

Food Packaging Technology
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Transport worthiness test P1

Hello everyone. Welcome back. In our last session, we talked about the principles of developing a safe packaging. Today, we will deal with a new topic, transport worthiness test. We have already discussed about transport packaging. And this transport package or the tertiary package, it ensures that the product arrives at the destination in undamaged condition.

So, the primary objective of the transport packaging is protection. Now, when you package and ship a product anywhere, in any mode of transport, the package that surrounds the product must contain and protect it. Now, most shipment are subjected to more than one mode of transportation. You can have a rail freight and then air freight and again a road freight.

So, all these cases, the package should stand up to both local and export conditions. So, these are the modes of transportation that are usually done for foot packages. You have the road freight, your cargo shipping freight, rail freight and the air freight. And this lists out some of the logistic packaging materials and forms that are used. We have wooden pallets, crates and blocks.

Corrugated fibre boards are being used as the transport packaging. Solid fibre boards. Another material is plastic and multi-wall paper, drums and bags. You have steel cans, pails and drums. Steel racks and cages for many packaging materials.

Fabrics or even woven plastics can be made into bags and blankets. Plastic film shrink wrap is another very popular packaging material used as a transport material. High density plastic boxes, pallets, blanket wrapping and restraints. Plastic strapping, plastic foam cushioning for fragile and irregular shapes. Now that you know what are transport packages and what are different forms, let's go into transport worthiness tests.

Now, as the name suggests, these are tests that you do to analyse the integrity and performance of the packaging during transit. So, most of these transport worthiness tests are done in the laboratory. So, how do you do it in the laboratory? In the laboratory, what they have is, they have simulation tests. The simulation test mimics the conditions that the package can encounter in real conditions. So, once you do things in the laboratory, this has an ability to compress the time in the evaluation of the package

performance.

So, shipment that might take several days of elapsed time can be stimulated in the laboratory in matter of hours. Now, the specific technique for the time compression depends on the test being performed. But in our sessions on transport worthiness tests, we will be detailing each of these transport tests that are being, worthiness tests that are done and how this helps in saving the time. But before we go into the tests, in this video, I would like to elaborate on the hazards, distribution hazards that the package will encounter. Three main distribution hazards are, you have mechanical hazards, climatic hazards and other hazards.

Now, in mechanical hazards itself, you might have impact, vibration, compression, deformation and piercing or puncturing. We will detail each of these in detail in the next few slides. Climatic hazards as the name suggests, it might include the high temperature, low temperature, low pressure, humidity, dust and light. And other hazards are also important though and enlisted under other hazards. These are the important ones like your biological hazards, microorganisms, insects and rodents and other goods which comes in contact with our packaging material.

Now, coming to the first distribution hazards, one is because these hazards actually play a role in when you do the test. So, once you understand the hazards, it is easier to understand the tests that are done. So, one of the important hazards is the mechanical hazard during distribution. And in mechanical hazard, impact is one of the main things. Impact is when one package hits another, an obstruction.

So, this impact can either be vertical, horizontal or a stationary package which is impacted by another package. Okay. So, when we have a vertical impact, what are the circumstances in which impact, vertical impacts can happen? One is the package may be dropped to the floor during loading or unloading. Another is when the package is rolled over or tipped over to impact a phase. One phase can hit the floor as a vertical impact.

Or there may be a fall from a conveyor or the result of throwing from top to bottom. So, these are all vertical hazards, vertical impact hazards that the package can encounter during distribution. Another mechanical hazard is horizontal impact. Horizontal impact is as you can imagine in a rail or a road, when you have a sudden stop or a start, it can hit horizontally onto an adjacent obstacle. That is one of the impacts.

Another is a swinging crane impact. While the crane is loading or unloading, you have a horizontal hazard hitting an obstacle. Or the impact on another package on the conveyor belts. When you pass through a conveyor belt, again another stop or a start,

sudden stop or a start, you can have an impact. And the result of throwing just like in your vertical impact.

And the third case circumstance in which an impact can happen is when a falling pack impact another. One pack falls onto another. That is also another impact that can happen during distribution. So, one is your impact is a mechanical hazard.

Another is vibration. Now, you would think this is a natural thing. But all these kinds of mechanical hazard directly have an effect on the package. And that on the secondary and primary package and that directly has an effect on the product. So, vibration is another hazard. What are the circumstances in which you have a vibration? From handling equipments.

One. Another one is from the engine transmission on a road vehicle. It is natural to have your vibrations either from the engine or because of the road transmissions. Or when you fare on a rail, it is a suspension vibration on the rail. Or on ships, you have mechanical vibration. If it is an aircraft, it will be the aerodynamic and the engine vibration.

So, you have impact, you have vibration. Another important mechanical hazard is compression. Now, compression is easy to imagine. When you stack one package over another, you have an impact of a compression. So, this is naturally one of the circumstances.

When your static stacks, static stacks you are not moving it but you are storing it. You store one package over another. That is called a static stack. A static stack in a factory or a warehouse can have a compression. That is going to have a long-term goal.

Over time, this can compress the lower packages. Another one is transient loads in vehicles. When you move in a vehicle, when you stack it, it is a transient load. Or in handling, during crane grabs or slings, when the crane has to actually hold it, it compresses the package and then takes it up. So, that again is a compression or compression due to restraint.

All these cases you can have a compression which is again a mechanical hazard. Another mechanical hazard is deformation or racking. That is when you place it on an uneven support on a floor or a storage space, you can have a deformation that happens. Or uneven lifting due to bad slinging can again have a deformation.

The package shape changes. Another mechanical change or a hazard is piercing,

puncturing, tearing. Very naturally that happens when you try to load or unload with hooks or projections or a misuse of the handling equipment or wrong handling. All this can result in a mechanical hazard. So, the number one hazard during distribution is a mechanical hazard. The second one, another important one is your climatic hazard.

We already said there are different modes of transportation that are used. If you have it on an air or a ship, ship you can encounter the sea water. Or when you go on a river or you can go on a rail. All these will have climatic effects.

One is high temperature. So, direct exposure to sunshine is one. Proximity to boilers, when you store your packaging materials in the factory next to your boiler or heating system. That can also have an effect on your packaging material. Plastics can melt.

Packages can stick to etaalja. Indirect exposure to the sun, sheds and vehicles. You are not directly exposing it to the sun. But there is no circulation during the storage condition. So, this sunshine can actually have an effect or have a high temperature effect on the packaging material. And then the last one is high ambient air temperature.

Naturally, air in summer times, that has an effect on the packaging material. Another distribution hazard is low temperature. That is in areas where you have or in the winter season or in the areas where it is cold. Unheated storage in cold climate. Transport in unheated aircrafts or cold storage.

All this can lead to a distribution hazard. Low pressure is another one. Very common in your aircraft. When there is a change in altitude as an unpressurized aircraft, you have an aircraft pressurization failure. This again can lead to bursting or it can lead to compression and deformation of your packaging medium. So, pressure is another important climatic hazard that can finally affect your final packaging material.

Light is another one. Direct sunshine, UV exposure or artificial light. All this can. So, light is usually affecting packages which are transparent to it. You know when you have containers which are transparent to it, that can have an effect. Or even to accessories which are directly exposed to the sunshine, can be affected by the light.

Fifth one is water. This water itself can be, you can have either fresh water or polluted water. Fresh water, you are unfortunate to end up, your packaging material ends up in the rain. So, rain during transit or direct exposure to sunlight, puddles and flooding, condensation and ship sweat. All this will affect final package.

Polluted water is even worse. Polluted water is when you pass through a ship, your

cargo in the ship, you can have salt sea sprays. Salt water puddles can be there in the dock. When you have your dock, you load your packaging material onto the dock. You have the puddles that can easily enter into your packaging material. Or industrially polluted puddles and sprays are another cause.

Dust is another factor which is a hazard. You have, especially in, you know, the desert places, your Middle East and other places, exposure to wind driven particles of sand, dust and grit, again affects the packaging material. Water vapour, very important. Humidity, both in the atmosphere, both natural and artificial, will affect your packaging material. So, we talked about hazards which are mechanical, hazards which can come from as a climatic hazard. And the last but not least is your other hazards which are biological or when in contact with others.

Now, biological itself, you have microorganisms. So, what are the microorganisms that can affect your fungi, mould and bacteria? Now, all of these have their required water vapour requirements. They will not grow at average less than 70%. So, try to keep your storage conditions in such a way that the relative humidity is less than 70%. But they do grow in a wide range of temperatures. So, we need to be careful that hygiene is maintained during transit also.

Beetles, moths, ants, flies, termites, a very important cause of trouble when you are transporting your packaging material. So, high temperature will most probably favour the development. RH of 70% is very favourable for most of the insects. But some may develop even below 50. So, 50% relative humidity is a very ideal storage condition for your packaging materials.

Mites is another problem that can happen just like your insects but they are more tolerant to your dry conditions. Rodents like your rats and mice, they may be present in the warehouses, transit shed, storage areas. So, this is another hazard that you have to be careful with during transportation. Now, in addition to microorganisms or the biological hazards, we also talk about contamination by other goods. So, when you are storing it in the warehouses, you are keeping it adjacent packed.

So, materials of the adjacent packs can be a hazard. Because the material of the adjacent packs, it can erase your markings and printings. You can, because of the rusty metals, the wire bands and damp packaging materials, all this can finally have an effect on your transit packaging materials. So, you should see that when you are storing it, that you store it in proper way that there are no leaks. Anything from an adjacent pack leak can affect your packaging material and radioactivity. Now that we have gone in detail with the different distribution hazards that a transit package will encounter, let's move on

to the testing of the different packages.

Now, when you test the packages, the transit packages, there are actually two tests that can be done. One is the actual use test and one is a simulated use test. In an actual use test, you actually send limited number of the food filled packages through whatever it is passing through. The processing, shipping, warehousing and the whole merchandising chain. It will be exposed to naturally occurring vibrations, humidities, changes in temperature, handling abuses.

So, the package undergoes everything naturally as it would in real time. Now, such packages are then sent for analysis. But this, as you all can understand, is a very tedious procedure. It involves cost and materials. So, usually in the packaging industry, we go for simulated tests or tests that are done in the labs.

Now, simulation is you mimic, you mimic or simulate experiences that the package encounters in real time in the laboratory. So, that will involve machines and devices for producing physical stresses. Or you can even have incubation cabinets where the packages are subjected to various different temperatures and humidity cycles. Now, all this will be comparable to whatever the package is going to experience in the real time trade channels. Now, this is very easy to understand that this is much cost effective.

You save a lot of time in this. Another thing that can be done is, in these simulated tests, the test conditions can be intensified. You can intensify, increase the stress conditions, you can increase the vibrations, you can increase the drop intensity. So, that you arrive at a conclusion or you can judge the package performance much more quickly. So, generally simulated tests are what is usually done. And these simulated tests are what we term as the transport worthiness test which is going to be discussed in detail in the next session.

What are the advantages of testing your transit packages? Number one, of course, cost. You can reduce the cost normally associated with damaged goods. Because you are predicting what can happen to these packages during transit and you can make corrections for them. So, naturally you can avoid financial loss.

Number two, it will ensure client satisfaction. Number three, you can identify the weakness of the product like I told you. And you can correct them before you send it for transportation, which is a big factor. You can make the products more environmentally friendly. How? You can eliminate excessive packaging materials. If a packaging material, if only a minimum is required and passes all the transport worthiness tests, there is no need to go in for extra packaging.

And last, enhanced brand image and reputation. Testing of transit packages are done for all packages, especially for the tertiary packaging materials. So, these transit packages, they should be strong enough to bear the handling, one, and the transport hazards which we have discussed in detail. And it should protect the products that are contained in it. As I told you, in the next video we will go in detail through all the transport worthiness tests.

But I have just enlisted some of these. You have the drop test, roll test, compression test, vibration test, incline impact test, and the climate test. So, I think you can relate these to all the hazards that we just detailed in this session. So, all these simulated tests can be easily related to what all we have covered for the distribution hazards. So, summing up what we did in this session, we talked in detail about the distribution hazards, mechanical, climatic, and other hazards that a transit package will go through. We also went in to describe what a transport worthiness test is, how are they done, and about the two important tests, actual test and the simulated test.

So, thank you. See you all in the next session where we will give you a detail of all the transport worthiness tests that are done in the packaging industry. Good day.