

PACKAGING EQUIPMENT AND MACHINERY

Packaging can be defined as "the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use". Packaging also refers to "the process of design, evaluation, and production of packages".

Packaging can be regarded as different types. The single item such as a bottle containing soft drink can be regarded as the item that a consumer would purchase known as "primary" packaging. Where as a pack of bottles, shrink wrapped, would be regarded as the transport package used within the distribution chain is known as "secondary" packaging. Primary packaging is the material that first contains the product. This is usually the package which is in direct contact with the contents. For example, this could be a bottle or carton for liquids; or a packet for various snack foods. The secondary packaging is outside the primary packaging, perhaps used to group primary packages together. For example, this could be a tray and shrink film. Secondary packaging is mainly used as a means of transporting the primary packs or product from producer to retailer. This is usually removed and recycled once the pack has reached its destination. Secondary packaging can also be retained to enable the product to be purchased in bulk. The choice of packaging machinery for packaging can depend on various situations. These can include available budget, payback period, integration, associated running costs, machine technology and available floor space.

Packaging machines can be of the following general types:

- Cartoning
- Cleaning
- Closing
- Coding and Marking
- Conveyors
- Filling
- Food Processing
- Form Fill Seal
- Handling
- Inspection
- Labelling
- Packing
- Pharmaceutical Processing
- Wrapping

These machine types are very general indeed. Each area or sector of packaging equipment can be expanded upon to reveal the various applications that are available today. As technology advances, packaging machines are becoming more and more advanced to not only meet the current demands but to try and "future proof" the packaging equipment and product development within an organisation. This can have a bearing on machine costs plus the interchangeability of operators and training.

1. Cartoning Machines & Systems

Cartons are one of the commonest forms of packaging. But while they almost all end up in a regular six-sided square or rectangular shape there are a number of different styles which are dictated by the filling and closing method. Cartoning machines are packaging systems which erect, close and/or erect, fill and close carton blanks or folded and side seam sealed cartons. Cartons are made from cartonboard which is a semi-flexible paper material 250 μ to 1,000 μ in thickness. Cartons can come in the form of blanks, which are flat, pre-printed and cut to size and shape, with slots and tabs pre-cut if necessary. These are then folded or 'erected' to form the carton in the machine. However the majority of cartons are delivered folded and side seam sealed to form what is sometime known as a skillet. On the cartoning machine these skillets are erected and then filled with product before the end flaps are folded and closed. Cartoning machines are used in all fast moving consumer goods sectors but especially food, pharmaceutical, toiletry, cosmetic, household products.

2. Filling & Dosing Machines

Filling and dosing machines are packaging machines which measure out a product from a bulk supply by some predetermined value, e.g. volume, level in a container, mass or count. The filling method used is influenced largely by the nature of the product e.g. liquid, gas, piece goods, powder, free flowing solids or sticky paste, but also by the measure for selling the product e.g. by weight, by volume or by count. Filling machines may comprise of one or a number of dosing devices that may be arranged with or without a mechanism to control containers or packages as they are filled. Fill & Seal machines undertake the filling function, but incorporate a sealing mechanism to close the container in a variety of ways.

3. Packing Machines

Packaging machines which group together a collation of products for transit purposes. Group packages include cases, trays, crates and cartonboard sleeves.

- **Container Erecting**

Featuring tray erecting, case erecting and division inserting machinery.

- **Container Loading and Unloading**

Featuring drop packing, place packing, place unpacking and horizontal packing machinery and equipment.

- **Container Sealing**

Featuring case gluing, pressure sensitive tape sealing, pre-gummed tape sealing, case stapling and wraparound lidding machinery and equipment.

- **Package Form Fill and Seal (PFFS)**

Featuring plastic ringing, wraparound tray packing, wraparound case packing, top load case packing, end load case packing, bottom load case packing machinery and equipment

- **Package Handling**

Featuring Tray denesting, crate stacking and unstacking and tray stacking Machinery and Equipment.

4. Inspection Machines & Inspection Equipment

Inspection Machines are a series of machines including manual, mechanical and computerised electronic systems which inspect products, packages or packaging components to ensure they conform to specification. For example colour, size, mass, the presence of foreign bodies in a product or package, pack integrity, missing labels or items, or incorrect data; any items which fall outside the pre-set values are rejected. The most common forms of inspection machines are colour sorters, checkweighers and metal detectors but the range of inspection equipment available has grown hugely in recent years driven by the need to automate production and to remove the people from the line who as well as carrying out manual tasks also inspected products and packs visually. Advances in technology have also increased the range of inspection tasks which can be performed. For instance while conventional metal detectors were limited to detecting ferrous metal, using different technologies it is now possible to detect bone, glass, wood, fibres and most non-ferrous metals in products as well. Other inspection machines carry out functions such as checking pack integrity for leaks, checking fill levels and even checking the temperature of a product in the pack without destroying the pack. Inspection machines are used in all end user sectors, including food, beverage, pharmaceutical, toiletries & cosmetics, and household chemicals. Some kinds of inspection are more common in some sectors than others or even unique to a particular industry (for example missing or broken pill detectors in the pharmaceutical sector).

5. Closing Machines

Packaging machines which seal or close filled packages.

6. Coding and Marking Machines

Coding machines apply a code, (including bar codes), dates and other variable or unique information to a package or transit container. There are two basic methods: contact or non-contact; and programmable and non-programmable. There is a whole range of machines and equipment carrying out these functions, from simple mechanical stamps or overprinters to sophisticated ink jet and laser coders applying computer generated data. These machines are usually attached to a larger packaging machine such as a cartoner, filler or wrapper. Modern ink jet and laser coders can be programmed to carry a large amount of variable information such as lot number, date code; sequential coding based on a unique serial number which is recorded in a secure database. A range of styles, typefaces and character sizes can be used and changed easily especially in comparison with older mechanical devices.

7. Form Fill Seal

Form Fill Seal (FFS) machines are packaging machines that form fill and seal a package on the same machine. The main types are vertical form fill seal (VFFS) and horizontal form fill seal (HFFS) machines – a term often used in the market place to cover horizontal versions of flow-wrappers, sachet machines, blister pack machines, four side seal machines and thermoform fill and seal machines.; in both cases packaging material is fed off a roll, shaped, and sealed. The bags/packs are then filled, sealed and separated. The

multiplicity of FFS machines employ a wide range of material types and are used across numerous markets including food, drinks, cosmetics, electronics, stationary, tobacco, chemical, medical, and pharmaceuticals. **Products** commonly associated with form/fill/seal include: Crisps; Nuts; Sugar; Rice; Pulses; Sweets & Confectionery; Sauces & Soups; Pet Foods; Grain; Jams & Preserves; Cakes; Bread; Biscuits; Tea Bags; Condiments; Tablets, Capsules and Pills, Greetings cards; Phone cards.

8. Labelling Equipment and Labelling Machines

Labelling Machines apply labels and decoration onto all types of packaging containers, display, point-of-sale and transit packs. Labels are used on every kind of product to brand, decorate or provide information for the consumer. Many labels do all three functions and can contain, for example, pre-printed bar codes supplying, batch, stock and price information to the retailer and consumer. Labels are also used to provide protection against tampering (tamper evident) to ensure the product reaches the consumer without interference and unopened. A growing market is security labelling to counter fraud and theft, and give brand protection and authentication. These include RFID and smart labels, holographic labels, tamper evidence, counterfeit deterrence and source tagging. Other machines are used to apply Leaflet labels – multi-page labels that provide space for large amounts of consumer information e.g. in pharmaceutical applications. Other types of labelling include in-mould labelling a technique that applies labels to blown bottles, injection moulded containers, and thermoform fill seal machines for yoghurt pots as they are formed on equipment. There are two principal types of labelling machine: Wet Glue and pressure Sensitive (Self Adhesive) applicators.

9. Pallet Loading & Pallet Securing Machines

Pallet Forming, Dismantling and Securing machines are packaging machines that assemble or dismantle pallet loads of products, groups of packages or rigid containers on a pallet, with little or no manual intervention, and secure the load on the pallet for security and stability during transportation. Modern warehousing and distribution methods mean just about every sector uses pallets for storage and transport of their products. It is now common to see bricks and sacks of sand and cement being transported to their point of use on a pallet secured by a plastic film stretched or shrunk around the load. A recent application for this type of machinery has been to form the retail-ready pallets, mini-pallets and dollies which supermarkets are now demanding for fast-moving product lines not only to minimize the use of transit packing materials but also reduce the amount of labour needed in store to prepare products ready for sale.

10. Conveying Machines

Conveyors are machines and equipment which carry ingredients, products, containers, packs or packaging components from one place to another. There are a large number of different types of conveyor, designed to convey different types of product or to perform particular tasks. They can be divided into four main groups:

- Conveyors for bulk products e.g. powders or free flowing solids

- Conveyors for both bulk products and small unit loads
- Conveyors for small unit loads e.g. bottles or cartons
- Conveyors for large unit loads e.g. pallets or kegs

In their simplest form conveyors are mechanical assemblies which can be demountable and easy to move. In their most sophisticated form conveyors can be complex machines with drives, controls and sensors. In this form they undertake complex tasks or those needing highly accurate sorting, ordering or distribution of the items or products being conveyed. Common forms of belt and slat band conveyors are used for all types of semi-automated or automated processing and packaging functions. They facilitate different requirements during production, and enable different products and packaging functions to be handled.

11. Wrapping Machines

Wrapping Machines wrap a flexible packaging material, (e.g. paper, aluminium, plastic film), around a product or group of products. Because of wrapping is so versatile it is used in many sectors, however, it is most common in food, bakery and confectionery for single items which can range from confectionery (count line), bars and cakes through to cheese and sausages. When wrapping is used for larger items or units or for grouping single products in multipacks for point of sale, or in larger numbers for transportation, then speeds tend to be slower. However some applications in the beverage sector can achieve reasonable speeds to match demand from the speed of other machines in the line. Machines have been specifically designed to wrap very large items and pallets for both protection and security reasons. These have found many applications in the building and beverage industries, but can be used in many other sectors.