

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter

**FOOD & BEVERAGE
INDUSTRY**

**ENGINEERING
& DESIGN**

**SCIENCE &
TECHNOLOGY**

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DESIGNING PARAMETERS FOR ANIMAL FEED INDUSTRY



Introduction

Animal feeds plays a significant role in food processing industry as it promotes the economic production of products of animal origin throughout the world. Feeds, available in the variants of 'industrial', 'formula', 'blended' or 'compound' are used to grow or maintain animals for food, fiber, and other products under a wide range of farming conditions. There are around 8000 feed manufacturing plants across the globe which have capability of producing more than 620 million tones products annually, resulting in annual turnover of around US\$85 billion.

Animal Feed- Definition and its Types

Feed is defined by Codex Alimentarius Commission as "any single or multiple materials, whether processed, semi-processed or raw, which is intended to be fed directly to food producing animals." These can be classified into four extensive categories which are described below:

1.Feed additives: These are chemically well-defined substances which are added to the diet to exert a specific function, whether nutritional (vitamins, etc.), technological (binders, etc.), sensorial (flavorings, etc.) or zootechnical (enzymes, etc.). In several countries these feed additives are subject to an authorization procedure based on a risk assessment and are often subject to restrictions in terms of dosage or target species.

2.Premixes: These are uniform mixtures of micro-ingredients and feed additives on a carrier to facilitate their even distribution in a larger mix. Premixes are often dedicated to a given target species.

3.Feed Ingredients / Materials: These are feed from vegetable, animal, or mineral origin, which can be classified in four main categories:

- a. Forages:** It includes grass, silages, and straw.
- b. Unprocessed feed materials:** It includes food crops such as peas or feed wheat or the surplus of food crops.
- c. By-products of the food, drinks, and biofuel processing industries:** It includes bran, beet pulp, rapeseed meal, distiller's grains, soya meal, fish trimmings, etc. or former foodstuffs (surplus of bread).
- d. Minerals:** It includes minerals such as such as phosphates, limestone, etc.

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4.Compound Feed: A compound feed is a mixture of several feed materials, which may or may not contain feed additives. These are manufactured to meet specifications prepared by specialists in animal nutrition providing the required nutritional needs according to the species of animal and its growth stage or position in the production cycle. The compound feed manufacturer may be a specialized company or the farmer himself. Compound feed may be complete, i.e., sufficient to meet the animal's needs, or complementary (or concentrate), i.e., they must be distributed to animals together with other feed.

5.Windows: Windows should be easy to clean, constructed to minimize the build-up of dirt, be fitted with removable and cleanable insect-proof screens.

6.Doors: Doors should have smooth, nonabsorbent surfaces and should be easy to clean.

7.Water supply: Water meant to be used for the preparation feed products should be of potable quality. There must be an adequate supply of potable water with appropriate facilities for its storage, distribution, and temperature control. All Non-potable water supply systems, for use in fire control, steam production, refrigeration and similar purposes should have a separate system and not to be allowed to get connected or mixed with potable water system. All hoses taps and other similar possible sources of contamination should be designed to prevent back-flow or siphoning. Water treatment chemicals, where used, should be food grade. Recirculated water should be treated, monitored, and maintained as appropriate for its intended purpose and must have a separate distribution system which is clearly identified.

8.Equipment Design: Equipment and containers should be made of nontoxic materials, capable of being disassembled to allow proper maintenance, cleaning, and inspections. Equipment should be placed away from the walls to facilitate cleaning and maintenance and to prevent pest infestation.



9.Air quality, temperature, and ventilation: Adequate means of natural or mechanical ventilation should be provided to:

- a)Minimize airborne contamination of feed from aerosols and condensation droplets, especially in open production systems.
- b)Control ambient temperatures where these may adversely affect feed safety.
- c)Provide ventilation of sufficient capacity to prevent grease and condensation from collecting on walls and ceilings.

10.Lighting: Lighting sources should be sufficient to ensure that hygienic conditions are maintained throughout the production and storage areas, as well as where equipment and utensils are cleaned, in hand-washing areas and toilets. Recommended lighting are as follows:

- a)Inspection areas: 540 lux
- b)Work areas: 220 lux
- c)Other areas: 110 lux

11.Pest control: Active measures should be taken to control and limit pest activity throughout all process, storage, and handling areas. Risk assessment methods should be used to identify potential problems with all classes of animals (e.g., birds, insects, reptiles, and mammals) whether they are wild, feral, or domestic. Records should be maintained to show that risks from pests are adequately managed and consistently under control.

12.Designing of Drain System: All drains must be designed and maintained in a manner that ensures they do not present a hazard to any feed products. No wastewater or material recovered from wastewater systems should be incorporated into feed ingredients.

ADVANCEMENT IN PACKAGING TECHNOLOGY



What is Packaging?

According to International Packaging Institute (IPI) " packaging is the enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, can, tube, bottle or another container form to perform one or more of the following functions as given below.

Types Of Advanced Packaging:

Food packaging technology is continuously evolving in response to the growing challenges in modern society. Active and intelligent packaging systems are the two most innovative branches of the packaging field, which allow the development of food products with extended shelf life, enhanced food quality and safety. Apart from this edible packaging, sustainable packaging also falls in the category of Advanced Packaging.

1. Intelligent Packaging:

Intelligent packaging materials is the term used to represent a class of packaging materials that can monitor the condition of either the packaged food or the food environment inside the package which includes temperature, pH, etc.

These categories are summarised in the table :

Types of Intelligent Packaging

1. Indicators: Substances which can determine the presence or concentration of other substance, or the reaction between two or more substances, by giving characteristic optical changes like colour change.

A. Freshness Indicators: Indicate the product's microbial quality by reacting to the metabolites produced in the growth of microorganism and reflecting it through indicators.

B. Time-temperature indicators (TTIs): It is responsible for indicating whether the ambient temperature of the stored food exceeded the threshold temperature and is it safe for consumption

C. Integrity Indicators: Integrity indicators function to ensure their integrity by providing indications on leakage

2. Sensors:

A. Gas sensors: Gas sensors are employed inside the package for the detection of gaseous analytes like oxygen, water vapour, etc based on the principle of quenching or luminescence upon gaseous analyte contact

B. Biosensors: Here antibodies are printed on polyethylene based plastic packaging material. The interaction between pathogen and the antibodies results in producing a fluorescent signal that indicates a pathogenic attack.

READ MORE....



2. Active Packaging System:

It is a kind of packaging system in which a constituent is either added in the headspace or included within the packaging material, maintaining food safety, sensory and all the other quality attributes.

Since sachets cannot be used in the liquid products moreover, it will have less effect in vacuum packaging; hence one of the alternatives was introducing the active component in the primary plastic packaging. Making a packaging film active is more complicated than introducing a sachet e.g. when making an oxygen-absorbing film one has to take care of the thickness of the material, should look that oxygen should not be absorbed before the food is in it. After so much of consideration also, the results are lower than that of a sachet.

3. Edible Coating:

Edible films and coatings are a thin layer of material which can be consumed and provides a barrier to moisture, oxygen and solute movement for the food. Edible films and coatings must be chosen for food packaging purpose according to specific applications, the types of food products, and the significant mechanisms of quality deterioration. Components used to prepare edible films can be classified into three categories: hydrocolloids (such as proteins, polysaccharides, and alginate), lipids (such as fatty acids, acylglycerol, waxes).

4. Sustainable Packaging:

Sustainable and green protocols recommend using biodegradable and environmentally friendly food packaging materials, as other packaging materials generate waste. There is a renewed focus on creating sustainable packaging and some of the examples of those materials are polylactide acid (PLA) plastics, sugar cane pulp, fibre composite, starch-based films, and so on Sustainable packaging is a complex idea which must be applied with a systematic approach and critical thinking.



Three critical issues to be considered in the evaluation of packaging sustainability are

(1) entire lifecycle of the package from raw materials through to ultimate disposal, to avoid problems being transferred from one part of the lifecycle to another.

(2) interactions between the package and the product ,it contains so that the environmental impacts of the product-packaging system as a whole are minimised.

(3) there is also a need to consider impacts on the business, people, and the natural environment.

Conclusions:

The recent years have witnessed development in various intelligent packaging systems. When integrated with the food packages, these technologies can prove to be useful not only for the extension of food shelf life while improving quality, but also can provide useful information regarding the product. More intensive research is still required in the area of intelligent packaging material to develop more economical systems while offering convenience to the consumer.



INDUSTRY BUZZ



FSSAI starts legal action against FBOs found to be breaking food safety regulations.

The nation's top food regulator, the Food Safety and Standards Authority of India (FSSAI), has taken decisive action against Food Business Operators (FBOs) found to be breaking food safety legislation. Since April 1, 2023, according to the records, 1,411 prosecution charges have been brought against FBOs who were found to violate the Food Safety and Standards (FSS) Act, 2006.

The FBOs are being prosecuted for various offenses, including operating a food service without a proper license and producing or selling dangerous food. Numerous food goods from a variety of categories, including milk and milk products, spices, packaged drinking water, nutraceuticals, sauces, pickles, chips, jaggery, and more, have been tested since the start of this financial year to ensure that they are safe and in conformity with product requirements.



The Center extends the Tur and Uranium stock restrictions deadline until December 31.

The Essential Commodities Act, 1955's existing stock limits for tur and urad have been extended by the government from October 30, 2023, to December 31, 2023, and the government has also changed the stock holding limits for some stockholding corporations. According to the notification released today, the limit for stock held by wholesalers and large chain retailers at the depot has been decreased from 200 MT to 50 MT, and the limit for millers has been reduced from the last three months' worth of production to last one month's worth of production, whichever is higher.

To prevent hoarding, encourage the ongoing release of tur and urad in sufficient amounts to the market, and make tur dal and urad dal accessible to customers at reasonable rates, the stock restrictions have been revised, and the period has been extended.





The 2nd Sustainable Vegetable Oils Conference discusses current issues and strategies for future adaptability.

The fastest-growing food product, vegetable oils, continues to face the issue of fulfilling the rising demand that steadily exceeds supply. To reduce potential supply constraints that could jeopardize food and energy security, producers must work together and combine to address the effects of climate change and geopolitical development.

The 2nd Sustainable Vegetable Oils Conference (2nd SVOC) was co-organized by the Council of Palm Oil Producing Countries (CPOPC) and the Indonesian Palm Oil Association (GAPKI) to discuss current issues and plan strategies to improve future resilience in the provision of sustainable vegetable oils. In Mumbai, India, we wish to support the G20 by emphasizing India as a significant consumer nation and enhancing collaboration on sustainability, food and energy security, renewable energy, resilience and inclusive food value chains, and circular economy.



Kaapi, SCAI, UCAI, and Coffee Board conclude the 22nd National Barista Championship.

The Speciality Coffee Association of India (SCAI) and the Coffee Board of India, along with Kaapi Solutions, have confirmed the 22nd National Barista Championship, Delhi prelims, was a success. One of the most critical events in the Indian coffee business, this eagerly awaited event recently displayed the pinnacle of innovation and artistry in the coffee sector.

The tournament was a great success because of an unshakable dedication to fostering coffee culture and developing the business. Forty incredibly skilled baristas from all over India participated in the event, held at the Sriram Centre for Performing Arts, Mandi House, competing for the coveted title. These baristas, who represented various coffee businesses and included both industry veterans and home roasters, showed their mastery of the craft by pushing the boundaries of taste and technique.



In Delhi NCR, Shah unveils Mother Dairy's modern booth design.

The modern Mother Dairy booth design in Sector-79, Noida, was inaugurated by Dr. Meenesh Shah, Chairman of the National Dairy Development Board (NDDB). To enhance the consumer shopping experience at all of its booths in the Delhi-National Capital Region, the company has built a modern structure in collaboration with the National Institute of Design, India's top design school. The newly constructed booth was officially opened by Manish Bandlish, managing director of Mother Dairy, and Major General Sharad Kapur, YSM, SM, Director General, Resettlement, Department of Ex-Servicemen Welfare (Ministry of Defence).

The newly designed booth is all set to provide improved visibility, identification, and an immersive experience to the consumers in the Delhi NCR region, providing a diverse product selection. It was developed in the brand colors of Mother Dairy—blue and white. The company's renowned Token Milk has a new avatar with the new look. Customers can now view milk transfer from storage to container thanks to a set-up made of see-through glass.

WEEKS HIGHLIGHT

NON-TECHNICAL CONTENT



27 SEPTEMBER

WORLD TOURISM DAY

To acknowledge and applaud the engineers, Engineer's Day is observed nationwide on September 15 each year. On the anniversary of his birth, it is observed to honour Sir Mokshagundam Visvesvaraya's outstanding accomplishments. It serves as a reminder of the essential designs and constructions that have contributed to the seamless operation of our world.



28 SEPTEMBER

MILAD UN NABI

The majority of the UV light from the Sun is absorbed by the Earth's stratosphere's ozone layer, also known as the ozone layer. Every year on September 16, people throughout the world celebrate World Ozone Day in an effort to raise awareness of the ozone layer's deterioration and identify potential ways to protect it.

SEPTEMBER

DID YOU KNOW?

EDIBLE OIL PLANTS PROCESSING PLANTS



1/4

Oilseed preparation plants are facilities that process oilseeds, such as soybeans, canola, sunflower seeds, and flaxseed, to extract oil for use in various applications. Oilseed preparation plants typically receive raw oilseeds from farmers or other suppliers and process them into oil, meal, and other by-products.

Oilseed preparation process

It involves a series of mechanical and chemical processes that extract oil from oilseeds and refine it into a usable product.

1. **Cleaning:** The raw oilseeds are cleaned to remove any foreign materials, such as stones, dirt, or plant debris.
2. **Conditioning:** The cleaned oilseeds are then conditioned, which involves heating and moisturizing them to facilitate the extraction process.
3. **Crushing:** The conditioned oilseeds are then crushed to break them into smaller pieces and release the oil.
4. **Extraction:** The crushed oilseeds are then processed using either a solvent or mechanical extraction method to remove the oil. Solvent extraction involves using a chemical solvent to dissolve the oil, while mechanical extraction involves pressing the oil out using a screw press.
5. **Refining:** The extracted oil is then refined to remove any impurities, such as free fatty acids, phospholipids, and pigments.
6. **Packaging:** The refined oil is then packaged into containers, such as bottles, cans, or drums, and shipped to customers.

2/4

- The meal, or solid residue left after oil extraction, is typically used as animal feed or fertilizer.
- Other by-products may include hulls, which can be used as fuel, and lecithin, which is a valuable ingredient in many food products.

Food products processed using oilseed preparation plants



1. **Cooking oils:** Vegetable oils such as soybean, canola, sunflower, and corn oil are commonly used in cooking.
2. **Margarine and spreads:** Margarine and other spreads are made using vegetable oils.
3. **Salad dressings:** Many salad dressings contain vegetable oil as a main ingredient.
4. **Snack & baked foods:** Snack foods such as potato chips, popcorn, crackers, cakes, and cookies are often fried in vegetable oil.
6. **Dairy alternatives:** Some dairy alternatives, such as plant-based milk and yogurts, contain vegetable oil as a main ingredient.
7. **Processed meats:** Vegetable oil is sometimes added to processed meats, such as sausages and hot dogs.

3/4

Market insights

The global demand for vegetable oils is expected to continue growing in the coming years due to the increasing population, rising disposable incomes, and changing dietary habits.

1. Technological advancements are driving efficiency and productivity:

Advancements in technology are allowing oilseed preparation plants to improve efficiency, productivity, and output. This includes the use of automation and robotics, precision agriculture, and data analytics.

2. Sustainability and traceability are becoming more important:

Many companies are implementing sustainable practices, such as reducing greenhouse gas emissions, conserving water, and promoting biodiversity, to meet consumer demands.

3. Trade agreements and policies affect the industry:

International trade agreements and policies can have a significant impact on the oilseed preparation industry, as they can affect market access, prices, and competitiveness.

4. Consolidation and mergers are occurring in the industry:

As they seek to improve efficiency, reduce costs, and increase market share. This trend is expected to continue in the coming years, with larger companies acquiring smaller ones to expand their reach and capabilities.



3/4

Fact 1

Oilseed preparation plants in the food industry are specialized facilities or sections within food processing plants that focus on the preparation and processing of oilseeds for various food products. Oilseeds are seeds with a high oil content, and they are a crucial source of vegetable oils used in cooking, baking, and food manufacturing. Some common oilseeds processed in these plants include soybeans, sunflower seeds, canola seeds, rapeseeds, and peanuts.

REFINING AND PROCESSING PLANTS FOR FAT AND OILS



1/4

Refining and processing plants for fats and oils are facilities that transform crude oils and fats into high-quality finished products that are suitable for use in food, industrial, and other applications. The refining and processing of fats and oils typically involves a series of physical and chemical processes to remove impurities and enhance the quality of the final product.

PROCESSING

- 1. Degumming:** This process removes phospholipids, gums, and other impurities from crude oil using water or an acid solution.
- 2. Neutralization:** This process removes free fatty acids from the oil by adding an alkali solution, such as sodium hydroxide or sodium carbonate.
- 3. Bleaching:** This process removes pigments, such as chlorophyll and carotenoids, from the oil using an adsorbent, such as activated carbon or bleaching clay.
- 4. Deodorization:** This process removes odors and flavors from the oil using steam distillation or vacuum stripping.
- 5. Hydrogenation:** This process adds hydrogen to unsaturated fats and oils to increase their stability and shelf life. This is commonly used in the production of margarine, shortening, and other food products.
- 6. Fractionation:** This process separates fats and oils into different fractions based on their melting points. This is used to produce specialty fats and oils with specific properties for different applications.
- 7. Packaging and storage:** Refined and processed fats and oils are packaged in various forms, such as bottles, drums, or tanks, and stored in temperature-controlled environments to ensure their quality and stability.

2/4

FOOD PRODUCTS

- 1. Cooking oils:** Vegetable oils such as soybean, canola, sunflower, and palm oil are commonly refined and processed for use as cooking oils.
- 2. Margarine and shortening:** Refining and processing plants are used to produce margarine and shortening, which are used as substitutes for butter in baking and cooking.
- 3. Confectionery fats:** Specialty fats are produced using fractionation and hydrogenation processes and are used in the production of confectionery products such as chocolate and candy.
- 4. Dairy products:** Milkfat, such as butter oil and anhydrous milkfat, are refined and processed for use in dairy products such as cheese, ice cream, and yogurt.
- 5. Bakery products:** Fats and oils are used in the production of baked goods such as bread, pastries, and cakes.
- 6. Snack foods:** Fats and oils are used in the production of snack foods such as potato chips, crackers, and popcorn.
- 7. Infant formula:** Vegetable oils are often used as a source of fat in infant formula.

- The working principle of refining and processing plants for fats and oils is to remove impurities and improve the quality of the crude oil or fat, transforming it into a high-quality finished product suitable for use in food, industrial, and other applications.

3/4

MARKET SCOPE

- According to a report by Research and Markets, the global market for fats and oils is expected to reach \$247.8 billion by 2027, growing at a CAGR of 3.6% from 2020 to 2027.
- Major players operating in the industry are, Cargill, Wilmar International, Archer Daniels Midland (ADM), Bunge Limited, and IOI Corporation. These companies offer a wide range of refining and processing technologies, including physical refining, chemical refining, enzymatic refining, and fractionation.
- The Asia-Pacific region is the largest market for refining and processing plants, driven by the growing demand for vegetable oils and other fats in the food industry. China and India are the two largest markets in the region, with high demand for cooking oils, margarine, and other food products.
- In addition to the food industry, the market for refining and processing plants is also driven by the growing demand for biofuels and other industrial applications.
- Vegetable oils and animal fats are increasingly being used as feedstocks for biodiesel production, while other specialty fats and oils are used in cosmetics, personal care products, and other industrial applications.



4/4

Fact 2

Refining and processing plants for fats and oils are industrial facilities where various types of fats and oils, typically derived from plant and animal sources, undergo a series of physical and chemical processes to purify, modify, and enhance their quality for various applications, including food production, cosmetics, pharmaceuticals, and industrial uses.

PULSES

1/3



Pulses are a type of edible seed that comes from legume crops. They are members of the family Fabaceae, which includes plants such as beans, lentils, chickpeas, and peas. Pulses are an important source of plant-based protein and other nutrients, and they are used extensively in cuisines worldwide.

Products

1. Lentils
2. Chickpeas
3. Black beans
4. Peas
5. Kidney beans



2/3

Market Scope

- The market scope for pulses is large, as they are an important source of plant-based protein and other nutrients.



- Report by the Food and Agriculture Organization (FAO), global production of pulses reached 77.8 million tonnes in 2019, with the top five producing countries being India, Canada, Myanmar, China, and Australia.

- The major players in the market for pulses include ADM, Cargill, AGT Food and Ingredients, and The Scoular Company.

3/3

Fact 3

Pulses are a subgroup of legumes, specifically the dried seeds of certain plants in the legume family, scientifically known as Fabaceae. Pulses are typically harvested when they are mature and dry, and they are primarily used as a source of food for humans and animals. These edible seeds are valued for their high protein content, fiber, essential nutrients, and versatility in cooking.



RICE MILLS

1/3

Rice mills are industrial processing plants used to process raw rice into various products, including white rice, brown rice, and parboiled rice.

Stages

- 1. Cleaning**
Cleaning the raw rice to remove any impurities or foreign materials, such as stones, dust, or other debris.
- 2. Husking**
Removes the outer husk or hull.
- 3. Whitening or polishing**
Removes the bran layer and gives the rice its characteristic white color and shiny appearance.
- 4. Sorting**
Remove any broken or damaged grains and to separate the different grades of rice.
- 5. Packaging**
The final stage of the process involves packaging the rice for distribution and sale.

2/3

Market Scope

The rice mill market is a significant segment of the global food industry, driven by the demand for rice as a staple food in many parts of the world.

1. Growing population

Global population projected to reach 9 billion by 2050, the demand for rice is expected to increase, driving the growth of the rice mill market.

2. Urbanization

From rural to urban areas, the demand for processed and packaged rice products is expected to increase, driving the growth of the rice mill market.

3. Increasing disposable income

Rising incomes in developing countries are expected to increase the demand for premium quality rice products, driving the growth of the rice mill market.

4. Health and wellness trends

An increasing demand for organic and healthier rice products, driving the growth of the rice mill market.

Regional markets, Asia-Pacific is the largest market for rice mills, accounting for more than 80% of the global market, Other significant markets include North America, Europe, and Latin America.

3/3

Fact 4

Rice mills are facilities or processing plants specifically designed for the hulling, milling, and processing of rice, which is a staple food in many parts of the world. These mills play a crucial role in the food industry by transforming raw, harvested rice into various rice products that are suitable for consumption.



Fact 5

"Rice products encompass a diverse array of culinary treasures, from the comforting simplicity of white rice to the wholesome nutrition of brown rice, and the versatility of rice flour, noodles, and snacks. These products bring the world's cultures together on a plate, offering endless possibilities for delicious meals and culinary creativity."



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