Modern Food Packaging Technologies: Regulatory Aspects and Global Trends

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Week – 02
Lecture – 06

Dear friends, welcome to NPTEL online certification course. On modern food packaging technologies, regulatory aspects and global trends. We were discussing about the introduction to the food packaging and in that we have discussed printing and labelling of the food products. Now, let us discuss in this lecture the purpose of labels. Information about packaged foods, it provides information about packaged foods.

It requires that all packaged foods list the name of addresses of the foods manufacturer, the weight or count of the food and nutrition facts for the food. The NLEA applies to all foods except for meat, poultry, eggs, prepared foods or foods that are sold in bulk. About the nutritional value of the product, the nutrition facts labels is the label with the most information for consumers. The first line of this label list the serving size.

The nutritional information that follows is based on this specific serving size. The next line lists the total calories and the amount of calories that are from fat. The following lines contain the foods total fat content including a breakout of saturated and trans fats, cholesterol and sodium. Carbohydrates, fibers, sugars, vitamins and minerals are listed next. The percent of the daily value for each nutrient based on a 2000 calorie diet is listed on the right side of the label.

The footnote on the bottom of the label has the FDA's recommended dietary guidelines. If the food label is very small this footnote is abbreviated. About the decoration of the labeling, when the food product is choicily labeled in bright and attractive colors, it attracts consumers to buy. It acts as a silent self salesman. The color and design should be in symmetry with product color and the label should have some relationship to the size and shape of the package and container.

About the warning, the food labels also having warning and instructions about the food product labels educate consumers about allergens, preparation methods and storage conditions for the product. About the identification, the identification of the product is the main role of the labels as the consumer must be able to identify name and address of the manufacturer, packer and or seller and brand name also identify by the labels. The glued on labels these are the simplest type and consist of sheet material typically paper which has been printed on cut to size. They are attached to the package with adhesive which is

applied either at the same time which is supplied either at the time of application or at the time of manufacture in which case the adhesive is activated with moisture immediately prior to application. This type of label is widely used for large volume items such as beer, soft drinks, wines and canned foods where high speed application is required.

For returnable glass and plastic bottles, it is important that the weight strength of the paper is sufficient to ensure that the label can be removed in the bottle washer without ripple ping. The self-adhesive pressure sensitive labels these can be made from paper, plastic or aluminium foil laminated to paper or plastic and can be produced to adhere to a wide range of materials. They are supplied with an adhesive coated on the printed side and mounted on release paper which is removed immediately before application to expose the adhesive. In mould labels, in mould labeling is a decoding technique used worldwide for blow moulded bottles as well as injection moulded and thermo formed containers. Printed labels can be applied to containers and lids during thermo forming, blow moulding and injection moulding.

The first in mould labels consisted of paper clay coated on both sides. One side had a heat seal adhesive and the other an inked surface with an over print coating to provide protection. Today such paper labels comprise approximately half the IMLs is typically made from high density polyethylene or low density polyethylene blended material and is compatible with a hot of plastic containers. In the greatest advantage with the use of film is decorative consideration designed the no label look. This means it is possible to prepare an in mould labeled containers that actually appears to have no label at all the unprinted areas of the label blend into the container wall.

During the in mould labeling process a label is placed in the open mould and held in place by vacuum ports, electrostatic attraction or other appropriate means. The mould closes and molten plastic resin is extruded into the mould where it conforms to the shape of the object. The hot plastic envelops the label making it an integral part of the moulded object. Holographic labels that incorporate a hologram are finding increasing application in food packaging for both marketing and security reasons specifically in the areas of anti counter fitting, authentication and brand protection. Holograms are part of a family of technologies known as diffractive optically variable devices.

The sleeve labels a wide range of containers can be sleeve labels including glass bottles, plastic bottles, extrusion blow moulded PP polypropylene and HDPE high density polyethylene bottles as well as a stretch blow moulded PET and metal cans. There is almost no restriction regarding the shape of the container. Sleeve labels shrink into a stretch around contours penetrate variable geometries such as hour glass shapes and conform to irregular features grips or slender necks. Performed printed sleeves are slipped

over the container normally a glass or plastic bottle on line and then either shrunk in a heat tunnel are provided that the container is of simple shape. The actual label relaxes on to the container itself.

A complex container shape will generally require the sleeve to be shrunk to the contours of the container. Most shrink sleeves are made of oriented plastic films that shrink around a container when heat is applied. They are used as labels, tamper evident, neck bands and safety shields. Most shrink sleeves are made from PVC or PS films that has been uniaxially oriented to give the desired degree of shrink. Now the coding it has been a standard practice in almost all food manufacturing and processing establishments to put a close code.

So called because only those with knowledge of the coding system can interpret the code on to the package products. Generally this code indicates the time of processing and packaging for example, day and year or shift day and year or hour day and year. Dating of food products has been known to exist in the US dairy industry since 1917 and in the 1930s US consumers expressed a desired for an open dating regulations to indicate the freshness of their products. The European Union's general food law entered into force in 2005 and makes traceability compulsory for all food and feed businesses. Under European Union law traceability means the ability to track any food feed, food producing animal or substance that will be used for consumption through all stages of production, processing and distribution.

ISO 22005 gives the principles and specifies the basic requirements for the design and implementation of a feed and food traceability system. GSI is an international not for profit association with number organizations in over 100 countries. The GSI traceability standards is a business process standard describing the traceability process independently from the choice of the enabling technologies. Now barcode, a barcode is defined as a series of parallel bars and spaces arranged according to the encodation rules of a particular specification in order to represent data. Its purpose is to represent information in a form that is machine readable typically by scanning devices that are programmed to analyze the structure of the bars and spaces and transmit the encoded data in electronic format to a computer.

Although there are more than 200 barcode symbologies, only few are in common use with the most popular being EAN-UPC symbology. EAN-UPC symbology is wisely used on consumer products including food and has the advantage of omni directional scanning capability. The data matrix code or quick response code, data matrix code are consist of black and white cells on or modules arranged in either a square or rectangular pattern. They use a small area of square modules with the unique perimeter pattern which helps the

barcode scanner determine cell locations and decode the symbol. A QR code contains information in both the vertical and horizontal directions whereas, a barcode contains data in one direction only.

As a consequence QR code holds a considerably greater volume of information than a barcode. Radio frequency identification that is RFID tag and RFID uses radio frequencies to read information on a smaller device known as a tag or transponder with few problems from obstructions or disorientation. Their advantages are that they can be read wirelessly and without line of sight. Contains more information than barcodes and are more robust. To date RFIDs have been used to increase convenience and efficiency in supply chain management and traceability being normally applied to secondary or tertiary packaging.

If costs can be reduced significantly then they could find application to individual consumer packages where in addition to supply chain management they could also monitor food temperature and ensure food safety if they contained the appropriate sensor. Most all conventional RFID tags contain a transistor circuit employing a microchip attached to an antenna that is packaged in a way that it can be applied to an object or package. Typically a tag picks up signals from and sends signals to a reader also called as interrogator the tag contains a unique serial number, but may have other information such as a customers account number. Tags come in many forms such as a smart labels that can have a barcode printed on them. The tags can simply be mounted inside a carton or embedded plastics.

There are three types of RFID tags active, passive and semi passive which are presented in the pictures. Active tags have an internal power source and are externally flexible in terms of the functionality they can offer due to their on board battery which extends their reading range. Semi passive tags contain a power source, but it is only used to power the circuitry. The radio signal is transmitted using power from the incoming radio signal. Whereas, the passive tags are not self powered, but are activated by the electromagnetic field emitted by the reader.

RFID tags fall into four regions in respect of frequency. Low frequency which varies from 30 to 500 kilohertz, high frequency which varies from 3 to 30 megahertz typically 13.56 megahertz and ultra high frequency that is 300 to 950 megahertz. Each band has its own advantages and disadvantages. Low frequency tags are cheaper than any of the higher frequency tags.

Another advantage is that low frequency tags are least affected by the presence of fluids or metal. The disadvantage of such tags is their short reading range that is less than 30 centimeter. Frequencies for low frequency and high frequency tags are license exempt.

The frequencies for low frequencies and high frequency tags are license exempt and can be used worldwide. However, frequencies approved for ultra high frequency tags differ from country to country and require a permit.

Furthermore, since the passive components both inductors and capacitors are smaller at these higher frequencies total tag size and thus cost can be reduced. Thank you very much.