

Food Packaging Technology
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Rigid, semi-rigid, flexible packaging forms P1

Welcome back to another session of Food Packaging Technology. In today's session, we will be discussing about different forms of packaging and the need for packaging system with respect to food. And in the last class, we had discussed about the different components in food and how these components are important, what are the spoilages or deterioration that may happen in the products or in these components and how this can be prevented by adopting different preservation techniques. So, these are different types of packaging materials and we had already discussed about it. Glass as a packaging material, metals as a packaging material, paper as a packaging material and under that we had seen cartons, cardboards, paper boards. We had also discussed about plastics as a packaging material, different types of packaging, plastics also we had discussed. And this table, it shows the properties of different polymers and how it differs from each other based on these properties, how we can select the packaging system for different foods. In the last class, as we discussed food products, they contain macronutrients and micronutrients. These nutrients they are prone to spoilage because food generally they have very high moisture content and moisture it serves as a media for microbial growth and multiplication and which ultimately leads to spoilage.

So, the immediate step that a person can adopt or a processor can adopt is to reduce the water activity or the moisture content. So, this can be done by preservation or we can also go for novel techniques. But when we do preservation, we definitely we bring down the microbial contamination or we can prevent the growth of microorganisms. But processing it may also affect the other components.

For example, vitamin C which gets deteriorated when product is heated. For example, we find vitamin C in rich amounts in gooseberry and when we prepare gooseberry syrup or juice as a fruit juice, then these may be lost. Similarly, in garlic acid we have a lecithin, it's a very important compound which has several health benefits. And this gets lost actually during crushing or any processing techniques we are using. So, when we are losing such things, this need added to the food products or we can add products which are not there in that particular food.

For example, milk in market we find is supplemented with vitamin D or sodium

chloride, the salt what we are using in the kitchen regularly, it is supplemented with iodine or it can also be supplemented with folic acid that is double supplementation. So, this is sort of enrichment or fortification. And when you do fortification of that particular compound, which was lost, which has health significance, it can be added excess amount or it can be added in suitable amount which will help the consumer. By this method, we can prevent whatever has been lost that can be regained or it can be reconstituted in the food product. And again, when we add all these things, we may adopt reservation.

But again, this finally the packaging that decides whether the product can remain safe or not, or it can continue to have the component with which it was enriched or fortified, it can it be retained for till the product reaches consumer. So, there packaging is a very important criteria and we have to choose the suitable packaging material so that whatever methods we had adopted to extend the shelf life and also to retain the nutritional quality, it should be retained and it should not be lost during the process it reaches to the consumer. So that's why packaging is very important. And it has to most of the food products, they need to have a package which is resistant to moisture, which has good barrier properties against water vapor and gas or oxygen. Therefore, accordingly, based on these properties of the packaging system, the packaging material need to be selected.

Now cellulose here you can see these are filaments that are used in the food packaging and these filaments they may or may not be coated. So here cellulose is coated with nitrocellulose or aluminium and this enhances the barrier properties of the material of the film. So, it has good barrier properties against moisture and gas. It also enhances the strength but it is not more or it is not equal to the other packaging material. For example, polypropylene where you have given aluminium as a coating and the strength has gone by several times.

So, depending upon the requirement, the packaging material needs to be modified accordingly and it has to be adopted. Now, if you look at the figure here, we have different food products and different commodities. And based on the commodity, the packaging material needs to be chosen. And here we have gums, it is a pack of gums, they are sold as stick you most of you might have seen this thing. And then we have blister packing for tablets packet of ketchup is again a different packaging system.

Now tube we had already seen it as a tube which is coated with aluminium and it is mainly used for sauces, toothpaste or creams. So again, we have juice box and it is a box like a packaging system for chocolates and juice. And is also the search boxes can be adopted for tissue paper and other things and even tissue paper, it can come into in roll form. So we have rolls for toilet papers, and then tubs for ice cream, we have tubs in

KFC, that is a different form of packaging. So as per the requirement of the product, that has to reach to the consumer, the packaging material, it can be modified and it can be selected.

Similarly, we have cartons for milk and egg and here egg is brittle, the packaging need to be a shock proof, it should be able to withstand the shock. So accordingly, moulded tray is used here. So, this shows that different packaging materials are required for different products. And based on the requirement of the what is expected from the product that has to be known first, and only then we have to go for the packaging material. Now when we get the packaging material, customer doesn't know what is inside the container or inside the packaging material.

So, it's the label and the package that gives the information. So, it communicates everything to the consumer. If you look at the figure here in this right bottom, this part is called principal display panel and this is the information panel. So principal display panel, it is the area that is easily seen by the buyer. And that is the first place where the glance goes.

So, buyer just immediately they look at this spot. And for a rectangular container, this PDP area is the product of the height and the width. So, this area will be the PDP area and for a cylindrical area, this will be the 40% of the product of height and circumference. And information panel is immediately on the right side of the PDP. So, and this place all the information's like product type, product logo, any picture, those information's are put on the information side.

So, in the PDP area, all the information's relevant to the content inside has to be given. So, it will contain the logo, the brand name, it will also contain all the what is the product or content inside and in the information label, it is a legal requirement, it should contain nutritional value, nutritional labeling should be proper, it can be according to the serve size or in terms of 100 grams or 200 grams. So, whatever be the amount, accordingly information needs to be given in the panel. And it should also contain the ingredients. What all ingredients has been used in the development of the product, everything has to be mentioned in this label. What are the instructions for opening for cooking for heating, such kind of storage instructions. Those also need to be added here and there need to be a barcode. Batch code is are important for back tracing. And if anything goes wrong or anything is bad with the content or the container immediately producers, they have to back trace the entire load.

So, for this barcoding and batch coding; they help. The producer should also give best before date and manufacturers name and address. They should give their guarantee

the customers they should know how long it is going to be safe. So, such kind of information is need to be given in the information panel so that it includes statement of identity is not the brand name it is the content what is inside. So, it can be local name, a common name, or it should be a legal name. For example, Kellogg's is brand name for conflicts, PDP panel, it should be Kellogg's and conflicts and if anything has been done or any modifications has been done to the conflict that also need to come on the PDP panel. So, it must be placed on the panel should be the primary element which comes in the front and which consumer must be able to see immediately.

And the phone type height should be half the size of the largest phone on the package. The requirements they clearly mentioned what should be the phone size, what should be the width of the phone and how legible it should be. So, such details are very important. Also, the net quantity of the product is important and then nutritional labeling. So different type of packaging systems primary packages are those packages which comes in direct contact with the food product or the content or the product which needs to protection and or which is being contained.

Then we have secondary packaging, both secondary and primary packaging, they pass the information to the consumer. So, they are the packaging materials that communicate with the consumer or they help in marketing. And final packaging is the third layer which protects the contents inside. So again, this shows the primary secondary and tertiary packaging. Now primary packaging can be soda cans, so it comes in the contact and it protects the content inside.

Then we can have blister pack that seen in tablets. So, again, that is a primary packaging. Whereas secondary packaging here is a carton which where you place all the bottles and bottles are arranged in such a fashion that they will face minimum risk of damage during transportation. So, they should be intact, they should not be extra space or anything inside the carton. And if anything is there, then it should be wrapped with shrink wraps or shrink films and the spaces need to be adjusted.

Because while transportation or while movement, they should not have any impact on the contents. And then tertiary packaging, it is very important during stacking where more boxes are stacked over one another and bottom layer, it should be able to withstand the shock from the above. And these are different types of packaging. But one thing you have to note down here it is, it is not the food content, it is the bottle inside. And that bottle has to be protected.

The bottle is the container and this going to the consumer or it is going to the processor where the contents will be filled inside. But the primary package or the main

object which needs protection is the bottle. So, primary packaging in this case, it can be over top opened, it can be open carry top carrier wrap around carton, divided carton. And again, accordingly, we have secondary packages like trays and other things. And we can also have combinations of primary and secondary packagings.

Primary packaging, they can be flexible packaging, they can be rigid or semi rigid, we had already seen different types of rigid packages and or materials that can be used for developing rigid packaging. And we had also seen flexible packaging materials cellophane, paper, foil, these all come under this category. And these are generally used for the packaging of food items like chips, candies, they're also used for packaging, personal care products, it's easy to mould the flexible packaging material. And rigid packaging materials, they generally include glass, metal and plastics. And they protect the content inside from the shocks or the temperature changes.

And then semi rigid packaging material, these are semi rigid, they have the properties of flexible as well as rigid. So, it is a hybrid of these two materials and they are used to develop foams and cardboard and mainly they help in absorbing impacts or shock absorbers during transportation. So, they provide protection to the contents mainly the trays are made up of semi rigid packaging material. So these are different types of primary packaging, we have folded bags, then stacked and we also have side by side bag and end load skillet and we have standard floor wrapping as in chocolates. We also have multiple pieces collected then in-line, on edge, in-line, sliced as in cheese, then we have retail food package, food service case, we get in for donuts and other things that is retail packs.

These are different forms of primary packaging. It does not same for all the products, it will change from product to product. And the functions of primary packaging offer protection. So that is it prevents the contents or protects the contents from damage or any tamper keeps the product inside from the point it leaves the factory and until it leaves the consumer and then it helps in giving a presentation that is the most important thing it communicates with the consumer and it should be eye catching, it should not be dull. The primary packaging is the first package or the retail pack that a consumer buys.

So it need have a good appeal and it should look best and it should be well packed. Poor package is not sold, consumer will not look at them. So, presentation of the package is also very important. Then branding, it is the first thing brand is very important in marketing and it is the first thing that a consumer sees primary package is the best place where one can market their brands and it will create a good impression on the consumer. So, it's an awareness or it creates awareness.

Branding should be consistent in all channels. You cannot have one branding in one district and another branding in another place or you have branding in malls or big shops you are keeping and one kind of brand or one kind of product and you have another same product it is put under different label in different shops. So that cannot happen. So, it should be uniform because if one is looking for a Maggie, we have that Maggie is known for its quality. So, we are looking at Maggie that is the brand.

We go along with the brand. Similarly, Kellogg's is a brand name. So, Kellogg's corn flakes, other breakfast cereals, we look at the brand and then that is how it is marketed. That tempts the consumer to purchase the product and it also builds up the confidence in the consumer to buy it again and again it should pass the information what is the content inside. In some medicines you would have seen that it is written keep it in dry place, keep it in dark place or keep it away from heat. So, such kinds of instructions which is essential for consumers to know such kind of information also need to be clearly labeled on the package and it should be legible and easy to find.

It shouldn't happen that it's written in small fonts and consumer is not able to read it. That shouldn't happen. And most of the countries they have their own regulations for primary packaging and they strictly follow these regulations. Now secondary packaging these are the layer of protection around the primary package and these are important during shipping and storage and these can also be used for branding and marketing purpose and the main materials generally used for secondary packaging are cardboard box, plastic containers.

We also use shrink wrap in case of bottles. There are different types of secondary packaging as wrapping. We go for plastics, paper, fabrics which includes the product or number of products. Then we have boxes made of cardboard or paper board which also protects the content from the impact. Generally, if it is a glassware any glass bottle or any glassware that has been purchased, if it has to move from one place to another it is wrapped in paper boards or it is wrapped in cardboard so it is packed tightly. So, that it does not break during the transportation. So, boxes they act as a media for secondary packaging, then we have containers like plastic and metals which also protect from tampering the cosmetics and pharmaceuticals. These are examples of containers and these are some of the containers secondary packaging materials. We have three flap closure then hooded lid closure and then single flap closure with test flaps. We have crash locks then tray and lid three-sided cartons for pizza, you might have seen all these things. Then we have three-sided cartons. You might have observed this type of packaging material when you buy pizza or other bakery items or snacks then aeroplane tuck. We have tuck and glue closure gable top carton assortment carton. So, these are different types of secondary packaging materials. These are also secondary packaging sleeve wrap around.

So, you might have seen, if you are buying some ready to eat products. Usually there will be a sleeve around the container. So, it helps in protecting the container. It keeps the products inside so that lid doesn't come out. So, sleeve wrap wraps then pre-made skillet. Sleeves may be provided. We have multi-packing of bags together and stacking of these things together. That also comes under secondary packaging. Now functions of secondary packaging similar to primary packaging. It also helps in protection.

We can have bubble wrap or foam to protect the contents inside during shipping and storage. Stacking is very important feature which it should be designed to stack on top of each other and which improves the efficiency during shipment and storage. That is a parameter which is not shown by the primary packaging but shown by the secondary packaging. Branding of course it's the same thing which the primary packaging shows and again secondary packaging. There are strict regulations and the countries they have to follow these regulations. They should pass the information to the consumer. Tertiary packaging these are the final or the third layer of packaging. The idea behind tertiary packaging is to give protection and these also help protection during shipment and storage or transportation. Sometimes they can be used as media for branding and marketing generally the tertiary packaging materials include pallets gala boxes and crates.

This figure shows different types of tertiary packages; gala boxes and crates and pallets and these are some other types of tertiary packages. We have shallow tray then high-sided tray. You have noticed the Maggie soups, the number of soups which are kept in the shelves. They are kept in this kind of shallow trays and we have tapered sided display front. We have shelf and shipping ready package. This comes during transportation and blue dot, come for courier, they bring such kind of boxes. These are the tertiary packaging systems where they put your items, it will not be tampered during transportation. We also have shrink wrap with no tray. These are some of the tertiary packaging systems and the functions of tertiary packaging system to protect the contents inside during transportation and storage.

Stacking it should be able to withstand the force or the impact during stacking and ensure that there's a space management and then bulk shipping if it can ensure that the space can be utilized properly then it safely. Pallets are designed with specialized hooks and forks forklifts which will help in moving or lifting the packaging material. That also becomes a part of tertiary packaging. Now, packaging materials they are selected based on product type which we have been discussing till now and also it depends upon the quantity. The weight of the product inside is also very important because it should not be too heavy, where the packaging material tears so that quantity should be is very important. Cost of the product at what cost it is going to be sold in the market, that is also important so if you put the market price then that should also include the packaging price and packaging charge should very high then nobody is going to buy it. Cost should include the package and then one must know how much they are going to spend on

packaging material. Then sustainability, it should have no impact on environment or it should be sustainable that is recyclable reusable. If it is hazardous material then we have to use packaging materials usually in food sector we don't come across such kind of materials. Still, it should be airtight and it should be easy to transport safe and then handling and storage how easily you can handle the product it is not only from the point of producer also from the point of consumer. It should be easy to handle and store.

So, with this we have come to the end of this class today. We have discussed about different packaging systems and different criterias that need to be taken into consideration when we go for a packaging system. Thank you!