

Food Packaging Technology
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Week – 05
Lecture – 21
Principles developing safe and protective packing

Hello and welcome to another session of the Food Packaging Technology course. We are moving on to the fifth week, module 3. And the first topic is the principles and development of safe and protective food packaging. So, we have in the last session, we had gone through different tests that were done in packaging. And these tests are very important to ensure the quality of the product.

Now moving further, when you develop a safe and protective packaging, there are a few things that we need to keep in mind. In India, it's the Food Safety and Standards Authority of India, which is FSSAI, which regulates the packaging of all products in India. Okay, so this regulation pertaining to packaging is, it comes under the Food Safety and Standards Packaging and Labeling Regulation 2011. So, the separate regulation, just that it enlists all the packaging regulations that have to be followed.

So, they have also given a wide range of substrates that is approved to be a food contact. Okay, so these can be used as a food packaging material. It's very important that manufacturers of raw materials and the finished product is expected to understand, apply and validate these processes. Okay, and unless you follow this, it's very difficult to maintain the quality and the safety of these packaged products. Let's look at the risk that is coming through the food packaging.

It has its own risk. Generally, it is the product that will have its risk and problem to the consumer. But package is nonetheless having its own risks. But understanding HACCP and following the good manufacturing practices help to protect the consumer. So, what are the risks that are involved? They may be divided into biological, chemical and physical.

So this portion actually, these are just practical experiences. So, you would find a little dry but at the same time, when you can practically apply to the daily use of these food packages, you will understand how important is the handling and how important is to follow the guidelines that is laid down. Looking at the biological risks, see packaging is usually not related to any pathogenic outbreaks till now. But it's always better to be safe. So, everyone is strongly advised to be vigilant and proactive.

So, we need to maintain in a system, we need to maintain a biological program. What do you mean by a biological program? That is the ambient facilities, atmosphere in the packaging section. See that there is airflow in each section. There is no airflow and when there is a humidity buildup, there is a chance of mold growth as well as pathogens. Okay, that is one thing we need to take care of.

Also, the outside air quality and the soil. There is no doubt that soil can be a part of the packaging and then that in turn can enter into the product slowly in some way. These are things we need to be careful about. That's what we meant on biological program. Implement and maintain a biological program.

Third one, contact surfaces. Be very careful of the floors, the walls, the ceilings and every contact surface that can come in contact with the packaging material. We have to remember that it is a packaging material that is coming in contact with the outside environment and protecting it. We have to just make sure that none of the contact surfaces will pose any biological risk to the product that is inside the package. Moving on, utilities.

You should take care of the utilities, the sewers, the water, including the air facilities in your processing and packaging area. Production equipment is another very important portion where your hygiene has to be maintained. Raw materials, the native materials, the recycles. In packaging especially, there is a trend to use recycled packages again. So that also can bring in biological risk to the product.

Bio-fingerprint of totes, rail cars, hoppers or any containment devices. Any devices which will contain the packages that also should be hygienically maintained. The pre, in and post processing sampling should be done. That is before processing, during the processing and after the processing. See that sampling is done regularly to see that the quality is maintained.

And the last one is very important, general personal hygiene and health of the personals who are dealing with these especially in the high-risk areas. So, if you can maintain this, a lot of biological risk can be avoided. But these are some of the common areas where which can pose a biological risk through the food packaging. And when you have such a comprehensive microbiological baseline, this can be used as a reference later if a hazard or problem arises. This is one prop thing we were discussing, reusable support packaging.

See packaging is not usually associated with pathogenic outbreaks like we said. But in the industry, there is a trend to reuse certain packaging systems. For example, pallets,

wooden and plastic are reused. And these can actually host a number of biological, chemical and physical hazards. And these have to be decontaminated.

How are you sure? When you leave your plant, it might be decontaminated. How are you sure that when it enters back that it's going to be contaminated or is it free from contamination? That is a problem. Questions need to be asked at every point. Then contaminants, traces and other residues in the items might be unknown. So reusable cartons, totes and shippers, they are the places where your pathogens can reside.

Reusable plastic dairy crates, which is very common in all the industry, this is a part of the packaging or unitization. So, this can harbor salmonella, which is a very dangerous pathogen. There are cases where the whole product had to be recalled just because of this. Just like your crates, there are reusable corrugated boxes, totes, shipping bulk containers, which are reused. So anywhere or anytime, including during the transportation, you can expect contamination to take place.

So, precaution is the most important thing that has to be taken. Right? Wood is one thing that has been used, especially near tertiary packaging systems and wood is extremely absorbent. Then these can pose a biological risk to the product. So, the key to this is sanitation. Effectiveness in sanitation and the cleaning process of these reusable.

It's not a problem to reuse it, but see that it is well sanitized before you reuse it. And the reuse of packaging can create a risk, but it has to be tested and analyzed before it is used. So, what safe practices if you're using these reusable support packages? One, protect yourself from these unknown contaminants. Sequester, that means keep it aside with the reusable packages unless it's necessary. Assess and document the risk.

See when you assess it, you write it down, you document it, you're sure of what to expect and you're more prepared to confront it. Okay, customize the handling and sanitation procedures. See that there is a good training given to all your personals. High-risk facilities, dairy, meat plants. Okay, these are areas of high risk, extra precautions need to be taken because these are going to be the places where they have got neutral pH, these kinds of foods have a neutral pH, high water activity, high nutrients.

So, this is a chance of all the pathogens harboring in those areas. But if proper sanitation and good manufacturing practices are followed, this should not be a problem. So, the key is again, beware of these kinds of risks, anticipate it and effectively address these risks. Okay, so when you have going to control it, so anticipation is important, but suppose there is a problem and you need to control it, you have to control, maintain a reliable pest control plan. So, food industry pests are inevitable, so but if you have a good pest control

plan in place, this should again be taken care of.

Choose qualified and certified providers, whether it's your lab assistants, microbiologists, your pest control. Use certified personals, train them properly. Implement practical prevention measures and monitor all the places. We should never assume anything, we need to monitor, we need to take precautions ahead of time. So biological hazards, as we saw, it's not a big risk for the packaging, but awareness, anticipation and proper preparedness is very important if you have to have a safe packaging.

The second important risk or hazard is the chemical hazards. What can be included here, you can have mislabeled incoming substrate, see, the product might be toxic, it might be mislabeled, it happens. So, this is a hazard. The other one is allergen contact. See, the traces of an allergen can cause illnesses to certain people.

Asphyxiation is a big problem, death can even result. So, we should never undermine such problems, but we should be prepared. Another chemical hazard is the misuse of proper ingredients and processing aid. Contact with sanitizers, cleaners, solvents, a very big risk. When these packages come in contact with this, they can leach in and even enter into the product, unknowingly can reach the consumer.

This next point is something that is usually undermining. Uncured process chemicals, your inks and your coatings and adhesives. These also should be properly maintained so that it will not migrate through the packaging. Unexpected adulteration of non-food approved supplements. So, these things can happen in the industry.

The only thing is we should be using good manufacturing practices and follow them in the factory. How do we control them? Again, very similar to your biological hazard control. You verify the incoming chemicals and the materials through analytical means, visual means, sensory. You consider an audit system, which is important. Internal and external audits on a regular interval will actually help to train the personnel who are working in this area.

Implement and validate an effective plan for any internal or external risk that might happen. So, if you do a mock drill of such incidents, people are aware and are well prepared in case of such chemical hazards. We went through other chemical and biological hazards. The third one is the physical hazards. So, these are things that accidentally enter into the system.

They may be metals, nuts, bolts, small parts that might enter into the package and later

into the product itself. Wood and paper, you know, through that you can have your dusts coming in. Pallet fragments can pitch ship off and this can also enter into the package. Another is your polymer itself. You know, rigid containers, they can again chip off and it might enter into the product.

Manufacturing defect is another physical hazard. You can have flash hot melts and all these. This again is a manufacturing defect, which is comes at a physical hazard. Laser burns through and glass dust, even small particles of glass may enter as a physical hazard into your product through the package. So how do you control these? Corrective measures have to be taken.

One important thing is awareness. So, we need to be aware that such things can happen and we need to be proactive. Preventive maintenance should be done. You have a quality control in place. Sanitation hygiene, housekeeping, which is important in all three hazards. If you have maintained good sanitation, good manufacturing practices, these hazards will never cause a problem in the end.

So, let's look at two examples, one on paper and one on flexible films and see how you can control these hazards in these two very important packaging materials. In case of paper, to control the microbiological hazards, you need to do a microbiological analysis of any incoming goods, raw material and the finished goods. Never assume, like I said before, never assume that it's all well. We need to keep analyzing it and see that it's all maintained, the qualities maintained. High percent of recycled products, they should be inspected regularly and you need to verify the cleanliness of the equipment, material and every utility that is there in the facility.

Now when you come to chemical, you see that there is a careful control of all the additives that you're adding into your surroundings, wherever you're keeping the packages. Use reliable vendors, especially for your packages, for your inks and everything. Have an audit system in place and have your HACCP and other good manufacturing practices also in place. Physical, like I told you, the metals, the wood chips and everything that can accidentally enter into your product through the package. So, for this, you need to have metal detection everywhere.

These metal detectors which have magnets will attract iron or any other metals and can help to detect these at every point. Audits and inspection, just like the hazards and you need to have a well protected packaging to see that these physical hazards in case they're there also, they will never enter into the package. Those were for the paper. Similarly for the flexible films like plastics and other laminates, how do you maintain or how do you control these hazards? For microbiological hazard to control them, again you have to

have strict program in place in the facility and for the processes. For chemical hazards, see that you control and analyze the adhesives, the inks and any other chemicals that you're going to use on the packaging material.

Audits are again very important like in all the other cases, audits are very important and you need to have a sampling plan. Sensory and laboratory analysis of these films have to be done. For the physical hazards, to prevent that in flexible films, you need to have regular inspection of the rolls and also have a timely change of the different parts of the equipment so that these will not enter into the product. Before I conclude, I would like to take you all through one of the documents given by the Food Safety Alliance for Packaging. It's just a group of individuals who are interested in implementing food safety in the packaging section.

So this was given in 2009. It's a very extensive list but I'm going to touch in only the important points and show you all and to highlight what are the hazards and how we can control it in the packaging industry. Okay, so these are the principles that you need to keep in mind when you develop any prep package and to see that it is safely delivered to the consumer. They have mentioned in detail, the first one they've mentioned is all the printed packaging materials, you know, your labels, the cartons, the rigid plastic containers, the lids and films. So, what can happen through that? So, one of the hazards they have named is printing error. It might seem as a very trivial error, but it is a very, very dangerous error.

When your label is wrong, when your printing is wrong, it can cause a lot of problems. For example, allergens may be left out, but a person who is looking out for if it's got allergy and it's left out, they consume it, it's going to cause even a problem for his life. Okay, so these unlabeled allergens can come, you can have wrong printing taking place. So, these are all grave mistakes that can happen in the labels or in the package. So, what do you do? So, there is a need for inspection, there is a need to control the printing press and see that such errors are avoided.

So then once you're aware of it, you're more careful that you see that the printing is done properly. Another one they have mentioned in these labels and packets are returned goods are mixed with the newer goods. So returned goods might have a defect that is why it was returned. So, when these goods might be mixed with the fresh ones, it might again cause a problem. This is another error, a safety aspect which has to be dealt with, okay.

Or you might even have mixed materials in the case. For example, a case is supposed to have one material, one kind of product, you might have a mix just because of human error. This is again a problem when you label it properly. When labeling on the top might

be of a particular product, below it might be another product. These are again problems that can happen in the packaging industry. Human error, very important, they have listed that out, they have written it in bold because human error is one of the main causes for many of the mixed material problems in the industry.

Another problem is inks that are not approved or might be toxic is used. So, this might migrate into the product and cause a problem, okay. They have inks that are allergic might be there. So, there are problems with the printing itself.

Coming to cut and stack labels. The cut and stack labels may be mixed, you know, you'll have one set of labels which is meant for a product, but that might be mixed with another product. So, it's going to have a mislabeling. So, mislabeling is a big grave mistake because the label might say one thing, the product is something else, which is again a problem. So, this all comes under the quality assurance of packaged products. Mixed stacks of labels within a case, just the case mentioned before, you'll have the same case, you'll have different kinds of products, which is again a problem.

Now coming to pressure sensitive labels. In pressure sensitive labels, you apply pressure to attach the label onto the container. Here one of the problems again, a mix comes when the roll that contains a mixed label, it comes ahead due to splice, you know, by mistake you stick one on top of the other, that again can cause a problem. So, a very minutely detailed, these are things that can happen, and these incidents also might have grave consequences. Again, mixed cartons due to handling errors in the palletizing operation.

So, till the end, till it's your tertiary package, it's all perfect. Then when it is palletized for your shipment, it might go wrong. Addresses can be wrong; products can be wrong. These kinds of problems can happen. Now coming to printed films, the pre-printed films, the rolls can contain mixed products because of the splicing, as we said.

Rigid plastic containers. Rigid plastic containers are your PB boxes that can have your products. So, these PB boxes again, shipping can take place. And these shipped products or extraneous pieces of plastics can enter into the container and the product. So micro plastics are a big problem everywhere right now.

And this can also contribute to this kind of hazards, health hazards. Glass jars. Moving on to glass jars, the one of the big problems in glass jars, glass is one of the most inert packaging materials that is used in industry. Breakage and the chipping are one of the problems that is there. So naturally extraneous pieces of glass from the package into the product is one of the hazards that you can expect in the case of glass containers.

Glass defects can happen during your manufacturing process itself. What do we do for that? So, you need to have a system which analyzes it, quality assurance in the line itself, see that you reject defective materials and it's not packed. Such kind of quality check programs can help a lot to prevent such hazards. Again, damage to the glass, hot filled glasses are there where the product is filled hot, which can cause a crack. It might not be noticeable immediately, but during the transit, you might end up having a leakage. Leakage in one product can actually end up in destruction of a whole lot of, which is a great economic loss.

So for packaging, you see that at every point, quality assurance is maintained and the product is intact. So, let's conclude the principles of developing safe and protective packaging. There is only one line that is important. We have gone through many things, safety measures that have to be taken, how to protect your packages if you maintain certain hygienic as well as good manufacturing practices.

The only thing we need to remember is do not assume anything that it is good. You need to follow the guidelines. Prevention is always better than cure. I hope you keep these points in mind when you are in the industry. In the next class, we'll go through the different transport worthiness tests, which is a new topic and I hope to see you all in the next class. Thank you so much!