



PACKAGING TECHNOLOGY USED FOR READY TO EAT PRODUCTS



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PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)

WHAT IS PACKAGING?

- Packaging refers to a **protective wrapper** or **container** to protect from contamination, improving shelf-life, communicating through consumer, storage and shipment ,which aids for general protection such as physical & mechanical damages

Functions

- Containing
- Informing/Selling
- Protecting/Storing
- Transporting

CLASSIFICATION OF PACKAGING

Based of areas of use

- **Primary packaging or sales packaging** - Packaging that covers the product., which is in direct contact with the product and the other components of the packaging .
- **Secondary packaging or group packaging** -packaging is used to bundle the sales units together in the sales setting for quick transportation(i.e. shrink film wrap and corrugated cardboard box).
- **Tertiary packaging or transport packaging**- is used to make it easier for a collection of sales units or secondary packaging to be transported/delivered to avoid physical harm during packaging/delivery (i.e. corrugated cardboard box).
- **Unit load** - is a packaging category consisting of more than one distribution box for loading/unloading processes packed together (i.e., unit re-packaged with stretch film on the palette).



As per the product and component the packaging terms changes. The secondary packaging of a product can be a tertiary packaging for another.

FACTORS TO BE CONSIDERED

- The food type and its structure, moisture, fat, protein, taste, etc..
- Product form and shape-smooth, regular, irregular, with sharp edges etc..
- Crisp, brittle, sticky etc.. Quality of the substance
- Factors affecting spoilage of food such as microbiological spoilage, Abiotic spoilage due to chemical reactions like hydrolysis, oxidation, and enzymatic reactions.
- Different environmental factors like Humidity,temperature,light etc..
- Different processing parameters such as processing temp,pressure,time etc..
- The desired shelf life of the product and storage parameters.
- Desired properties like barrier property, mechanical properties ,Antimicrobial property, Vapour barrier, Thermal properties, Aroma barrier, Optical properties, Gas barrier, environment friendly etc.

GENERAL PACKAGING COMPOSITES

Material	Properties	Use
9mmfoil/adhesive/paper coated with heat sealing vinyl resin	Good moisture barrier runs well on machine	Over wraps confectioneries
9 mm foil / adhesive / paper /polyethylene (extruded)	Good moisture barrier runs well on machine	Fin-sealed pouches and sachets – soups, etc..
1 in. polyethylene /9 mm foil / adhesive / paper	Heat seals by the wax bleeding through the tissue	Over wraps for confectionery
9 mm foil / adhesive / paper / micro-wax comp. / tissue (20 g/m2)	Low WVTR	Over wraps for biscuits, etc..
Foil	Excellent WVTR, good machinability	Candy wrap, biscuit wrap
Cellophane/wad /cellophane	Excellent WVTR, sandwich printing, good machine performance	Bags or pouches for hygroscopic items
Cellophane/adhesive/ pliofilm	Excellent gas barrier, transparent pack	Nut packing with inert gas
Cellophane/polyethylene	Excellent gas barrier trapped printing	Chocolate, etc..
Polyester film / Saran coated polyethylene	High strength, positive sealing	Vacuum food Pouches
Polyester/adhesive/foil/ polyethylene	Excellent gas barrier, good heat resistance, good rigidity, aroma retention	Flexible processable cans

RETORT PACKING

- Retort packaging is a heat-resistant package used for packaging food and beverages. Laminated inside with several layers of flexible plastic and metal foils, healthcare packaging can withstand high temperatures and pressures.
- Rigid and flexible designs have been developed so as to with stand the high temp and pressure.
- Barrier properties are very crucial as it effects the shelf life of the product.

RETORT POUCH MARKET

- The demand for flexible packaging has replaced the demand for rigid structures.
- The demand for retort packaging was estimated **at USD 41.65 billion in 2020 and a CAGR of 7.11 %** over the forecast period is projected to occur (2021-2026).
- The versatility and adaptability of the retort packaging technology has resulted in rapid market development.
- The thin pouch profile leads to a reduction of processing times of about 30-40 %.
- The rise in the demand for the convenience goods has resulted in the growth .

RETORT POUCH

A **retort pouch** is a flexible packaging structure that is hermetically heat-sealed to accommodate **low-acid foods** and to withstand thermal processing necessary to sterilize the contents in compliance with the regulatory specifications of the **12D low-acid** thermal process so that, when delivered at ambient temperature, the package contents will be free from any microbiological contamination



STRUCTURE

- The retort pouch normally consists of a **polyester or nylon** outer layer for printability and toughness/protection, a middle **aluminium foil** layer that acts as the main barrier to oxygen and water vapor, and a heat-sealant material such as **polypropylene** inner or food-contact layer.
- The other materials commonly used in the structure of the retort pouch include **nylon coated silica, ethylene vinyl alcohol (EVOH) and polyvinylene chloride (PVDC)**.
- The key players in the market are: Amcor, Berry Plastics, Coveris, Mondi, Sonoco, Astrapak, Bemis, Clondalkin, Flair Flexible Packaging, Floeter India, Fres-co System USA, Graham Packaging, Logos packaging, Nittopack, Otsuka.

COMMON STRUCTURES

Product Type	Structure	Features
Microwaveable pouches	High barrier Pet/Nylon/CPP	Other forms are pillow (three-side-seal) & Bottom gusseted stand-up formats provides shelf appeal Available with Heat-free-handles Spouted or tear-notch for easy dispensing and opening
Pillow pouches	Pet/AluFoil/PE Pet/AluFoil/CPP	Sealed on three sides Tear notch for easy opening
Spouted retort pouch	Pet/AluFoil/Nylon/CPP Most commonly used is 12 μ AlOx PET / 15 μ BON / 70 μ CPP	Reclose able spouts offer convenience on-the-go Can be attached to any combination of stand-up or pillow pouches in microwaveable or non-microwaveable variants

EXAMPLES OF POUCHES



(a)



(b)



(c)



(d)

Fig 3.2(a) Gusseted stand up pouch,(b) Spout Pouches (c) Aluminium/Transparent pillow pouches

(d) Spout Pouches

RETORTABLE TRAYS

- The retort tray (or cup, bowl, container, bottle) consists of a molded base with a wide opening and a **flat flexible structure hermetically sealed to the base by heat.**
- In recent years, the prices of container structures have fallen to far below those of metal cans and glass jars as more responsible converters have entered the market.
- Co-extrusions or laminations of water-vapor-barrier polypropylene plus oxygen-barrier ethylene vinyl alcohol have been the foundation materials in recent years



COMMON STRUCTURES

Food Application	Type	Materials	Properties
Gravies/Rice/ Vegetables/ proteins	Tray	PP/EVOH/PP	1)Retort food package sterilizable at high pressure (over 120°C) 2)Reheat able in a microwave oven 3)Long ambient shelf stability with oxygen barrier and excellent hygienic function 4)Easy peel lid)
		PET/EVOH/OPA/C	
	Lid	PP	
		OPA/PP	
	Bowl	PS/EVOH/PS	

MACHINERY USED

- Retort pouch and tray production speeds and efficiencies have not nearly approached those of metal cans or glass jars because of sealing limitations. Speeds of less than 100/min/line are not rare, although higher outputs can be achieved by ganged lines.
- Major manufacturers who provide the same are **Toyo Jidoki** from Japan , **Robert's** from the U.S., and **Bossar** and **Laudenberg** from Europe.
- Equipment that produces pouches from roll stock has become commercially viable in recent years.
- Trays, cups, or bowls are covered with aluminium foil, metallized plastic, or all-plastic barrier laminations, now typically peel able, and precisely heat sealed.
- The widely used tray manufacturing equipment is from Switzerland's **Hans Rychiger AG**.

PROS

- They are lightweight, quick to open, use, transport and re-close.
- For ease of use, you can have ergonomic shapes.
- It can be modified to include features such as tear-notches, spouts, etc.. in different formats such as microwaveable, non-microwaveable etc.
- Provide solutions for reclosing and dispensing
- Require less storage space
- Provides extended shelf life without using preservatives and without cold chain
- Enhance shelf appeal, which provides more visibility of the branding a graphics.
- Up to 97% reduction in the amount of raw material needed for the same product volume compared to other packaging formats such as metal, glass, rigid plastic
- Improved quality of packaging by reducing the ratio of product to box by up to 35:1 vs. rigid containers

CONS

- Pouches are more sensitive to mechanical damages, snagging which leads to microbial spoilage of the product.
- In general, the convectional retort pouches are not recyclable , but recently some companies are in the phase of developing recyclable pouches.

FROZEN FOOD PACKING

- Packaging for frozen foods is unique since altered deterioration mechanisms and rates must be avoided. Some degradative reactions are reduced in the frozen setting, but others increase or are unique to frozen products.
- It is important to be compliant with low-temperature environments and to promote rapid cooling and space efficiency with packaging that protects items in freezers.

FROZEN FOOD MARKET

- The demand for frozen food packaging was estimated at USD 41.53 million in 2020 and is projected to hit USD 56.2 million by 2026, with a CAGR of 5.18% over the forecast period (2021 - 2026).
- Frozen food packaging offers features such as lightweight, unbreakable, and resealable packings.
- The demand is rising due to numerous factors, such as changing lifestyles, increasing disposable incomes, and rapid urbanization.
- Variety in the packaging design has captured eyes of consumers.

FEATURES

- Protection against spoilage and coloration
- Easy in filling
- Sealable
- Easy to store
- Resistance to moisture,oil,grease etc.
- Produced with food-grade substrates from the FDA
- Should not crack once the product is frozen

FACTORS TO BE CONSIDERED

- Should withstand temperatures all the way down to -40 degrees.
- Able to withstand the pressures of Sealing, freezing, storing, transportation, defrosting and storage and in certain cases cooking
- Should be not be light sensitive, with minimum WVTR & OTR.
- Good printability.
- Heat sealable
- Thaw stable
- Dual ovenability, that is, products that can be heated in a microwave oven or a traditional oven, is the latest trend in frozen food

TYPES OF PACKAGING MATERIALS

a) **Shrink Film**(also known as **shrink wrap**).

- Commonly made of **polyethylene, polyolefin, or poly-vinyl-chloride**.
- Polyolefin is the best option for shrink film .
- For sealing boxed frozen foods such as pies, pizzas, cakes, baked goods, vegetables, fruit, and almost every other type of frozen food
- The box wrapped with shrink film and passed through heating tunnel, this prevents the formation of vapour, moisture and prevents freezer burn.



TYPES OF PACKAGING MATERIALS

b) Cardboard/Chipboard

- Packaging pies, veggies, pizza, cakes, and various other types of frozen food products.
- Make it easy to unify pallets for shipment across the country.
- Commonly used in tandem with shrink film, chipboard boxes are also popular because they can be printed, edge-to-edge, with vibrant and colourful branding imagery, text, and graphics.



TYPES OF PACKAGING MATERIALS

c) Ovenable Board

- New technology used solid bleached sulphate sheet with extrusion coated **polyethylene terephthalate(PET)** which is resistant to exposure and temperatures of 200-250 °C in hot-air ovens.
- It is also used to re-heat food containers in microwave ovens.
- the material must be microwave-radiation-permeable
- Must be heat resistant for a temp range of 200-250°C with no thermal oxidation, browning or odour production
- It should also be resistant to grease

TYPES OF PACKAGING MATERIALS

- The oven board must have good deep-freeze efficiency because the filled containers are usually stored under deep-freeze conditions
- Strong printability
- Ovenable boards are gaining popularity as reheating is done through ovens.



TYPES OF PACKAGING MATERIALS

d) Flexible pouches

- Most of the products such as snacks, frozen nuggets patties etc.. has this packaging.
- The product will be having a shelf life of more than 12 months, so the packaging material should be durable and must have low temperature stability as frosting happens on a longer run.



TYPES OF PACKAGING MATERIALS

Packaging
Type

Structure

Features

**Flexible
pouches/
bags**

Transparent or Matte
PET/Adhesive
layer/Transparent or White
PE

Transparent or Matte
PP/Adhesive
layer/Transparent or White
PE

Transparent or White
PE/Adhesive
layer/Transparent or White
PE

Resistance to puncture, high elasticity & durability at temp below 0°C
PET: have good barrier properties resistant to water condensation and have high transparency
PE : Structural and sealing layer Durability against frost & water vapour,puncture.Good elasticity. Good oxygen barrier property.
PP:have good barrier properties resistant to water condensation and good transparency.

TYPES OF PACKAGING MATERIALS

e) Lidding Films

- Lidding film is a food grade plastic film used to produce lids for various kinds of containers.
- used in form-fill seal process or in thermoformed trays which are used in modified atmospheric packaging/vacuum packaging
- The mostly used are shrink lidding layer (for form ,fill and seal)and **Vacuum skin packaging(VSP)** which have high barrier properties, usually used for meat ,fish and poultry.
- These films have good clarity and anti-fog properties



TYPES OF PACKAGING MATERIALS

f) High barrier thermoforming film

- Made of plastic resins and is made specifically for specialty films of these kinds.
- Thick corners and better film memory are provided by this form of film.
- Strong barrier thermoforming films have excellent strength and increased resistance to puncture.



TYPES OF PACKAGING MATERIALS

g) Skin film

- Specialty film designed to wrap products evenly and seal the product on a printed skin board or plate of corrugated cardboard.
- For packaging seafood especially salmon, trout, and other different kinds of frozen seafood, skin film is widely used.



TYPES OF PACKAGING MATERIALS

h) Ovenable Plastic Based Food Trays

- Made using **polypropylene (PP)**, high impact polystyrene (HIPS) and **crystalline polyethylene terephthalate (CPET)** thermoforming sheets.
- The trays are either vacuum-formed or thermoformed from a sheet reel. PP is co-extruded with barrier resins such as EVOH to enhance barrier properties for shaping when extended shelf-life is necessary.
- PP trays do not handle the temperatures of traditional ovens and are mainly used for microwave ovens .
- CPET trays can be used for both.

TYPES OF PACKAGING MATERIALS

- CPET trays are stable from 40 °C -200 °C .
- All food trays will be heat sealable lidding films.
- Foamed polystyrene trays with special low-density polystyrene blends can withstand much higher temperatures,



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