distribution, marketing and retailing of packaged products.
- This can be achieved by mandating rules and regulations. The Government of India has formulated a number of laws pertaining to packaging in the past years. Due to the sensitive nature of food, stringent rules and regulations have been mandated to address specific issues.

Negative Effects of Plastics as Packaging Material

Negative health effects

- **PVC (polyvinyl chloride)** → toxic chemicals called **adipates** and **Phthalates** ("plasticizers"), are used to soften brittle PVC into a more flexible form.
- International Agency for Research on Cancer (IARC) of WHO Has recognised these chemical as human carcinogen
- Plasticizers used to make soft PVC for toys can leach out into the mouths of the children chewing on the toys.
- Phthalate softeners, including **DEHP** (diethylhexyl phthalate), used in toys and **DINP** (diisononyl phthalate) is found to be risky. These plasticizers are banned since 2006.
- PVC plastic has been used safely for more than 70 years in a variety of medical and commercial applications and humans. No reports of adverse human health effects have been reported from intravenous (IV) bags and medical tubing made with PVC.

Vinyl chloride monomer: The carcinogenicity of vinyl chloride monomer to humans who were exposed to very high VCM levels, routinely, for many years have been linked.

- Vinyl chloride is a known human carcinogen that causes a rare cancer of the liver.
- **Dioxins:** The dioxin is produced as a by product of vinyl chloride manufacture and from incineration of waste PVC in domestic garbage
- Dioxins are a global health threat because they persist in the environment and can travel long distances. At very low levels, dioxins have been linked to immune system suppression, reproductive disorders, a variety of cancers, and endometriosis

- **PS (polystyrene)** is one of the toxins the EPA (Environmental Protection Agency) monitors in America's drinking water. Its production also pollutes the atmosphere, destroying the ozone layer.
- Other (usually polycarbonate - PC) group that consists mainly of polycarbonates, whose primary building block is **bisphenol A (BPA)**, a hormone disrupter that releases into food and liquid and acts like estrogen.
- Research in Environmental Health Perspectives finds that BPA (leached from the lining of tin cans, dental sealants and polycarbonate bottles) can increase body weight of lab animals' offspring, as well as impact hormone levels.
- A more recent animal study suggests that even low-level exposure to BPA results in insulin resistance, which can lead to inflammation and heart disease.

Negative effects on environment

- Plastics are durable and degrade very slowly.
- In some cases, burning plastic can release toxic fumes.
- The manufacturing of plastics often creates large quantities of chemical pollutants.
- Thermoplastics can be re melted and reused, and thermoset plastics can be ground up and used as filler, though the purity of the material tends to degrade with each reuse cycle.
- To assist recycling of disposable items, the Plastic Bottle Institute of the Society of the
- Plastics Industry devised a now-familiar scheme to mark plastic bottles by plastic type.

- A recyclable plastic container using this scheme is marked with a triangle of three "chasing arrows", which encloses a number giving the plastic type i.e. Resin identification code.
- Unfortunately, recycling plastics has proven difficult. The biggest problem with plastic recycling is that it is difficult to automate the sorting of plastic waste, and so it is labor intensive.

Recycling certain types of plastics can be unprofitable, as well, e.g. polystyrene is rarely recycled because it is usually not cost effective. These unrecyclable wastes can be disposed of in landfills, incinerated or used to produce electricity at waste-to-energy plants.

Residual Toxic Components Present in Plastics

- Many plastics are used for foods. Packaging materials are made up of polymers which are insoluble in beverages as well as pharmaceutical products and foods.
- Great number of substances are extracted by food such as plasticizers, pigments, catalyst, adhesives and monomers or low molecular weight, polymer/oligomers and these are hazardous and toxic for human health.
- Even leaching of plasticizers by liquid product from packaging material results into embrittlement of the packaging material itself.
- The preservatives in food/pharmaceutical are absorbed into plastic and therefore the resulting unprotected product leads to spoilage.

- In case of PE bottles, **the milk fat gets into plastic by absorption** and it results into rancidity of the product and therefore such bottles can't be reused.
- Also product and packaging material reacts with each other. Human health is affected by continuous consumption of such product which increases the level of undesirable components in blood.

Therefore, for food grade plastics, two types of limits are fixed:

1. **Global migration:** Includes all substances (from plastics) transferred to food i.e. sum of all mobile packaging components transferred to food. They may be toxic/non-toxic, even substances physiologically harmless and even unknown also.
2. **Specific migration:** Includes one or two individual, identifiable components only. For these reasons Toxicological substances and Labeled components are used.

Overall migration units are fixed at 10 mg/cm² of the surface of the packaging material or articles in the following cases as per BIS:

- Rigorous scrutiny and list “Food Grade materials” is to be made.
- Global migration limits of 60 mg/kg of food stuff or 10 mg/cm² is been suggested by EEC.
- Typical food simulating solvents suggested are water, 3% acetic acid, 50/80% ethanol, Rectified spirit or heptane.
- Extraction conditions are high temperature, short duration or moderate temperature and long duration.

- India: BIS and CCFS (Central committee on Food Standards) Guide lines prepared.
- PVC: The VC monomer content limit:1 ppm (max).
- PS: Styrene monomer limit: 0.2% by mass of polymer.
- Test method specified (IS: 9845 Revised 1986): With a view to help both manufacturer and health authorities, CFTRI and IIP (Indian Institute of packaging, Bombay) have built up infrastructural facilities to assess the compatibility of plastics and also to estimate the migration.

Residual toxic compounds likely to be transferred to food through plastics

1. **Monomers and oligomers:** Polymers have very high molecular weight and hence not assimilated by the body. Monomers being small may be assimilated by the body and therefore may pose health problems.
2. **Polymerization residues:** There may be presence of catalysts, solvents, emulsifiers and wetting agents having low molecular weight. During film container manufacturing a variety of processing aids are added which are:
 - a. **Antioxidants:** To prevent fading of colour and prevent cracking, viz. BHA/BHT etc.
 - b. **Antiblock agents:** To avoid blocking of film i.e. when it is drawn rolled the film surfaces should not adhere to each other.
 - c. **Antistatic agents:** They are important in packaging industries, when two materials/surfaces are in contact, the electrons on the surface atoms intermingle and may move from one material to another.

The nature of plastic will determine the degree to which this takes place e.g. PS is most active followed by Acrylic and PE. Friction between the materials increases movement of electrons when they are separated. Absence of antistatic agents may lead to:

1. Fire/spark hazard
2. Dust attraction and
3. Difficulty in De- rolling

Presence of moisture in air causes ionization resulting into neutralize electrons. The antistatic agents absorb moisture from air.

d. Plasticizers: At lower processing temperature they **avoids decomposition of polymer** and modify processing characteristics like flexibility. They do these functions by **acting as lubricant**. They allow the molecules of plastic to **slide over one another freely**. Plasticizers tend to ooze out during long contact or high temp and they may migrate from one plastic to another (e.g. from vinyl to PS if they are in contact). They may also leach out by solvents or by liquid product.

e. Lubricants: Internal lubricants such as Fatty acid glycerides **reduce friction between plastic molecules**, and External lubricants like Montanic acid reduce friction with processing equipments.

f. Slip agents: like Silicon components helps in easy rolling/derolling of film

Methods of reducing migration from packaging material to food

- Use of new migration resistant plasticizers.
- Improvement in formulation or reduce greatly their use.
- Surface treatment of finished plastic products to reduce plasticizer migration (U.V. light, laser radiation treatments given).

Factors involved in migration

- Composition and properties of packaging materials
- Composition and properties of food stuffs
- Surface (plastic) to volume (food) ratio
- Temperature conditions
- Duration of contact
- Influence of light

Restriction on Advertisement

- There shall be no advertisement of any food which is misleading or contravening the provisions of Prevention of Food Adulteration Act, 1954 (37 of 1954) or the rules made thereunder.

The institutions for testing the general classes of materials or packages

1.	ASTM	American Society of Testing and Materials Standards
2	TAPPI	Technical Association for the Pulp and Paper Industry (USA) Standards
3	BIS	Bureau of Indian Standards
4	ISO/R	International Standards Recommendations
5	BS	British Standards
6	FEFCO	Federation Europeenne des Fabricants de Carton Ondule Test Methods
7	PIFA	Packaging and Industrial Films Association Standards
8	ABA	American Box Board Association
9	BPBMA	British Paper and Board Manufacturers' Association
10	NFPA	National Flexible Packaging Association
11	PFMA	Packaging Film Manufacturers Association
12	FPA	Flexible Packaging Association
13	FCBMAI	Federation of Corrugated Box Manufacturers Association of India

A. PAPER & PAPER BOARD

Sl no	Stand ard	Detail
1	1397	Kraft Paper Specification Reaffirmed 1995
2	1848	Writing and Printing Specification (Third Revision) Reaffirmed 1995
3	6956	Cover paper specification Year 2001

B. STEEL / METAL

1	1783	Type - 1 Specification for drum Part - I Year 1993 Reaffirmed 1998
2	2552	Steel Drums (Galvanized & Un-Galvanized) Reaffirmed 1995
3	3575	Specification of Bitumen Drum - Year 1993 (Third Revision) Round & Rectangular Tinsplate Cans for Liquid Pesticides - Year 1991
4	9992	((First Revision) Square Tins - 15 Kg./litre for Ghee, Vanaspati, Edible Oils and Bakery
5	10325	Shortening - 2000 (Second Revision)

C. PLASTIC & ALLIED MATERIALS

	13262	Specification for pressure sensitive adhesive cellulose tapes : Year 1992 Reaffirmed 2003
	6312	Polyethylene Containers for the Transport of Material - specification Year 1994 Reaffirmed 1999
	8069	High Density Polyethylene (HDPE) Woven Sacks for Packing Pesticides - Specification (Second Revision) Year 1989 Part (1 & 2) Reaffirmed 1997
	2508	Low Density Polyethylene Specification Year 1984 Reprint Dec 1996

D. PLASTIC FEEDING BOTTLE

	14625	Plastic Feeding Bottle Year 1999 Reaffirmed 2004