

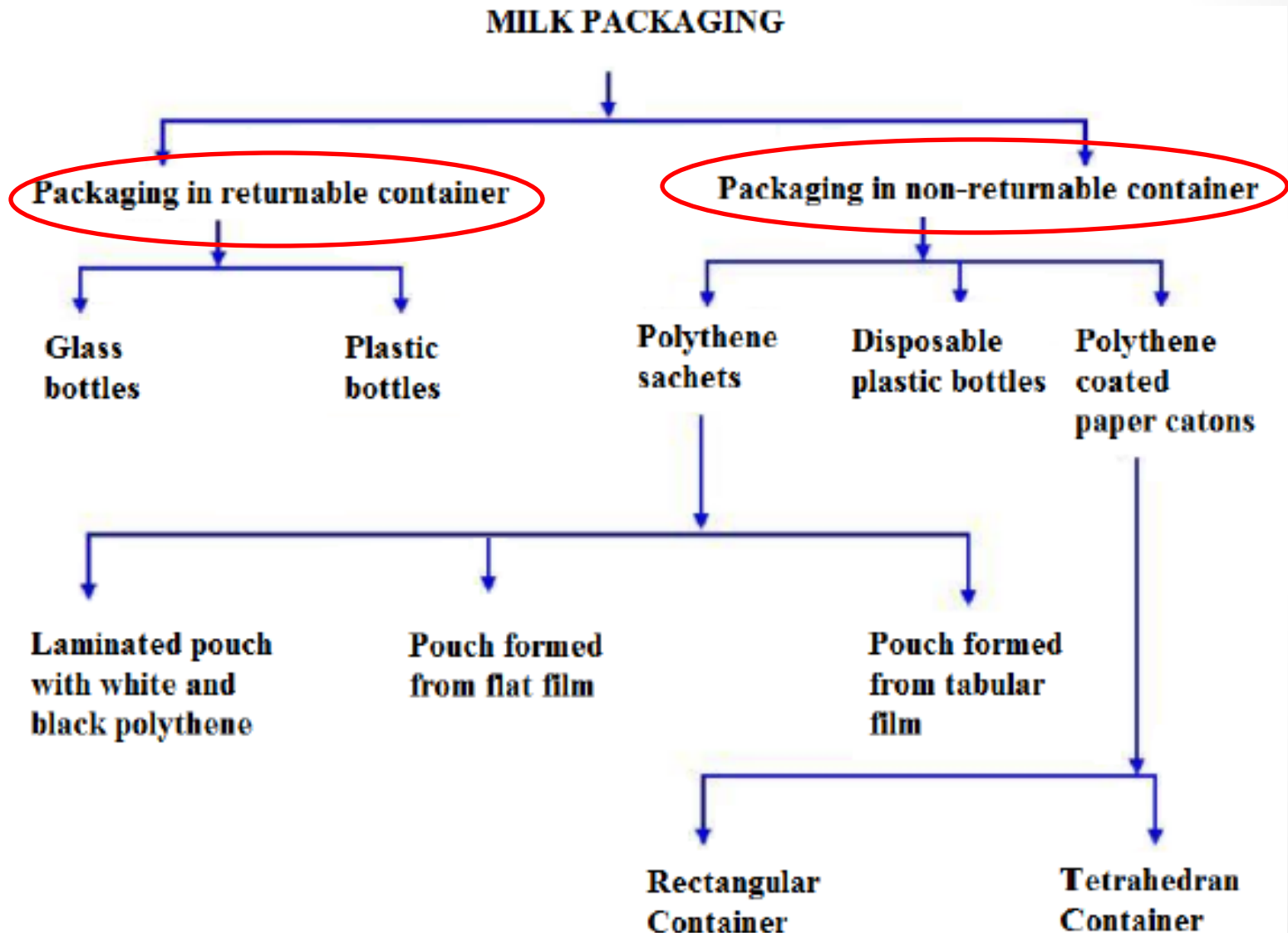
Packaging of Pasteurised and UHT sterilized milk

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Introduction

- Preserve its nutritive value
- Saving of wastage
- Improve the marketability to achieve better returns.
- To deliver the nutritious milk to the consumer in most economical, hygienic, safe and environmentally friendly package.

Classification of Milk Packaging Systems



Characteristics of Pasteurized Milk

- Milk has a tendency to absorb the flavours from its environment.
- Risk of Contamination is more in liquid milk.
- Adulteration can be done easily when not packed properly.
- It is difficult to handle milk in bulk quantities.
- Milk is prone for oxidation when exposed to sun light

Criteria for Selection of Milk Packaging Material for Pasteurized Milk

- It should be free from off-flavours.
- It should not impart any taste or flavour to the product.
- It should act as barrier to bacterial contamination,
- It should be resistant to UV light (max transmission: 8% at 500 nm & 2% at 400nm).
- It should have no physiological effects on the products .
- It should possess good mechanical properties (sealing, tensile, structural strength etc.).
- It should be tamper proof.
- It should possess good oxygen barrier properties.
- It should be economical.
- It should fit in to processing- in-Line.

Materials Used

1. Glass
2. Plastics: (1) LDPE is widely used (2) LLDPE: 25% thinner film used and LDPE and LLDPE in 5:1 to 4:1 ratio.
3. Others: Coated paper board, wax coated paper board ESL (Extended Shelf life Pouch)

Types of packaging materials used for milk packaging

Type of packaging	
Sachet	LDPE 45-75 m (LDPE+LLDPE)
Glass Bottle	500 ml
Tetra pack	200 ml brick, 500 ml tetrahedron/brick, 1000 ml brick
Pillow pack	500 ml pillow pouch

Glass bottles

- Packaging of milk in glass bottles is the oldest system.
- Clear glass bottles of 500ml capacity conforming to IS: 1392 – 1967 are used.

Advantages:

- Transparency, rigidity, hygienic and non-toxic nature and compatibility.

Disadvantages:

- It involves collection and transportation of empty bottles to processing plant, washing and sterilization of dairy bottles.
- Requires large storage space for both empty as well as filled bottles which increases the fixed and the variable costs.
- Heavy weight, fragility and return ability of bottles has inconvenience both to the distributor as to the well as consumer which made this packaging system undesirable and is not in use at present.

Returnable plastic bottles

- Plastic bottles reduce the weight and the chances of breakage are rare but most other characteristics of packaging milk in glass bottles remain same.

Non-returnable plastic bottles

- This system reduces transport charges through light weight and one way of delivery of bottles in a convenient way in comparison to any other system.
- Ex: HDPE with PP lid, car buoy.

Plastic films

- Plastic pouches are generally made of low-density polyethylene (LDPE) film.
- Co-extruded LDPE-LLDPE film is also used because of its advantage of eliminating pin-hole problems.
- The films are of 45-75 μ thick. The pouches are formed and filled on form-fill-seal (FFS) machines in capacities of 200, 500ml and 1000 ml.
- The film should conform to IS: 11805 –1999.
- The plastic pouches are clean, hygienic and safe for this application and since these are not reused, the cleaning operation is eliminated and energy loss is avoided.
- Moreover, these pouches are easily recyclable for other purpose.

Developments in milk packaging in plastic pouches

- The **milk pouch** concept actually **originated in Europe** with late fifties and had received growing popularity among consumers because of its **convenience and reduced costs**.
- **Polyethylene**, particularly **LDPE** has been used for packing milk.
- In Czechoslovakia milk was packed in 0.09 mm thick white pigmented film.
- In Denmark and Finland, milk has been packaged mostly in co-extruded PE laminate consisting of a black inner layer and white outer layer.
- Similar packaging was also used in India by certain Dairies.
- In North America clear plastic material is used.
- The thickness of LDPE film got gradually reduced to 55 μ - 65 μ .
- Now a days, **in India** milk pouches are formed from **LLDPE film** of **50-55 μ thickness**.

Aseptic packaging of milk

- Aseptic or long-life milk was originally **introduced in Sweden** in the early 1960's originally called the **“Tetra-pack”** system.
- It utilizes a laminate pre sterilizer and a filling environment heater.
- Aluminium foil is an integral part of the flexible laminate in order to provide a barrier against light and gas.
- In UHT processing, Milk is preheated to 73– 85°C then rapidly raised to 135°C for fraction of second and then suddenly cooled by flashing into a vacuum chamber. It must be packed under completely sterile conditions.
- No refrigeration is necessary for at least 3-6 months. If kept under refrigeration a self life of up to 1 year is possible.
- In the distribution system, the pouches are placed in reusable multi-trip plastic crates.
- The crates are made of HDPE or PP
- The plastic crates shall follow IS: 11584 – 1986 standard.

UHT packaging

- High heat treatment of milk is not enough to give long shelf life of UHT milks if packaging is not proper.
- So packaging plays an important role in UHT products.
- Because of the shelf-life requirements of UHT milks, multiple laminates, for example a triple layer of high density polyethylene are used.
- An intermediate light barrier may be incorporated, according to the manufacturer's preference.
- Oxygen penetration during storage is not usually a problem. Whatever the source of bottles, aseptic techniques are used in filling and sealing to prevent contamination
- Shelf-life is expected of 6 months at ambient temperatures.
- For short shelf-life (10-15 days) products, pouches are usually made of white polyethylene and paper.

Cans

- Aseptic canning is expensive, particularly for a low cost product like milk.
- The cans may be of tinplate or drawn aluminium.
- The solder in tinplate cans must be of higher melting point than normal to withstand the in-can sterilization temperatures.
- The cans pass along a conveyor belt within a continuous tunnel.
- Tunnel temperature (200-220°C) for sterilization of cans is attained by steam (at atmospheric pressure), superheated with gas flames-sterilization time being 40s, normally.
- The cans having passed through the sterilizing tunnel continue through the filling chamber where they are filled with the product.
- The can lids are sterilized, again by superheated steam, in a separate unit.
- The lids are applied and seamed in a chamber kept sterile by super heated steam and flue gas.



Paper board cartons

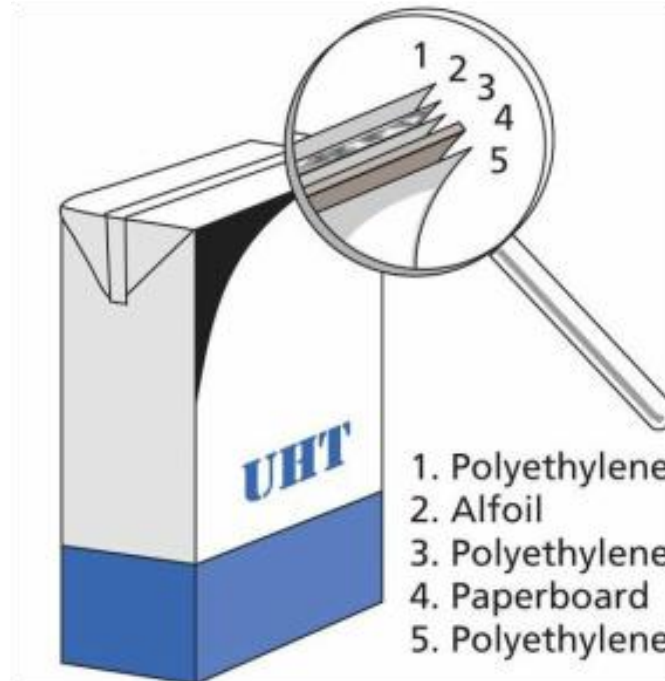
This kind of packaging materials are commonly used in aseptic filling systems for milk, cream, fruit juices, soups etc.

The filling systems could be either of the following two types:

1. Those in which the carton is formed within the filler from a continuous reel of material
 2. Those in which the cartons are supplied as preformed blanks, folded flat, which are assembled into cartons in the filler.
- The packaging material is mainly composed of printed paper coated with aluminium foil and several plastic layers (Polyethylene-paper board- polyethylene- aluminium foil- polyethylene).
 - The inner material side of the finished package is coated with a special layer facilitating the sealing process.

Each layer has a specific function:

- The outer polyethylene layer protects the ink and enables the sealing process of the package flaps.
- The paperboard serves as a carrier of the décor and printing gives the package required mechanical strength.
- The laminated polyethylene binds the aluminium to the paper.
- The aluminium foil acts as a gas and light barrier.
- The inner polyethylene layer provides liquid barrier and sealing



Flavoured Milk

- Flavoured milk drinks are generally skimmed or partly-skimmed and contain less than 1.5% fat.
- The package should be leak and tamper proof, should have sufficient wet strength and should not pass on any odour or taint to the product packed inside.
- The plastic based material used for sachets is octane LLDPE (O-LLDPE). OLLDPE when blended with 50% LDPE provides excellent puncture resistance, excellent seal strength.
- Co-extended multiple layers low-density films with an outer opaque film and an inner black film for reducing the transmission of light are also used.
- In India, flavoured milk drinks are available in sterilizable crown cork glass bottles, glass bottles with aluminium foil lid or snap-on plastic lid, plastic sachets and aseptic packs (Tetra bricks).

- Recently 200ml, translucent bottles of HDPE with an aluminium foil cap have also been introduced.
- Poly carbonate bottles with the leak proof screw cap are also used in place of glass bottles as these are unbreakable and are much lower in weight (1/6th the weight of glass bottle).
- PET containers are in use as they are light in weight, have good sales appeal and are strong.