

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter



**FOOD & BEVERAGE
INDUSTRY**

**ENGINEERING
& DESIGN**

**SCIENCE &
TECHNOLOGY**

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YOGHURT AND ITS COMMERCIAL PROCESSING



Introduction

Milk and its processing has evolved a long way from being consumed as liquid milk to processing of milk to various dairy based product. If we are to list, some of the well known product frequently used in almost all household are Curd, Yoghurt, lassi, chach, paneer, dairy sweets etc. Requirement of these processing evolved from the fact, that milk is highly perishable in nature and cannot be stored long, hence processing of milk help in achieving the product shelf life from certain days to months.

Yoghurt, it is fermented dairy product having sort of thick consistency. And as per FDA code of Federal Regulations – “yogurt is a food produced by culturing cream, milk, partially skimmed milk, or skim milk alone or in combination with a bacterial culture that contains the lactic acid-producing bacteria *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.”

Being a rich source of protein and calcium, the fermentation process facilitate the absorption of nutrients in our body. The live bacteria in yoghurt promotes the balancing of good and required microflora in stomach hence promoting digestion. Apart from *Lactobacillus bulgaricus* and *Streptococcus thermophilus* other bacterial culture such as *Lactobacillus acidophilus*, *Lactobacillus* subsp. Casei, and Bifido-bacteria as probiotic culture.

Principle behind Yoghurt making

The bacterial fermentation of milk facilitates the yoghurt manufacturing process. The process starts with bacteria fermenting the present milk sugar of milk into lactic acids. The produced lactic acid brings down the milk pH to range of 4 and this causes the beginning of protein coagulation in milk.

The influential parameters for yoghurt thickness, consistency, texture and taste are

- Starter culture

- Fat content of milk

- Amount of milk solid, protein

Another approach to have thick and set consistency product is to add skimmed milk powder- the catch point being, addition of skim milk powder to cold milk rather than heated milk or instead of firmer yoghurt, stringy natured yoghurt will be observed.

Yoghurt and its type

Natural Yoghurt – When no flavour or sweetener are added to the prepared yoghurt

Flavoured- Have added flavour and sweetener that can be natural or artificial sweeteners

Greek Yoghurt – Natural yoghurt goes through straining process to remove whey content. The thick remaining is Greek yoghurt.

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Type per 100g	Protein (g)	Fat (g)	Carbohydrate (g)	Energy (Kj)	Calcium (mg)
Natural					
Regular	6.0	4.4	5.0	367	193
Low-fat	6.8	0.3	6.2	249	244
Flavoured					
Vanilla regular	5.1	3.0	10.2	404	177
Vanilla low-fat	6.1	0.5	14.5	382	174
Fruit - strawberry		8.7			
Strawberry regular	4.8	3.2	12.1	417	164
Strawberry low-fat	5.4	0.3	13.5	341	168

Nutritional chart of yogurt

Greek Style Yoghurt- Natural Yoghurt when thickened with milk solids and stabilizers rather than straining.

Set Yoghurt- Yohurt when fermented in final packing material to get set form.

Stirred Yoghurt- After incubation period is over and yoghurt proceeds for filling it is stirred at particular RPM for certain time to cut have stirred yoghurt

Drinking Yoghurt- To increase the fluidity and flavour, milk is added along with desired fruit and fruit syrups.

Frozen Yoghurt- Regular yoghurt is mixed with pasteurized ice cream mix of milk cream and sugar along with other ingredients such as stabilizers and then frozen

Yohurt Cheese – Also known as “Labna”, which has its whey drained

range of 90-95 Deg C with holding time of 10 minutes.

Step-3: Homogenization

Along with pasteurization, the milk is homogenized where the fat globules are uniformly broken in to smaller consistent product.

Step-4: Cooling

Milk is cooled down to temperature of 42+2 Deg C, which is to provide most suitable growth temperature to bacteria.

Step-5: Fermentation

Milk is inoculated with the fermentation culture to a concentration range of 1.5-2% and the temperature of milk is maintained at 42+2 Deg C for 4-6 hours, depending upon the time required to attain the lower pH of 4

Step-6: Addition of flavors/fruits and other ingredients

Flavors are added to product after cooling. Reducing the temperature stops the fermentation process, hence reduces the change or acidity change.

Flavour addition is also dependent on the type of final product required- In case of set curd, fruits are added at the bottom of the packing cup and then filled with product, while it can also be belended with product during/after fermentation process and then cooled for packing.

Yoghurt with abundant nutritive value is currently under extensive studies, to unveil many other health benefits of taking yoghurt in diet apart from already known benefits such as acting as immunity booster, reducing chances of infection and reducing risk of colon cancers. To make it more attractive and to satiate the demand of consumers, research works are going on for new flavour developments, along with increasing nutritional content and decreasing the shelf life of yogurt.

How is Yoghurt Processed ?

Yoghurt process or commercial manufacturing have following steps involved -

Step-1: Milk Composition

There is desirable characteristic that is required to start with yoghurt processing. As mentioned, the texture and end consistency depend upon milk composition and to be specific – milk solids. To increase the protein content, skim milk powder is also added in cold milk which enhances the texture.

Step-2: Pasteurization

The pasteurization step is to kill pathogenic microorganism from milk so that the processed product is free of any form of contamination. The process can be either batch pasteurization or continuous pasteurization depending upon the facility. Pasteurization is done at temperature

PANEER PROCESSING



Introduction

Paneer is an unaged variety of cheese, classified as a traditional Indian dairy product and is known to be one of the most popular party foods among vegetarians. Undeniably paneer is a versatile delight which happens to be the most loved main course, side dish and appetizer delicacy. No matter how you prepare paneer, its amazing taste can add soul to any party or occasion. Popularly consumed in South Asian subcontinents, especially in India; From appetizer to desserts, paneer can certainly take your food experience up by a notch. Interestingly, every year about 5% of milk is converted to paneer.

Indian paneer is the fresh and non-melting cheese, which is prepared by curdling of milk using some citric acid or any acidic vegetable liquid. The curdled milk is also called as chena or cottage cheese. The only minor difference between traditional Indian paneer and regular cottage cheese is that cottage cheese contains a little salt.

Paneer is obtained by the acid and heat coagulation of milk at a high temperature. Paneer contains large structural aggregates of proteins formed during the coagulation of milk in which milk fat and other colloidal and soluble milk solids are entrained with whey.

According to FSSR, paneer shall not contain more than 70% moisture and the fat content should not be less than 50% of dry matter. Good quality paneer is characterized by a white color, sweet, mildly acidic flavor, spongy body, and a closely knit texture. Paneer has a high nutritional profile as it retains about 90% of the fat and protein, 50% of the minerals, and 10% of the lactose of the original milk. The proximate composition of paneer is 54% moisture, 17.5% proteins, 25% fat, 2% lactose, and 1.5% minerals.

Manufacturing of Paneer

Commercial production of paneer involves 6 process steps:-

Step 1: Milk Standardization

For commercial manufacture of paneer buffalo milk is standardized to 5.8% fat having 9.5% SNF (standardize the buffalo milk to a fat: SNF ratio of 1:1.65).

Step 2: Heat Treatment:

After standardization of milk, it is heated to 90°C without holding (or 82°C with 5 minutes holding) in a jacketed closed vessel known as Paneer Vat. Then milk is allowed to cool down to 70°C. Heat treatment of milk causes destruction of microorganisms, denatures whey proteins and retards colloidal calcium phosphate solubility.

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Step 3: Coagulation and Draining of Whey

Coagulation is done at about 70°C by slowly pouring 1% hot (70°C) citric acid solution with constant stirring till a clean whey is separated (pH 5.30 to 5.35) and coagulum is allowed to settle for 5 minutes, after which the whey is drained off.

Step 4: Hooping

The curd so obtained is filled into hoops lined with cloth.

Step 5: Pressing

Pressure is applied on top of the hoop at a rate of 0.5 to 1 kg/cm². The surface of hoops must contain holes to facilitate whey expulsion. Good quality product can be prepared by pressing for around 15 min.

Step 6: Dipping in Chilled Water

The pressed blocks of paneer are removed from the hoops and immersed in chilled water for 2-3 hrs. The chilled paneer is then removed from water to drain out. This step assists in developing texture and speeds up the cooling process. The water used for chilling should be of good bacteriological quality.

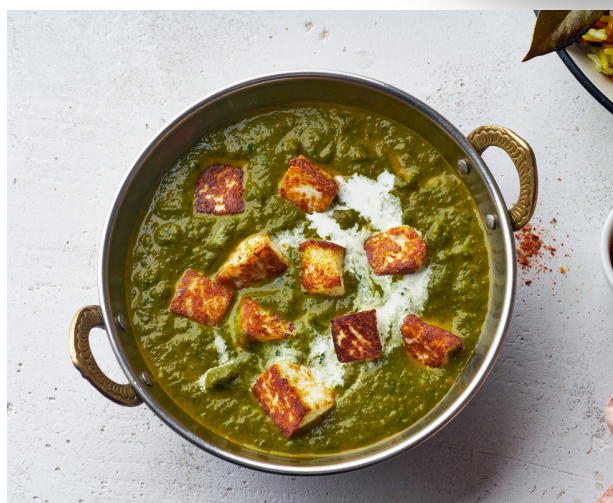
Step 7: Packing

Finally, paneer blocks are wrapped in parchment paper / polyethylene bags and placed in cold room at about 5 to 10°C.

Quality Affecting Factors

Type of milk

Paneer prepared from buffalo milk will have desirable frying properties, body and texture as compared to cow milk. The cow milk paneer is too soft, weak, and fragile and during cooking it tend to disintegrate. Paneer made from skim milk has chewy, rubbery, and hard body.



Quality of Milk

To obtain paneer of good quality, the milk must be fresh and free from off flavor. Growth of psychotropic organisms should be minimized to restrict the off-flavor development. The milk with COB positive and low acidity is not suitable for paneer making. Paneer made from such milk has weak body and texture, more moisture, acidic smell and not safe for human consumption.

Type and Strength of Coagulant

Citric acid is generally used as a coagulant. The concentration of citric acid used for best results is 1%. A higher concentration may lead to a harder product with a higher loss of solids. For coagulating 1 kg of milk, about 2-2.5 g of food-grade citric acid is used.

Heat Treatment of Milk

The milk is heated to 90°C without holding or 82°C for 5 minutes to maximize the total solids recovery. Whey proteins especially β -lactoglobulin and α -lactalbumin form a complex with K-casein and retain with the curd thus increase the yield of the product. The high heat treatment imparts desirable cooked flavor by controlled liberation of sulfhydryl compounds.

Coagulation Temperature

At 70° C, paneer has the best organoleptic and frying quality in terms of shape retention, softness, and integrity.

pH of Coagulation

The optimum pH of coagulation of milk at 70°C is 5.30-5.35. The moisture retention in paneer decreases with the fall in pH and consequently the yield also decreases. Optimum pH when cow milk is used for paneer preparation is 5.2.

Due to increasing demand for paneer, advancement is required in the manufacturing of paneer which will result in increased yield of paneer, reduction in production cost, and increase in shelf life of paneer as well as production of new varieties of paneer for health-conscious people.



INDUSTRY BUZZ

Cosmo Plastech bags are certified by the internationally renowned FSSC 22000 for food packaging.

Thermoforming, injection moulding, and rigid sheet manufacturer Cosmo Plastech from Cosmo First have earned the FSSC 22000 food safety certification, which is needed for any packaging material that comes into direct contact with food. The criteria of FSSC 22000 assist businesses in managing risk in various contexts, including environmental monitoring programs, food fraud, food defence, food safety and quality culture, quality control, and allergen management.

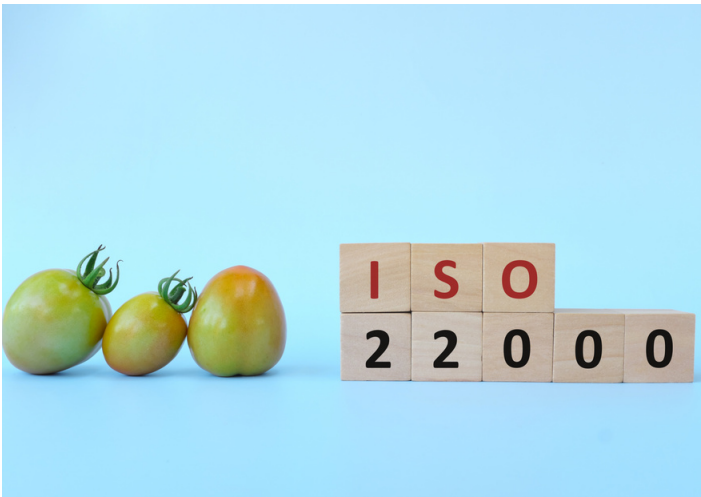
The certification is founded on the widely accepted ISO 22000 standard.

Benefits of the FSSC 22000 accreditation for the business and its stakeholders include a dedication to recognizing, assessing, and mitigating food safety risks to prevent direct or indirect harm to consumers. It supports both legal compliance and food quality and safety needs.

Plant-based pleasure and pizza are combined in Brik Oven's new vegan menu.

In celebration of Veganuary, a month-long plant-powered promise, and Brik Oven's scorching special menu, Bangalore's favourite spot for handmade Neapolitan pizzas, unveils an exciting new vegan menu! Everyone wins since the Veganuary menu features a tempting selection of dishes made with vivid, fresh ingredients that appeal to vegans and non-vegans.

Brik is proud of its house-made vegan mozzarella, prepared from cashew milk, which gives each item a creamy, decadent touch. On the other hand, the sourdough bread is carefully fermented for at least 72 hours, giving it an exceptional texture and flavour depth.





Through its "King Farmers Cohort" initiative, BioPrime seeks to develop leaders in sustainable agriculture.

With the introduction of its "King Farmers Cohort" initiative, BioPrime AgriSolutions, a preeminent biotechnology company that specializes in creating innovative agri-biologicals, is revolutionizing farmer empowerment. Farmers will receive knowledge and skills appropriate to their region and crop through this project, enabling them to prosper in the changing agricultural landscape. Cohort members will receive technical and business support throughout the crop cycle through group farm visits, one-on-one support, mentorships, and concentrated technical training sessions.

The King Farmers Cohort promotes a holistic approach to agriculture by going beyond simple production maximization and emphasizing essential areas such as creating profitability, managing soil health, and adopting climate-resilient methods.

Mandaviya opens Neelkanth Van's first sanitary and healthful food street.

Prasadam aims to provide the general public with safe, wholesome local and traditional meals nationwide. This initiative will promote safe and healthful eating practices among the general public and tourists. Dr Mansukh Mandaviya, the Union Minister for Health and Family Welfare, made this claim at the opening of "Prasadam," the nation's first clean and nutritious food street, at Neelkanth Van, Mahakal Lok, in Ujjain, Madhya Pradesh. Dr Mohan Yadav, the chief minister of Madhya Pradesh; Rajendra Shukla, the deputy chief minister; Narendra Shivaji Patel, the minister of state for the state's public health and family welfare, and Lok Sabha member Anil Firojiya joined him.



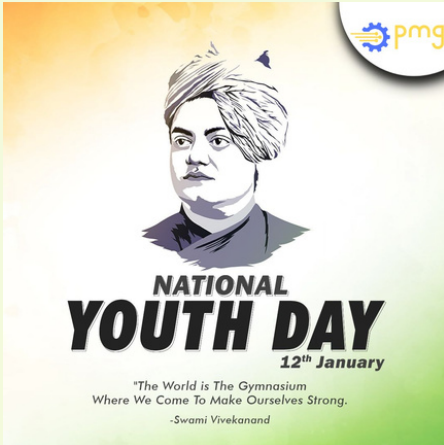
Associated Alcohol & Breweries introduces a handcrafted, premium gin to broaden its offering.

The renowned alco-beverage sector leader Associated Alcohols & Breweries Limited, a trailblazing flagship company within the prestigious Associated Kedia Group, has announced the release of "Nicobar," a handcrafted premium gin.

Nicobar is a well-blended spirit that tastes intensely floral without sacrificing strength. It has hibiscus and elderflower infusions, and the peppery sting of grains of paradise balances the drink's delicate flavour. It's unique because it's the only gin in the nation made with three different varieties of juniper.

This gin's well-rounded flavour profile is enhanced by adding citrus notes from coriander seeds and sweet orange peel, contributing to its richness. It's a sophisticated spirit that's good on its own. AABL deliberately purchased specialized copper stills due to their exceptional craftsmanship and distillation.

WEEKS HIGHLIGHT



12 JANUARY

NATIONAL YOUTH DAY

National Youth Day celebrates the energy, enthusiasm, and potential of young people worldwide. Observed on January 12th, it honors the birthday of Swami Vivekananda, emphasizing youth empowerment and leadership.



13 JANUARY

LOHRI

Lohri is a popular Punjabi folk festival celebrated primarily by the Sikh and Hindu communities in the Indian state of Punjab and other parts of North India. It marks the culmination of winter and the onset of longer days, symbolizing the harvesting of winter crops.



15 JANUARY

MAKAR SANKRANTI

Makar Sankranti is a Hindu festival celebrated in India and Nepal, marking the transition of the sun into the zodiac sign of Capricorn (Makara). It usually falls on the 14th or 15th of January every year. The festival signifies the end of the winter solstice and the beginning of longer days.

DID YOU KNOW?



A yeast fermenter is a vessel used for the fermentation of yeast, which is a critical step in the production of various alcoholic beverages, such as beer, wine, and spirits. Yeast fermentation is the process by which yeast consumes sugar and converts it into alcohol and carbon dioxide.

- The yeast fermenter is typically a large tank that is designed to hold a specific volume of liquid, along with the yeast culture and any additional ingredients, such as hops or fruit.
- The tank is usually made of stainless steel or other food-grade materials, and it may be equipped with various features, such as temperature control, agitation, and oxygenation.

Uses

1. Beer
Made by fermenting malted barley or other grains with yeast in a fermenter.
2. Wine
Made by fermenting grape juice with yeast in a fermenter.



3. Bread

Made with yeast, which ferments the sugars in the dough and produces carbon dioxide gas, causing the dough to rise.

4. Cheese

Made by adding specific strains of yeast to the cheese curd during the fermentation process.

5. Soy sauce

Made by fermenting a mixture of soybeans, wheat, and salt with yeast and bacteria in a fermenter.

6. Kombucha

Made by adding a symbiotic culture of yeast and bacteria to sweetened tea.

7. Vinegar

Made by fermenting alcohol with bacteria and yeast in a fermenter.

The key players in the yeast fermenter market include Sartorius AG, Thermo Scientific Inc., Eppendorf AG, Bioengineering AG, and GEA Group AG.

Fact 1

Vinegar, a versatile liquid derived from fermented ethanol, is a culinary staple renowned for its tangy flavor and acidity. Beyond its use in cooking, vinegar serves as a natural cleaner, preservative, and health aid. With various types like apple cider and balsamic, it has found a place in diverse cuisines worldwide. Its acidic properties make it a valuable ingredient, offering both culinary and practical applications.

RESIDUAL BREAD CHOPPERS

1/3

Residual bread choppers are machines used to process and repurpose leftover or unsold bread into smaller pieces or crumbs that can be used in other food products. These machines are commonly used in bakeries, cafes, and other food production facilities to minimize food waste and maximize profitability.

Working Principle

- Equipped with a hopper or feeding mechanism where the bread or breadcrumbs are loaded into the machine.
- Crushed or ground into smaller pieces using a series of rotating blades or rollers.
- Size of the resulting bread pieces can be adjusted based on the specific needs of the user.

2/3

Components

- 1. Hopper or feeding mechanism**
Machine where the bread or breadcrumbs are loaded into the machine for processing.
- 2. Blades or rollers**
Rotating components that crush or grind the bread into smaller pieces.
- 3. Screening or sifting mechanism**
Separate the bread from any packaging or other materials that may be present.
- 4. Motor or energy source**
Motor or other energy source that drives the blades or rollers.
- 5. Control panel**
Machine where the user can adjust the speed and force of the blades or rollers to ensure that the bread is crushed or ground into the desired size and consistency.
- 6. Collection bin**
Used to store the resulting bread pieces or crumbs.

3/3

Fact 2

Mustard, a versatile condiment derived from the seeds of the mustard plant, adds a zesty kick to culinary creations worldwide. Renowned for its pungent flavor and vibrant yellow hue, mustard enhances a myriad of dishes, from sandwiches and dressings to marinades and sauces. Its rich history spans cultures, and its distinct taste continues to captivate palates, making mustard an indispensable element in the global gastronomic tapestry.



Fact 3

Mayonnaise, a versatile condiment, is a creamy emulsion of oil, egg yolks, vinegar, and seasonings. Renowned for its rich texture and tangy flavor, it enhances sandwiches, salads, and various dishes. A culinary staple, mayonnaise's smooth consistency and ability to bind ingredients make it a go-to choice for chefs and home cooks alike, elevating the taste and texture of a wide array of culinary creations.

POTATO CHIP PRODUCTION PLANTS



1/3

Potato chip production plants are manufacturing facilities where potato chips, also known as crisps, are produced. Potato chips are a popular snack food made from thinly sliced potatoes that are fried or baked until crispy and then flavored with various seasonings.

Stages

1. Potato Washing and Peeling Machines

Used to wash and peel potatoes and can be either manual or automated.

2. Slicing Machines

Used to cut potatoes into thin, even slices of the desired thickness.

3. Blanching Machines

Used to partially cook the potato slices and remove excess starch, resulting in a crispier chip.

4. Fryers

Used to fry the potato slices in oil until they are crispy and golden brown.

5. Seasoning Machines

Used to add various seasonings and flavorings to the chips, such as salt, barbecue, cheese, sour cream, and onion.

2/3

6. Cooling and Packaging Machines

Used to cool the chips after frying and package them in bags or containers.

The key manufacturers of potato chip production plants include the following:

- Heat and Control Inc.
- Kiremko B.V.
- GEA Group
- JBT Corporation
- Urschel Laboratories
- TOMRA Sorting Solutions
- Marel



3/3

Fact 4

Ketchup, a versatile condiment, has become a staple in global cuisine. Originating from China, it underwent transformations across cultures to evolve into the tomato-based sauce we know today. Its sweet and tangy profile enhances a myriad of dishes, from classic burgers to gourmet creations. With a rich history and widespread popularity, ketchup continues to be a beloved companion in kitchens worldwide, adding a burst of flavor to countless meals.



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