

Modern Food Packaging Technologies: Regulatory Aspects and Global Trends

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Welcome to the NPTEL online certification course on Modern Food Packaging Technologies regulatory aspects and global trends. Dear friends in the last lecture we have seen the secondary packaging and now in this in continuation to that we will be seeing or discussing in this lecture the working principles of food packaging machines, other common equipment for food packaging, important considerations for purchasing packaging machineries, choosing a packaging machine and material supplier what does the future hold for the food packaging industry. The introduction food packaging machineries are essential equipment in the food industry. They are designed to package food products in various forms such as pouches, sachets and bags to name a few. These machines work on a simple principle of weighing, filling and sealing the bags with product.

The working principle of a food packaging machine involves several stages that work together seamlessly to ensure the packaging process is efficient and reliable. Working principle of food packaging machines, the working principle of food packaging machines involves several stages. The product is fed into the machine via the conveyor system in stage 1. In stage 2, the filling system weighs and fills the product into the packing machine, while in stage 3 the packaging machine make the seal the bags.

Finally in stage 4, the packaging undergoes inspection and any defective packages are rejected. The machines are connected via signal wires ensure that every machine operates smoothly and efficiently. Conveyor systems, the conveyor system is an essential component of a food packaging machine as it moves the product through the packaging process. The conveyor system can be customized to fit the product being packaged and it can be designed to move products in a straight line or to elevate them to a different level. Conveyor systems can be made of various materials including stainless steel or plastics depending on the product being packaged.

A filling system, the filling system is responsible for filling the product into the packaging. The filling system can be customized to fit the product being packaged and can be designed to fill products in various forms such as liquids, powders or solids. The filling system can be volumetric which measures the product by volume or by gravimetric which measures the product by weight. The filling system can be designed

to fill products into different packaging formats such as pouches, bottles or cans. The packing system, the packing system is responsible for sealing the packet.

The sealing system can be customized to fit the packaging format and can be designed to use different sealing methods including heat sealing, ultrasonic sealing or vacuum sealing. The sealing system ensures that the packaging is air tight and leak proof which helps preserve the products quality. Leveling system, the leveling system is responsible for applying the necessary level to the packaging. The leveling system can be customized to fit the leveling requirements including level size, shape and content. The leveling system can use various leveling technologies including pressure sensitive leveling, hot melt leveling or shrink leveling.

Control system, the control system is responsible for ensuring that the food packaging machine operates smoothly and efficiently. The control system can be customized to fit the packaging process. For standard packaging line, the machine are connected via signal wires. The control system can be programmed to detect the issues that may arise during the packaging process, ensuring that the machine operates reliably and efficiently. Other common equipment for food packaging, canning machine.

A canning machine also known as can simmer is used to seal a lid on to a can after it has been filled. The sealing process also called the double seam process is typically the final step in preparing the product for sale. There is a wide range of canning machines available. From industrial production canning lines used for major food and drink companies to more affordable machines for smaller businesses. Different machine involved in canning processes are the can filling machine, can seaming machine, can capping machine, can leveling machine, can coding machine or can rinsers.

Can filling machine, a can filling machine is a versatile piece of equipment used to fill various containers with products. Depending on the industry and container type, it might be referred to as an automatic tin can filling machine, oil tin filling machine or even a jar filling machine. This machinery is pivotal in ensuring that each container whether it is a can, jar or bottle is filled accurately and efficiently. In the commercial canning world precision is paramount. Can fillers not only ensure that each container is filled in the exact required level, but also play a crucial role in the maintaining the quality and consistency of the product.

With the right can filling machine, businesses can significantly enhance their production efficiency and product quality. Can simmer machine, a can simmer machine often referred to as can sealer or closer. It is specialized piece of equipment designed to hermetically seal the lid to the body of containers. These containers can range from

paper cans, aluminum cans, tin cans to even pet cans and jars. The primary goal is to ensure that the contents inside retain uncontaminated and fresh for an extended period.

The importance of a secure seal cannot be overstated. Imagine purchasing a can of your favorite beverage only to find it that due to a poor seal or even worse discovering that a canned food product has been contaminated. In industries like food and beverages where the stakes are high, can sealer machines are not just equipment, they are a vital part of the promise businesses make to their customers. Canned capping machine, a canned capping machine is a specialized device in the commercial canning equipment arsenal. Its primary function is to apply caps to containers.

These caps can range from plastic, snap caps, metal threaded caps, filaments to even some plug or cork types. The machine ensures that each container is capped securely preventing any potential spillage or contamination. A cap is not just a lid, it is the first line of defense against external contaminants. It also plays a pivotal role in ensuring products freshness and extending itself life. A reliable capping machine ensures that each container is sealed correctly enhancing product safety and consumer trust.

In industries where product integrity is paramount having a dependable can capping machine is non-negotiable. Another can leveling machine, a can leveling machine is a device designed to print and apply labels to various containers. Labels serve multiple purposes. They provide consumers with vital information from ingredients and nutritional facts to usage in sections and safety precautions. Canned coding machine, canned coding machines help brands to monitor their products in real time facilitating seamless recalls, accurate stock management and stringent regulatory adherence.

The information then print while miniscule in size is monumental in its importance. Canned ringer, a canned ringer is a machine designed to clean or sterilize packaging containers before the filling process begins. Ensuring that containers are free from dust, germs and other contaminants is not just about meeting international packaging standards. It is about ensuring product safety, quality and consumer trust. This is the depalletizer table where the containers are arranged in a single line then, it is goes to washing parts where the containers are washed properly.

Then it is filling and capping parts where the containers are filled and here the containers are capped it is properly capped. Then it goes for vacuum leakage checker where it detects the whether there is leakage in the sealing part or not. Then it goes for the bottle warmer, then it goes for the leveling the levels are dropped on the can and then it is passed through the shrink chamber where the levels are shrinked and tightly fixed shrink wrapper. It is palletized by shrink wrappers then again it pass through the hot air

chamber where the wrappers are shrunk to give a tight packaging of that. Now the bottle filling machines, bottling is a popular beverage producing process that involves filling glass bottles with various types of liquids.

The machines used for this task is called a bottle filler and it is an important part of the manufacturing process. Bottle filling machines work on the principle of a reciprocating piston. In order to fill a bottle the machine has a large barrel with a small hole in the centre. The barrel is mounted on a carriage which moves it up and down. As the carriage moves the piston inside the barrel pushes up liquid from a vat below filling up each bottle as it goes.

There are three basic types of bottle filling machines, screw, hydraulic and pneumatic. Screw machines use a screw to push the filler into the bottle neck. Hydraulic machines use pressurized water or oil to fill the bottles. Pneumatic machines use compressed air to fill the bottles. The main advantage of a screw machines is that they are faster than hydraulic and pneumatic machines.

However, they are less accurate because the filler can get out of control and spill over. Hydraulic machines are more accurate, but slower than a screw machines. They also require more maintenance because they can leak and contain more water than other types of machines. Pneumatic machines are the fastest, but the least accurate type of machine. This is the how the bottles are filled here.

These pipes are coming and getting inserted into the bottles, empty bottles and inserts the juice or the liquid is to be filled in. Then it is passed through the capping machine where it is capped and sealed properly. Here is the way how the caps are coming in a steam line and then it is being capped. Now, powder packing machine. Powder packaging machine is a specialized machine designed to efficiently and accurately package powdered products into bags, pouches or containers.

These machines are widely used in industries such as food, pharmaceuticals, chemicals and cosmetics where powdered substances need to be packaged in a controlled and precise manner. The powder packaging machine fills the powder into preformed packaging bags through a weighing system and then seals the packaging bags using appropriate sealing methods to ensure the safety and freshness of the powder. These machines typically include steps such as feeding, weighing, bag forming, filling, sealing and inspection to achieve an efficient and accurate powder packaging process. This is the flow chart and the way how the powder is packed. Here at the first stage the bags are picked up then this coding is done that is optional then the bags mouth is opened then the product is filled then this is again an optional then the first sealing is done then second

sealing is done and then it is dropped on the conveyor belts for the storage.

The weighing machine adopts a single vertical screw feed which is composed of a single screw. The screw is directly driven by a servo motor to ensure the speed and accuracy of measurement. When working the screw rotates and feeds according to the control signal the weighing sensor and the weighing controller process the weighing signal and output the weight data display and control signal. Main features automatic weighing, automatic bag loading, automatic bag sewing, no manual operation is required, touch screen interface, simple and intuitive operation. This unit is composed of bag storage, bag taking and bag sorting device, bag loading manipulator, bag clamping and unloading device, bag holding device, bag opening guide device, vacuum system and control systems etcetera.

Pneumatic components such as solenoid valves are all sealed not exposed to install and can be used in dusty environments which can ensure a long life of the equipment. Now, the important considerations for purchasing packaging machines. The type of product being packaged, product shape, weight and dimensions, objectives for color and labeling, can film be printed to meet requirements, way of packaging products into the flexible film, product journey from conception to shipping to the shelving and beyond, will it be handled frequently and are put to rough handling. The types of environments/climates it will be experience, whether it needs specific film additions to keep it fresh, requirements for security and anti-tempering of the completed goods. Now, choosing a packaging machine and material supplier, first thing is to consider is a location.

A packaging machine supplier quite close to a company's geographical location will easily travel when needed for emergency services or repairs. Technicians Certified and experienced technicians who are trained to operate on packaging equipment. Customer service, it might be tempting to buy the cheapest packaging material to cut costs, but buying from a business with poor customer service may cause a loss of the anticipated savings. Poor service frequently means loss of dollars and money. Cost when comparing there are commonly cheap films which have low clarity and high cost films which will shine better and have more clarity.

Parts depending on the running frequency of machinery your downtime because of the repairs or emergency service will differ. It is imperative to ask machinery suppliers about parts availability, lead times and preventive maintenance schedules. Now, what does the future hold for the food packaging industry? The first is the technology enabled solutions. More and more packers are shifting towards automated robotic food packaging solutions. These significantly reduce the cost and time taken to package while increasing efficiency.

The robotics utilizing robotics in the food industry significantly reduces the cost and time taken to package while increasing efficiency. Emotional engagement, brands seek to engage customers emotionally by using food packaging effectively. In fact, with proper emotional engagement some brands can create a need in the mind of the customer instead of being used only by customers who need the product already. Now, transparency, customers like to know what they are eating. Providing more transparency about the contents of the food items can lead to more trust by the customers and many brands are leaning this way.

Thank you very much. This is all for today.