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TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

FOOD & BEVERAGE INDUSTRY | ENGINEERING & DESIGN | SCIENCE & TECHNOLOGY

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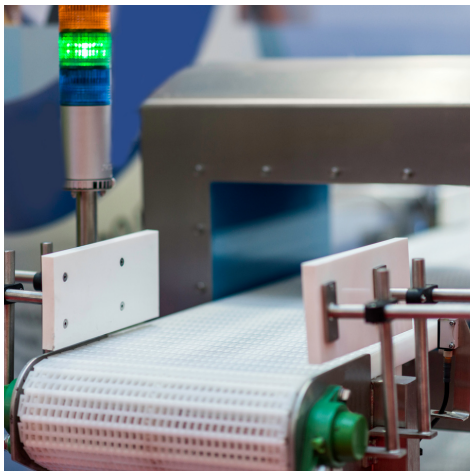

CONTROLLED ATMOSPHERIC STORAGE

Introduction

Oxygen is life, but in the case of foods, it is not so. When harvested, fresh fruits and vegetables are at the peak of their quality. Their quality cannot be improved; it can only be deteriorated or maintained.

Fresh, high-quality products are the primary requirements for the national and international food industry during this current era. After harvesting, especially for fresh fruits and vegetables, continue their respiration process. The respiration rate has to be reduced to maintain quality, especially when the products are stored for an extended period or shipped to distant markets. The best way to preserve quality and extend shelf life is by cooling, and another method used to extend shelf life is the modification of the atmosphere surrounding the product.

Also known as “CA storage” in the produce business, Controlled atmospheric storage is the storage in which external control systems control the atmosphere of oxygen, carbon dioxide and nitrogen (and sometimes other gases).

Outside air consists of approximately 78% nitrogen (N2), 21% oxygen (O2), 0.045% carbon dioxide (CO2). CA lowers the oxygen level generally to 0.5-2.5%, depending on the type of product and the variety. CA conditions extend the shelf life of fruit and vegetables with a factor of 2 to 4.

Principle

The principle behind controlled and modified atmosphere technologies is to reduce-
(a) respiration rate
(b) reduce microbial growth
(c) retard enzymatic spoilage by changing the gaseous environment surrounding the food product. This is achieved by reducing the concentration of oxygen (O2), which is required in respiration, or by adding an inhibitory gas such as carbon dioxide (CO2) or carbon monoxide (CO). The balance between O2 and CO2 is critical, and an optimal ratio is required for each specific product.

The CA implies a higher degree of control than MA in maintaining specific levels of O2, CO2, and other gases.

Requirements for Ideal CAS

(A) CA Storage Room: A gas-tight room is an obvious prerequisite for achieving a well-controlled atmosphere storage system. Thus it is necessary to make room walls gas-tight. To ensure that the walls are gas-tight to CA storage, they are lined with sheets of galvanized steel.

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(A) Temperature Control: CA storage is only successful when applied at low temperatures. Standard refrigeration units are, therefore integral components of the CAS system. Temperature control is achieved by having pipes containing a refrigerant inside the storage. Ammonia or chlorofluorocarbons are common refrigerants.

(A) Humidity Control: Most fruits, vegetables, and meats kept in CA storage, require high relative humidity, generally the closer to saturation the better, so long as moisture does not condense on the foods.

(B) Gas Control: The atmosphere in a modern CA store is continuously analysed for CO2 and O2 levels using an Infrared gas analyser to measure the gas content in the store regularly. There are also ethylene analysers that continuously measure ethylene concentration in the store. In storage rooms where low ethylene is essential, checks can be made to operate the ventilation and ethylene removal systems correctly.

(C) Scrubbers: The composition of the gas mixture inside the storage rooms undergoes continuous change as a function of the stored product's metabolic activity and scrubbers are necessary to absorb excess CO2. Scrubbers are generally classified according to the absorbent material: Ca(OH)2, NaOH, H2 O, zeolites, activated charcoals.

Methods of CA storage

1. Scrubbers :
To regulate CO2 levels in a CA room, one of the simplest methods is the hydrated lime (Calcium carbonate) Ca(OH) 2 “scrubber”. The scrubber is constructed using an insulated and airtight plywood box located outside the CA room. The box should contain enough lime for the entire storage period, but new lime can be added if CO2 absorption drops. The CO2 and hydrated lime react in a 1:1 ratio to form limestone and water. Lime with a smaller particle size (fine mesh) is more efficient at reacting with CO2 than lime with a coarse mesh.

2. Using plastic tents:
Controlled atmosphere storage of pallet loads of produce is also possible using a semi-permanent set-up for creating a gas seal. Any number of pallets can be accommodated inside a plastic tent made using. The seal is then made by joining the tent plastic with the floor plastic (using tape).

Benefits of CAS

In fresh fruits and vegetables stored under optimal CA or MA, practical quality advantages include:
1. Reduction in chlorophyll breakdown, with resulting higher colour stability.
2. Reduction in enzymatic browning in cut produce, whenever low levels of O2 are used.
3. Improvement in texture caused by the action of CO2 on enzymes acting on cellular membranes.
4. Reduction in some physiological disorders induced by C2H4, such as scald of apples and pears and chilling injury of citrus fruits, avocado, chilli pepper, and okra.
5. Reduction in microbial activity, especially molds.

DETECTION OF PHYSICAL HAZARDS

Introduction

Food recalls can happen due to a variety of reasons, including the detection of foreign bodies in food products. In 2016, a very well-known chocolate manufacturing company has to withdraw its products from market due to the incidence of finding a piece of plastic from it. Presence of foreign objects in food products are considered as one of the major reasons for consumer complaints in food industry. They represent either a quality defect affecting company and brand reputation or a food safety hazard, due to potential injury or choking. Foreign bodies are sensitive issue for consumers and therefore requires special attention when the product has to be either directly consumed from the packaging (e.g., ready to drink, ready to eat, confectionary, ice cream) or while feeding a third person (e.g., babies or the elderly).

1. Understanding Physical Hazards

Physical hazards are either foreign materials unintentionally introduced to food products (ex: metal fragments in ground meat) or naturally occurring objects (ex: bones in fish) that are hazardous to the consumer. A physical hazard contaminates a food product at any stage of production.

Foreign bodies might be differentiated from the product by any of their physical characteristics: magnetic or electrical conductivity, density, color, shape, or dimension. Food processors should take adequate measures to avoid physical hazards in food. Physical hazards can be categorized into following two groups based on its incidence of its occurrence:

a.Extraneous Foreign Bodies:
These can be defined as unwanted / unintentional material which are not product associated and occurs in the product as the result of various agricultural, processing, transportation, and storage activities throughout the supply chain. e.g., glass, metal particles, plastic pieces, wood, hair, strings, stones, pebbles etc.

b. Intrinsic Foreign Bodies:
These are defined as product associated unwanted material which may present naturally in the raw material / product. E.g., eggshell, feathers, bone, hide (rind), cartilage, wood, leaves, larvae, eggs etc.

2. Sources of Physical Hazards

a.Glass: light bulbs, glass containers and glass food containers
b.Metal: fragments from equipment such as splinters, blades, needles, utensils, staples, etc.
c.Plastics: material used for packaging; fragments of utensils used for cleaning equipment
d.Stones: incorporated in field crops, such as peas and beans, during harvesting

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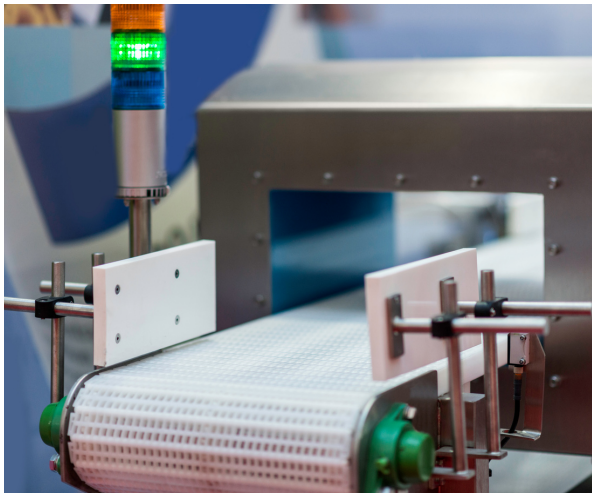

a.Wood: splinters from wood structures and wooden pallets used to store or transport ingredients or food products
b.Natural components of food: hard or sharp parts of a food (ex: shells in nut products).

3. Regulation for Controlling Physical Hazard

FDA declares any food item to be adulterated if it contains:

1. a hard or sharp object between 7mm and 25mm in length in ready-to-eat food, whenever the product requires minimal preparation or further processing, which would not (or may not) eliminate the foreign object.
2. any object of any length up to 25mm, in food intended for special groups such as infants, surgery patients, and the elderly.

The 7mm-threshold is based on the several case studies related to foreign object contaminations, which states that objects below 7mm rarely cause injuries to individuals not in the special-risk group. Hard or sharp objects longer than 25 mm will also be investigated by the authorities, but in general they do not lead to immediate product recalls.

Physical hazard management

Devices for preventing or minimizing physical hazard:

1. Sorters:
This category of equipments is known to remove foreign bodies from a product identified as contaminates (e.g., agricultural material, nuts, cacao, or green coffee beans). For these equipments no corrective actions are taken when foreign bodies are identified through these devices, except in the case of abnormally high contamination or if a non-conventional type of material is discovered.

Following is the list of equipments that falls in the category of sorters:

a) Drawer magnet
b) Magnet traps
c) Sifters
d) Simplex sifters
e) Duplex Sifters
f) Optical and laser sorters

2. Detection Equipment:
Detection Systems are usually installed at the last stage of the process to control foreign body hazards prior to dispatch to consumers. Detection devices should be installed at the end of the process, at or after packing, when no contamination is expected. These can be also installed at important intermediate process steps also for example at the filling or discharging of intermediate bulk containers. Following is the list of Detection System which are used in food industry:

a) Metal detectors
b) X-ray system

The application of good manufacturing practice (GMP) and hazard analysis (HACCP) through the whole food supply chain, “from plant to plate,” is the most effective way to prevent and reduce contamination and thereby protect the consumer; this includes, for example, hygienic design of buildings and machinery, training of factory employees, eradication of pests or certification of raw material suppliers. In addition, separators, and sorters (e.g., filters, sieves, magnets, lasers) must be placed on production lines to improve foreign body reduction.

INDUSTRY BUZZ

First-ever release of aseptic-packaged long-life probiotic yogurt by SIG and AnaBio Technologies.

SIG and AnaBio Technologies are introducing a long-life probiotic yogurt for the first time in the world, marking a significant advancement in aseptic packaging and probiotic beverages. A new product category, probiotic drinks packaged in aseptic carton packs and spouted pouches that are shelf-stable for extended periods without refrigeration, is created by this revolutionary invention. Globally, consumers see probiotics as having health advantages, specifically enhanced immunity and gut health.

Due to their incapacity to withstand common heat treatments used in processing, probiotics have not yet been able to be included in aseptic beverage packaging. Probiotics are usually limited to chilled beverages with a short shelf life because they can become unstable during storage.

Together, Pakka and Brawny Bear introduce compostable flexible packaging.

Pakka Limited, a manufacturer of compostable packaging solutions, has introduced India's first compostable flexible packaging. The new invention will be presented in collaboration with Brawny Bear, a nutrition company that creates tasty, healthful food products using dates' inherent sweetness. This is a significant step forward for the packaging industry in India, which is estimated to be worth over $70 billion.

With more than 60% of the Indian packaging market comprising flexible packaging, this sector commands the largest market share. It is everywhere in our day-to-day lives; it can be found in everything from biscuit packets to shampoo sachets. Because of how affordable, practical, and versatile this type of packaging is, it has become a necessary part of modern life.

Gulfood Manufacturing 2023: A landmark location in terms of technology and output

Gulfood production, the world's most significant yearly food and beverage production event, will be held at the Dubai World Trade Center (DWTC) from November 7 to 9, 2023. Anticipated to be the biggest yet, this year's event will occupy 15 halls and include over 2,000 exhibitors, including the biggest names in the food and beverage industry worldwide.

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Extended deadline for supplies of Bajra, Jowar, and multigrain flour

The deadline for implementing the regulations about total dietary fiber and alcoholic acidity in Bajra (pearl millet), Jowar (sorghum), multigrain, and mixed millet flours has been extended by the FSSAI. These requirements were announced in November 2021 under the FSS (Food Product Standards and Food Additive) 5th Amendment Regulations, and FBOs were required to abide by them as of January 2022.

However, in response to requests from the relevant parties, they were initially extended through June 2022 and then placed on hold until December 31, 2022, and June 30, 2023, respectively. FSSAI has now chosen to further postpone the deadline for putting these restrictions into effect by six months while it examines the "data" that food manufacturers have supplied.

सत्यमेव जयते

MOFPI

MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

MoFPI is seeking proposals for a range of PMKSY programs.

Proposals for different programs under the Pradhan Mantri Kisan Sampada Yojna for establishing infrastructure projects in the food processing sector are being requested from potential entrepreneurs by the Ministry of Food Processing Industries (MoFPI).
The PMKSY covers the following components:

- The establishment of agro-processing cluster infrastructure.
- The development and enlargement of food processing and preservation capacities, the establishment and modernization of food testing laboratories.
- Operation Greens.

According to MoFPI, entities may submit their proposals to the Sampada site along with pertinent information by the operational requirements of the applicable PMKSY scheme.
The online application deadline is November 22, 2023, at 5 p.m.; hardcopy submissions will not be accepted.

WEEKS HIGHLIGHT

6 OCTOBER

WORLD SMILE DAY

In 1963, Harvey Ball, a commercial artist from Worcester, Massachusetts, invented the smiley face. He declared that the first Friday of October would be designated as World Smile Day from now on. "Do an act of kindness. Help one person smile "It was Harvey Ball's original challenge when he created the first World Smile Day in 1999.

10 OCTOBER

NATIONAL POST DAY

National Post Day in India is celebrated on October 10th every year. This day is observed to commemorate the establishment of the Indian postal system. It marks the anniversary of the Indian postal service, which was officially started on October 10, 1854, under the British East India Company.

10 OCTOBER

MENTAL HEALTH DAY

The 10th of October is designated as World Mental Health Day. The goal of World Mental Health Day is to raise global awareness on mental health and mobilize efforts in support of mental health. The Day allows everyone who is working on mental health conditions to discuss their work and what more needs to be done to make mental health care a reality for people all over the globe.

11 OCTOBER

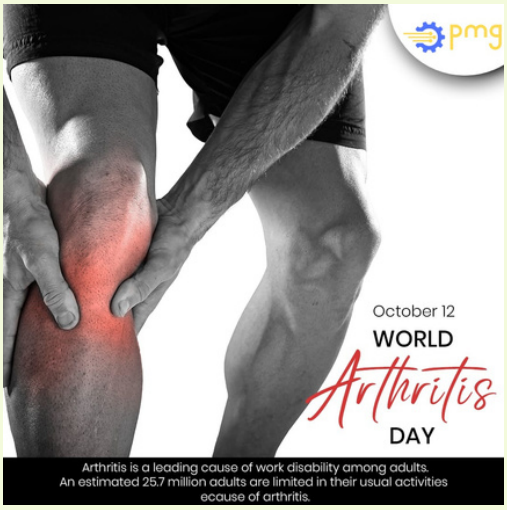
INTERNATIONAL GIRL CHILD DAY

"International Day of the Girl Child celebrates the rights, potential, and resilience of girls worldwide. On this day, we unite to promote gender equality, empower girls, and address the challenges they face, including discrimination and unequal opportunities. It's a reminder that girls are essential agents of positive change, deserving equal access to education, healthcare, and opportunities to shape a brighter future for all."

11 OCTOBER

EMERGENCY NURSES DAY

Emergency Nurses Day was established in 1989 and is observed annually on the second Wednesday of October, which tumbles on October 11 this year. It was founded by the Emergency Nurses Association and is celebrated as part of Emergency Nurses Week. The day honors the unprecedented dedication and hard work of emergency nursing professionals around the globe.

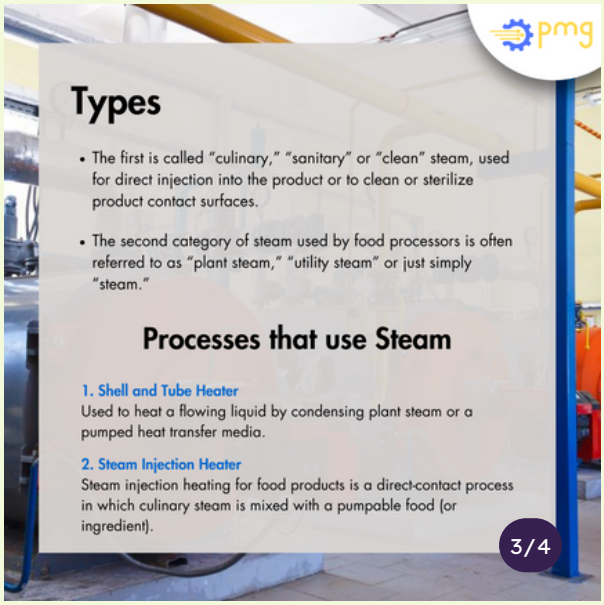


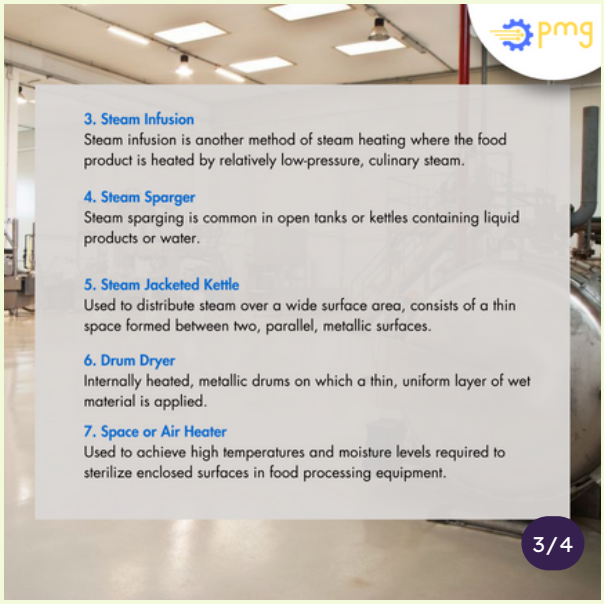
12 OCTOBER

WORLD ARTHRITIS DAY

Every year on October 12, World Arthritis Day is a global awareness day. Arthritis is a condition characterized by joint inflammation mainly associated with the elderly. WAD aims to raise awareness of the existence and impact of rheumatic and musculoskeletal diseases in all audiences worldwide.

DID YOU KNOW?



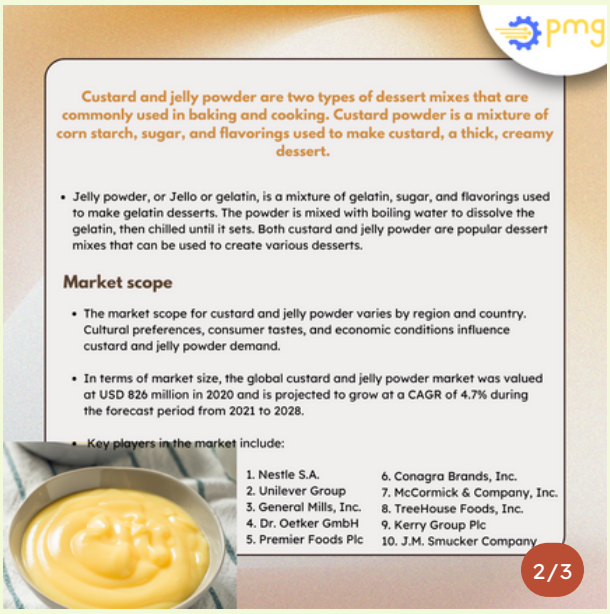


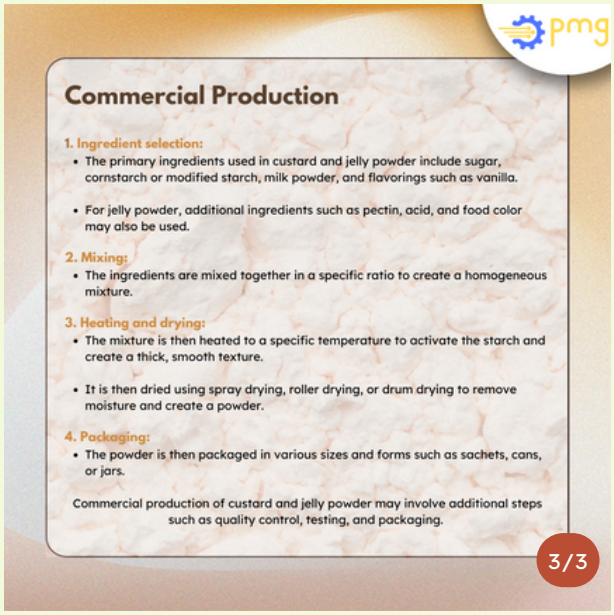
Fact 1

Steam generation plays a crucial role in food processing, and it's a fundamental part of many food production processes. Steam is widely used in the food industry for various purposes, including cooking, sterilization, heating, and cleaning. Steam generation is an energy-intensive process, and efficient steam systems are essential to minimize energy consumption and reduce operating costs in the food industry.

Fact 2

Gelling and binding agents are indispensable components in culinary arts and food production. Gelling agents, such as gelatin and agar-agar, create semi-solid textures in jellies and desserts. Binding agents, like eggs and breadcrumbs, hold ingredients together, providing structure in dishes like meatballs and baked goods. These agents are key in achieving the desired consistency and texture in a wide array of culinary creations.





Fact 3

"Custard and jelly powder are kitchen essentials that transform simple ingredients into delightful desserts. Custard powder blends with milk to create a creamy, sweet custard, perfect for topping pies or enjoying on its own. Jelly powder, on the other hand, turns into colorful, fruity gelatin desserts that satisfy cravings for a wobbly, refreshing treat. Both powders offer endless possibilities for creating delicious and customizable desserts."

Fact 4

Vegetable preserves are food products made by preserving vegetables in various ways to extend their shelf life and maintain their flavor and texture. The preservation methods can include canning, pickling, fermenting, and dehydrating, among others. These methods help prevent spoilage and allow vegetables to be stored for longer periods, making them available for consumption even when they are out of season.

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Delivering End-to-End Engineering Design & Construction Management in Food & Beverage Industry

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