

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

**FOOD & BEVERAGE
INDUSTRY**

**ENGINEERING
& DESIGN**

**SCIENCE &
TECHNOLOGY**

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SEAFOOD TRANSPORTATION SYSTEM



Introduction

Seafood is a very perishable food material and needs to be cared for from the moment of catch till cooked for the table or processed in the factory. Spoilage begins as soon as the fish dies and affects its appearance odor and texture. Transport plays an important part in dealing with a perishable commodity like fish.

When many indigenous and mechanized boats bring their catches ashore into numerous coastal villages, link roads between the villages and the nearest highways become essential for quick transport. Shellfish and fish destined to reach processing places are transported by trucks, trains, and sea vessels. The commercial food sector, including agriculture, food manufacturing transport and retailing is responsible for 22% of the total greenhouse gas emissions. Food distribution and retail accounts for approximately one-third of this, with food transport which includes motive power and refrigeration estimated to be responsible for 1.8 % of total emissions. Road transport refrigeration equipment is required to operate reliably in much harsher environments than stationary refrigeration equipment.

Due to the wide range of operating conditions and constraints imposed by available space and weight, transport refrigeration equipment has lower efficiencies than stationary systems.

Regulations for Refrigerated Transport

Various regulatory legislation covers temperature control requirements during the storage and transport of seafood items that requires manufacturers to have suitable temperature-controlled handling and storage facilities that can maintain food at appropriate temperatures and enable these temperatures to be monitored controlled and recorded. Frozen seafood products are required to be maintained at -18°C or below and fresh fish, shellfish and their products are required to be transported at temperature close to 0°C . It is recommended to use freezer bags, ice slurry, chilled seawater or refrigerated seawater wherever possible. Fresh whole fish should be kept in shallow layers of melting ice and maintained at a temperature between $0-4^{\circ}\text{C}$.

Components of Transportation System

(A) Vehicles: Most of the refrigerated road transportation is conducted with semitrailer insulated rigid boxes.

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A rigid semi-trailer box normally consists of expanded foam insulation sandwiched between two external skins. Each skin consists of a few millimeters of plywood covered with a glass-reinforced polyester, steel, or aluminum skin. The most popular insulation is expanded polyurethane (PU) foam with cyclopentane as the blowing agent.

b. Refrigeration Units : The most common refrigeration system in use for refrigerated food transport applications today is the vapor compression system. Mechanical refrigeration with the vapor compression cycle offers a wide range of options for compressor drive methods. The choice may be based on duty required, weight, noise requirements, maintenance requirements, installation cost, environmental considerations, and fuel taxation.

c. Air delivery system: The top air delivery system is predominately used for air distribution in a refrigerated semi-trailer. Refrigeration unit fans cause temperature-controlled air to circulate around the inside of the vehicle roof, walls, floor, and doors to remove heat, which is conducted and infiltrated from the outside, returning to the cooling coil via the floor or space under pallets.

d. Multi-compartment Vehicles: In multi-compartment vehicles the refrigerated space is subdivided into several compartments with individual temperature set-points to provide logistics flexibility for many business operations. It is common practice for supermarket chains to deliver produce inside multi-compartment semi-trailers.

e. Eutectic systems: Eutectic systems consist of hollow tubes, beams or plates filled with a eutectic solution (phase change material) to store energy and produce a cooling effect whenever necessary to maintain the correct temperature in the refrigerated container.



The Eutectic concept is different to conventional refrigeration systems in that a cold source (heat absorption) is provided by phase change material rather than direct expansion of refrigerant gas. The plates or beams that contain the eutectic are charged (frozen down) at night on mains power.

f. Cryogenic cooling system: As an alternative to mechanical refrigeration, total loss systems using liquid nitrogen or carbon dioxide injection may be used. Advantages are rapid pull-down of temperature and relative silence. For longer journeys, these systems are expensive to operate; so cryo-mechanical systems exist which combine the rapid pulldown of a total loss refrigerant with the more economical steady running of a mechanical system.

Good transportation practices

1. Avoid unnecessary exposure to elevated temperature during loading and unloading of fish and fish products.
2. Loading to be done in such a way to ensure good air flow between product and walls, roof, and floor.
3. During transportation, all precautions should be taken to maintain the appropriate temperatures so that discoloration, foul smell, and microbial spoilage, possible cross contamination could be avoided.
4. Conveyances and/or containers or tankers used for transporting Fish and Fish products shall be kept clean, hygienic, and maintained in good repair condition.
5. Facilities for recording temperature or data logger should be present.

FOOD PRESERVATIVE



Introduction

To understand preservatives, one should first know about food additives as preservatives are a type of food additive. Food additives are substances added to food to maintain or improve its safety, freshness, taste, texture, or appearance. The Joint FAO/WHO Expert Committee on Food Additives (JECFA), is the international body responsible for evaluating the safety of food additives. Only food additives that have been evaluated and deemed safe by JECFA, based on which the Codex Alimentarius Commission has established maximum use levels, can be used in foods that are traded internationally.

What FSSAI and Codex say about Food Additives!

Food additive is any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its byproducts becoming a component of or otherwise affecting the characteristics of such foods. The term does not include contaminants or substances added to food for maintaining or improving nutritional qualities.

Food preservation is one of the methods to protect food from unwanted microbial growth. After the food is produced, product is store and protect by covering the rice and curry with lids to keep away flies and other insects. By this, we are protecting it from any infection caused by them. This is a short-term condition. Chemical food preservation, on the other hand, is done to preserve food for a longer time.

According to FSSAI- "Preservative" means a substance which when added to food, is capable of inhibiting, retarding, or arresting the process of fermentation, acidification, or other decomposition of food.

Food Additives v/s Food Preservatives

Food Additives: Food additives are a wide range of chemical compounds used for different purposes of food processing and storage.

Food Preservatives: Preservatives are a type of food additive that inhibit the growth of bacteria, yeasts, and molds in foods, and prevent some disagreeable chemical reactions such as lipid oxidation.

Objective

- 1.Prevention of food by damaging agents like microbes, insect etc.
- 2.Delay of enzymatic spoilage.
- 3.Hinder or prevention of the growth of microorganism.

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Why chemical preservation?

- 1.To preserve the natural characteristics of food.
- 2.To preserve the way natural food looks.
- 3.To increase the shelf life of foods for storage.

Types of Chemical Preservatives

According to the Canadian Food Inspection Agency (CFIA), preservatives are grouped into classes (I-IV), with each class having similar microbiological or chemical activity.

Class I: Curing preservatives in cheeses and meats

Class II: Antimicrobials (which inhibit the activity or growth of microorganisms)

Class III: Antifungals (which inhibit the activity or growth of yeast and mold) and

Class IV: Antioxidants and their synergists (which are used to prevent the oxidation of vitamins, minerals, and lipids of foods and ant browning agents which prevent both enzymatic and non-enzymatic browning of foodstuffs).

However, according to FSSAI Chemical preservatives are divided into two categories, namely:

1. Class I Preservatives: Those which are obtained from natural sources.

2. Class II Preservatives: Those that are obtained synthetically.

Natural Preservative: Common salt, Dextrose, Glucose, Spices, Acetic acid/Vinegar, Honey, Edible Vegetable oil.

Artificial Preservative: Benzoic acid including salts, Nitrates/Nitrites of sodium or potassium salts, Niacin, Sorbic acid, Propionic acids including salts.



Conclusion

A suitable method of food preservation is one that slows down or prevents the action of the agents of spoilage altogether. Also, during the process of food preservation, the food should not be damaged. To achieve this, certain basic preservatives can be used. Nowadays almost all food products have food preservatives. Chemicals are used as food preservatives as they are the most effective for longer shelf life stopping or delaying bacteria's growth and suppressing the reaction when food meets oxygen. Some Chelating agents and antioxidants (Vitamin E, Vitamin C) work as preservatives, for example, Disodium ethylenediaminetetraacetic acid (EDTA), Polyphosphates, Citric acid, and Ascorbic acid.





INDUSTRY BUZZ



Cheetos Pretzels mark the brand's entry into a new category.

Cheetos has been making waves in the snack aisle with its unanticipated innovations for years, starting with Cheetos Popcorn and continuing with Cheetos Mac N' Cheese. With the invention of Cheetos Pretzels, Chester Cheetah is back at it, cheating on yet another popular snack.

According to Tina Mahal, senior vice president of marketing at Frito-Lay, "Our fans are always hungry for unique ways that they can experience Cheetos' signature cheesy flavor, which is why this latest innovation is breaking into an entirely new category." "Cheetos pretzels maximize the fan-favorite seasoning in each bite with the perfect product texture, ultimately bringing the Cheetos flavor experience to life in pretzel form."

Kerry will serve cutting-edge ideas at Gulfood Manufacturing that are delicious and healthier.

Kerry, a global innovation partner for food and beverage brands, offers a tasting menu for Gulfood Manufacturing 2023 that showcases the finest creations from its scientists, chefs, and application specialists. The menu features concepts for snacks, meat, bakery, and beverages that strike a balance between innovative regional flavors and wholesome ingredients.

Kerry's Dubai World Trade Center booth will be in Hall 7, A7-4. Guests at the Kerry booth from November 7-9 can taste delectable ideas such as:

Preserved lemon sparkler

Flavorful, succulent plant-based Shawerma

Cookie electricity from plants: Sweet cookies made with plant protein.





Atul Bhalla has been promoted to vice president of ITC Hotels' north and west operations.

In a recent restructuring, Atul Bhalla has been promoted to vice president of operations for ITC Hotels' north and west area. He will continue to provide strategic support for the successful completion of upcoming projects, with a sharp focus on the brand's asset-right growth strategy. He will also be crucial in advancing operational excellence for the division's fast-paced portfolio of existing lifestyle and luxury mix brands.

Bhalla has worked for ITC Hotels for thirty years in various top management capacities. He is an essential part of the company's leadership think tank.

To counteract water constraints, ICAR-IIHR promotes soilless cultivation for fruits and vegetables.

The novel technique of growing vegetables and medicinal plants in terrace, rooftop, or vertical gardening—known as colonics or soilless culture—offers enormous potential, according to the Indian Institute of Horticulture Research, or ICAR-IIHR. This occurs due to integrating soilless system techniques, which maximize water and nutrient efficiency, into horticulture production.

BESST-HORT, or Business Entrepreneurship and Start-up Support through Technology in Horticulture, recognizes that soilless cultivation is a contemporary method of plant cultivation that supplies nutrients to plants primarily through nutrient solution in conjunction with inert organic or inorganic growing substrates.



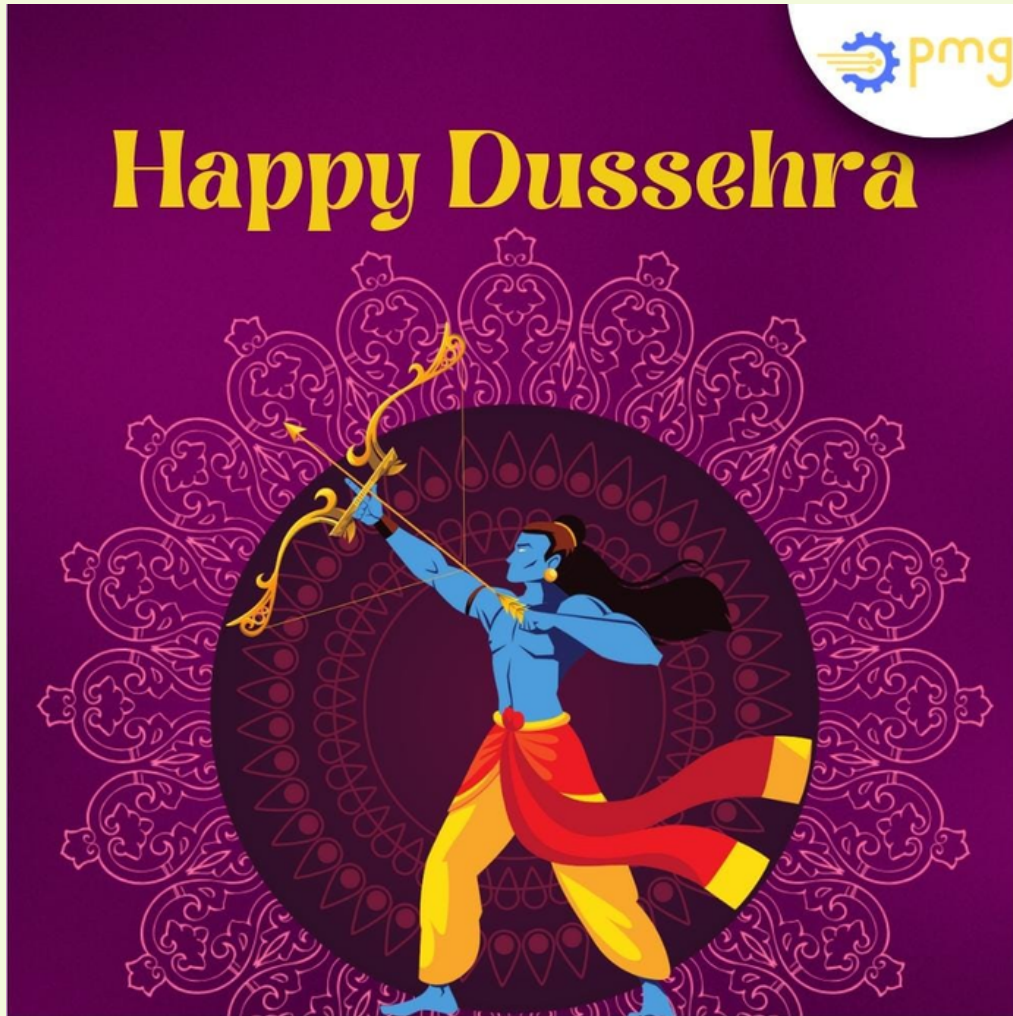
Coca-Cola and Skill India are launching the Retailer Skill Development Program.

Under the auspices of the Ministry of Skill Development & Entrepreneurship (MSDE), the National Skill Development Corporation (NSDC) announced a partnership with Coca-Cola India to launch the Super Power Retailer Program under the Skill India Mission. The program's pilot location is Odisha. The cooperation was formally launched in the presence of Sanket Ray, president of Coca-Cola India & Southwest Asia, Ved Mani Tiwari, COO of NSDC, and Union Minister for Education, Skill Development, and Entrepreneurship Dharmendra Pradhan.

The initiative is a significant step forward in Skill India's efforts to support the workforce as it empowers and advances retailers. The initiative's primary goal is to give small and micro retailers the training they need to understand their customers' tastes and behaviors better and enhance their skills and capacity in the contemporary retail industry.

WEEKS HIGHLIGHT

NON-TECHNICAL CONTENT



24 OCTOBER

DUSSEHRA

Dussehra, also known as Vijayadashami, is a Hindu festival celebrated with fervor in India. It symbolizes the victory of good over evil, with the story of Lord Rama's triumph over the demon king Ravana. People participate in processions, burn effigies of Ravana, and worship the goddess Durga. It's a time of joy, unity, and cultural significance, marking the triumph of righteousness.

OCTOBER

DID YOU KNOW?



PORTIONING PLANTS

1/3

Portioning plants are industrial equipment used in the food processing industry to accurately portion, weigh, and package food products. These plants are commonly used in meat, poultry, and fish processing and in the production of baked goods, confectionery, and other food products.

Examples

Raw Materials:

- Meat, poultry, and fish products (such as beef, chicken, salmon, etc.)
- Vegetables (such as carrots, potatoes, onions, etc.)
- Doughs and batters (such as for bread, pizza, and pastry products)
- Cheese and dairy products
- Confectionery items (such as chocolate bars or candy)
- Frozen food products (such as ready meals or ice cream)

Packaging Formats:

- Trays with plastic or film lids
- Plastic containers with snap-on lids
- Cardboard boxes with plastic liners or dividers
- Shrink-wrapped packages

2/3



Equipment Used

- 1. Slicers and Cutters**
Used for slicing or cutting food products to the desired size and shape, such as meat slicers, vegetable cutters, and dough rollers.
- 2. Weighing Systems**
Used for measuring and controlling the weight of the food product, such as load cells, scales, or check weighers.
- 3. Portioning Machines**
Used for dividing the food product into individual portions of the desired size, such as patty formers or dough dividers.
- 4. Packaging Machines**
Used for packaging the food product into the desired format, such as form-fill-seal machines, tray sealers, or baggers.
- 5. Inspection Systems**
Used for checking the quality of the food product, such as metal detectors, X-ray machines, or vision inspection systems.
- 6. Automation and Control Systems**
Used for controlling and monitoring the portioning plant, such as programmable logic controllers (PLCs), human-machine interfaces and supervisory control and data acquisition (SCADA) systems.

3/3

Fact 1

Portioning plants play a pivotal role in the food industry by ensuring accurate and consistent serving sizes. These advanced machines employ precision and automation to divide various food products, such as meats, fruits, and vegetables, into predetermined portions. This not only enhances food safety and quality control but also boosts efficiency, reduces waste, and meets consumer demand for convenience in packaged foods.

PICKLING PLANTS



1/3

Pickling plants are industrial facilities used for the chemical process of pickling, which involves the removal of surface impurities from metal parts, such as steel or iron, using an acidic solution.

Components

1. Acid storage tanks

Used to store the pickling acid, which is typically a solution of hydrochloric or sulfuric acid.

2. Acid circulation systems

Pumped through a series of pipes and nozzles to distribute it evenly over the metal parts to be pickled.

3. Pickling tanks

Pickling tanks filled with the acid solution. The tanks may be made of plastic or lined with acid-resistant materials to prevent corrosion.

4. Rinse tanks

The metal parts are rinsed with water to remove any remaining acid and prevent further corrosion.

5. Fume scrubbers

Pickling process are captured and treated using fume scrubbers to prevent environmental contamination.



2/3

Principle

1. Surface preparation

The metal parts to be pickled are typically cleaned and degreased to remove any surface contaminants.

2. Acid solution preparation

The pickling solution is typically a mixture of solid acids, such as hydrochloric or sulfuric acid, diluted with water to the desired strength.

3. Immersion

Immersed in the pickling solution for a period, typically ranging from a few minutes to several hours, depending on the type and thickness of the metal.

4. Neutralization

Rinsed with water to remove any remaining acid, then neutralized with sodium bicarbonate or other alkaline substances to prevent further corrosion.

5. Waste treatment

The spent pickling solution containing acids and metal impurities is typically treated before disposal to prevent environmental contamination.



3/3

Fact 2

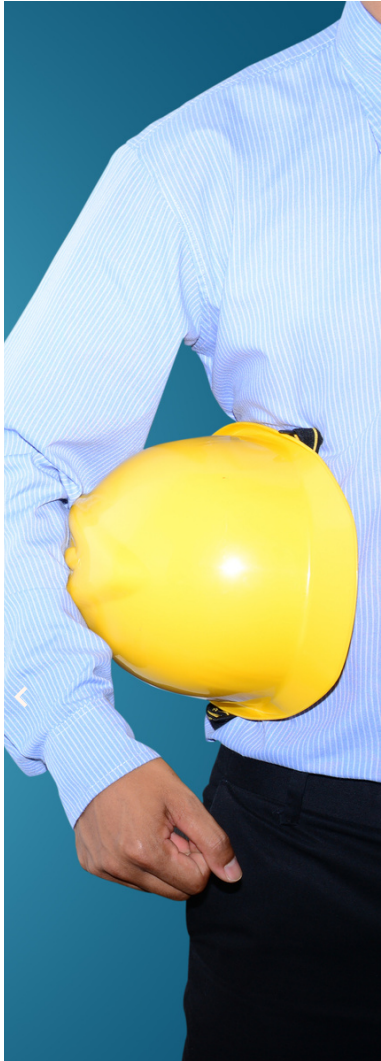
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for FOOD and BEVERAGE Industry with SINGLE POINT ACCOUNTABILITY

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