

Modern Food Packaging Technologies: Regulatory Aspects and Global Trends

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Week – 07

Lecture – 31

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 corrosion of packaging materials and now we shall be taking testing and regulatory aspects of food packaging. In the following slides and this lecture we will be trying to find out the answer of following questions like what is food packaging testing, what is food packaging testing, why is food packaging testing important, how does package testing work, how to choose the right packaging testing method. Food packaging testing is the process of assessing food packaging for variety of characteristics including safety and quality. Food packaging must keep food products safe from contamination, protect the food from damage and maintain the foods quality such as flavor, smell and texture. Testing is a critical step to ensure that food packaging is performing its intended function effectively.

Food packaging testing includes chemical and physical tests to ensure that the packaging materials are compatible with the food they contain and that there are able to withstand a wide range of conditions from exposure to contaminants to jostling during shipment to high temperatures in customers house. Many companies may also choose to leverage food packaging testing as they explore innovative new materials and packaging designs. Why food packaging testing important? The food packaging testing helps to achieve the numerous benefits of functional safe food packaging including consumer safety, physical protection, consumer satisfaction, reduced costs and sustainability. The consumer safety any material that comes into contact with food must avoid the migration of chemicals from the packaging into the food product itself.

This migration can cause the consumption of heavy metals and other toxic chemicals as well as damage to the quality of the food. Durable packaging that is not prone to leaks or holes is also an important safety measure as it keeps contaminants like bacteria from touching the food this helps keep consumer safe. Effective packaging also helps ensure that the food does not spoil as eating spoiled food can also cause significant harm to consumers especially the very young or the elderly. Different kinds of packaging materials are used to preserve the freshness of different types of foods. Physical protection effective food packaging protects the food against physical damage.

For example, if an item is dropped in transit the packaging helps to ensure that the food is not broken or is squeezed. Reduced costs effective food packaging may also help to reduce costs associated with over packaging as less material is necessary to properly protect the food. Functional food packaging will also help avoid potential recalls due to damaged or unsafe food products. Consumer satisfaction food packaging is a major part of creating a unique brand image. For example, eye catching designs or eco friendly packaging can influence consumer purchasing decisions and increase consumer loyalty.

Food packaging also helps to maintain the quality of the food which is another crucial aspect of meeting consumer expectations. Customers that receive high quality food products in perfect condition are more likely to become repeat customers. Sustainability Today's leaders in the food industry are increasingly making the switch to sustainable packaging such as packaging made from recycled materials. Food packaging testing helps develop and assess new types of food packaging in order to continue prioritizing safety and quality while innovating. Now, the why is food packaging testing important? Thus quality evaluation of the packaging materials is done mainly for the following purposes.

Comparison with competitive packaging material for example, to compare offers. Comparison of the current supply of material with the quality of that offered for the first time also regular checking of uniformity in new supplies of packaging materials. Quality checks during the production of packaging materials. Evaluation of the suitability of a packaging material for a certain specific purpose for instance protection against mechanical or climatic hazards.

Test procedures that are applicable for general classes of materials or packages are available and published in standardized form. Like for example, ASTM that is the American Society of Testing and Materials Standards TAPPI that stands for Technical Association for the Pulp and Paper Industry of USA, BIS is Bureau of Indian Standards, ISO are that is International Standards Recommendations, BS is British Standards, FEFCO is Federation European Desk Fabricants Day, Carton, On Due Late Text Methods, PIFA stands for Packaging and Industrial Films Association Standards, ABA is American Box and Board Association, BPBMA British Paper and Board Manufacturers Association, NFPA is National Flexible Packaging Association. Now, how does package testing work? For any business involved in shipping and receiving products it is crucial to ensure the safety and undamaged arrival of their shipped components to the best of their ability. This is particularly important when dealing with delicate items like medical devices and food regardless of whether they are transported to nearby destinations or around the world. Packaging testing plays a pivotal role in ensuring these products can withstand their journey and arrive without damage as often as possible.

Various processes of testing involves establishing testing object, select test method, conduct performance test, analyze the results. Now establishing testing object, defining objectives for primary packaging testing is essential in ensuring the overall quality and safety of products within the supply chain. Primary packaging test factors such as proper sealing, preservation and ease of use. Product composition will narrow down the options for primary packaging since not all packaging materials are compatible with every product. Secondary packaging which includes corrugated shipping boxes that transport the primary packages focuses on assessing how protected the product inside is.

By establishing clear testing objectives for both primary and secondary packaging business can effectively uphold product integrity, regulatory compliance and consumer satisfaction from the time of production to the end user. Select the test methods after establishing objectives to select the testing methods it is required to use for the packaging materials. The goal is to make sure the products inside reach the end user without damage. Therefore, it is essential to consider the packaging materials and testing methods thoughtfully. Below is a list of some examples of different testing methods utilized in testing primary and secondary packaging.

The primary packaging testing methods, the first is compatibility testing. This test the compatibility of the primary packaging material with the product to ensure no interaction can compromise product quality. The second one is seal integrity testing that assesses the sealing strength and integrity of closures, caps and seals on individual product packaging. Third one is barrier property testing. This method evaluates the packages ability to prevent the ingress of moisture, gases or light which could negatively impact product quality or shelf life.

The fourth one is drop and impact testing. This simulates the effects of mishandling during transportation. Packages are subjected to control drops and impacts this helps determine whether the primary packaging can protect the product from damage during transit. And the last one is tamper evident testing that ensuring the integrity of tamper evident features on primary packaging is critical for consumer safety. Now the secondary packaging testing methods, the first one is a labeling and printing quality checks.

Verification of accurate labeling, bar codes and printing quality helps ensure proper product identification and tracking. The second one is compression testing. Packages undergo compression tests to simulate the pressures experienced during stacking in storage or transportation. Next is environmental testing. Secondary packaging may be subjected to environmental conditions such as temperature and humidity variations to evaluate its performance under different storage and shipping conditions.

Next is ease of opening and handling. Assessing how easily consumers can open and handle the packaging is important for users' experience and the last one is transit testing. This test simulates the shipment conditions for all the packaging that surrounds the product. Now the select test methods. Next it is time to run the test or work with experts who can conduct testing in a laboratory.

Consumer goods travel all around the world every day. So it is vital to make sure the quality of the packaging system meets the high standards expected to safely travel through the supply chain to the end user. Now analyze test results. This comprehensive evaluation requires interpreting data gathered from the various testing methods to assess the packaging's integrity, functionality and suitability for the intended product. By scrutinizing each detail of the tested factors manufacturers and suppliers can certify whether the packaging effectively safeguards the product from external influences and maintains its intended quality.

The analysis also adds in identifying any potential weaknesses or areas for improvement allowing for timely adjustments to packaging materials or design. Finally the careful analysis of packaging testing results ensures that products reach consumer in optimal condition strengthening both consumer satisfaction and brand reputation. These are the different steps in testing of any packaging material. The first is the design and this will build design based on material, structural integrity, graphics requirements and more. And after that the testing is done and test prototype with transportation stresses, environmental stresses, varying temperatures and impact forces.

And after testing the data obtained is analyzed, the analyzed data from testing to identify areas to improve the packaging design and if required the refining is done analyze the data from testing to identify areas to improve the packaging design and after refining it is retested and if it passes the test then it is through otherwise it is repeated. Now, how to choose the right packaging testing method? Choosing the right method for package testing is vital. For example, if one to choose test that determine the factors you need to verify such as ensuring an air tight seal on a food or personal care item. You will want to be certain that you are performing tests that will benefit your business and ensure consumer and product safety. With that in mind there are several different categories of testing to consider.

The physical testing, physical testing methods evaluate the structural and mechanical aspects of packaging materials and products to ensure their durability, safety and integrity during handling transportation and storage. Some examples of physical testing are drop and impact test, compression test, vibration test, shock test, torque, peel, tensile test, bursting test, creep test, fatigue. Now, the environmental testing. Environmental testing

methods assess how packaging materials and products react to different environmental conditions to ensure their suitability for various storage and transport scenarios. Some examples of environmental testing are temperature and humidity, light, weathering, altitude, corrosion.

The material testing. The material testing methods analyze the properties of packaging materials to ensure they meet the required standards for strength, flexibility and compatibility with the packaged product. Some examples of material testing are permeability, chemical resistance, flammability, toxicity and migration. Now, the chemical testing. Chemical testing methods aim to identify potential chemical interactions between packaging materials and the packaged product to ensure safety and product integrity. Some examples of chemical testing are sterility, microbial challenge, shelf life, sensory, color, odor, tensile, sound, accelerated aging and extractable and leachables.

That is all for today. Thank you very much.