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US tariffs on European dairy products

A threat to the dairy industry?

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It was foreseeable that the administration of the newly elected US President Donald Trump would pose a new threat to Europe. The seemingly arbitrary measures of recent weeks no longer stop at the European dairy industry. On 9 April, Trump announced additional country-specific tariffs for countries with which the USA has a high trade deficit, which were suspended for 90 days on the same day and reduced to 10%. This tariff alone could result in a 10-15% drop in US imports of cheese from the EU. Trump's latest highlight was the threat of tariffs from 1st June totaling 50%, which were then postponed a short time later to the 9th July following a telephone call with EU Commission President Ursula von der Leyen.

The USA has been one of the most important third-country export destinations for European dairy products for years, with cheese specialities from Italy and France in particular being exported. In 2024, EU exports to the United States totaled around 1.96 billion euros.

While some US dairy associations such as the International Dairy Foods Association are against a tariff war, parts of the local industry are reacting positively to the new retaliatory tariffs. For example, the President and CEO of the National Milk Producers Federation, Gregg Doud, described the levy on dairy products from the EU as a 'bargain'.

Ultimately, a significant increase in the price of European products could not only lead to an immediate decline in sales volumes, but also jeopardise long-term market shares. The measure is part of a series of protectionist tendencies that are increasingly straining transatlantic relations.

Functioning free trade is particularly important for the export-orientated dairy industry. Punitive tariffs send the wrong signal! It remains to be seen whether this is ultimately just a threatening gesture by the USA, whether the US President is prepared to talk to his trading partners about easing the new tariffs, or whether he will conjure up further punitive tariffs out of thin air. The European Commission must prepare itself for the fact that the USA is no longer a reliable partner thinks

Anja Hoffrichter

PEOPLE

MULTIVAC Group expands its Management Board

Dr Johannes Epple becomes Group President and CFO

Dr Johannes Epple (41) has been appointed Group President and Chief Financial Officer (CFO) of the MULTIVAC Group with effect from 1 July 2025. In his new role he will be responsible for the departments of Corporate Finance, Controlling Production Companies, Controlling Sales Companies, Treasury and Corporate IT.

Epple has been working for the MULTIVAC Group since January 2018, initially as an advisor in Corporate Controlling, and then subsequently from February 2019 as Head of the IT Department. Since January 2020 he has been responsible as Vice President for Corporate IT. And in January 2024 he was also made responsible for the commercial management of the MULTIVAC Group.

photo: MULITVAC

NEWS

FRIESLAND CAMPINA GERKESKLOOSTER

Investing in sustainable water management

FrieslandCampina Gerkesklooster is reducing its ecological footprint through innovative water-saving solutions. By reusing water extracted from whey, the site saves over 100 million litres of water annually. As a result, it is now 70 percent self-sufficient in its water usage – an increase of 20 percent.

Reverse osmosis: extracting water from whey Cheese production generates whey as a by-product, which mainly consists of water and serves as a raw material for, among other things, infant and sports nutrition. While the water was previously lost, it is now recovered in Gerkesklooster using a smart technique: reverse osmosis. This process pushes the liquid through specialised membranes that allow only pure water to pass. The result is clean water that is reused, for instance, in production processes and for cleaning equipment and milk tankers.

Said Jasper Faber, Project manager: "Cheese is not only delicious but also nutritious. However, producing it requires a great deal of water and energy. Our focus on sustainability drives us to use these resources as efficiently as possible and to minimise our environmental impact. On top of that, we're cutting costs and improving our competitive position. It's a win-win situation. The implementation was technically challenging, but thanks to the efforts of more than a hundred colleagues, we achieved this without halting production. That's a true team effort."

photo: AI-generated by CatGPT_silvdesign

Global cheese market trends

High potential in emerging markets

Cheese is a hard consumable by-product of milk, which is made by coagulating milk into a solid form. The global cheese market is witnessing a growth trend due to factors, such as developing economies, easy availability of cheese products, and growth in consumption of dairy products. Cheese and cheese powder have various applications in the food industry, such as bakery & confectionery; snacks & cereals; ready meals; and soups, sauces, & dips.

According to MarketsandMarkets the global cheese market is estimated to reach $105.9 billion by 2026. With a very high potential in emerging markets such as the Asia Pacific. Although cheese consumption in Asia remains lower than in Europe and the US, the westernization of food habits of the Asian population has led to an increase in demand, especially from the young and millennial population. The widespread impact of western cuisines on developing regions such as the Asia Pacific and South America has led to a tremendous increase in demand for cheese-based fast-food products. By nature, the cheese market has been segmented into conventional and organic. While conventional cheese has been used traditionally, the advent of organically produced cheese has generated new revenue pockets for cheese manufacturers worldwide. Cheese products are mainly derived from dairy-based sources. However, there is an increase in trends of consuming cheese products derived from plant sources. Consumers are more inclined toward plant-based food products due to various health-related issues, such as lactose intolerance and allergies associated with dairy-based products. Furthermore, an increase in consumer shift toward vegan products also drives the growth of plant-based food products, such as dairy-free cheese. Cheese is the ripened or unripened soft, semi-hard, hard, or extra-hard product, which may be coated, and in which

the whey protein/casein ratio does not exceed that of milk. It is a hard consumable by-product of milk made by coagulating milk into a solid form. The global cheese market is witnessing a growth trend due to factors, such as developing economies, easy availability of cheese products, and growth in consumption of dairy products. Cheese powder has various applications in the food industry, such as bakery & confectionery; snacks & cereals; ready meals; and soups, sauces, & dips. The global fast-food industry, also known as the Quick Service Restaurants (QSRs) industry, is rising at a significant rate. This industry witnesses a high demand for cheese as a key ingredient in its various food products. Thus, the demand for cheese is growing on account of giant fast-food chains, such as Domino's Pizza, Inc. (US), Pizza Hut of Yuml Brands (US), and Papa John's International, Inc. (US). Changing lifestyles, such as increasing dependence on ready-made or ready-to-eat meals due to busier schedules and increased demand for packaged foods globally, have increased the demand for fast food products and ultimately fueled the demand for cheese. Furthermore, above-the-line sales promotion activities, such as advertisements through television, print media, and the Internet, have also increased awareness regarding cheese-based fast-food products among people. The rising influence of western cuisines, inflating disposable incomes, and introduction of a number of flavored cheese products, including pepper, garlic, red chili flakes, and oregano pickle, drives the cheese market. Although cheese is a staple in Western countries such as Europe and the

US, its versatility enables it to cater to the different tastes and preferences of consumers globally.

The cuisines of Western countries are diverse, although there are common characteristics that distinguish them from those of other regions. There are hundreds of varieties of cheese and other fermented milk products used in Western cuisines. The effects of rapid westernization have led to the rising demand for cheese in countries other than Europe and the US.

A sharp increase in consumer demand for packaged meals containing cheese and rising demand from the food processing industry are also propelling the market. For instance, in Japan, the free trade agreement with the EU entered into force in 2019, which improves the availability of European cheese to Japanese consumers.

Convenience food and ready-to-eat products are easy to cook and save preparation time. With the increasing number of working women in developed and developing countries, the demand for products, which are easy and quick to prepare while being tasty, fresh, and nutritious at the same time, continues to grow. Cheese is used in

a range of ready meal products for adding characteristic flavor. Owing to the rising inclination of consumers toward cheese-flavored ready meal products, the demand for cheese is expected to grow across the globe. Consumers are buying cheese for a variety of reasons, ranging from nutrition to convenience to taste. At the same time, regular cheese consumers are developing new interests and expectations when it comes to cheese options in the market. In Europe, for example, sustainability is becoming more important, as seen from the rise in environmental and ethical claims on packaging for cheeses. In the Americas, natural and clean label cheeses are growing more popular. However, the strongest driver right now is health, and each of the top 2025 cheese trends touches on this important consumer concern.

Cheese for Snacking

One in three US cheese consumers is eating cheese as a healthier alternative to other snacks and treats. Cheese brands globally have been tapping into consumers' growing interest in healthy snacking by promoting the nutritional benefits of cheese, from protein to calcium to keto-friendly. In addition, manufacturers are innovating around exciting and locally-inspired flavors to appeal to snacking consumers, particularly in Asia.

Functional Benefits

More consumers are also reaching for cheese for functional benefits. For example, 64% of Chinese consumers think cheese is good for their immunity. But opportunity is also high for cheese with added functional ingredients. In the UK, Benecol has launched a low-fat, cholesterol-reducing cream cheese that uses plant stanols. In the US, 27% of cheese consumers who are parents say they would try a cheese with better-for-you claims

Better Vegan Options

Demand for vegan cheese is growing, with major cheese brands such as Babybel, Boursin, and Philadelphia recently adding vegan options to their portfolios. While taste and texture continue to improve, vegan cheeses will also need to improve on nutrition to compete with dairy cheese. For example, though 22% of vegan cheeses launched in 2021 are vitamin/mineral fortified, the average vegan cheese contains only 5 grams of protein per 100 grams compared to 13 grams for dairy cheese.

Source: MarketsandMarkets Analysis

PEOPLE

New CEO at SÜDPACK

Thorsten Seehars has been appointed as the new CEO of SÜDPACK. He succeeds Erik Bouts, who successfully led the company over the past six years and is stepping down to begin his well-deserved retirement. Seehars is no stranger to Ochsenhausen, having served the company in an advisory role before.

photo: Südpack

NEWS

GNT
China: new industry standard for Coloring Foods

EXBERRY color supplier GNT has welcomed China's decision to introduce an official industry standard for Coloring Foods.

"Coloring Food Ingredients for the Food Industry" came into force nationwide on May 1, 2025, and regulates their production, use, and labeling. It has been developed by the China National Food Industry Association (CNFIA) and China's Ministry of Industry and Information Technology (MIIT) alongside GNT and other relevant experts and stakeholders.

Coloring Foods are plant-based, edible concentrates and are used to deliver color to food, drink, and supplements. China's new industry standard stipulates that they must be made from fruits, vegetables, plants, or algae that are normally consumed as foodstuffs.

In addition, Coloring Foods can only be created using physical processing methods and without the use of chemical solvents. Unlike most natural coloring solutions, these products must retain the key properties of the raw materials, including color, taste, and nutritional value. Rigorous testing and quality control measures are also required to ensure that all Coloring Food ingredients meet the highest safety standards.

Due to the way they are produced, the standard classifies Coloring Foods as ingredients rather than additives. This means they qualify for clean and clear label declarations with wordings that reflect the coloring characteristic and the function, such as "carrot coloring ingredient."

photo: GNT

A modern approach to data management for combating costs

Connection between data and efficiency

Author: Kati Hope, Global Account Manager, Mettler-Toledo Product Inspection

Mettler-Toledo CM (Checkweighing and Metal Detection) Combination System inspecting packs of cheese (photos: Mettler-Toledo)

Data plays a crucial role in shaping the world, fostering societal growth, learning and development. In food manufacturing, data is the driving force behind optimal processes and results. This holds particularly true for product inspection, where the impact of data ripples through various operational and commercial facets. One company that exemplifies this connection between data and efficiency is Heinrichsthaler, a German cheese manufacturer.

Heinrichsthaler churns out 200 tons of dairy products daily across 12 production lines. At critical checkpoints, five combination checkweigher/metal detection systems diligently inspect the output, scrutinising 7,000 products per hour. The meticulous optimisation of these product inspection facilities, leading to a remarkable reduction in product giveaway from 3% to 0.9%.

What lies at the core of this success? The answer lies in the goldmine of production line data collected by the combination product inspection system's data management software. This real-time treasure trove not only identifies errors and inefficiencies but also corrects them on the fly. According to Ralf Gründinger, the Production Director at Heinrichsthaler, "Real-time proactive data preparation helps us to avoid costly overfilling. Our investment in the inspection management equipment has already paid for itself within three months."

The data management software doesn't just stop at real-time corrections; it provides a holistic view of the inspection equipment's status, adding a layer of transparency to the production process. This transparency enables timely implementation of production flow control measures, enhancing the production line's overall availability. Trend analysis becomes a valuable tool in detecting anomalies, such as weight discrepancies, while metal detection systems undergoing rigorous testing every 90 minutes, supporting compliance with defined specifications.

Test results are continuously documented in the data management software, helping Heinrichsthaler to check that inspection systems are working according to defined specifications. The data management software is also allowing the company to quickly and easily prepare reports for submission to auditors, such as the weights and measures authorities and the IFS certification office.

Putting data first

With a data management system in place, food manufacturers can take major steps towards combating operational costs and becoming more efficient by making the management of product inspection data central to the way they organise manufacturing. Essentially, by putting data first.

Indeed, data management really is the gateway to the digitalised future of food manufacturing, leading to true supply chain transparency. There are stages that manufacturers can work through to reach this aspirational level, however, and often this begins with the realisation that the business needs to move from labour-intensive manual record-keeping, to automated collection and storage of records.

While this is a big culture change for some manufacturing plants, it is a key part of the process. Real-time data, automatically collected, gives manufacturers true, actionable information, providing insights on which to base manufacturing decisions that improve efficiency and boost productivity.

A critical component of data management is the ability to share collected data easily, and this is where connectivity comes in. Today, food manufacturers can invest

in product inspection devices that have built-in machine-to-machine communication protocols, enabling secure transmission of data on an individual machine or device level, up through production line and site systems to enterprise and cloud-based systems. Such connectivity unlocks a wealth of benefits and further possibilities, both within the manufacturing environment, where potential production issues can be averted through preventive action, and within a manufacturer's supply chain network.

Moving towards digitalization

Modernisation is also happening along the food supply chain, and the increasing drive towards digitalisation by food manufacturers is founded in sophisticated data management. In the not-too-distant future, the entire food supply chain is going to have to embrace digitalised food safety processes to comply with evolving regulatory requirements. The industry is heading towards food safety digital maturity – a point at which systems and processes can capture and record performance and production line data automatically, both for real-time production line improvements, and to make this information seamlessly available to necessary supply chain partners.

As technology becomes more sophisticated, companies will need to think beyond data management software to also factor in essential building blocks for the digitalized supply chain, such as cloud storage, Blockchain and systems integration.

The relationship between investing in such digital infrastructure and the drive towards combating costs might seem slightly more distant than some of the other aspects of data management that we have already discussed. However, the real impact lies in the fundamental operational efficiency, productivity, and reputational integrity of the entire food manufacturing business, which clearly makes it both a cost saver and a revenue driver.

The benefits to digital maturity can be profound, for example if a product recall needs to be actioned, it can be targeted to the exact products affected, instead of larger batches that might include perfectly good products. Food manufacturers will enjoy closer and far more positive relationships with their supply chain partners too, which could be a huge cost saving compared to taking no steps at all towards digitalisation and supply chain transparency.

Mettler-Toledo CM (Checkweighing and Metal Detection) Combination System in situ

Mettler-Toledo CM (Checkweighing and Metal Detection) Washdown Combination System inspecting meat products.

“Maximum yield, no acid whey” concept

Utilising acid whey side-streams

The new concept showcases Nutrilac HighYield range of milk proteins as an innovative, no-waste solution for dairy producers (photo: Arla Foods Ingredients)

Arla Foods Ingredients has launched a “Maximum yield, no acid whey” concept that demonstrates how acid whey can be eliminated from the strained dairy production process to enhance efficiency and maximise yield.

On a traditional processing line for strained dairy products, two-thirds of the milk used is typically filtered off as acid whey. This represents a significant loss of productivity and nutrients, and also creates disposal challenges and costs for manufacturers.

The new concept showcases Arla Foods Ingredients’ Nutrilac® HighYield range of milk proteins as an innovative, no-waste solution for dairy producers. Adding Nutrilac HighYield prior to fermentation enables dairies to omit the acid-whey separation or filtration steps, resulting in zero acid whey and 100% milk yield.

Nutrilac HighYield requires minimal and manageable modifications to standard production lines and reduces the need for separation/filtration equipment, which is costly to acquire and maintain. It also offers greater flexibility, enabling dairies to increase their volumes of final products or maintain current volumes with up to 85% less milk and shorter processing times.

Four new concepts from Arla Foods Ingredients demonstrate the benefits of Nutrilac HighYield ingredients for zero-waste strained dairy production:

- A 4% fat Greek-style yoghurt with a thick texture and mouthfeel
- A 7.4% protein cottage cheese with appealing softness and a clean, mild taste
- A 10% protein cottage cheese with milky notes and real cheese texture in the curd
- A cream cheese with a smooth, spreadable texture that is also ideal for cooking

In all the recipes, Nutrila HighYield’s good water-binding properties ensure product stability, preserving creamy texture and taste throughout shelf life.

Expanding the range with motif cheese

New market opportunities for companies

The Fuchs Gruppe's motif cheese offers cheese manufacturers the opportunity to create new product impulses in the market (photo: Fuchs Gruppe)

The motif cheese, developed with the innovative strength and technologies of the Fuchs Gruppe, offers cheese manufacturers the opportunity to set new product impulses in the market and appeal to new customer groups, also with regard to seasonal offers. Instead of a herb rim or evenly applied herbs and spices, the product solution convinces with a flavourful herb (-of-Provence) cheese filling in the form of an individual motif.

The motif filling follows the Fuchs PURE approach (clean label) and allows the list of ingredients to be reduced to the essentials. This is an important aspect, as clean labelling has long since ceased to be a niche trend and is now a strategic must-have for food manufacturers – driven by regulatory requirements such as the EU Food Information Regulation as well as consumer demand for natural products.

We spoke to Christoph Bietendorf, Product Developer in the Food Industry division of the Fuchs Gruppe, about how the idea came about and the special technological features of the motif cheese.

IDM: How did the idea for the motif cheese come about?

Bietendorf: The idea for the motif cheese came up during an innovation workshop. Initially, we thought about creating a cheese with herb flecks. During realisation, it proved difficult to ensure the spots were cut-resistant. We therefore looked for solutions and developed our basic idea further. The result: a cheese with a large motif on the inside. In addition to a cow design, a Christmas cheese with a Christmas tree motif, a Valentine's Day cheese with a heart motif or a product for football fans is also conceivable, for example. (Almost) anything is possible here – customised to the needs of the respective company.

IDM: What was the biggest challenge during product development?

Bietendorf: The biggest challenge was getting the respective pattern into the sliced cheese block. The paste-like motif filling must be durable, homogeneous and easy to process. In addition, a certain compactness must be guaranteed so that the filling can

be moulded into the cheese block. It is also important that it does not smear when cut and that the motif remains recognisable so that the cheese slices look appetising on bread or rolls. Last but not least, the flavour must be convincing. The natural PURE flavour comes from the use of spices and herbs. They are mixed with grated cheese from the cheese block and can be perfectly matched to the respective type of cheese. The green colouring of the mixture is enhanced by the use of ground parsley.

IDM: What technology is used for the PURE filling compound?

Bietendorf: In addition to taste and appearance, a short list of ingredients without artificial flavourings was particularly important to us. This is what consumers want. We reduce the list of ingredients to the essentials, which is an important purchasing decision factor for shoppers. We achieve this through the Fuchs LiquidControl technology. It gently preserves the freshness and naturalness of the spices and herbs in terms of seasoning and colour intensity of the end product. At the same time LiquidControl extends the product shelf life and offers product safety and stability by reducing germs.

Micronutrients and dietary trends 2025

Innovation opportunities for functional foods and beverages

More and more people around the world are turning to food and beverages that offer them functional added value and are tailored to their personal needs. This growing demand is also reflected in a survey conducted by Innova Market Insights: 42% of respondents said that a product's health benefits were a key quality criterion for them. According to the survey, one in five is willing to pay more for functional ingredients that address specific health issues (Innova Market Insights: Global Ingredient Trends 2025).

How manufacturers score in the marketplace

This opens up a wide range of innovation opportunities for food and drink manufacturers. By highlighting certain ingredients on the packaging, the functional added value of a product can be better communicated and health-conscious target groups appealed to. The micronutrient experts at SternVitamin help manufacturers to develop innovative products that are tailored to specific target groups and at the same time enable health claims to be made. Based on nutritional trends, the company develops customized micronutrient premixes that reflect current market demand in line with trends.

Personalized nutrition as a key topic

Personalized nutrition was highlighted as one of the key themes in Innova's Nutrition Trends 2025 study (Innova Market Insights:

Top 10 F&B Trends 2025). "Consumers are increasingly attaching importance to products that are specifically tailored to their stage of life or their specific health needs. This applies to dietary supplements as well as to food and beverages," explains Anna Schäfer, Junior Product Manager at SternVitamin. SternVitamin's focus is particularly on women's health. With premix solutions such as SternWoman 45+, which contains plant extracts such as green tea and blackcurrant extract in addition to various vitamins and minerals, SternVitamin supports interested companies from idea generation to product development.

Focus on micronutrients

As Innova's nutrition trends show, there is growing interest in a wide range of health trends, and increasingly in products with functional added value. With an annual growth rate of 6.4%, this trend is also reflected in the market for new products enriched with vitamins and minerals (Innova Market Insights, CAGR 2020-2024).

The "beauty from within" trend represents a holistic approach to health that aims to enhance beauty from within. In addition to physical health, consumers are also interested in mental health. Globally, 36% of respondents cite mental and emotional wellbeing as a primary health goal (Innova Lifestyle & Attitudes Survey, 2024). In line with this, SternVitamin has developed the Matcha Wafer Snack with the SternPowerUp premix, which supports cognitive performance with a blend of B vitamins, vitamin C, zinc and matcha powder, and can reduce the occurrence of fatigue.

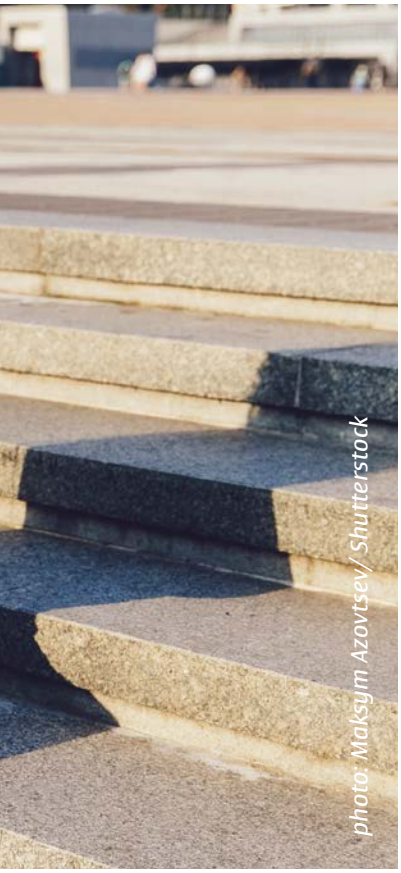

photo: Maksym Azovtsev/ Shutterstock

The gut is also increasingly becoming the focus of health-conscious nutrition. Scientific research shows that a healthy microbiome is essential for the immune system, digestion, and even mental wellbeing. Manufacturers offering innovative solutions for holistic gut health are thus tapping into another growing market segment. Schäfer: "With SternGutFeeling, SternVitamin has an innovative premix solution consisting of short-chain fructooligosaccharides, vitamins C, D, E, zinc and selenium in its portfolio, and supports manufacturers in product development with scientific expertise in micronutrients."

Dulce de leche and similar products marketed in Europe

Characterization in terms of labelling, nutritional aspects and market price

Authors:
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"Dulce de leche" or "Doce de Leite" (DL) is a typical Latin American product, found from Mexico to Argentina/Chile, and usually produced on a large scale, especially in Brazil, Argentina, Uruguay and Chile. It is typically made by evaporating milk and adding sucrose, which gives it its characteristic colour, consistency and flavour. Depending on the country in which it is produced, it may have different names and compositions (FRANCISQUINI, et al.; 2016; PINTO, et al., 2021) due to the different production methods used (STEPHANI, t al., Foods, 2024).

In Brazil, the production of dulce de leche is highly diversified, ranging from artisanal to large-scale operations, highlighting a diverse landscape with no standardization or uniformity in production methods (STEPHANI, et al, 2024; CARVALHO, et al, 2007). This process resulted in a variety of products that were traditionally consumed as desserts or used as ingredients in confectionery, cakes, biscuits and ice cream. In this sense, dulce de leche could have different textures and colors depending on its final use, ranging from solid to pasty and from light to dark. According to Brazilian legislation (BRASIL, 1997), dulce de leche must contain at least 5% protein, no more than 2% ash, no more than 30% moisture and between 6.0 and 9.0% fat. The carbohydrate content (generally sucrose and lactose) is not defined; for a product with a maximum moisture level it will be less than 55% (w/w).

Although dulce de leche is not yet well known outside Latin America, its consumption is expanding in Europe (for example, Spain and France) and the United States (OLIVEIRA et al., 2019). In terms of the names given to dulce de leche around the world, this product has been given different names depending on the country in which it is sold. In Argentina and Uruguay, it is called dulce de leche, as well as in Brazil, where it is commonly known as doce de leite. In Mexico, it was made from goat's milk and called cajeta. In Venezuela and Colombia it is known as arequipe. In countries such as Panama, Peru, Chile, Ecuador and Bolivia it is called manjar blanco. In Cuba, it is called dulce de leche cortada and is a solid mass, often sold in small bars (GAZE et al., 2015; PENCI AND MARIN et al., 2016). In Europe, on the other hand, dulce de leche-type products are known to be less sugary and often enriched with walnuts, hazelnuts or chocolate, and are particularly popular in France.

In each country, dulce de leche was not just a sweet, but also an integral part of the culinary culture, enjoyed on special occasions as well as in everyday life. Its regional variations reflected local traditions and tastes, making it a versatile product (SCHMITZ et al., 2017). Standardizing the characteristics of this product and complying with legislation was made difficult by the great cultural diversity and technological variations in its production (GAZE et al., 2015; VARGAS et al., 2021). The aroma, characteristic flavour and production technology made dulce de leche an interesting object of study, despite the few reports in the European dairy literature, mostly limited to Latin America (SCHMITZ et al., 2017).

In this context, and in view of the increasing demand and interest in dulce de leche from countries outside Mercosur, the aim of this study was to collect samples of dulce de leche and similar products sold in Europe in order to characterize them on the basis of the information provided on the product label in terms of nutritional aspects, list of ingredients, sales name, market price, main claims and differences with Brazilian products.

Methodology

The present work is based on the analysis of samples of dulce de leche and similar products from 7 different countries, purchased online from the local market in Europe and delivered within the same region. Similar to recent studies for some specific Brazilian UHT milk and vegetable drink products (MELLO et al., 2021), twenty-nine samples of different brands were analysed with regard to the labelling of each dulce de leche and similar product, taking into account the sales denomination, claims and attributes on the front display, nutritional information (energy value, carbohydrates, proteins, fats, saturated fats, fibre, sodium and calcium) and the list of ingredients. Their prices were also analyzed, taking into account the purchasing periods of January and December 2023.

Results and discussions

Figure 1 shows products purchased in the Spanish market and their front of pack claims. There was a wide variety of products, demonstrating cultural diversity with items such as sweet arequipe, Andean, gourmet, pastelero, caramel cream, reduced calorie and reduced sugar. There were also light and reduced calorie products, reflecting the growing market demand for products with fewer carbohydrates.

In recent years, growing concern about food-related illnesses has led consumers to seek healthier options (SILVA et al, 2023). Many were looking for foods with a total or partial reduction in certain components, such as sugars (BRASIL, 1997). Diet and light

Figure 1: Products from Spain, and their frontal displayed claims.

products emerged as a response to this demand, particularly focusing on and catering for people with specific conditions such as hypertension, diabetes and obesity. However, these products also attracted consumers seeking a more balanced and healthier diet without sacrificing the sensory quality of traditional foods (CELESTINO et al., 2024).

The products shown in **Figure 2**, purchased in the Netherlands, France and Portugal, showed a remarkable diversity, both in terms of nutritional composition and specific characteristics, reflecting the cultural and technological adaptations of each country, as well as consumer preferences and needs. The absence of gluten and palm oil in some French products, for example, reflected a greater awareness of food allergies and environmental concerns. The variation in fat content and adaptation to different culinary uses showed how manufacturers were trying to cater for consumers looking for a traditional product as well as those who preferred healthier options. These differences highlighted the importance of standardizing certain aspects of the product to ensure quality and food safety, while allowing for variations that responded to local and specific market demands (DURCO et al., 2021).

Figure 3 illustrates dulce de leche products from South America purchased on-line in the European market and shows that Brazil, Uruguay and Argentina are trying to maintain traditional recipes. The claim on 'Los Nietitos' dulce de leche emphasized the use of a 'traditional recipe' with no added preservatives as an attraction for consumers. This demonstrated an appreciation of artisanal production methods and a growing interest in more clean-label products (SCHMITZ et al., 2017).

The Brazilian dulce de leche 'Xodó' also reinforced the 'traditional' character of the product, with simple plastic recyclable packaging. This type of packaging, which was generally more economical, may have reflected a marketing strategy aimed at a broader group of buyers, as the product had an affordable price (CARVALHO et al., 2007).

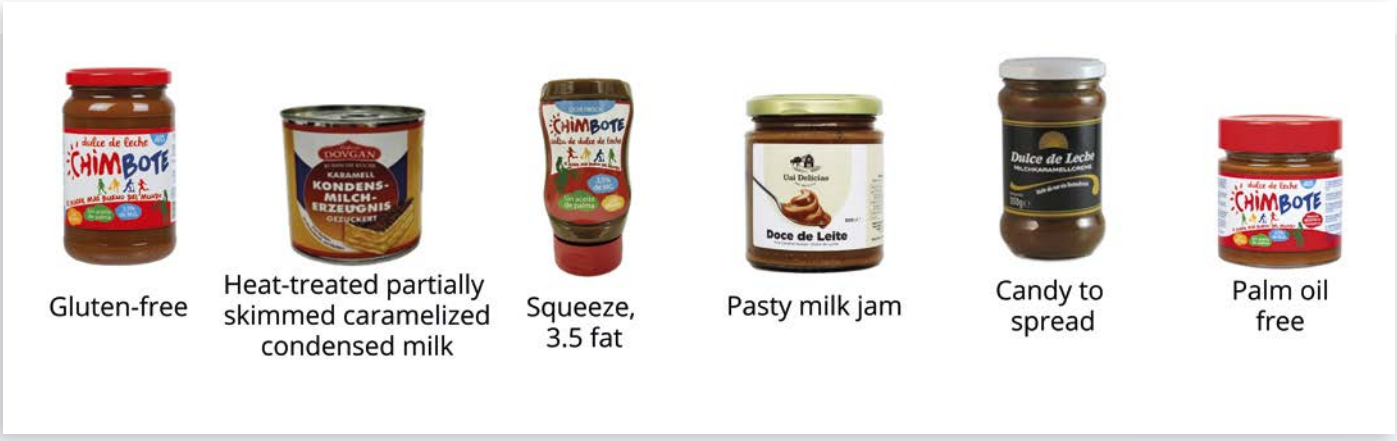

Figure 2:
Products from France, the Netherlands and Portugal, with the relevant information highlighted on the packaging.

Figure 3:
Products from South America (Brazil, Argentina and Uruguay) with relevant information highlighted on the packaging.

Figure 4 illustrates the origin of dulce de leche and similar products, showing in detail the distribution of products by country and the percentage share of each of the 29 products analyzed. Spain was the country with the largest dulce de leche market share in Europe, accounting for two thirds of the total, with 19 out of the 29 products dominating.

France was the second largest market, indicating high demand and significant diversification of dulce de leche products. Brazil, the Netherlands, Portugal, Argentina and Uruguay had much smaller shares, indicating more specialized or less developed markets (OLIVEIRA et al., 2019).

This distribution suggested that dulce de leche had different levels of popularity and availability in the European markets. In Spain and France, there was greater diversity and potential consumption capacity, while in the other countries analyzed, the market appeared to be less diverse (PENCI; MARÍN, 2016).

Table 1 shows general information about the samples, such as origin, type of packaging and price. A variation in price was observed, with a maximum of 11.99 euros and a minimum of 3.90 euros per unit. This price variation was related to the type of packaging, including squeeze, glass, plastic and can. There were four products: S1 sold for 4.95 euro for 400 grams (~12.38 €/kg); S14 sold for 10.58 euro for 370 grams (~28.59 €/kg); S18 sold for 10.00 euro for 400 grams (~25.00 €/kg); and S19 sold for 3.90 euro for 330 grams (~11.82 €/kg).

Glass products were widely sold in Spain, with varying prices and quantities, reflecting their popularity and versatility for different purposes. Plastic packaging was commonly used for large volumes at affordable prices, suitable for consumers looking for practicality and economy. Canned products, on the other hand, were moderately priced and popular in some places (PENCI; MARÍN, 2016). Contrary to the culture of sweets sold in Brazil, which were usually packaged in glass, plastic or cans, squeeze packaging

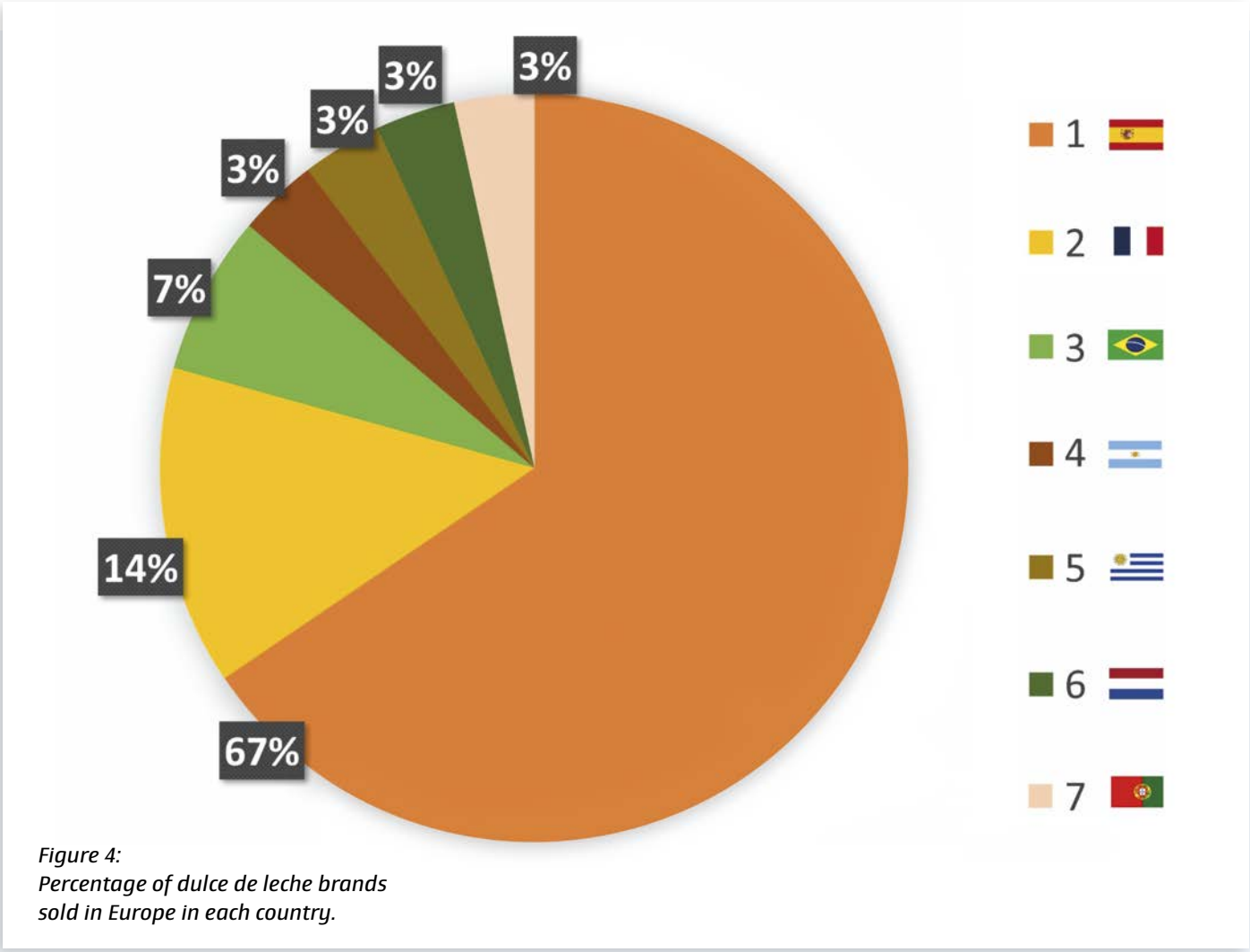

Figure 4:
Percentage of dulce de leche brands sold in Europe in each country.

Code	Origin	Packaging	Unit price (€)	Quantity per package (g)	Price per kg (€/kg)
S1	Spain	Squeeze	4.95	400	12.38
S2	Spain	Glass	6.49	450	14.42
S3	Spain	Glass	4.18	250	16.72
S4	Spain	Glass	6.29	450	13.98
S5	Spain	Glass	8.58	450	19.07
S6	Spain	Glass	5.79	450	12.87
S7	Spain	Plastic	9.95	1000	9.95
S8	Spain	Glass	3.99	450	8.87
S9	Spain	Glass	8.96	350	25.60
S10	Spain	Can	4.38	397	11.03
S11	Spain	Can	6.16	397	15.52
S12	Spain	Can	6.29	397	15.84
S13	Spain	Glass	7.81	420	18.60
S14	Spain	Squeeze	10.58	370	28.59
S15	Spain	Glass	8.58	450	19.07
S16	Spain	Glass	4.50	250	18.00
S17	Spain	Plastic	2.79	250	11.16
S18	Spain	Squeeze	10.00	400	25.00
S19	Spain	Squeeze	3.90	330	11.82
F1	France	Glass	11.99	430	27.88
F2	France	Glass	5.10	250	20.40
F3	France	Glass	4.95	370	13.38
F4	France	Glass	5.79	350	16.54
N1	The Netherlands	Can	5.29	397	13.32
P1	Portugal	Glass	5.65	300	18.83
B1	Brazil	Glass	6.52	220	29.64
B2	Brazil	Plastic	5.54	400	13.85
A1	Argentina	Glass	4.39	450	9.76
U1	Uruguay	Glass	6.99	400	17.48

Table 1: Sample code, origin, type of packaging and selling price.

was also widespread in Europe (CARVALHO, A. F. de; CARVALHO, L. C. de, 2007). These differences could be exploited by companies wishing to enter these markets by adapting their offers to local preferences in order to maximize their sales success (DURCO et al., 2021).

Table 2 provides a detailed analysis of the nutritional value of dulce de leche in different countries, including energy value, total and saturated fat, carbohydrates, sugars, fiber, proteins and salts for a 100 g portion. It can be seen that the nutritional composition of dulce de leche varies considerably from country to country. In addition, only three of the 29 samples contained dietary fiber in their composition.

According to Brazilian legislation (Brazil, 1997), dulce de leche should have a maximum ash content of 2%, a minimum protein content of 5%, a maximum moisture content of 30% and a fat content of between 6.0% and 9.0%. However, when analyzing the labels, a variation in fat content was observed, with most of the samples having a value below 6.0%. Products P1 and B1 had a protein content below the recommended minimum.

Spanish dulce de leche products varied considerably in terms of energy value and nutrient composition. The energy value (per 100 g) ranged from 9.9 kcal (S19) to 334 kcal (S8 and S16). Most products had around 6.0 g of total fat and 3.9 g of saturated fat, with notable exceptions such as S8 and S16, which had 4.6 g of saturated fat. Carbohydrates and total sugars varied between 23.0 g (S19) and 63.1 g (S8 and S16). Protein content varied from 5.4 g (S13) to 8.0 g (S7). The salt concentration was generally low, ranging from 0.13 g (S9) to 1.0 g (S19).

French products have a fairly uniform and standardized composition, with an average energy value of 288 kcal, total and saturated fat averaging 1.9 g and 3.5 g respectively. Carbohydrates and sugars average 57.0 g and 56.0 g respectively, protein 7.4 g and salts 0.35 g. Dutch dulce de leche products have a nutritional profile close to the overall average for confectionery, with an average energy value of 296 kcal, total fat 6.0 g and saturated fat 4.0 g. Carbohydrates and sugars average 55.1 g, protein around 5.5 g and salts 0.23 g.

The product from Portugal has the lowest average energy value, with 185 kcal. Total and saturated fats average 3.7 g and 2.3 g respectively, while carbohydrates and sugars average 34.7 g and 31.4 g respectively. Protein content is around 3.4 g and salt averages 0.10 g. Brazilian products show considerable variation, with energy values ranging from 290 kcal to 345 kcal. Total fats range

Code	Country	Calories (kcal)	Total fat ($g.100g^{-1}$)	Saturated fat ($g.100g^{-1}$)	Carbohydrates ($g.100g^{-1}$)
S1	Spain	288	3.9	2.1	58.4
S2	Spain	397	6.0	3.6	57.5
S3	Spain	297	6.0	3.6	57.5
S4	Spain	297	6.0	3.6	57.5
S5	Spain	310	6.0	3.9	57.0
S6	Spain	310	6.0	3.9	57.0
S7	Spain	318	6.0	3.9	58.0
S8	Spain	334	6.2	4.6	63.1
S9	Spain	310	6.2	4.3	54.8
S10	Spain	318	7.1	4.0	57.3
S11	Spain	301	6.0	3.5	56.2
S12	Spain	301	6.0	3.5	56.2
S13	Spain	290	5.8	4.8	54.1
S14	Spain	310	6.0	3.9	57.0
S15	Spain	232	0.5	0.3	35.6
S16	Spain	334	6.2	4.6	63.1
S17	Spain	310	6.0	3.9	57.0
S18	Spain	147	0.0	0.0	1.5
S19	Spain	9.9	0.0	0.0	23.0
F1	France	288	3.5	1.9	57.0
F2	France	288	3.5	1.9	57.0
F3	France	288	3.5	1.9	57.0
F4	France	288	3.5	1.9	57.0
N1	The Netherlands	296	6.0	4.0	55.1
P1	Portugal	185	3.7	2.3	34.7
B1	Brazil	290	3.5	2.5	62.0
B2	Brazil	345	5.0	0.0	65.0
A1	Argentina	333	8.2	5.8	58.0
U1	Uruguay	310	7.0	4.5	55.0
Average		287	4.9	3.1	53.1
Maximum value		397	8.2	5.8	65.0
Minimum value		10	0.0	0.0	1.5
Standard deviation		70	2.1	1.6	13.3
Standard error of the mean		13	0.4	0.3	2.5
Coefficient of variation		**24%**	**42%**	**51%**	**25%**

Sugars ($g.100g^{-1}$)	Fiber ($g.100g^{-1}$)	Proteins ($g.100g^{-1}$)	Salts ($g.100g^{-1}$)
41.9	0.0	7.0	0.30
57.5	0.0	6.0	0.30
57.5	0.0	6.0	0.30
57.5	0.0	6.0	0.30
57.0	0.0	7.0	0.40
57.0	0.0	7.0	0.40
58.0	0.0	8.0	0.40
54.5	0.0	6.4	0.30
48.8	0.0	7.2	0.13
57.3	0.0	6.3	0.17
56.2	0.0	5.5	0.15
56.2	0.0	5.5	0.15
44.8	0.0	5.4	0.20
57.0	0.0	7.0	0.40
35.6	23.0	9.8	0.70
54.5	0.0	6.4	0.30
57.0	0.0	7.0	0.40
1.5	70.0	0.0	0.25
0.0	0.0	0.0	1.00
56.0	0.0	7.4	0.35
56.0	0.0	7.4	0.35
56.0	0.0	7.4	0.35
56.0	0.0	7.4	0.35
55.1	<0.1	5.5	0.23
31.4	0.0	3.4	0.10
72.0	0.0	3.0	0.28
65.0	0.0	5.0	0.00
42.0	<0.5	7.4	0.30
48.0	0.0	6.0	0.14
49.9	3.6	6.0	0.31
72.0	70.0	9.8	1.00
0.0	0.0	0.0	0.00
15.9	14.3	2.1	0.2
2.9	2.8	0.4	0.0
32%	**399%**	**35%**	**60%**

Table 2:
Nutritional table on the label of various samples of dulce de leche and similar products (standardized for 100 g portion)

from 3.5 g to 5.0 g and saturated fats from 0.0 g to 2.5 g. Carbohydrates and sugars range from 62.0 g to 72.0 g, protein content varies from 3.0 g to 5.0 g and salt from 0 g to 0.28 g.

Argentinian dulce de leche had higher nutritional values, with an energy value of 333 kcal, total and saturated fats of 8.2 g and 5.8 g, carbohydrates and total sugars of 58.0 g and 42.0 g, protein content of 7.4 g and salts of 0.30 g. However, the overall average energy value was 287 kcal, with a standard deviation of 70 kcal, indicating considerable variation between products. The average total fat was 4.9 g, with significant variation (coefficient of variation of 42%). The average saturated fat content was 3.1 g, with considerable variation (coefficient of variation of 51%). The average carbohydrate content was 53.1 g and the average sugar content was 49.9 g, reflecting the high amount of sugar in these products. The average protein content was 6.0 g, with moderate variations (coefficient of variation 35%). Salts averaged 0.3 g, with significant variations (coefficient of variation of 60%). Dietary fiber was practically absent in most products, except in some specific Spanish products such as S15 and S18, which explains the high coefficient of variation.

Table 3 shows the lists of ingredients on the labels of dulce de leche and similar products. It was clear that there was a wide variety of ingredients added, which may reflect the culture of the country, as mentioned above. Dulce and similar products from Spain showed a variability in their composition, with common ingredients such as sugar, water, whole or skimmed milk powder and glucose syrup. The presence of natural flavorings, usually vanilla, was also observed. Notably, some products contained preservatives and stabilizers, such as potassium sorbate and sodium carbonate, to improve shelf life and texture. Technological variations were evident in the different types of syrups used, with some products adding glucose and others fructose, and in the inclusion of ingredients such as polydextrose and bamboo fiber in some products, suggesting attempts to modify texture or nutritional value.

In France, the composition of dulce de leche was fairly uniform, with recipes basically using fresh whole milk as the main ingredient (61%), followed by sugar and a small amount of skimmed milk powder (8.4%). French products also used natural vanilla flavoring, maintaining a relatively simple and traditional recipe. Dutch dulce de leche consisted of whole

Table 3: List of ingredients on the label of samples of dulce de leche and similar products

Code	Country	List of ingredientes
S1	Spain	Sugar, water, whole milk powder (15%), skimmed milk powder (10%), glucose syrup, natural flavoring (vanilla)
S2	Spain	Sugar, water, whole milk powder (23%), glucose syrup, natural flavoring (vanilla)
S3	Spain	Sugar, water, whole milk powder (23%), glucose syrup, natural flavoring (vanilla)
S4	Spain	Sugar, water, whole milk powder (23%), glucose syrup, natural flavoring (vanilla)
S5	Spain	Sugar, water, whole milk powder (22%), glucose and fructose syrup, skimmed milk powder (5%)
S6	Spain	Sugar, water, whole milk powder (22%), glucose and fructose syrup, skimmed milk powder (5%) and flavoring
S7	Spain	Glucose and fructose syrup, whole milk powder (22%), water, sugar, skimmed milk powder (9%) and flavoring (vanilla)
S8	Spain	Water, sugar, whole milk powder (24%), glucose syrup, acidity corrector (sodium carbonate E-500ii), preservative (E-202), stabilizer (E-471), vanilla
S9	Spain	Whole milk, sugar, glucose, vanilla, potassium sorbate E202, sodium bicarbonate
S10	Spain	Milk and sugar
S11	Spain	Whole milk and sugar
S12	Spain	Whole milk 51,9% and sugar
S13	Spain	Whole milk, sugar, glucose, vanilla flavoring
S14	Spain	Sugar, water, whole milk powder (22%), glucose and fructose syrup and skimmed milk powder (5%)
S15	Spain	Skimmed milk powder (29%), water, filler (polydextrose), sugar, glucose and fructose syrup, whole milk powder (1%) and flavoring (vanilla)
S16	Spain	Water, sugar, whole milk powder (24%), glucose syrup, acidity corrector (sodium carbonate E-500ii), preservative (E-202), stabilizer (E-471), vanilla flavouring
S17	Spain	Sugar, water, whole milk powder (22%), glucose and fructose syrup, skimmed milk powder (5%) and flavoring (vanilla)
S18	Spain	Polydextrose, water, bamboo fiber, salt, flavorings, preservative (potassium sorbate), colorings (ammonia sulfite caramel, beta-carotene), acidulants (lactic acid and phosphoric acid) and sweeteners (sucralose and steviol glucosides)
S19	Spain	Water, sweeteners (erythritol, maltitol, sucralose and steviol glucosides), salt, stabilizer (xanthan gum), bamboo fiber, flavorings, colorings (ammonia sulfite caramel and beta-carotene), preservative (potassium sorbate) and acidulant (lactic acid)
F1	France	Fresh whole milk (61%), sugar, skimmed milk powder (8,4%), natural flavoring: vanilla
F2	France	Fresh whole milk (61%), sugar, skimmed milk powder (8,4%), natural flavoring: vanilla
F3	France	Fresh whole milk (61%), sugar, skimmed milk powder (8,4%), natural flavoring: vanilla
F4	France	Fresh whole milk (61%), sugar, skimmed milk powder (8,4%), natural flavoring: vanilla
N1	The Netherlands	Whole and skimmed milk, 48% sugar, disodium phosphate stabilizer
P1	Portugal	Milk, sugar, invert sugar, glucose, powdered milk, margarine, cornstarch, baking soda, salt
B1	Brazil	Sugar, milk powder and/or whole milk, corn glucose, corn starch, whey powder, sodium chloride (salt), sodium citrate stabilizer (INS 331ii), potassium sorbate preservative (INS 202) and sodium bicarbonate acidity regulator (INS 500ii)
B2	Brazil	Milk, sugar, glucose, starch, sodium chloride, sodium citrate stabilizer, sodium bicarbonate acidity regulator and potassium sorbate preservative
A1	Argentina	Milk (79%), sugar and glucose syrup (contains sulfites), acidity regulator (sodium bicarbonate), vanilla flavoring
U1	Uruguay	Milk and sugar

and skimmed milk with a high sugar content (48%). It also contained a disodium phosphate stabilizer, indicating a concern for the stability and consistency of the product.

In Portugal, dulce de leche typically had a wider range of ingredients (i.e., invert sugar, margarine and cornstarch), including a combination of milk, different types of sugar (invert sugar and glucose), milk powder, margarine and corn starch. In addition, baking soda and salt were used as acidity regulators, contributing to the specific texture and flavors.

Brazilian dulce de leche products often contained milk powder or whole milk, sugar and corn glucose. Ingredients such as cornstarch and whey powder were common, as were stabilizers (sodium citrate) and preservatives (potassium sorbate). Although dulce de leche contains a high level of sugar and solids, which generally eliminate the need for preservatives, the wide variation in different factory conditions and the risk of air contamination make its addition important. Although dulce de leche contains a high sugar and solids content, which generally eliminates the need for preservatives, the wide variation in different factory conditions and the risk of air contamination make its addition important. These preservatives, as permitted ingredients, could be added either at the beginning or at the end of the production process, as they do not quantitatively affect the final concentration but act as a preservative for the product (Pinto, et al., 2023). This suggested an approach that balanced flavor, texture and product stability, adapting to local preferences and storage conditions.

Argentinian dulce de leche was characterized by a high milk content (79%), accompanied by sugar, glucose syrup and an acidity regulator (sodium bicarbonate). The inclusion of sulphites and vanilla flavoring indicated a focus on maintaining aroma and taste and preserving the product. Uruguayan dulce de leche had a very simple recipe, consisting only of milk and sugar. This simplicity may have reflected a preference for more traditional production methods, with the aim of creating a gourmet dulce de leche.

In this context, it was noted that milk (whole, powdered or skimmed) and sugar are the basic ingredients common to all countries, reflecting the traditional essence of dulce de leche and complying with the regulations. According to Brazilian legislation (1997), "Dulce de leche is understood to be the product, with or without the addition of other food substances, obtained by the concentration and action of heat under normal or reduced pressure of milk or reconstituted milk, with or without the addition of milk solids and/or cream and with the addition of sucrose (partially replaced or not by monosaccharides and/or other disaccharides)". The use of additives such as preservatives and stabilizers varied widely. Products from Spain, Brazil and Argentina often included these ingredients to extend shelf life and maintain texture, while products from Uruguay and France tended to have fewer ingredients.

The diversity of production techniques in Spain and Brazil was notable, with the use of different types of sugar (glucose or fructose) and other ingredients such as polydextrose and cornstarch, indicating greater innovation in these markets (SILVA et al., 2015). In summary, while the base of dulce de leche has remained constant, variations in ingredients reflect cultural preferences and national regulations (PENCI; MARÍN, 2016), as well as technological innovations aimed at improving the quality and durability of the product.

Conclusion

European dulce de leche-type products varied widely in composition and nutritional value depending on the country of origin. Spain had the greatest diversity of ingredients and nutritional values. France and Brazil showed greater standardization, with more similar ingredients and nutritional values, while Argentina and Uruguay had simpler recipes, reflecting traditional production. It is worth noting that all the samples were taken from the European market.

This variation reflects the cultural and technological adaptations in the production of dulce de leche in each country, as well as the response to local consumer demand for healthier and more differentiated products. The diversity of dulce de leche formulations and ingredients around the world highlighted the richness of culture and different market needs. Each country adapted the product to its local preferences and traditions, while responding to global trends for healthier and more sustainable food. This diversity not only enriched the consumer experience, but also reflected the ability of producers to innovate and adapt to a globalized and increasingly demanding public.

The data collected and analyzed confirmed the importance of preserving the cultural identity of dulce de leche, while at the same time trying to meet today's demands for healthier and more environmentally friendly products. This balanced approach ensures that dulce de leche continues to be a "self-indulgence" enjoyed around the world,maintaining its relevance and appeal in the global marketplace.

Dulce de leche, a delicacy enjoyed in Latin America, has untapped potential in European markets, where consumers have a strong preference for sweet and indulgent flavors. This caramel-like paste has similarities to popular European products like toffee or caramel sweets (called Weichkaramelle in German).

The references can be requested from the authors.

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Manufacturing technology

Growing market for machine retrofit

photo: Anna Shvets_Pexels.com

A new research report from Siemens Financial Services (SFS), A perfect (retro)fit: The retrofit revolution and its role in managing the production machine portfolio, has gathered opinion from 100+ OEMs and vendors internationally to understand retrofit market demand, product offering and financing techniques.

Manufacturing respondents to the SFS report understand the benefits of digital transformation. The challenge is how to invest in that transformation without tying up precious capital. This is where the value of flexible financing can make the difference between investing or not.

For the manufacturer, each week without modernized capabilities is a week of lost revenues. In some cases, acquiring brand new replacement equipment can involve long lead times from the OEM. Therefore, according to research respondents, manufacturers who wish to bridge the gap between the investment burden of digital transformation and its well-publicized benefits – efficiency, productivity, reduced cost-per-piece – often make the choice of retrofitting and modernizing existing machines.

Respondents to the SFS study emphasized that retrofit should be seen in the context of an OEM or vendor's whole offering, with the whole machine portfolio

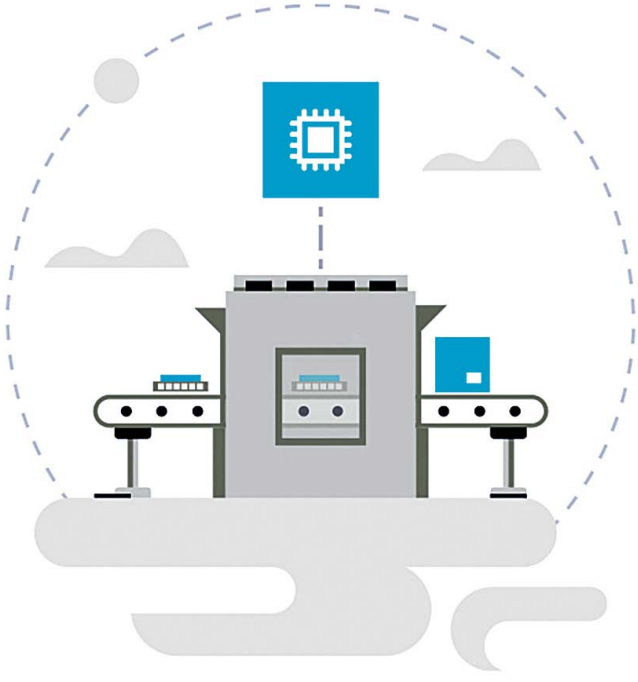


photo: Mark Stebnicki_Pexels.com

carefully managed throughout the lifespan of the machines and through their upgrade and replacement cycles to optimize value and productivity.

The SFS research project, named Talking Sustainability, delivered a number of key findings about today's manufacturing machinery retrofit market, an important component of circularity in the sector:

- Respondents confirmed that many manufacturing machine builders have a very established retrofit business. Three quarters of respondents offer retrofit options to their manufacturing clients, with a slight bias towards companies selling into international markets.
- Respondents who gave an idea of the breadth of their retrofit business estimated that it represented between 5% and 30% of annual revenues. Furthermore, a selection of respondents noted that the margins of profit on retrofit projects are equal to those on sales of new machinery solutions.
- Many respondents expect their retrofit business to grow over the rest of the decade. Moreover, a handful of the machine builders taking part in Talking Sustainability specifically noted that they were now designing machines with future retrofit in mind.
- Nevertheless, financing structures to specifically support retrofit sales are at an early stage of development, said respondents. While two thirds state that integrated financing options helped them sell more sustainability-enabling equipment (of which the retrofit proposition is one), only a few pioneers are yet working with specialist financiers such as SFS to provide integrated retrofit financing solutions.

John Bolton, Sales Manager, Industry Finance, Siemens Financial Services notes, "Retrofit is definitely a growing segment, as OEMs and vendors seek to offer best value to their manufacturing customers, even though many will still prefer brand new models. The beauty of flexible finance is that it makes the transition to digitalized, more sustainable equipment affordable and cash-flow friendly for manufacturing customers whether they opt for the new or the retrofit option."

Research methodology

Over 100 machine builders were interviewed in 2024 – via a combination of qualitative and quantitative research methods. These machine builders were located across the globe, including the U.S., Europe, India and China. Respondents were asked their views on:

- The drivers of sustainability for manufacturing customers
- The ways in which their machinery and technology enables sustainability for those manufacturing customers
- The role of finance to ease investment in more sustainability-enabling machines

photo: Tormius_Unsplash.com

drinktec 2025

New formats in the supporting programme

World's leading trade fair for the beverage and liquid food industry, drinktec 2025, is fully on track. All leading companies around the globe have already secured their space for the industry's global economic summit, which will take place from 15th to 19th September 2025 in Munich, and are actively preparing their exhibits. Internationality remains a significant strength of the fair in 2025. With exhibitors from approximately 60 countries, drinktec will again serve as the definitive platform for showcasing the global range of solutions available to the beverage and liquid food industry.

New formats in the supporting programme

The trade fair organizers are placing special emphasis on the Liquidrome supporting programme. "We see drinktec as a platform created by experts for experts. This naturally includes the exhibitors' presentations at the trade fair and the introduction of new ideas on the future of the industry. With a dedicated space for knowledge exchange in Hall C4, we will place even greater focus on communication between researchers, visitors, and exhibitors," explains Markus Kosak, Executive Director drinktec Cluster at trade fair organizer YONTEX. In various interactive zones, the future of the beverage and liquid food industry will be discussed

photo: Jan Frommel/YONTEX

with demonstrations, presentations and executive discussions. This format will be rounded off with a networking area for exchange among visitors with exhibitors also invited to participate.

Future-oriented approaches are essential across the entire value chain. In the coming years, the diverse range of consumer preferences will continue to influence product offerings in the beverage and liquid food industry. This trend will also be driven by the increasing demand for bespoke product formulations tailored to consumer needs, supported by new ingredients and innovative production processes, such as those for protein production. In order to provide orientation here, the drinktec team is consolidating these emerging trends within the supporting programme, under the main theme "Lifestyle & Health". Visitors will gain a comprehensive overview of plant-based beverages, with their flavor profiles and associated processing technologies. The use of plant-based side streams will also be explored as a future avenue.

Progress in the digitalisation of business processes remains a broad field of work in the industry. The key topic "Data2Value" is dedicated to these activities in the industry, highlighting how the use of AI tools is expanding the potential applications of data across the value chain. Many tasks in beverage and liquid food production can benefit from the deeper integration of data, including the use of external data and machine learning-based forecasting tools that reveal overarching relationships in product formulation, process technology, and plant operations.

The triad of focal points is completed by the topic area of "Circularity & Resource Management". Sustainable products and production processes continue to be of paramount importance in consumer surveys. For many beverage producers, these criteria are now integral to investment decisions. Despite some shifts or adjustments to sustainability targets by some global players, the recovery of materials, the efficient use of energy and innovative recycling solutions – often in collaboration with other sectors – remain priority objectives. A prime example of this is wastewater treatment concepts that help optimise water use in production cycles.

The contributions of start-ups, which will feature prominently within the Liquidrome, also play a crucial role in stimulating idea generation among trade visitors.

NEWS

STERNCHEMIE
ProTerra certification

Sternchemie has strengthened its commitment to sustainability and high quality standards. As a member of the ProTerra network, the company now includes ProTerra-certified products in its line of IP-soya lecithins. These are offered as part of the successful Yellothin range. This strategic initiative ensures that customers receive safe, traceable, and environmentally responsible ingredients, reinforcing Sternchemie's reputation as a trusted partner in the global food sector.

photo: Sternchemie

Stretching success

The science behind pizza-perfect mozzarella

photo: dsm-firmenich

Author: Ardy van Erp, Business Director Cheese, dsm-firmenich

Mozzarella is more than just a pizza topping – it's the heart of the pizza experience. The silky stretch, golden melt, and subtle creaminess define not only taste and texture but also the expectations of consumers worldwide. As global demand for pizza grows – with the market projected to increase by over USD 70.1 billion between 2025 and 2029[1] – so does the pressure on mozzarella producers to deliver consistent, high-quality performance on an industrial scale.

Achieving 'pizza-perfect' mozzarella is no small feat. Behind that simple slice lies a complex set of technical challenges: balancing moisture and fat retention, ensuring consistent texture and clean taste, optimizing yield, achieving a perfectly consistent golden color without over-browning after baking, and maintaining all of this throughout its shelf life. With finite milk supplies and increasing production demands, efficiency must align with the expectation for flawless quality from production to plate.

Meeting these challenges calls for a detailed understanding of the cheese-making process. dsm-firmenich works with manufacturers globally to deliver enzyme and culture technologies like Maxiren®EVO, Maxiren®XDS, and Delvo®Cheese CP-500. These tools are designed to help cheesemakers optimize texture, sustainability, and efficiency, while adapting to evolving consumer and industry needs.

Coagulation: The foundation of functionality

Mozzarella's defining characteristics – stretch, meltability, and moisture – are rooted in casein protein structure and curd development. The selection of the coagulant enzyme has a significant influence on these attributes. Maxiren Evo is a 100% fermentation-produced chymosin, which builds on the strengths of traditional, trusted bovine rennet, developed to selectively target αs1-casein, converting it into αs1-i-casein. This highly-precise enzymatic action promotes fast and even curd knitting, improved water binding, and optimal moisture distribution – which help achieve all the hallmarks of mouthwatering mozzarella.

With low proteolytic activity, Maxiren Evo helps preserve structure, prevents bitterness, and supports a smooth, clean flavor profile throughout shelf life. Its performance extends beyond the vat: by enhancing emulsification and maintaining curd integrity, Maxiren Evo enables cheesemakers to deliver mozzarella with reliable functionality – from early slicing and shredding to consistent performance at the end of shelf life. For mozzarella, these qualities ensure reliable stretchability, visual melt, and structural resilience – and for manufacturers, they mean more precision, less variability, and greater flexibility.

For applications requiring firmer, more elastic cheese —such as low-moisture mozzarella – MaxirenXDS offers high texture retention and low proteolysis. This makes it ideal for cheeses that undergo mechanical handling, shredding, or longer storage. It helps reduce fragmentation during slicing and ensures uniform distribution in foodservice and retail applications.

Both enzymes are fully inactivated during whey pasteurization, preserving whey integrity for value-added use in applications like infant formula, sports nutrition, or processed dairy powders – an increasingly relevant factor in a resource-conscious dairy supply chain.

Culture synergy: Enhancing yield and texture

Coagulants lay the foundation for 'pizza-perfect' mozzarella, but cultures complete the matrix. DelvoCheese CP-500 cultures are designed specifically for mozzarella production. With yield

improvements of up to 1.3%, faster acidification, and enhanced stretch and melt, they're a key tool for improving performance without sacrificing consistency.

These cultures offer robust phage resistance and integrate easily into standard or customized recipes. When paired with Maxiren coagulants, DelvoCheese CP-500 delivers balanced biochemical and physical characteristics – ensuring reliable results across formats from fresh to frozen.

DelvoCheese CP-500 also helps improve appearance by reducing undesired browning and improving golden color formation during baking. This enhances the visual appeal of mozzarella in high-heat applications such as pizza ovens and ensures brand consistency across regions and distribution models. DelvoCheese CP-500 creates a rich, buttery taste in the mozzarella. This smooth, creamy note adds an indulgent element to the eating experience and complements a wide range of pizza toppings and sauces without introducing any bitterness.

Boosting efficiency, reducing waste

In today's competitive dairy market, the pressure to do more with less has never been greater. Maxiren Evo can increase yield by up to 1.7% per liter of milk while improving curd quality and reducing whey loss. This supports cheesemakers in optimizing every drop of raw material.

The economic benefits are significant: higher moisture retention means a more sellable product, reduced reliance on high volume milk inputs, and improved return on investment for fixed assets. Moreover, the enzyme's performance has been linked to a 1.6% reduction in carbon emissions compared to first-generation fermentation-derived coagulants – an important metric for meeting environmental targets.

With improved firmness and slicing properties, Maxiren solutions also reduce product losses during cutting and shredding. Earlier sliceability enabled by Maxiren Evo allows producers to accelerate timelines and reduce storage, contributing to leaner, more responsive operations.

This earlier maturity aligns well with logistics pressures across the cheese supply chain, particularly in export markets, where shipment times, customs delays, and retail lead times must be carefully managed.

Adaptability across cheesemaking conditions

Cheesemakers operate under diverse production environments – and flexibility is key. Maxiren Evo performs well at a low pH, making it ideal for fast-acidification processes like those used in mozzarella production. This makes it ideal for cheesemakers looking to increase the moisture or fat content of their cheese without sacrificing flavor or processability. Meanwhile, MaxirenXDS delivers extra strength and resilience for cheeses subject to mechanical stress.

photo: dsm-firmenich

DelvoCheese CP-500 cultures can also be customized to emphasize stretch, smoothness, or shelf life. Together with dsm-firmenich's application support, manufacturers can fine-tune formulations to meet evolving consumer and market needs.

For example, in regions where refrigerated storage is limited or shelf-life requirements are longer, formulations can be adjusted to ensure long-term functionality and stability. Conversely, in markets that prioritize fresh mozzarella performance – such as quick-service restaurants (QSR) – rapid culture activation, paired with Maxiren Evo, enables immediate stretch and meltability. This responsiveness allows manufacturers to meet specific performance demands without delay, supporting consistent quality in fast-paced, high-output environments.

Maintaining quality across shelf life

Industrial mozzarella must perform across an extended shelf life – whether fresh, frozen, or pre-shredded. Maxiren enzymes maintain curd integrity and reduce proteolytic degradation, helping cheeses retain their sensory appeal over time. Melt, stretch, and sliceability remain reliable throughout the product's lifecycle.

This consistency gives cheesemakers a broader operational window to match production schedules with demand – while avoiding quality issues that lead to rework or waste. For foodservice providers and distributors, dependable cheese performance simplifies menu development and helps avoid customer complaints tied to texture or visual appeal. For manufacturers, delivering mozzarella with uniform quality – vat after vat, batch after batch – is not ideal, it's imperative. This is especially true for international pizza brands and private label manufacturers who rely on standard performance across countries, production lines, and dairy sources.

Additionally, rapid inactivation of the enzymes post-pasteurization enables high-quality whey recovery reducing waste and unlocking new revenue streams. Clean, undegraded whey contributes to both cost efficiency and broader sustainability goals.

Sustainability as a growth driver

Modern cheese production must be sustainable by design. Maxiren Evo and MaxirenXDS enable higher yield per liter of milk, reduce curd loss, and minimize energy use during processing. These gains support circular production models and long-term environmental goals.

Improved shredding stability and longer shelf life also reduce food waste – helping producers align with sustainability commitments while improving margin. For many, these operational gains support more robust ESG reporting and customer-driven climate pledges.

Moreover, dsm-firmenich's commitment to responsible sourcing and local manufacturing strengthens the environmental profile of these ingredients, giving customers the ability to align procurement strategies with regional sustainability standards.

Future-proofing cheese production

As the dairy sector evolves, agility will separate leaders from laggards. Whether responding to shifting consumer tastes, clean-label demands, or regulatory pressures, manufacturers need tools that can adapt with them.

Maxiren coagulants and DelvoCheese cultures are built for that reality. Validated in a range of production conditions and milk qualities, they offer proven performance with global reach. From fermentation to formulation, dsm-firmenich continues to invest in solutions that balance functionality and efficiency. And with sustainability front and center in today's dairy sector, using ingredients that inherently reduce emissions, increase product output, and extend product life is smart science – and even better business.

Beyond mozzarella, these technologies are also being applied to innovation in other cheese types, including sliced cheddar and other semi-hard formats – creating new avenues for premiumization, performance differentiation, and market expansion.

1 https://www.technavio.com/report/pizza-market-industry-analysis?utm_source=prnewswire&utm_medium=pressrelease&utm_campaign=ai_trend_v2_report_week49_2024&utm_content=IRTNTR70864

NEWS

KERSIA consolidates its international presence

Acquisition in Greece and a strategic partnership in Mexico

Kersia is continuing its global development by acquiring a majority stake in the family business Ikochimiki, a leading player in the Greek market for biosecurity solutions in the food industry and food service areas. This acquisition allows the group to strengthen its presence in the Balkans and to join the top 3 Greek players in this sector, thus consolidating its activities throughout the food chain.

At the same time, Kersia is joining forces with Beta Procesos, a leading independent and family-owned company in the Mexican agri-food and food service. With an extensive national network, this manufacturer and distributor of detergent and disinfectant products opens up new growth prospects for Kersia on the Central American continent.

Climate action through partnership

The role of biosolutions in Next Level Dairy

Authors:
Anne Nordmark Murmann, Global Marketing and Business Development Manager, Dairy Bioprotection and Timea Puskás-Larsen, Marketing Manager, Scandinavia & the Netherlands, both from Novonesis

Reducing carbon emissions isn't a challenge awaiting us in the future; it's an urgent responsibility we must tackle today. Across various industries, biosolutions offer a powerful means to mitigate climate impact. By harnessing natural biological processes, these solutions enable businesses to streamline operations while minimizing their carbon footprint.

Novonesis recognises the transformative potential of biosolutions within the dairy sector. Through their innovative expertise, the company developed methods to produce delicious, nutritious dairy products while unlocking sustainability benefits. This dual benefit is what Novonesis refers to the "carbon handprint" of their biosolutions.

Lowering the climate impact in dairy

The dairy industry faces significant pressure to contribute to a low-carbon future. Reducing greenhouse gas emissions is crucial for the health of our planet yet achieving a lower climate impact presents challenges. Fortunately, biosolutions offer a promising path forward.

The concept of a "carbon handprint" refers to the positive climate impact generated by biosolutions when applied effectively. Certain dairy cultures and enzymes enhance productivity by increasing cheese yield, improving shelf-life stability, minimizing waste, and optimizing the use of raw materials. Biosolutions like Novonesis' FreshQ® food cultures play a pivotal role in empowering dairy producers to achieve these goals. By extending shelf life and reducing food waste, these solutions are essential tools for tackling issues related to spoilage, supply chain emissions, and the growing consumer demand for sustainable products.

Rune Joergensen, Head of Sustainability Analytics at Novonesis, emphasizes, "To accelerate the transition to a low-carbon society, carbon must become the new currency, and we must help each other in this transition. Providing carbon data as part of the product value proposition must be shared with customers as naturally as the economic price tag."

Novonesis has detailed climate transition plans turning climate ambitions into action. The company committed to a 75% reduction of greenhouse gases from its operations (scopes 1 and 2[1]) and

a 35% reduction from its supply chain (Scope 31) by 2030 from a 2018 baseline. Novonesis has developed a climate transition plan enabling them to deliver on their climate promise including levers like renewable energy, low-carbon transport and supplier engagement.

But where the company can truly make a difference is by quantifying how their microbial and enzymatic solutions empower dairies and farmers to enhance their climate and sustainability performance.

Tackling global dairy waste

A significant challenge facing the dairy industry is waste. Each year, 17% of yogurt in Europe is discarded, with 80% attributed to shelf life issues[2], which result in financial losses, harm brand reputation, and elevate greenhouse gas emissions associated with waste. Yeast and mold are the primary spoilage organisms in fermented dairy products like yogurt, rapidly deteriorating quality during shelf life. These spoilers may occasionally be detected in quality release tests, but more frequently manifest as quality issues for consumers. This not only causes financial setbacks and reputational damage for producers and retailers but also contributes to greenhouse gas emissions from squandered resources.

The benefits of minimizing spoilage and extending shelf life are extensive. For the dairy industry, it means reduced waste, enhanced production efficiency, and increased brand value. For consumers, it offers longer-lasting products, improved quality, and greater convenience.

Why FreshQ is a game-changer for dairy professionals

In the search for effective solutions, biology provides a promising avenue. FreshQ food cultures, composed of natural lactic acid bacteria, offer an innovative method to extend the shelf life of dairy products. By effectively inhibiting the growth of yeast and mold, FreshQ reduces spoilage risks and product recalls, ensuring consumers receive fresh, high-quality products.

Novonesis scientists were the first to discover the main mechanism behind the growth-delaying effect against yeast and mold in fermented dairy products. Their research[3] showed that specific lactic acid bacteria effectively absorb the available manganese, a specific micronutrient only available in limited amount in milk, thus starving the yeast and mold contaminants and significantly delaying their growth.

"If we can reduce food waste both on store shelves and in consumers' homes while optimizing the production process, it will have a significant climate impact. Together, we can create a positive climate footprint with our innovative biosolutions," says Florian Sanchez, Business Unit Director, Dairy Bioprotection at Novonesis.

1 https://www.esganalytics.io/insights/what-are-scope-1-2-and-3-carbon-emissions
2 FAO, Qbiz impact study – White Paper (2016)
3 https://journals.asm.org/doi/10.1128/aem.02312-19
4 https://www.novonesis.com/en/era-of-biosolutions#planet

Together with its customers Novonesis can create a positive handprint through innovative dairy biosolutions, helping customers to count what matters and take their climate management to the next level.

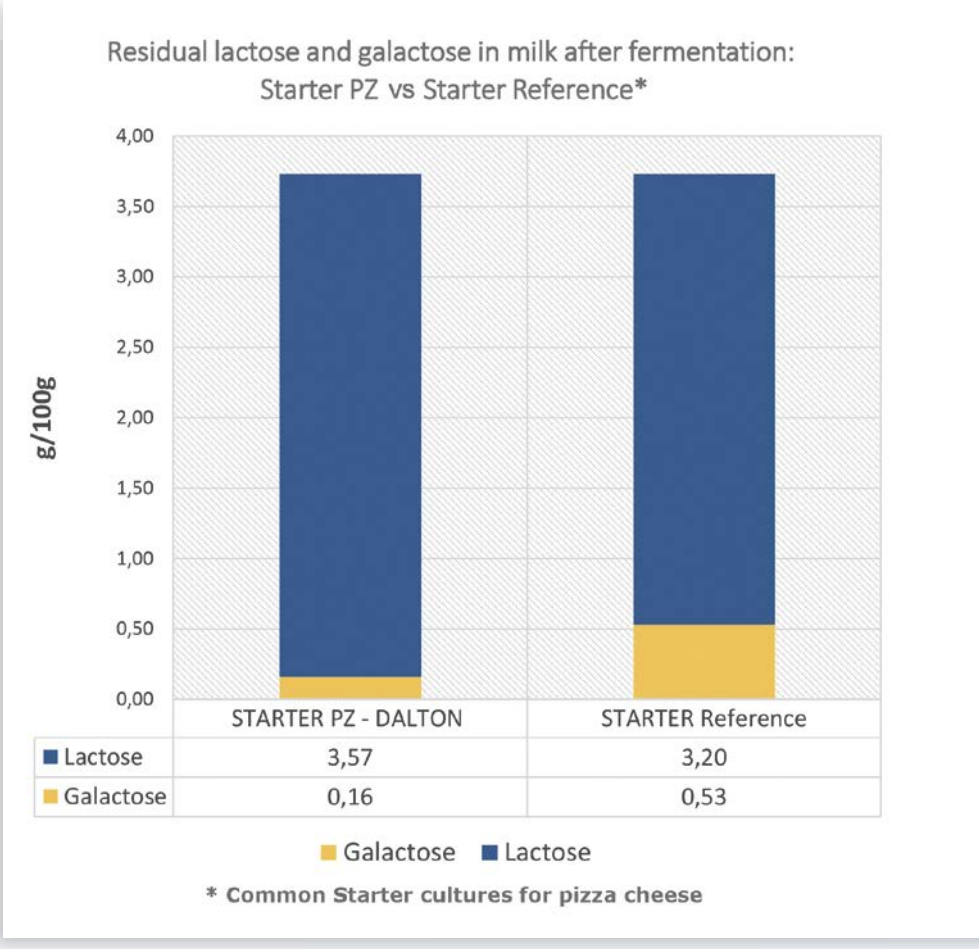
New Microbial Cultures for Low-Galactose Pizza Cheese

Dalton Biotecnologie's Innovation

In an increasingly competitive market, the quality of food products and the ability to enhance them with distinctive features allow companies to strengthen customer relationships and open up new business opportunities. In the world of pizza, the color mozzarella takes on after baking adds value, also for the sensory characteristics associated with it. Defining the right degree of browning of mozzarella is currently one of the aspects in which producers are investing, in order to deliver a product that meets market expectations, both in Italy and internationally.

The Browning Issue: The Role of Galactose

The browning of mozzarella during baking is mainly caused by the Maillard reaction, a chemical process that occurs at high temperatures between reducing sugars (especially galactose) and the amino groups of proteins. In pizza cheese production,



the use of conventional starters—such as commonly employed thermophilic cultures—typically leads to the metabolism of lactose, leaving a significant amount of galactose undegraded.This residual sugar accumulates in the cheese and, during baking, actively participates in the Maillard reaction, promoting the formation of brown spots and often causing excessive browning of the product.

A Project to Reduce Galactose in Mozzarella

In response to this industrial need, Dalton Biotecnologie SRL recently completed a research project, in collaboration with the University of Teramo, aimed at developing microbial cultures capable of reducing or even eliminating galactose content and its contribution to the browning phenomenon. These cultures represent a useful tool for more precise control of the degree of browning in pizza cheese during baking.

Innovative Solutions for Real Added Value

The new cultures developed by Dalton Biotecnologie SRL, in collaboration with the University of Teramo, are based on microbial strains specifically selected for their ability to ferment galactose. This approach represents a technologically advanced and sustainable solution, offering a competitive edge to dairy companies operating in the pizza cheese sector. Reducing galactose in mozzarella for pizza is now a concrete and strategic frontier of innovation. Dairy companies can thus differentiate themselves in the market with an added value product, developed through targeted biotechnology, that meets the demands of today's consumers and the quality standards required by the pizza industry.

Funded with the contribution of the Abruzzo Region under the PR FESR Abruzzo 2021/2027 – Policy Objective 1 - Action 1.1.1. Intervention 1.1.1.1 "Support for Research and Innovation projects of companies pertaining to the technological domains of the Regional Strategy for Smart Specialization RIS3 Abruzzo 21-27"

Effects of different galactose content on pizza cheese browning

NEWS

NESTLÉ
Creation of a new center for deep tech

Nestlé announced the strengthening of its R&D expertise in biotechnology and the creation of a new center for deep tech, to boost its innovation pipeline and increase efficiency in research, innovation and operations. The investments will be unlocked by a leaner R&D organization, more agile ways of working, a focused project portfolio and the redeployment of existing R&D resources.

Nestlé will build on existing expertise in sensor systems, solutions for product recognition, remote control and display solutions. The new center will screen, test and develop new generations of sensors, robots, coding systems, high-performing AI and virtual/mixed reality solutions to increase efficiency in research, innovation and operations. New technologies will enable the development of smart coffee machines, innovative solutions for precision nutrition, self-controlling equipment and new solutions for dynamic quality assurance. The center will be officially opened in the first half of 2026, at the existing facilities of the Nestlé System Technology Center in Orbe, Switzerland.

Functional Dairy in 2025

Probiotics & High Protein

Author:
Vicky Painter, Content Analyst at FMCG Gurus.

FMCG GURUS
Consumer Experts, Insight Driven

The association between dairy and overall health has been a constantly evolving relationship over the last decade. In 2017, The Guardian released an article titled "Why Have Young People Gone Off Milk?", highlighting the vilification of dairy among millennials and Generation Z, predominantly influenced by social media and celebrity narratives.

In 2025, dairy is far less demonized, with consumers holding more nuanced views on dairy products. While some still avoid it (for example due to ethical or dietary intolerance reasons), others embrace dairy as an intricate part of a healthy diet that can provide many benefits. Specifically, FMCG Gurus' consumer insights show that people turn to milk (31%) and yogurt (40%) as food and drink products that can help to boost overall health. This has contributed to the diversification into value-added and functional dairy products, such as high-protein or probiotic-rich drinkable dairy.

Probiotic Dairy products

Digestive health is a major focus in 2025, as consumers increasingly recognize its integral role in overall well-being. This growing awareness has led many to seek ways to support gut health, particularly through dietary changes. Specifically, consumers use functional dairy products that contain probiotics to help maintain the health of their gut and digestive system.

When addressing digestive health, FMCG Gurus' market research highlights that 53% of consumers say they actively seek out probiotics and live cultures.

Yogurt is the most popular format for this purpose, due to its association with "good" bacteria in the gut, and benefitting from its strong presence in mainstream retail and wide familiarity. In contrast, products like kefir are significantly less popular, with only 14% of consumers identifying it as their preferred probiotic format. This highlights the opportunity for education within the sector, as consumers are interested in addressing their digestive health through probiotic dairy products, but are unaware about the variety of products that can do so.

Functional foods like yogurt also offer the added benefit of convenience, making it easier for consumers to integrate digestive health support into their daily routine. When consuming yogurt at home, FMCG Gurus' consumer insights demonstrate that people express a preference for spoonable yogurt (74%), while out-of-home they prefer it in a pouch (56%) or in a drinkable form (56%), allowing consumers to maintain their health goals on the go.

High-protein dairy products

Almost half of global consumers say that they want to increase the intake of protein in their diet. This can be for a variety of reasons, including wanting to lose weight, gain muscle, or maintain overall bodily repair. FMCG Gurus' market research shows that 77% of consumers say that they use dairy products as a source of protein, making it one of the most popular protein choices. Specifically on social media, cottage cheese has gained popularity as a high source of protein with added benefits, such as being nutritionally-dense but low in calories.

Traditionally, however, milk (88%), cheese (77%), and yogurt (75%) are the most popular dairy products that consumers choose to turn to as a source of protein. As mentioned prior, these products offer a boost in protein that can be easily fit into an existing routine, allowing for a convenient health boost.

There is also the opportunity for innovation within the protein dairy market. FMCG Gurus' market research reveals that 63% of consumers say that they use ice cream as a source of protein. This highlights to the dairy industry that there is an interest among consumers in products that are traditionally associated with indulgence providing a health boost. Therefore, consumers do not feel that they are compromising their health goals and cannot enjoy their favorite snacks guilt free.

This article is based on FMCG Gurus' surveys, including Digestive Health, Dairy, and Meat and Plant-Based.

photo: Markus Mainka_stock.adobe.com

Intelligent saving of resources on membrane plants

Part 1: New concepts – the ALPMA driving assistant

Authors:
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Daniel Kontny, Head of Division Process Technology, ALPMA

Responsible use of everything that is taken from nature is currently one of the most important tasks facing humanity. The need to conserve resources does not need to be explained or justified in 2025. It is common knowledge that our world is being used too wastefully. And that this process is finite.

What can be done to give this process a different, positive direction? Saving the world in one fell swoop – it would be nice if that was possible. However, the rescue must consist of many pieces of the puzzle. Regulations need to be changed on a large scale. And on a small scale, every company and all specialists must do what they are able to do in their own area.

Our area of expertise in the Membrane Filtration department of ALPMA's Division of Process Technology are membrane filtration systems. What can be done here - what resources can be saved and by what means? To answer this question, we will first look at the resources used by a membrane filtration plant, see Figure 1. It can be seen that there are involved different groups of resources. One group of resources is required in the operation of the plant; the other group of resources is already utilised in the construction of the plant. The third group is the product itself, which is to be produced with the plant. The topic of product yield is focussed on from an economic point of view and also from an ecological point of view.

All resource groups are influenced by the size of the system. These include the consumption of steam to heat up a certain volume of plant, the mass of stainless steel used in the plant, the mass of copper, which depends on the size of the motors used and more. The first task is therefore to design the system exactly to the point so that it can fulfil the task set, but does not have any excessive size reserves beyond

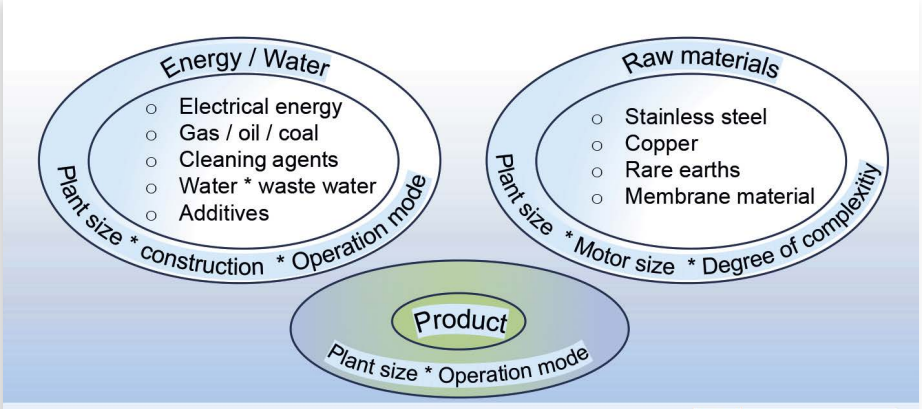


Figure 1: Resource utilisation in membrane plants

this. At ALPMA, the design is carried out on the basis of a special design tool and using data from the installed base (see Fig. 2). Alternatively it can be determined via pilot tests in the Technical Centre for membrane filtration (see Fig. 3).

The operating mode of the system has a further, very significant influence. This can be used to control the consumption of resources for the ongoing production and for the CIP processes.

Figure 2: Design of the plant size based on real values from the installed base

Figure 3: Design of the plant size based on tests in the Technical Centre Membrane filtration

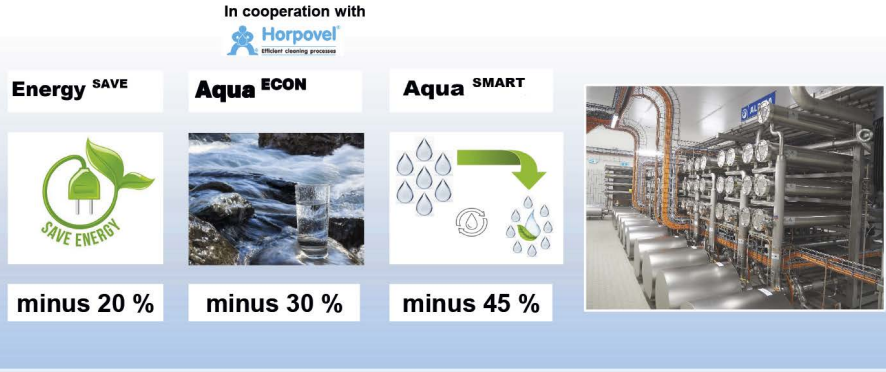


Figure 4: Operating mode – saving water and electrical energy

ALPMA has developed the 'Energy^{SAVE}', 'Aqua^{ECON}' and 'Aqua^{SMART}' energy- and water-saving modules, partly together with its cleaning partner Horpovel. Figure 4 shows the amounts of electrical energy and water that can be saved.

It is important not to save blindly and thus generate increased expenditure elsewhere by not operating the membranes appropriately, which may initially appear to save a little, but would necessitate premature membrane replacement. This would mean saving too much. What is needed is an optimisation process between desirable savings and essential expenditure for stable and safe system operation.

This includes knowing which savings are sensible and effective for which type of system in conjunction with which product. One example is the applied amount of crossflow over the membrane modules by means of the stage pumps. Standard values exist for this, from which it is possible to optimise downwards. As the crossflow is essential for controlling the fouling, the fouling potential of the product must be considered. In RO systems for UF permeate, for example, this is low as long as no calcium precipitation occurs. UF permeate contains neither fat nor casein nor whey protein as surface layer-forming substances, and the RO membrane has no pores that could become blocked. The situation is completely different with a ceramic microfiltration membrane for skimmed milk. Skimmed milk contains all the proteins found in milk. Casein has different structure-forming properties to whey proteins, which are also more effective in generating cover layers. In addition, ceramic microfiltration membranes have pores inside which deposits can build up.

In order to take this distinction properly into account, ALPMA categorises saving measures into specific clusters according to the type of system and the product's relevance to the formation of surface layers, within which the same or similar measures should be taken, see Figure 5. The less complex the system is and the lower the proportion of potentially surface-layer-forming substances in the product, the higher the savings potential.

To further ensure that the correct, i.e. the optimum operating mode is used, the 'response of the system' to the operating mode used is 'queried'. The ALPMA driving assistant can be used for this purpose. In many discussions, the terms Industry 4.0 or AI are used in an almost inflationary manner. Instead of repeating these terms, the ALPMA driving assistant offers a concrete solution to urgent questions.

The driving assistant is aimed at anticipatory driving. In car terms, this means - staying in lane - avoiding accidents - recognising problems in good time and taking countermeasures - driving in a fuel-efficient manner while ensuring that the destination is reached on time. This can be guaranteed by the ALPMA membrane experts and can also be realised electronically.

For example, a sensible CIP is configured on the basis of analysing the previous production data. This ensures that no over-cleaning takes place, which would take up more resources than necessary. On the other hand, deficient CIP is not selected, which would lead to losses in subsequent production performance and even prematurely required membrane replacement. The cleaning status can also be checked by regular maintenance as part of the ALPMA membrane service package (see Fig. 6).

A similar approach is used to optimise the saving of electrical energy. With a few exceptions, the largest consumers of electrical energy in membrane filtration systems are the loop pumps. This is where the greatest saving potential exists. At the same time, the loop pumps have one of the most important tasks within a membrane system - namely to control the formation of the surface layer. Here, too, the reaction of the system to the saving measure must be analysed and taken into account. This is done by adapting the crossflow to the analogue actual values of the system, i.e. only reducing it to the extent that the formation of the surface layer is still justifiable and can be cleaned economically.

In the future, the ALPMA driving assistant may be integrated into a cloud-based solution. The ALPMA Eco Clean system is already available in the ALPMA Connect cloud solution. This is an optimised operating mode for the dairy plant CIP that was developed by our colleagues from ALPMA France.

The following article by Horpovel presents the optimisation and solution of a complex cleaning task on an ALPMA nanofiltration system with diafiltration at Brixen-Milch.

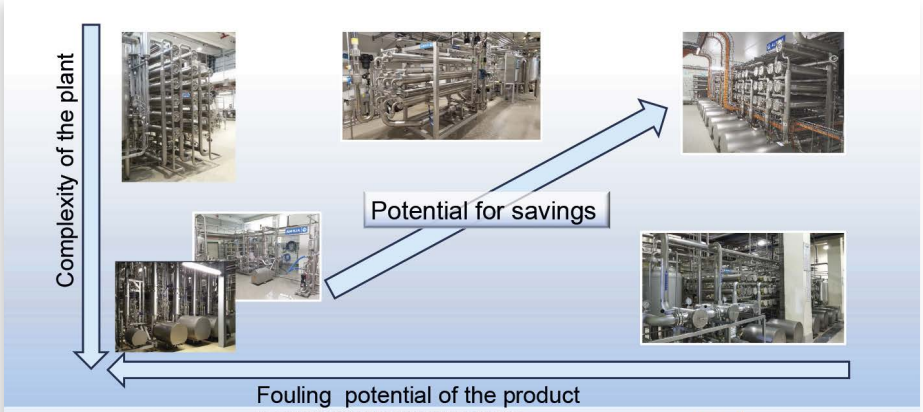


Figure 5: System clustering according to plant complexity and fouling potential of the product

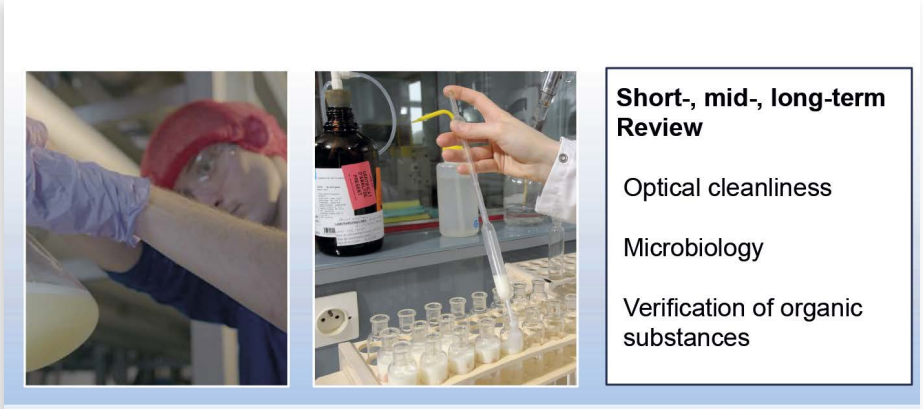


Figure 6: Monitoring of the long-term cleaning status by the ALPMA service team in collaboration with Horpovel

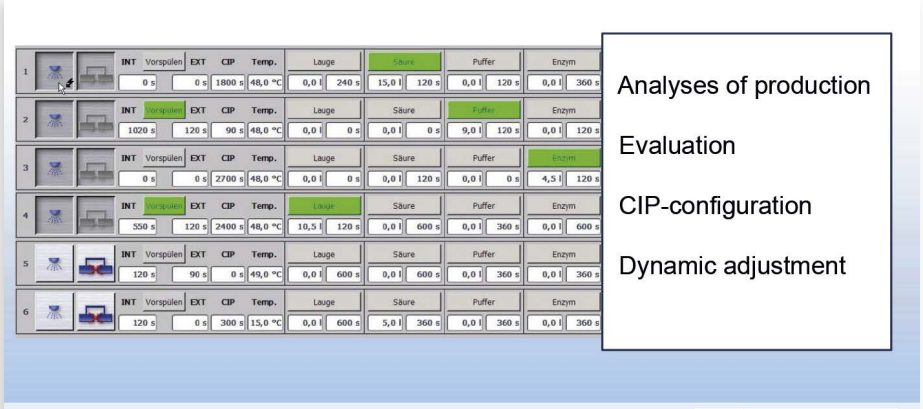


Figure 7: Driving assistant, configuration of the optimum CIP

Difficult cleaning tasks

Part 2: Customised solution using the example of mozzarella whey

Author: Martin Patzelt, Head of Application Technology and Sales, Horpovel

Nanofiltration plant for mozzarella whey (ALPMA) at the customer's site

Good cleaning is results-orientated, cost-effective, reproducible and achieves a stable result. For this reason, Horpovel® GmbH has developed application-specific cleaning concepts. These concepts are used both in the field of general CIP cleaning and in membrane cleaning.

This article presents a customised solution to a difficult cleaning task using the example of mozzarella whey as well as the application-specific cleaning concepts at a customer.

Both the general procedure and the influencing factors of cleaning optimisation are presented in order to concretise the adapted cleaning solution using the example of cleaning optimisation of a 4-stage nanofiltration system for mozzarella whey. Using the example of the nanofiltration system to be optimised, the customer's existing standard cleaning process was adapted on the basis of the findings from the previous analysis.

The customer's initial situation was as follows:

The desired end product was mozzarella whey with maximum dry matter and demineralisation.

The resulting consequences were

- Difficult filtration process due to the shift in salt balance.
- Calcium precipitation on the membranes.
- Faster tendency to clogging.
- More difficult adjustment of stable pH values, especially in the acidic purification steps.
- Cumulatively, this led to a shortened membrane service life.

The customer's existing cleaning process initially involved the following steps:

1. enzymatic cleaning
2. acidic cleaning
3. alkaline cleaning

The customer preferred a customised cleaning concept that was cost-effective, reproducible and, above all, stable. There was therefore a need for action.

Based on these criteria, it is essential to first record and analyse the cleaning problems. On the one hand, it must be determined at this point where and when the problem becomes apparent on the systems and how the membrane system performs during production and cleaning.

This problem analysis is initially carried out in a closed system and the parameters can be recorded non-destructively as follows:

- Record displayed values.
- Sampling of the various streams with control of essential chemical parameters.
- In addition, by circulating an indicator in the system, the deposits that do not pass directly into the liquid phase can be recorded and detected (e.g. organic deposits, which may be encapsulated in places).
- Disadvantage: Only what passes into the liquid flow can be measured.

The problem analysis in the closed system did not initially lead to the desired result, which is why a membrane replacement was unavoidable. Following the membrane replacement, an autopsy of the blocked membranes was carried out.

An autopsy can provide indications of mechanical damage, deformation or deposits, for example. In addition, an FTIR examination of the surface (direct comparison of a new and a used membrane) can be used to analyse detected deposits in detail.

When analysing the deposits in the customer's nanofiltration system, it was clearly established that they were calcium compounds. Observing the reaction of the calcium compounds to temperature and various cleaning agents led to a change in the cleaning process. Calcium compounds tend to precipitate with increasing temperature and increasing pH value. For this reason, a cleaning step with cold acid was placed before the enzymatic step in order to react to the calcium problem before further cleaning steps were carried out.

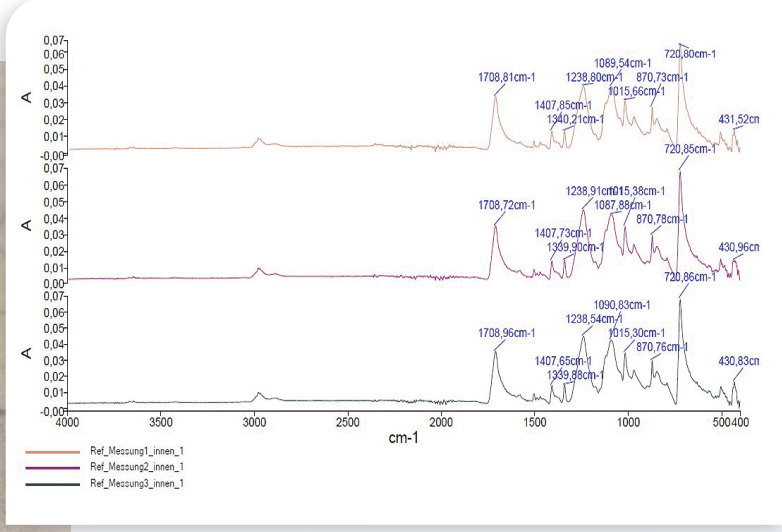
This was followed by an analysis of the current status of the production processes based on the relevant aspects:

- How does the calcium behave during production?
- What is the rinsing behaviour of the calcium before cleaning?
- How successful is the rinsing result of the calcium after the first cleaning step?

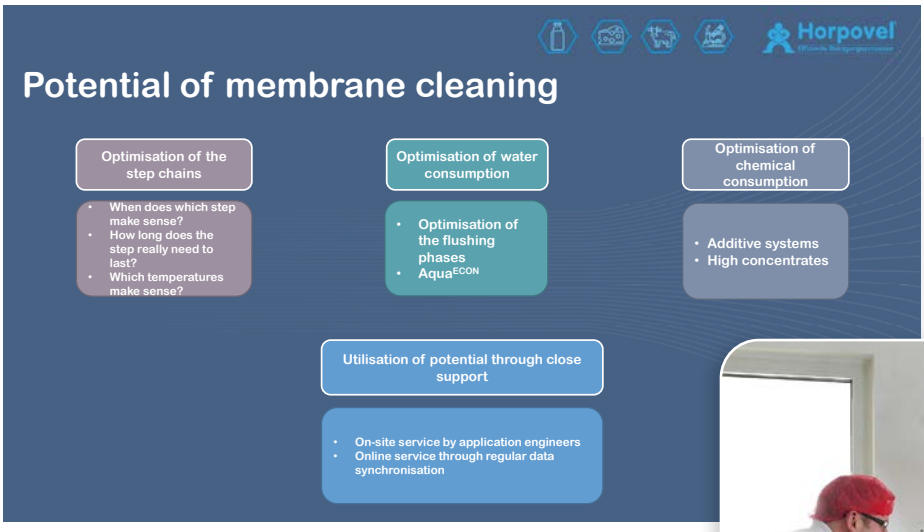
Together with ALPMA/LTH Dresden and the customer, the individual steps were observed, monitored and optimised. In this context, the filtration process and the existing cleaning concept were adapted in order to reduce the precipitation of calcium compounds. By removing the calcium before the enzymatic cleaning step, it was possible to stabilise the pH control in the cleaning steps and significantly extend the membrane service life.

The central problems of a membrane filtration system are, in addition to the restrictions on the cleaning agents used, the specifications in the membrane data sheets (physical possibilities limited

Blocked membrane of the customer

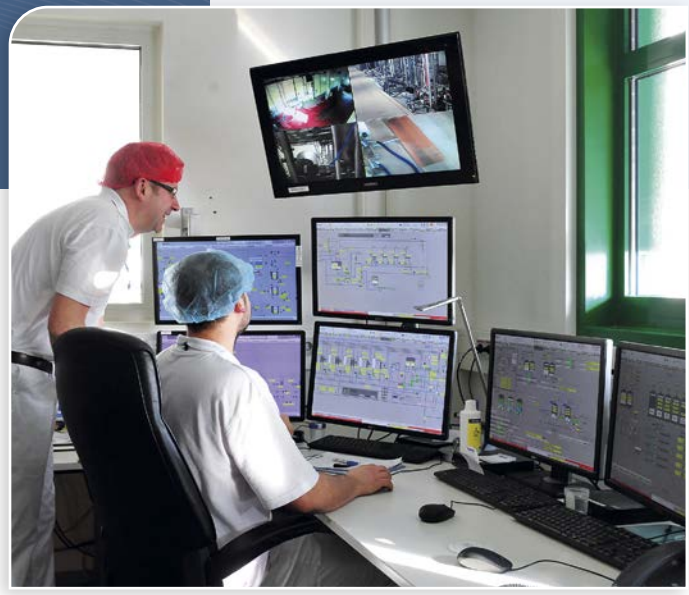


Membrane autopsy on blocked membrane



Optimisation potential of a cleaning system

Plant monitoring/plant inspection



by temperature and flow rate) and existing customer and regulatory requirements. In addition, the nature and quality of the functionality of the membranes changes over the length of the operating time and the natural fluctuations in the starting products used. This results in a repeated need to adjust the cleaning parameters during the service life of the membranes.

In order to achieve an extended membrane service life, close monitoring is essential. This is where Horpovel comes in, creating the right cleaning concept for each application and adapting it to the customer's specifications. This is done either in advance through appropriate pilot tests on our own laboratory plant at the Bochum site, or directly at the customer's plant through a precise analysis of the existing system.

In addition to purification concepts for dairies, concepts for plant-based product lines (such as pea/soy/oat/potato proteins and concentrates from carrots) have already been developed in this way. The control of all important parameters on site at the customer's premises, the recording of flow values (crossflow) during filtration and cleaning can be carried out and evaluated using Horpovel's own online system for data acquisition.

In general, with all optimisations and conversions, it must be ensured that the selection of cleaning agents meets customer-specific requirements. A distinction must be made between the simple handling of special, ready-made cleaning agents and the use of additives. Although these initially require more effort to set up correctly, the use of additives can significantly reduce cleaning costs in the long term.

Regardless of the choice of cleaning agent, it should be noted that a cleaning concept that is not optimised always has a negative impact on the service life of the membrane.

Horpovel sees the following optimisation potential for the areas of system performance and membrane service life:

- Optimisation of the step sequence, exact parameterisation of the circulation and rinsing steps.
- Optimisation of chemical consumption.
- Optimisation and adjustment of the cleaning processes by checking for residual organics.
- Reduction of operating costs while maximising efficiency.
- Reduced water consumption when cleaning membrane systems with Aqua^{ECON} (developed jointly with ALPMA/LTH Dresden)
  - Use of optimised Horpovel cleaning agent concentrates.
  - Enormous savings in fresh and waste water.
  - Reduction of tank storage capacities.
  - Improved ecological footprint.

There must be no unpolished concepts in sensitive cleaning processes. Effective products and responsive service are therefore essential. Horpovel's application engineers monitor all parameters during regular and technical inspections of the systems and intervene quickly in the event of deviations - before or when anomalies in production performance are detected. This is done with the help of existing online solutions (such as data loggers, live view, etc.).

Safeguarding balance in the dairy chain:

The European Commission's proposal to revise the Common Market Organisation (sCMO) Regulation 1308/2013 – particularly Article 148 on contractual arrangements in the dairy sector – has triggered intense debate across Europe.

Author:
Laurens van Delft
EDA Director of Trade and Economics

So far, Member States have – in full alignment with the subsidiarity principle - the possibility under article 148 to make written contracts between farmers and processors compulsory and to oblige purchasers of milk to offer farmers a minimum contract duration and include specific elements such as the price and volume in the contract.

In December 2024, the European Commission proposed to turn these options into an obligation.

Written contracts on the milk delivery are the norm all across Europe – this does not pose any question or problem at all.

Including a fixed ('static') milk price or an 'easily accessible and comprehensible' milk price calculation method in those contracts is simply impossible on our market oriented, hence global market exposed and highly volatile milk markets.

As the EU Commission clearly points out, this massive change is induced by the spring 2024 farmers protests. We have double-checked: none of the protesting farmer organizations had asked for that change in 2024. Today, the by far most important EU farmer organization, Copa-Cogeca, calls 'for the specific nature of the dairy sector to be acknowledged by keeping this (optional) framework in place... The choice should therefore remain with the Member States".

Let me be clear: EDA fully supports the goal of ensuring a fair and resilient food chain – cooperative and private dairies fully rely on their owners / suppliers milk deliveries.

We voiced our deep concerns about the direction of the proposed contract reforms with many Members of the European Parliament and with the EU Commission at all levels.

In particular, the attempt to embed production cost-based pricing formulas into contracts could fundamentally distort the dairy chain.

The milk price is built on market responsiveness. Imposing rigid contract rules weakens this model.

Furthermore, the push for expanded price transparency, while well-intentioned, could inadvertently harm the very actors it seeks to protect. We see the risk of encouraging downward pressure from buyers and eroding the competitive edge of branded and value-added dairy products. For farmers and processors alike, this translates into lost income and fewer incentives to innovate.

As the legislative process moves forward, EDA has been actively engaging with institutional stakeholders to highlight the practical implications of the current proposals. We appreciate the open and constructive exchanges to date and trust that our shared concerns will be reflected in the final outcome. Broad alignment across the supply chain remains essential to achieving a balanced approach.

Reforming the sCMO should not come at the expense of what already works – 'let's not try to fix what is not broken'.

Our sector needs a regulatory framework that respects diversity, rewards cooperation, and strengthens - not weakens - the position of dairy farmers. That is the message we will continue to bring forward, clearly and constructively, in the final stages of this debate.

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PEOPLE

Weber: Strengthening of the management board

New Managing Director Administration

On 1 April, **Simone Weyerich** joined the management board of Weber Food Technology as the new Managing Director Administration. In this role, she is responsible for the strategic management of the Finance & Controlling, Human Resources and IT divisions. With her clear creative ambition, she will drive forward the further development of the administrative areas at Weber Food Technology, make them viable for the future and thus greatly contribute to implementing the company's growth strategy. Weyerich is an industrial engineering graduate and looks back at over twenty years of relevant professional experience in the packaging industry.

photo: Weber

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Turkey's dairy industry
Country Report

photo: ABB

Increasing energy efficiency in the food and beverage industry
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New standards in UK whey processing
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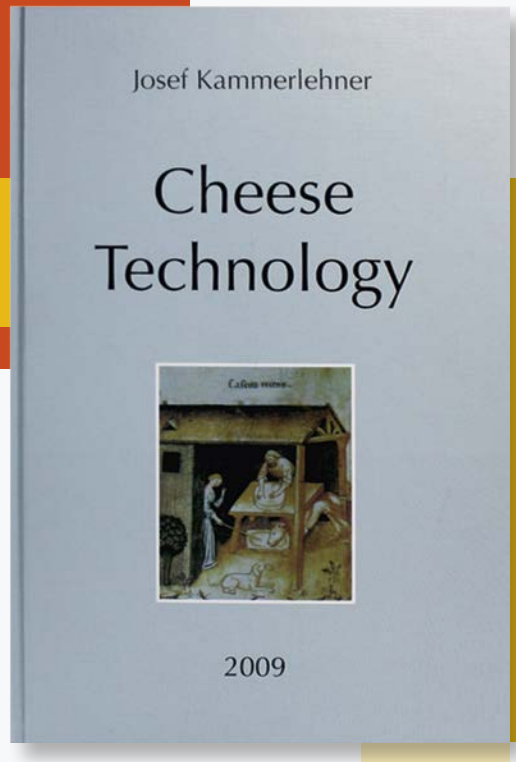

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