

4.4 Condensed milk & milk products

Condensed Milk:

Condensed milk is produced by evaporating a significant portion of water from regular milk and adding sugar. The process involves heating milk to remove water content, followed by the addition of sugar for sweetness. The mixture is then concentrated to achieve the desired thickness and consistency. The final product is a sweet, viscous liquid often used in desserts and beverages.

Milk Powder:

Milk powder is obtained by removing the moisture content from liquid milk through a dehydration process. The most common method is spray drying, where liquid milk is atomized into fine droplets and exposed to hot air to evaporate the water. The resulting powder can be used as a convenient and shelf-stable alternative to liquid milk.

Drying Equipment in Milk Powder Manufacturing:

Spray Dryers:

Spray dryers are widely used in milk powder manufacturing. The process involves spraying liquid milk into a hot chamber, where it is quickly dried into fine particles. The design of spray dryers ensures efficient heat transfer and uniform drying, resulting in a high-quality milk powder product.

Roller Driers:

In roller drying, a thin layer of liquid milk is spread over the surface of heated rollers. As the milk solidifies, it is scraped off the rollers, creating flakes that are

then ground into powder. While less common than spray drying, roller drying is suitable for certain types of milk powders.

Milk Products:

Paneer:

Paneer, a popular Indian cheese, is made by curdling milk and separating the curds from the whey. The curds are then pressed to form a solid block of paneer. This fresh cheese is widely used in Indian cuisine for its mild flavor and versatile texture, making it suitable for both savory and sweet dishes.

Casein:

Casein is a protein derived from milk and is commonly used in the production of various dairy products. It is separated from milk through acidification or enzyme coagulation, resulting in curds rich in casein. These curds can be further processed to produce different types of casein, such as sodium caseinate used in food and industrial applications.

Probiotic Dairy Products:

Probiotic dairy products contain beneficial live microorganisms, such as lactobacilli and bifidobacteria, which contribute to improved gut health. Fermented dairy products like yogurt are commonly used as carriers for probiotics. During fermentation, these live cultures multiply, enhancing the product's nutritional profile. Probiotic dairy products are known for their potential digestive health benefits and are gaining popularity as consumers recognize the importance of a balanced gut microbiome.

The manufacturing processes for these diverse dairy products involve specialized equipment and precise control over various parameters to ensure the desired quality, texture, and flavor. Innovations in dairy processing technology continue to contribute to the efficiency and sustainability of these manufacturing processes.

Evaporated Milk Production:

Evaporated milk is made by partially removing water from regular milk, increasing its concentration and extending its shelf life. The process involves heating the milk to reduce about 60% of its water content. After evaporation, the milk is homogenized and then sealed in cans for sterilization. Evaporated milk is a versatile ingredient used in cooking and baking, providing a creamy and rich flavor to various dishes.

Butter and Ghee Manufacturing:

Butter:

Butter is produced by churning cream, separating the fat from the liquid buttermilk. The cream can be obtained from milk through various methods, and the churning process transforms the fat globules into butter. The butter is then washed and shaped into blocks. Different types of butter, such as salted or unsalted, can be produced based on specific preferences.

Ghee:

Ghee is clarified butter, where the water and milk solids are removed through heating and skimming. The resulting golden liquid has a rich, nutty flavor and a high smoke point, making it suitable for cooking. Ghee has a longer shelf life than butter and is a staple in many cuisines.

Yogurt and Fermented Dairy Products:**Yogurt:**

Yogurt is produced through the fermentation of milk by lactic acid bacteria, primarily *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The milk is heated, inoculated with the bacterial cultures, and then allowed to ferment. The bacteria convert lactose into lactic acid, thickening the milk and imparting its characteristic tangy flavor.

Fermented Dairy Products:

Besides yogurt, various fermented dairy products exist globally, each with its unique taste and texture. Examples include kefir, a fermented milk drink, and sour cream, produced by fermenting cream with lactic acid bacteria. These products not only offer distinct flavors but also provide potential health benefits due to the presence of beneficial bacteria.

Specialty Dairy Products:**Mozzarella Cheese:**

Mozzarella is a semi-soft cheese traditionally made from buffalo milk or cow's milk. The curds are stretched and kneaded to achieve the characteristic stretchy texture. Mozzarella is widely used in pizza and various Italian dishes.

Ricotta Cheese:

Ricotta is a whey cheese produced by reheating the whey left over from the production of other cheeses. It has a mild, slightly sweet flavor and a creamy texture, making it suitable for both savory and sweet dishes.

Dairy Alternatives:

As consumer preferences shift towards plant-based diets, the production of dairy alternatives has surged. Plant-based milk substitutes, such as almond, soy, and oat milk, are commonly used as alternatives to traditional dairy products. These alternatives are often fortified to provide similar nutritional profiles to dairy milk.

Advanced Processing Techniques:**High-Pressure Processing (HPP):**

HPP is a non-thermal processing method that uses high pressure to eliminate harmful bacteria while preserving the nutritional and sensory attributes of dairy products. It is commonly applied to extend the shelf life of products like cold-pressed juices and certain dairy items.