

DESCRIPTION OF EQUIPMENTS AND MACHINES OF DIFFERENT PACKAGING SYSTEMS

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Packaging Machine

Choice of packaging machinery depends as

- Technical capabilities, labour requirements
- Worker safety
- Maintainability
- Serviceability
- Reliability
- Ability to integrate into the packaging line
- Capital cost
- Floor space
- Flexibility (change-over, materials, etc.)
- Energy usage
- Quality of outgoing packages
- Qualifications (for food, pharmaceuticals, etc.)
- Throughput
- Efficiency
- Productivity
- Ergonomics, etc.

Types of Packaging machines

1. Blister packs, skin packs and Vacuum Packaging Machines



2. Bottle capping equipment, Over-Capping, Lidding, Closing, Seaming and Sealing Machines



Cartooning Machines



Box, Case and Tray Forming, Packing, Unpacking, Closing and Sealing Machines



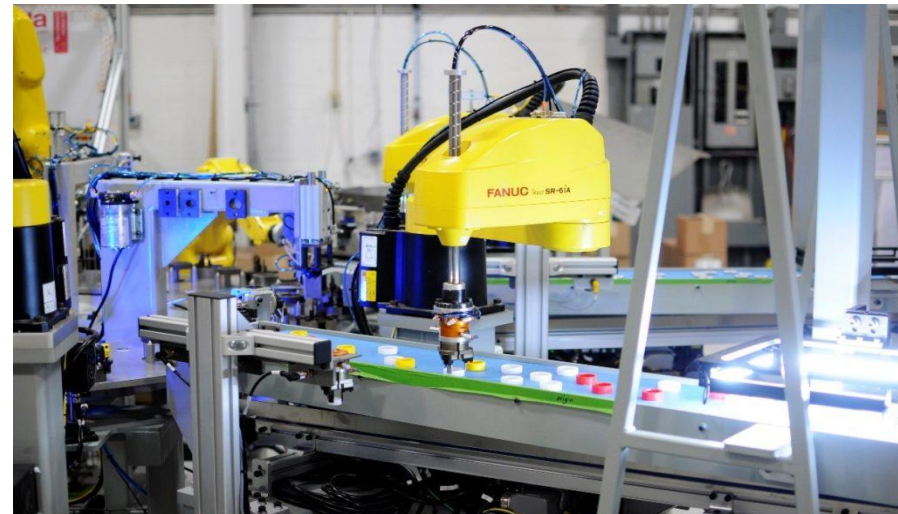
Cleaning, Sterilizing, Cooling and Drying Machines



Conveyors, Accumulating and Related Machines



Feeding, Orienting, Placing and Related Machines



Filling Machines: handling liquid and powdered products



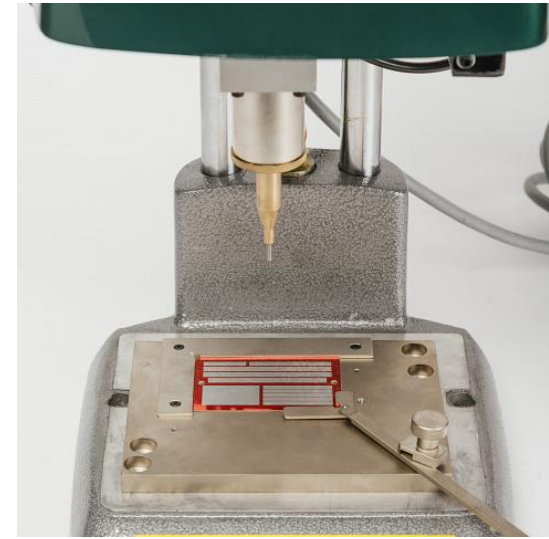
Inspecting, Detecting and Check weighing Machines



Palletizing, Depalletizing, Unit load assembly



Product Identification: labelling, marking



Wrapping Machines



Converting Machines



Packaging Machinery

Filling machine

There are two Types (a) Filling by gravitation (b) Mechanical filling.

(a) Filling by gravitation

- Filling by gravity is used for filling thin liquids like milk into glass bottles/plastic bottles.
- In gravitational filling, the filling process is stopped when the pre-calibrated filling height has been reached.
- This system is suitable for filling milk in glass bottles. However, packaging milk in bottles is outdated in India. In volumetric filling process, fixed volume of milk is filled.

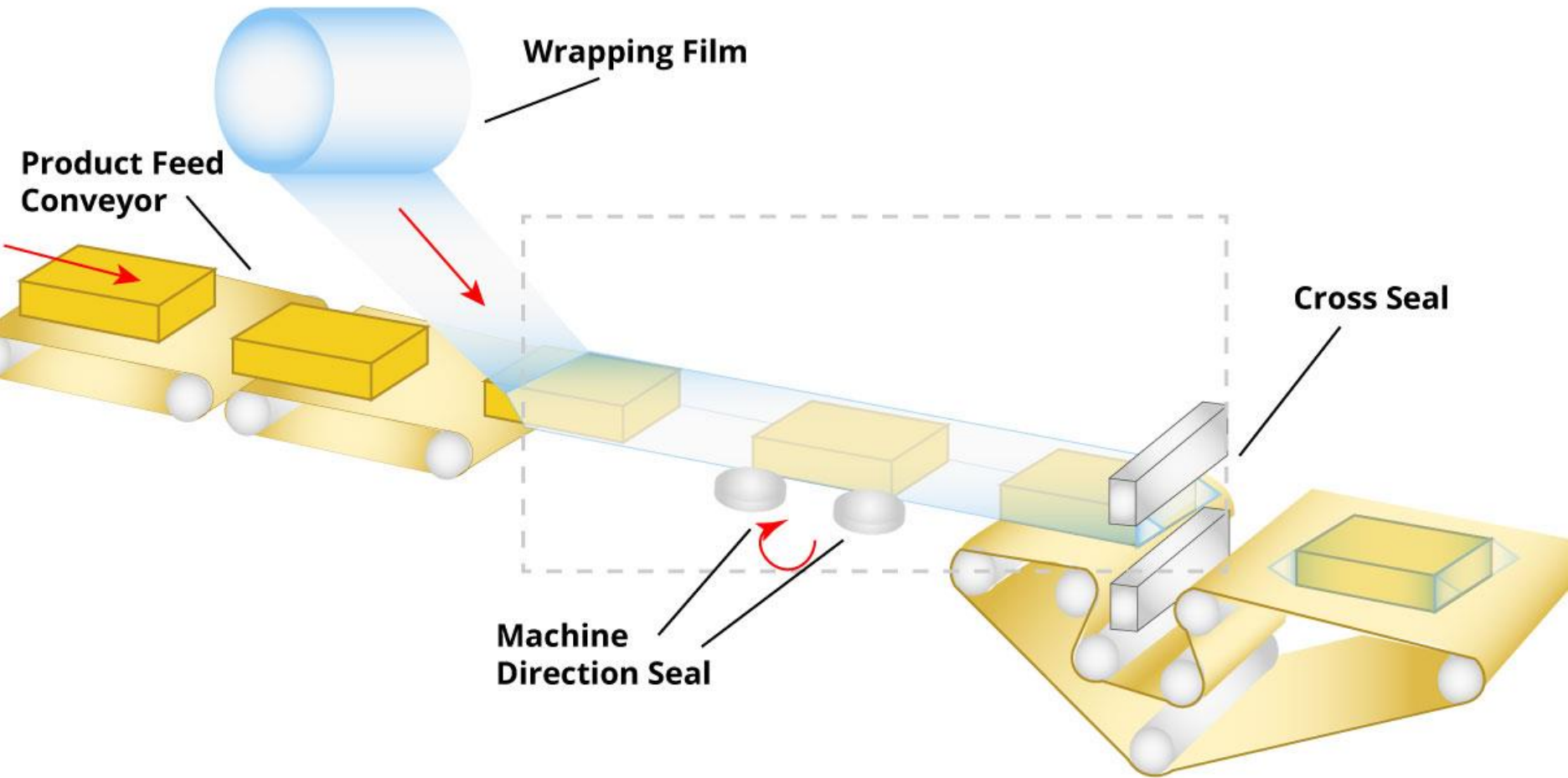
(b) Mechanical filling

- In this type milk powders are metered filled by using screw conveyors.
- The conveyors are used as metering and dosing devices.
- However, due to variation in bulk densities of milk powder, care must be exercised to ensure even delivery of the product and which shall be equal in weight from package to package.

Over wrapping machines

- Over wrapping the product with a film or foil is commonly employed for cheese and butter.
- Generally these machines work as the push – through principle i.e. the portion to be wrapped is pushed onto the film. In these machines, a measured amount of foil or film is pressed by a piston through a folding channel into a mould.
- The product shape that is generally packed is either rectangular or triangular. After the piston is drawn, the product is filled into the wrapper, situated in the mould by means of a dosing device.
- The wrapper is finally folded by the folding equipment. The finished pack is pushed out of the mould.

Over wrapping



Cup filling machines

- Ice Cream, yoghurt, Shrikand ,Dahi, Lassi etc are some of the products packed in cups.
- Plastic cups either preformed, from a film in the machine itself or ready made cups when used are placed in the stacker of the machine.
- Automatic packaging machines which work aseptically are in use for the production of long life products.
- In these machines the film is passed through a bath of Hydrogen peroxide and then goes to a sterile tunnel in which it is sterilized by either exposure to high temperature or exposure to excess pressure of air.
- The remaining stage like cup moulding, filling and sealing with lid takes place in the sterile tunnel.

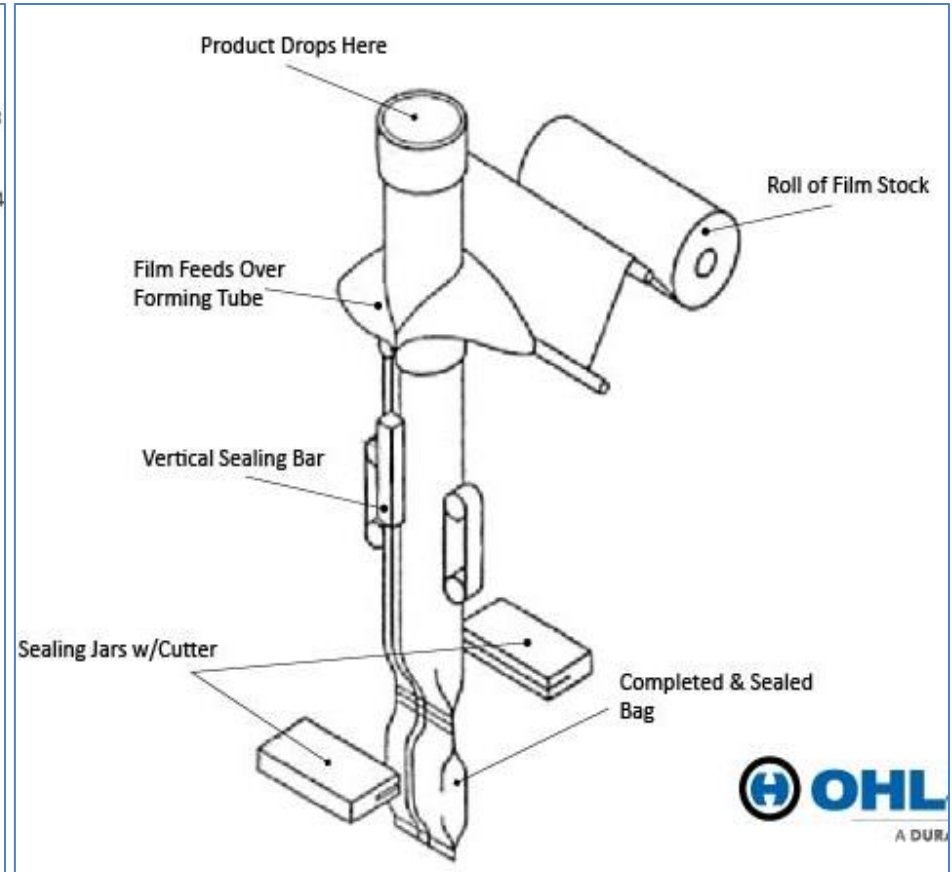
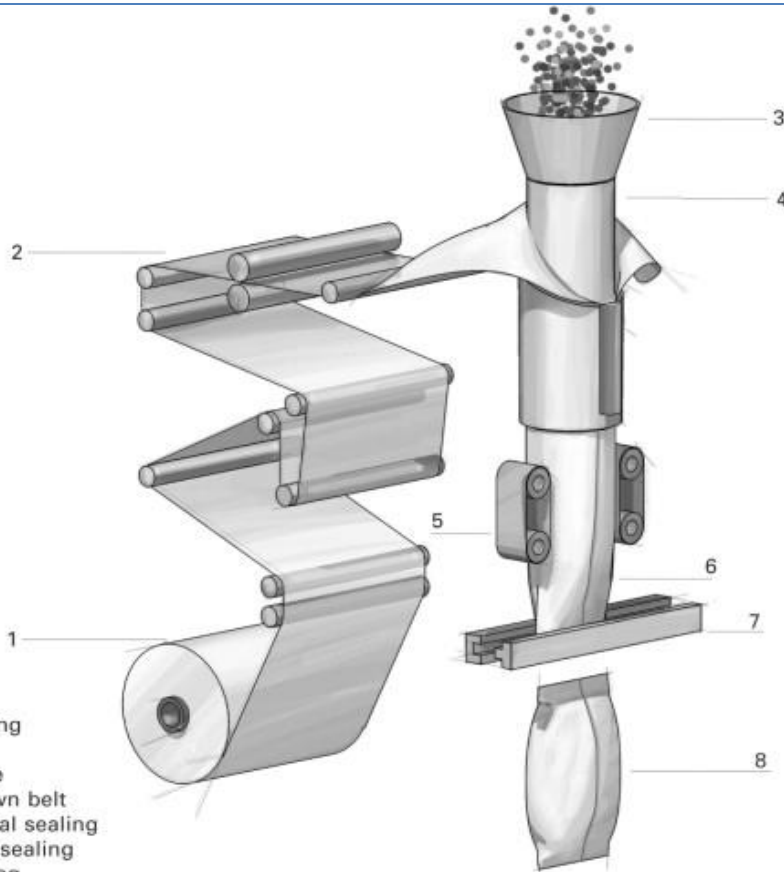
Cup filling machines



Form fill and sealing machine

- Form fill sealing machine (FFS) is a type of automated assembly-line product packaging system, commonly used in the packaging of milk, buttermilk, ghee etc.
- The machine constructs plastic bags out of a flat roll of plastic film, while simultaneously filling the bags with product and sealing the filled bags.
- The typical machine is loaded with a continuous flat roll of plastic film, which has had labelling and artwork applied to the exterior or interior of the film. LDPE or LDPE is the most commonly used packaging material.
- For some products the film may first be fed through a sterilizing chemical bath and dryer prior to use in the packaging system.
- The film approaches the back of a long hollow conical tube, and when the center of the plastic is near the tube, the outer edges of the film form flaps that wrap around the conical tube.
- The film is pulled downward around the outside of the tube and a vertical heat-sealing bar clamps onto the edges of the film, bonding the film by melting the seam edges together.

- To start the bagging process, a horizontal sealing bar clamps across the bottom edge of the tube, bonding the film together, and cutting off any film below.
- The sealed tube end is then lowered onto a precision weighing table and the product to be bagged is dispensed through the long conical tube in the center of the bag.
- When the tare weight of the product-filled bag is reached, filling stops, and the horizontal sealing bar seals the top of the bag, and simultaneously forms the bottom of the next bag above.
- This bag is then cut off from the tube and is now a sealed package, ready to advance onward into the product boxing and shipping processes.



Packaging in cans and tubes

- Cans made of tin plate are used for sweetened condensed milk, evaporated milk, canned Rasogolla and canned gulabjamoons.
- The cans open at the back are loaded into the machine which fills the product in to the cans.
- Then the lids are applied and closed by either simple or double seaming depending on the product.
- Cans with seam-on lids are also used for cream, ghee and milk powder.
- Aerosol cans are used for the packaging of whipped cream. In these, the product is filled with a propellant which is under pressure.
- Flat bottomed collapsible tubes made from aluminium are used for packing cream.
- After the product is filled from the back of the tube, the head space in the tube is filled with inert gas and the tube is then closed by folding. Polyethylene collapsible tubes are presently used for packing cheese spread/cheese food.



Shrink wrapping machines

- Shrink wrapping connotes packing of one or several articles with a thermoplastic film which when subjected to heat shrinks and form a tight wrap around the object.
- Shrink wrap is a material made up of polymer plastic film. When heat is applied to this material it shrinks tightly over whatever it is covering.
- Heat can be applied with a hand held heat gun (electric or gas) or the package can pass through a heat tunnel on a conveyor.
- Shrink wrap is commonly used as an overwrap on many types of packaging, including cartons, boxes, beverage cans and pallet loads.
- A variety of products may be enclosed in shrink wrap to stabilize the products, unitize them, keep them clean, add a degree of tamper resistance, etc.
- It can be the primary covering for some foods such as cheese and Paneer.

- The most commonly used shrink wrap is polyolefin. It is available in a variety of thicknesses, clarities, strengths and shrink ratios. The two primary films are either crosslinked, or non crosslinked.
- Other shrink films include PVC and several other compositions like LDPE, LLDPE, PP, EVA etc. Coextrusions and laminations are available for specific mechanical and barrier properties for shrink wrapping food.
- In shrink-wrap machine a loose plastic film pouch is made on a wrapping machine.
- The product is placed in this pack which passes through a heated tunnel in which the film shrinks and adheres closely to the product.
- The film is generally heated by hot air, infrared rays or hot water. Shrink wrapping is also used to hold together several singly wrapped products/packages in a multiple unit package.



Advantages of shrink wrap packaging

1. All types of items of regular / irregular shapes and sizes can be shrink wrapped.
2. Small items can be utilized and stacked one on top of the other
3. Requires minimum packaging material and operation.
4. Simple operation
5. Easy stacking
6. Enable unit packaging or packaging in groups.

Stretch wrapping

- Stretch wrap or film is a highly stretchable plastic film that is wrapped around items.
- The elastic recovery keeps the items tightly bound. In contrast, shrink wrap is applied loosely around an item and shrinks tightly with heat.
- It is frequently used to unitize pallet loads but also may be used for bundling smaller items.

Types of stretch film include

- Bundling stretch film,
- Hand stretch film,
- Extended core stretch film,
- Machine stretch film
- Static dissipative film.



Materials

- The most common stretch wrap material is linear low-density polyethylene or LLDPE, which is produced by copolymerization of ethylene with alpha-olefins, the most common of which are butene, hexene and octene.
- Other types of polyethylene and PVC can also be used.
- Many films have about 500% stretch at break but are only stretched to about 100 – 300% in use.
- Once stretched, the elastic recovery is used to keep the load tight.
- Other properties such as break strength, cling, clarity, tear resistance, static discharge, etc. are also important.

Functions

- Improved stability of products or packages, forming a unit load
- More efficient handling and storage of unit loads
- Some degree of dust and moisture protection
- Some degree of tamper resistance and resistance to package pilferage
- Stretch wrapping is the most cost-effective way to keep loads secured on a pallet.
- Stretch wrapping can be applied manually with small rolls (perhaps 5-inch wide) of film.
- Dispensers are also available for larger rolls. Machinery is available to automate the operation.
- This controls the amount of material used, controls the stretch, and controls the application pattern.
- It is important not to apply too much tension or too many layers: the stress can damage the vertical edges of the boxes and significantly reduce stacking strength.

Inert gas packing

Inert gas packing using nitrogen, carbon dioxide or a mixture of the two is done by passing the gasses around the product prior to sealing ex: Cheese. Whole milk powder packed in tins with a pin hole is evacuated under vacuum. The vacuum is then broken by the inert gas (usually N₂) and the pin hole is sealed immediately.



Vacuum packaging

Vacuum packaging is done for products like cheese blocks, panner etc, where there is problem of microorganisms growing on the surface. The product is placed in a plastic pouch and placed in the vacuum packaging machine for the creation of vacuum in the pack and subsequent sealing takes place in the machine itself.



THANK YOU