

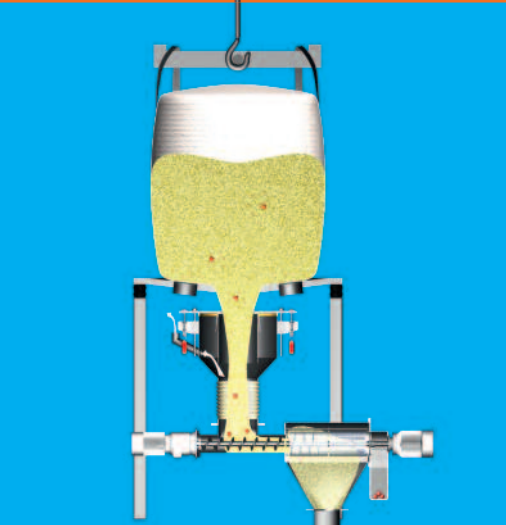
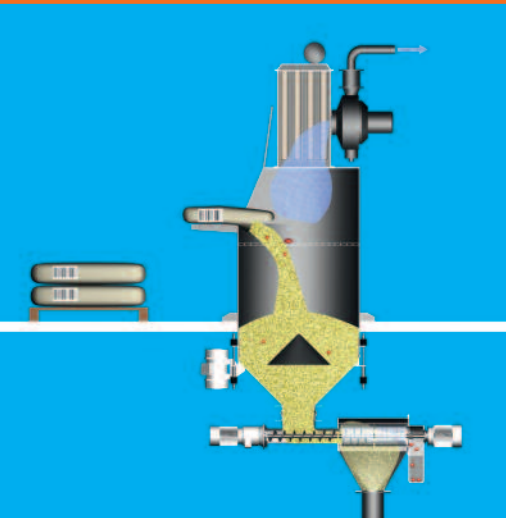
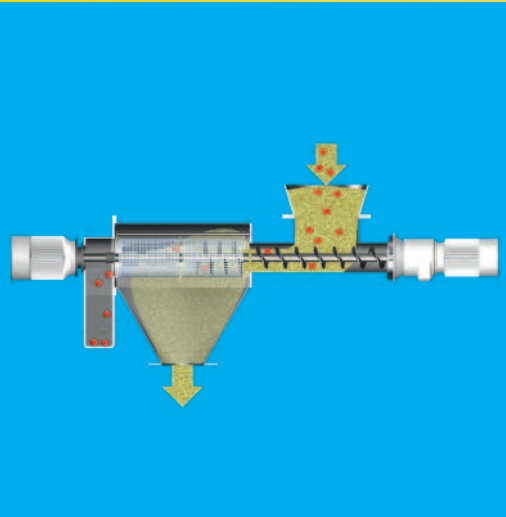
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Petra Westphal,
Exhibition Group Director,
Messe München GmbH

Editorial

In recent years, technologies for liquid food, in particular for milk and milk products, have become increasingly important at drinktec, the »World's Leading Trade Fair for the Beverage and Liquid Food Industry«. The reason is that in this area the different segments of the market are finding ever more common ground. More and more mixed drinks are being produced that are based on milk and fruit juice or alcoholic beverages, and vice versa.

The food and beverage segments are no longer as separate as they once were – increasingly the borders are blurring. As a consequence, the manufacturers of beverages and the producers in the dairy industry are now using many similar or even identical machines and systems. Flexibility is what the machinery manufacturers need to provide. And almost half of the exhibitors at drinktec will be offering technology for milk processing. Milk-industry professionals are very much a core group of visitors at drinktec, just as are their counterparts from the breweries and fruit juice manufacturers.

At drinktec 2013 visitors from the dairy sector will find solutions for the full spectrum of milk processing and bottling including all the associated technology. The large array of products and solutions for packaging and logistics, as well as ideas in packaging design, provides real added value for visitors from the non-beverage and liquid-food segments.

Milk, like few other foodstuffs, lends itself extremely well, through targeted processing, to ever new product ideas. For process technology suppliers, technical managers in dairies and for bottlers of milk-based beverages, drinktec is a »must«, it is the place to find out about the enormous variety of processing options available for milk products.

Of course the topic of milk will also be playing an important role in the supporting program to drinktec 2013. The Friday of the show – September 20, 2013 – is dedicated to milk. At the Trade Fair Forum in Hall A2, dairy technicians, beverages manufacturers, engineering offices and also marketing professionals can explore the wide range of themes to do with milk – there will be something for every specialism. In addition, the Technical University of Weihenstephan will be putting on milk-focus tours of the show for trainees and students.

The major associations, too, among them the Central Association of German Dairy Business Owners (Zentralverband Deutscher Milchwirtschaftler – ZDM) and the Association of European Dairy Industry Learning (Association Européenne des Diplômés de l'Industrie Laitière – AEDIL), are making use of drinktec as a forum and inviting their members to Munich.

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Drinking milk is in, especially in Asia

The world's thirst for milk is growing in the true sense of the word: because in the growth markets milk is indeed mainly consumed as a drink. Not surprisingly, therefore, the dairy industry is keenly interested in the processing, filling and packaging technology for beverages and liquid food on show at drinktec between September 16 and 20, 2013.

Almost half of the exhibitors at the show are presenting technological solutions for milk processing. When compared with the last drinktec, this sector has thus expanded by around 10 %. The major associations, too, have long since recognized that drinktec is becoming ever more important for the milk industry.

One not-to-be-missed attraction at drinktec for product developers and marketing experts in dairies and liquid food manufacturers is the »Special Area New Beverage Concepts« in Hall B1. At this interactive market place new sweetening, coloring and aroma strategies will be presented and explained by the various manufacturers. And on the Friday of the show – September 20, 2013 – drinktec 2013 will be shining the spotlight on milk, too. In the forum program in Hall A2 dairy technicians, beverages manufacturers, engineering offices and also marketing experts will be able to update themselves on current themes affecting the milk segment. This will include, for example, sustainability concepts and energy management in dairy operations.

Exports are becoming ever more important

The German milk market grew further in 2012. Including the deliveries from producers in neighboring EU countries, the dairies have for the first time collected and processed more than 30 million tonnes of milk. The strongest growth has been in exports of packaged drinking milk to third countries. By contrast, according to GfK

Consumer Tracking, in the first ten months of 2012 German households bought 2.2 % less drinking milk than in the same period in 2011. Away-from-home consumption, which not least reflects the increasing popularity of coffee specialties, was able to compensate for this slight downturn, but the final figure for the German domestic market again remained more or less constant. Exports are playing an ever more important role in the German milk industry.

Drinking milk is ever more popular in Asia

Market surveys by Euromonitor underline the globally very positive image for the dairy industry. Worldwide milk production is expected to increase from the current level of 126 billion l to around 137 billion by 2015. The forerunners in this trend, with the biggest rates of increase, will be Asia and the Pacific Region. Here Euromonitor sees volumes growing from 31 billion l today to 37 billion,

while consumption in Europe and North America is set to stagnate at a high level. In many of these strong-growth countries milk is consumed mainly as a beverage. In China, for example, the drinking milk proportion of the overall volume of milk processed, is over 90 %. In Germany, by comparison, it is at around 20 %.

Switching to packaged milk products

A key part in this growth, according to the latest Tetra Pak Milk Index, will come from the population group that can be described as the »middle classes of tomorrow«. This group comprises around 50 % of the population of the developing countries and consumes 38 % of the liquid milk products. And their thirst for milk is rising rapidly as their prosperity increases: The figure of 70 billion l in 2011 is set to reach almost 80 billion by 2014. Also many of these consumers are seen as switching in the coming years from unpackaged to packaged milk products.

Globally, in the period from 2011 to 2014, Tetra Pak sees the fastest growth rates in beverages based on lactic acid, in milk for infants and small children and in aromatized milk. Beverages based on lactic acid are set to rise fastest, with an annual average increase of 11.9 %, followed by milk for infants and small children at 9.0 % p.a. on average. Aromatized milk is in third place, with expansion rates predicted at an annual average of 4.8 %.



Photos: drinktec.com

Keeping up with the latest trend flavours!

Markets, technologies and trends are subject to constant change, so it's no wonder that this has an impact on the world of flavours. Worldwide observation and analysis of taste preferences allow an international team of Döhler flavourists to develop a regionally-focussed, contemporary product range. Currently, flavours like honey, ginger, tea, mint and even exotic fruits from all over the world are particularly on trend!



Honey is one of the oldest and most natural foods in the world. It has been an established part of almost every culture on earth for thousands of years – as a medicinal remedy, as the food of the gods and even as currency. Even today, modern consumers love the aromatic taste of honey in a wide variety of forms. The fine taste notes of honey provide the perfect finishing touch to fruity and spicy taste nuances. This particular taste twist is currently growing in popularity with consumers all over the world, and is increasingly used for product innovations.

Thanks to the most advanced flavour technologies, Döhler, the globally active producer of ingredients and ingredient systems, offers a large portfolio of compositional flavours which are perfectly modelled on the taste nuances of the various types of honey. The royal jelly in the flavour portfolio is a range of pure FTNS flavours extracted 100% directly from various honey varieties. These provide the most authentic honey taste Mother Nature has to offer, but without the high sugar content of honey.

Mysticism, wellness, purity: experience the world of tea in a new way with tea flavours!

Tea has many faces and allows us to take a sensory tour of discovery around the world. Depending on the type and origin, tea represents mysticism, wellness, purity or health. And the taste profiles of tea are just as multi-faceted. Döhler has reinvented the world of tea in a portfolio of unique and distinctive tea flavours. For example, the spectrum ranges from black tea flavours such as Chinese Keemun, malty, hay-like Assam and first and second flush Darjeeling to green tea varieties such as oolong, Japanese makinohara sencha, bancha and jasmine and even tea specialities such as white tea, mate, rooibos and chai. The tea flavours add a special note not only to classic tea beverages, but also to liqueurs, dairy products and innovative soft drinks like water plus and energy drinks.

Ginger is trendy! While the fruity and spicy root was used mostly in Asian cuisine in the past, it is now jazzing up supermarket shelves around the world. Döhler has deve-

loped a broad portfolio of ginger flavours, in line with this »hot« trend. The flavours lend a unique note to all imaginable foods and beverages. Or: »that special something!« When creating flavours, the ingredient specialist relies on well-founded know-how in formulations. The flavours are tailored to a wide range of applications and, thanks to many processing steps using modern technologies, are unique and unmistakable as well. The portfolio spans fresh and citrus nuances, spicy or floral tastes, even ranging to earthy and woody notes.

For products with that special something!

As a global producer, marketer and provider of technology-based natural ingredients, ingredient systems and integrated solutions, Döhler also develops innovative food and beverage applications. Sustainable market success can only be achieved with products characterised by their outstanding sensory properties. That is why Döhler puts its high standard »Enjoy Sensory Experiences« – the perfect product experience based on appealing harmoniously to all the senses – at the heart of every innovative product development and product application. This holistic sensory approach allows Döhler to guarantee its customers an important building block of success – helping them stand out from the crowd. At Drinktec in Munich, food and beverage producers will be inspired by many innovative product ideas following current flavour trends. The ideas range from milk&fruit drinks like »Energy & Cranberry-Açaí« to green tea & ginger ice cream and a lime, mint & passion fruit yoghurt dessert.

Reduced energy consumption through high yield concentration

Sabine Husby, Tim Steinhauer, Patricia Meyer, Prof. Dr.-Ing. Ulrich Kulozik, Department of Food Process Engineering and Dairy Technology, Technische Universität (TU) München, Weihenstephan

Possibilities of reducing the energy consumption for the production of concentrates and dried products.



Sabine Husby has a master of science in engineering in Biotechnology with a specialisation in »Food Technology and Nutrition«, from the Faculty of Engineering, Lunds Tekniska Högskola (LTH) at Lund University in Sweden. Since 2012 she has been working as a research scientist in the field of membrane processing at the Department of Food Process Engineering and Dairy Technology at the Technische Universität (TU) München.



Ulrich Kulozik has studied Food Engineering and Technology at the Technical University of Munich (TU München) and has a Ph.D. in the area of membrane processing. In 1991, he succeeded with his habilitation in the field of Food and Bioprocess Engineering. From 1992-1999 he worked at Kraft Foods R&D in various functions. Since 2000 he is the head of the Department of Food Process Engineering and Dairy Technology at the TU München.

The reduction of pollution and energy consumption is a climate relevant and economical priority for all industries. In the dairy industry alone, huge amounts of energy are consumed each year for the production and drying of milk and whey concentrates. The following report suggests a novel concept for the concentration of milk or whey. It stems from ongoing research work and will be followed up by scientifically new results in due course.

Prior to the drying step, milk and whey are first pre-concentrated through evaporation. This is due to better heat transfer capacity of the evaporation process. De-

spite technical innovations in the field of evaporation processes, the use of specific primary energy cannot be reduced any further. Table 1 presents the primary energy use for different concentration processes, taking into account the thermal efficiency ($\approx 33\%$) of the electricity generation. The specific energy demand of the spray drying step is approximately 30 times higher than that of the evaporation step (see Table 1). In turn, reverse osmosis (RO) is even 2-5 times less energy demanding than the evaporation. From an energy perspective, it is desired to first remove as much water as possible and

then to increase the amount of dry matter as much as possible, both with RO, before reaching the final dry matter content with evaporation (see Figure 1).

The RO is however limited by the formation of a deposit layer. The pressure drop across the deposit layer formed by caseins or whey proteins is up to 50% of the transmembrane pressure [2]. Moreover the RO is limited by the osmotic pressure of the solution being concentrated. Therefore operating pressures up to 40 bar are required to ensure a sufficient level of permeation. The concentration process of milk and whey with RO is therefore limited to a dry matter content of <20-25%.

Despite the limitations mentioned above, RO is, to a certain extent, used for pre-concentration. This is due to a favorable energy consumption compared to the other concentration steps.

To avoid the limitation of the RO caused by the osmotic pressure, nanofiltration (NF) can, as an alternative, be used for concentration. The NF is run at lower operating pressures, thus lower levels of energy consumption. However, recycling of the NF-permeate with a high salt concentration has to be considered [3].

A research project was recently started by the »Allianz Industrie Forschung AiF (16836 N)«. It focuses on energy saving pre-concentration processes, combining innovative membrane systems with already established industrial processes. This will be presented throughout this article.

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Table 1: Energy requirements of the different separation techniques. [1]

Process	Specific Primary Energy Consumption [kJ/kg]
Ultrafiltration	≈ 5
Reverse Osmosis (VRF = 1-3)	≈ 45 - 90
Multi-stage evaporation with thermal compression	≈ 200
Spray Drying	≈ 6000

Figure 1: Energy levels of evaporation and membrane processes.

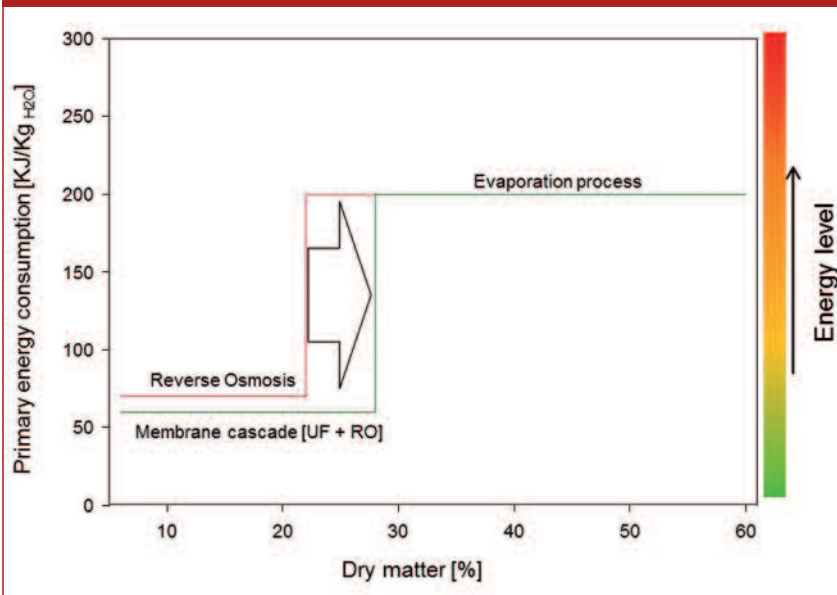
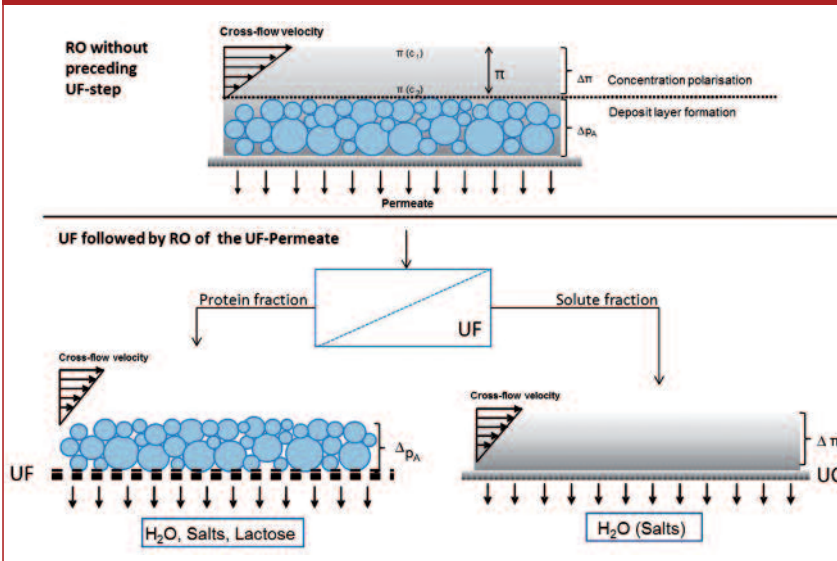


Figure 2: Decomposition of the concentration process into two separation processes.



Decomposition of the separation process into membrane specific subtasks

For the NF as for the RO, the deposit layer formation decreases the flux with up to 20-30% from the initial value. The deposit layer can although be transferred to a preceding step by adding an ultrafiltration (UF) step (see Figure 3).

Without UF as a pre-step, the capacity of the RO is not only reduced by concentration polarization but also by deposit layer formation. By including UF, the RO is released from the protein deposit layer as illustrated in the lower part of Figure 2. Hence the RO can exclusively be used to overcome the osmotic pressure, resulting from the presence of low molecular substances such as salts and sugar. The preceding UF which concentrates proteins is however not affected by the osmotic pressure of the filtered solution since the membrane structure is made up of big size pores. The combination of UF with RO or NF provides the option to split the concentration process into two subparts. Within the project, tubular ceramic membranes with optimized fluid flow geometry and in particular dynamic filtration modules will be studied for the production of high yield protein concentrates. The principle idea is here to transfer the effect of the deposit layer formation to a filtration running at lower pressures, thereby letting the fouling effect occur at lower critical energy consumption levels.

High yield concentration of the protein fraction with new membrane technology processes through the application of UF

The use of conventional tubular and spiral wounds UF-membranes when concentrating milk and whey up to 15-20% of protein, is still problematic. The extreme formation of a deposit layer namely leads to a strong flux decline. The permeate flow rate drops to a non-profitable operating level. The concentration process is therefore limited by the extent of the deposit layer. In addition to the fouling, the raising viscosity of the concentrate leads to increased friction during recirculation, hence contributing to a thermal energy input into the product. This can result in an undesirable change of the proteins as e.g. aggregation reactions. To avoid these effects, the UF-step can in

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Figure 3: Principle of the dynamic cross-flow filtration.

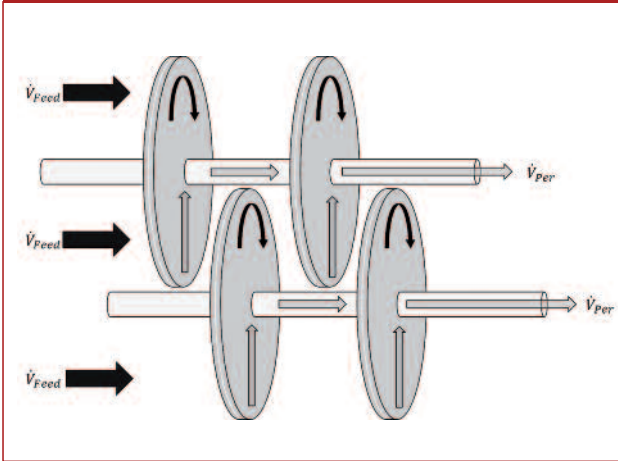
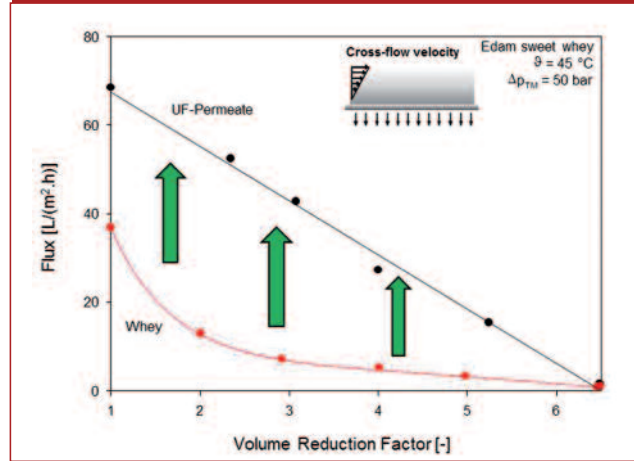


Figure 4: Reverse osmosis of whey and whey-UF-permeate.



turn be divided into two parts in order to reach higher protein yields than usual. Conventional UF cross-flow membranes (e.g. as spiral wound or tubular ceramic modules) can be used up to a certain degree of concentration of proteins i.e. to a certain volume reduction factor (VRF). Viscosity-tolerant dynamic UF systems are then necessary to reach higher concentration degrees.

As conventional UF, the dynamic UF is also based on the principle of cross-flow filtration. It generates the shear stress required to remove the deposit layer. However, this is not done not through the turbulent flow over the membrane, but through the movement of the membrane itself (see Figure 3). The hollow disc membranes used, are mounted on a rotating shaft powered by an electric motor. The resulting permeate is then transported, away from the membrane, through the shaft. The specific configuration of this

membrane system enables lower levels of energy consumption. This is due to the low pumping energy required, for the pump, to build up pressure and to recirculate the concentrate. Moreover, the dynamic UF process is less sensitive to high viscosities and can therefore be used for the concentration of high viscous products [4,5].

The research project investigates, by varying the process conditions, if dynamic cross-flow filtration systems are suitable as a post-step to the conventional UF for the production of high yield concentrates. This is analysed in regard of possible changes of the components, in particular milk and whey proteins.

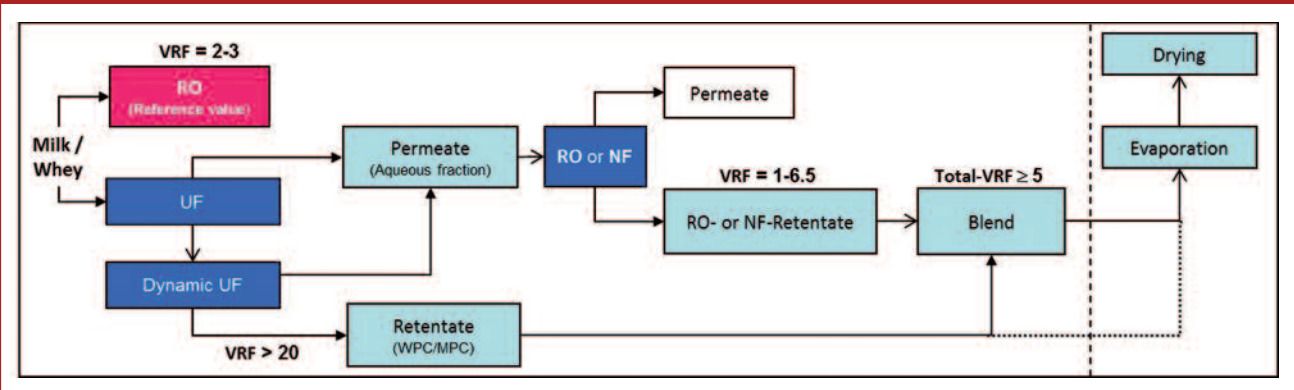
Concentration of the solute fraction through RO

The following step of the processing line is the concentration of the UF-permeates collected from the conventional

and dynamic UFs. These protein-free milk and whey UF-permeates can consequently be concentrated without the formation of a protein deposit layer. It is thus possible to work at higher flux levels and to efficiently concentrate the solute fraction to higher dry matter contents with minimal energy input. The results of the RO of sweet whey and sweet whey UF-permeate are illustrated in figure 4. It can be concluded that the RO-flux increases significantly after the removal, by the UF, of particles causing the deposit layer formation.

The blend of the concentrates individually obtained from the UF and RO/NF should result in concentrates of milk and whey with overall higher concentrations than those obtained by conventional methods. Those combined concentrates are produced through reduced energy consumption. On top of this, if higher dry matter contents need to be reached any

Figure 5: Combination of UF and RO/NF for the concentration of milk and whey.



further, less water has to be removed from the product during the energy demanding evaporation process. This is due to the high degree of concentration already achieved.

Impact of the cascade filtration concept on the energy demand

To summarize, combining various membrane filtration techniques in a cascade process for the concentration of milk and whey (see Figure 5), has both the advantage to generate a high degree of concentration and to minimize the energy input. By reaching higher yields of concentration for both the protein and the solute fractions than what has been

achieved to date, the energy demanding evaporation process can be significantly relieved. Moreover, the cascade filtration process (UF followed by RO) results in a reduced energy demand of the RO through the elimination of the protein deposit layer.

Hence, the transmembrane pressure can exclusively be used to overcome the osmotic pressure of the solution to be filtered. To conclude, a decrease of the overall energy consumption of the complete membrane cascade process is to be expected.

This concept is currently being worked out in technical detail. This early report is meant to highlight an opportunity for mo-

re energy efficient and therefore climate protecting concentration of milk and whey for enterprises to consider this for resource saving efforts in milk industries.

Future reports will follow up on this concept paper presenting more quantitative results.

Acknowledgement

This ongoing research project is supported by the German Ministry of Economics and Technology (via AiF) and the FEI (Forschungskreis der Ernährungsindustrie e.V., Bonn). Project AiF 16836 N. Companies interested in participating in this pre-competitive research project are invited to contact the authors.

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GEA Westfalia Separator presents sustainable process technology

GEA Westfalia Separator Group has once again lived up to its reputation as a leader for mechanical separation technology. At drinktec 2013 in Munich, the specialist for decanters and separators will present two pioneering processes for breweries and dairies. Both production processes stand out for their exceptionally gentle handling of the elements of foodstuffs beer and milk, which deserve protection, within the production process and for their explicit sustainability, which is reflected in reduced process stages and the economic handling of resources.

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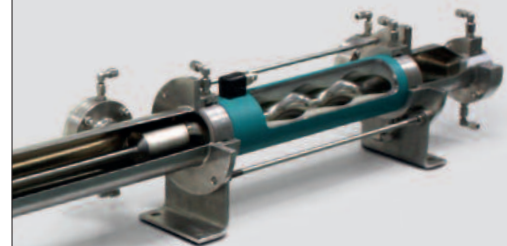
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Aseptic Processing: What you need to know

How many times has product quality been affected by improper processes that cause chemical, physical or microbiological contamination during the filling process resulting in premature spoilage, or even product recalls?

One way to create long shelf life, safe and therefore high quality products: **aseptic processing**.

What is the effect on the product of being processed aseptically?

If we compare the shelf-life of milk:

- Fresh milk: 7–10 days, when refrigerated
- ESL (extended shelf life) milk: 21–45 days in a cool environment
- Aseptic filled UHT milk: 6 months or longer, even without cooling

Aseptic processing extends the life of a product greatly, as compared to other filling methods, with minimal impact on nutritional value.

There are many advantages to aseptic processing including greater efficiencies, reduced energy costs and wider market reach. But the benefits don't stop at the plant. Retailers and consumers also see benefits. The benefits for the three groups can be summarized as follows:

Advantages for the processor (manufacturer):

- Efficient centralized plants which reach large geographical markets
- Opens up new markets
- Reduces costly product returns from retailers
- Decreases deliveries and simplifies the supply chain
- No need for refrigerated trucks
- Reduces labor cost

Advantages for the retailer:

- Retailers can reduce the need for expensive refrigeration
- Simplifies the ordering and stocking management system
- Reduces labor costs

Advantages for the consumer:

- Reduces any chance of product spoilage
- Shelf-stable, more convenient nutrition for people on the go
- Reduces refrigeration space
- Reduces trips to the store

a•sep•tic proc•ess•ing

| ey-sep-tik | pros-es-ing |

1. the process by which a sterile (aseptic) product (typically food or pharmaceutical) is packaged in a sterile container in a way that maintains sterility.



What are the requirements for aseptic processing?

- Automation of cleaning and sterilization in place
- Common sterilization media (steam, hot water chemical substances such as nitrogen)
- The plant must be operated with a defined overpressure in the system at all times
- Proper process design with the right flow components chosen and piping that allows for full drainage of the system

Having a well-engineered and highly automated installation doesn't necessarily mean that you also have a safe and reliable process. Skilled personnel and strictly documented, regularly scheduled maintenance are just as important.

Who is GEA Aseptomag?

GEA Aseptomag, a company of the GEA Group, are specialists in the field of aseptic processing. Since 1985, GEA Aseptomag has been using their knowledge and experience to develop and design a complete range of aseptic valves and related process components, aseptic modules and skids as well as product recovery systems and filling machines.

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aseptic technology.



GEA Aseptomag is a specialist in the area of aseptic components technology. Since 1985, we put our knowledge and experience into the development and fabrication of high quality aseptic valves as well as related process components and systems. To enable maximum safety in aseptic processes, we do not allow us any compromises with our own products. Thanks to our complete valve range and our experience in skid and machine fabrication, we can help you in the following areas:

- Valve technology
- Pigging technology
- Skid fabrication
- Machine construction
- Engineering
- Service & Support

Interested? Contact us:

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Direct digital printing of PET containers

Dr. Peter Stelter, Martin Schach

At the time of writing PET beverage bottles are usually dressed in wrap-around labels made of plastic or paper which are applied by a roll-fed labeling machine. With its newly developed Innoprint printing machine KHS can now offer its clients direct digital printing, from which both marketing and production profit.



The high quality of the direct print process produces brilliant color images.

The chief benefits of direct Innoprint printing lie in much greater flexibility and, accordingly, a very fast reaction time to new market demands, in minimized changeover times, and in even more sustainability. The resulting print has a high brilliance and excellent resolution. Bottle-to-bottle recycling is also possible.

Classic roll-fed labeling...

In classic roll-fed labeling offset printing is utilized for the film and/or paper used in the labeling process. Rolls of labels are supplied to the beverage company, with labels being glued to the containers

»from the reel« and adhesive applied by a roller or nozzles. As a rule, it takes 12 to 14 weeks from label layouting to the sale of the filled bottle. Minimum quantities must be ordered to keep label costs economically viable.

...versus direct digital printing

Direct digital prints are applied to PET bottles using inkjet printing technology, for which only special inks are utilized. This not only means that shipping costs for materials are greatly reduced compared to the standard system but also that CO₂ emissions are cut thanks to the smaller number of deliveries.

Time to market greatly reduced

The definitive argument for the beverage industry is, however, the extremely high level of flexibility direct digital printing gives them. Much shorter times to market are the result. There are no more time-consuming label printing processes or long shipping distances for label materials. The required print image is transferred straight from the computer to the labeler's control unit where it is broken down into the five colors white, cyan, magenta, yellow and black. Other spot colors are also feasible if a specific logo needs to be printed in true color, for instance.

This procedure opens up an entire range of unprecedented opportunities for the industry. Take sports events, for example. One of the options direct printing presents is of providing participants with

a filled PET bottle bearing the logo of the winning team shortly after the event. International companies also clearly profit from the new system, as all of their sites throughout the world which have an Innoprint can access centrally supplied data for new label designs. This enables products printed with the new labels to not only reach the markets faster but also at the same time. One good example here is the soccer World Cup. Should one of the sponsors suddenly wish to congratulate the winning team through its bottle labels on all continents simultaneously, direct printing is the answer.

Each bottle is individual

Another plus of the direct print system is that minimum order quantities for labeling materials are no longer an issue. Bottling plants can apply a specific motif to even the tiniest batch of bottles. The Innoprint control unit's very fast processing of the data it receives even allows each individual PET bottle to be printed with a different design if so desired. For example, on investing in the most powerful machine a beverage concern with 36 000 employees could dress 36 000 PET bottles with individual photos of its personnel in just one hour of production time.

Seamless production of new image files

Another advantage is that format changeovers are recipe controlled. As the bottles are handled by the neck and the

print head is mobile, no elaborate manual changeover of format parts is necessary. If the bottle type isn't changed when a new image file is used, the transition in production is seamless and without interruption. If the bottle size is altered, the print head reacts within seconds to the new bottle diameter and/or height. The machine is able to process a large number of different PET bottles, with containers holding from 0.33 to 1.5 liters all doable. Container diameters can vary between 40 and 120 mm.

Modular design

The Innoprint is designed to put out 36 000 PET bottles per hour. Each color carousel in the machine has 12 printing segments. If this capacity is too high, smaller output rates are possible, with the number of segments in the carousels simply being reduced to this end. In order to produce a maximum of 12 000 bottles per hour, for example, only four print stations per color are needed. This well-thought-out concept allows companies to start out with a low machine output and boost this at a later stage if required.



The empty PET bottles to be printed are handled by their necks on the Innoprint.



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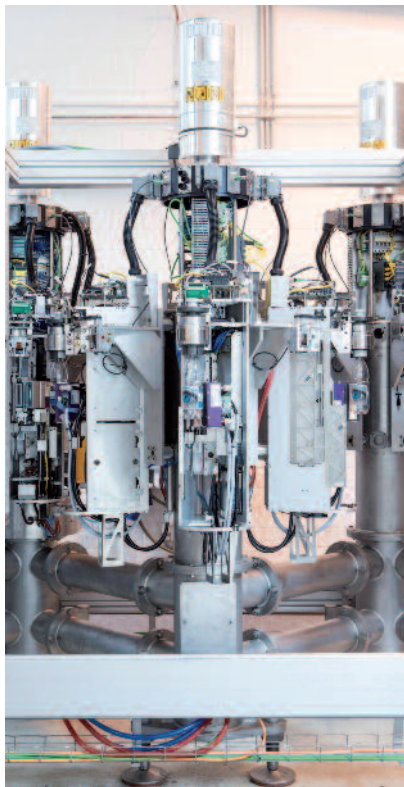
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UV inks for demanding KHS specifications

The containers are printed with UV inks which meet KHS' extremely demanding specifications. So that they can be processed by an inkjet head they must have a low viscosity. The fast-drying ink matches the machine speed, has a good opacity, and allows individual colors to be overprinted. These inks also have a perfect adhesion on untreated PET bottles. The quality of the print is retained during further processing of the PET bottles on the line, shipping to the retail outlet, and handling by the consumer. Should the line stop for any reason, there is no risk of these inks thickening or forming sediment.

Brilliant imaging

One very important point to note is that the impressive printing quality produces a brilliant color image that is in no way inferior to the quality of classic rolled labeling – and in some cases even surpasses it. The optical resolution here is 1 080 x 1 080 pixels.



At full capacity each color carousel in the machine has a maximum of 12 printing segments.



Low-migration inks used

The inks used are food grade. Investigations into their migration characteristics have revealed that the inks utilized by KHS are low-migration products which are well below the permissible limit values prevalent in the food-processing industry. The ink used by KHS is also practically odorless compared to conventional UV inks.

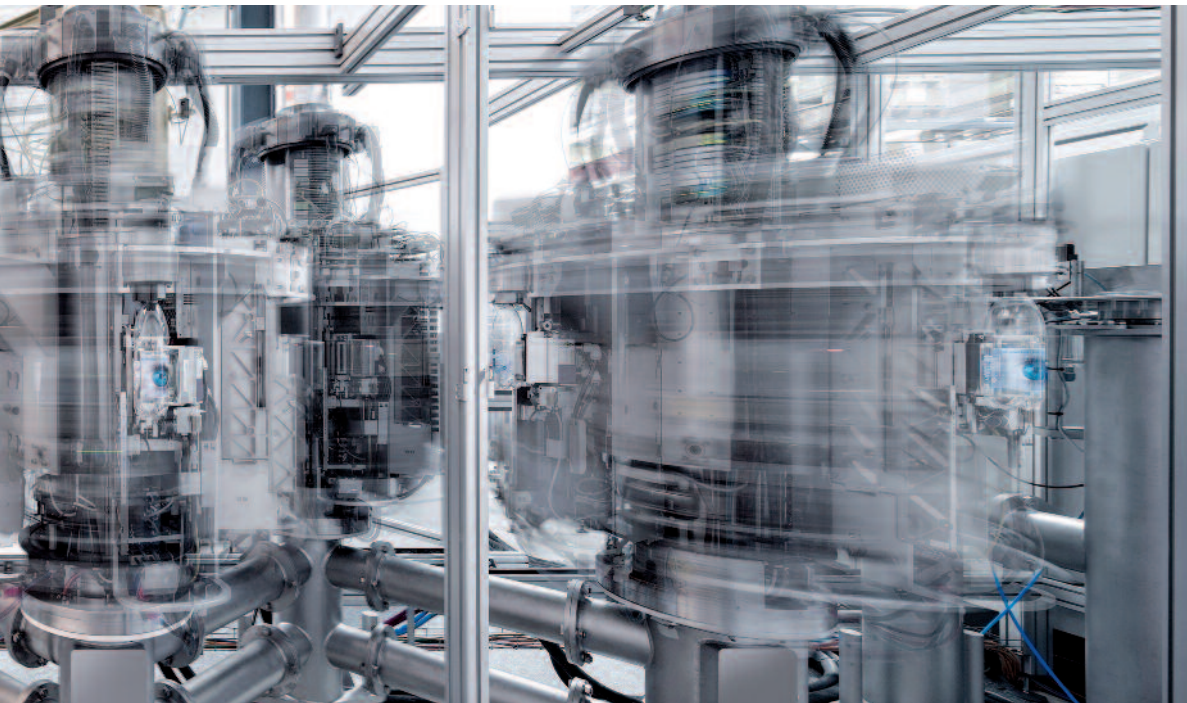
The Innoprint only prints on empty containers which are usually fed to the machine by an air conveyor. The printer can also be monoblocked with a stretch blow molder, thus reducing the amount of space required.

On the Innoprint the bottles are handled by their necks and the unfilled containers stabilized by sterile air or nitrogen being fed into the bottle interior. The mouth is sealed during direct printing to prevent germs and aerosols from entering the container. Clamping units (pucks) driven by a direct drive transport the PET bottles to the individual color carousels and lock each into place magnetically. At the end of the printing process the pucks are conveyed back through the color carousels towards the machine infeed where they pick up the next containers.

CYMK+W color model

The standard Innoprint has five color carousels, each of which applies one color. In order these are white, cyan, magenta, yellow, and black.

Within each color carousel drops of ink in the stations are printed onto the untreated PET substrate by high-speed print heads where they gradually form the required pixel. In the print heads the ink flows continuously through piezoactive channels which can be activated by electrical pulses with a frequency of up to 50 000 Hz, and which through narrowing can create drops of varying fineness from 6 to 42 picoliters. This principle has proved itself to be especially robust and produces very sharp printing outlines. A pinning lamp briefly dries the applied ink in each printing station, ensuring that it cannot run during the next stages in the process and providing a high edge sharpness. After passing through all of the color carousels the PET bottles then travel through the UV curing unit where more intense UV light reliably hardens the ink and causes the ink to adhere perfectly to its PET base. As it saves energy, is sustainable, and has a long service life, modern LED UV technology is utilized.



The standard KHS-Inno-print has five color carousels, each of which applies one color. In order these are white, cyan, magenta, yellow, and black and the machine is designed to put out 36000 PET bottles per hour.

Recesses in or projections on the PET bottle can also be printed on as long as they keep to the minimum required distance of about 3 mm to the print head. If this feature is required, a camera unit is inserted upstream of the printing process and the bottles placed in their pucks according to the camera's specifications. This ensures the highest precision here, too.

Bottle-to-bottle recycling

One crucial aspect of this process is that PET bottles printed on the KHS-Inno-print are suitable for bottle-to-bottle recycling, as studies at various recycling plants have illustrated. Hardened inks can be completely removed from the flakes.

If we compare the cost of labeling using this method with the labeling costs for classic labeling processes, we notice that direct digital printing is initially financially beneficial for small batches in particular. At present the printing process generates comparative cost advantages with small production runs of up to 100 000 PET bottles. Where the Inno-print setup is implemented, between 0.1 and 0.25 ml of ink is needed per bottle print, depending on the degree of coverage, resolution, and size of the printing area.

To sum up, for many companies the chief advantage of direct printing lies in its great level of flexibility which is crucial if they are to stay highly competitive. A clear reduction in warehouse logistics, minimized changeover times and thus higher line availability, and a smaller carbon footprint thanks to less shipping of materials round off the wide range of Inno-print benefits.



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Demand is increasing in the USA, South America and Asia

Greek yoghurt is currently experiencing a boom in demand in the North American markets. Other regions in the world are gearing up to enter this sector. Christian Frahm, Beverage and Dairy Director of GEA Westfalia Separator Group, Oelde, knows why.



Christian Frahm,
Director Beverage and
Dairy of GEA Westfalia
Separator Group, Oelde.
photos: GEA

dmz: Mr. Frahm, why is Greek yoghurt or »strained yoghurt« celebrating such successes at the moment in some regions of the world?

Christian Frahm: That is very easy to explain. Greek yoghurt is the taste of the moment. It is creamy yet fat-free or light with a maximum fat content of 2 %. It is a natural product with no added preservatives or stabilizing agents. Compared with normal yoghurt, the 8 to 10 % protein content of Greek yoghurt means it has around twice as much protein and up to 50 % more of vitamins A and B and therefore a third less lactose. At the same time, it is also nutritious, healthy and tastes simply fantastic. That is exactly in line with the big trends of the day for healthy nutrition with natural foodstuffs.

dmz: Particularly in the USA, demand is growing disproportionately. What is the situation there?

Christian Frahm: In the USA, normal yoghurt has been present on a greater scale only since the 1940s. Consumption per head is still around a fifth of the European average. This alone reveals the potential. For a few years now, a wave of demand has been rolling along the East Coast of the USA – and washing over to the very health-conscious West Coast.

In the state of New York, which now has 28 yoghurt factories, they are already talking about a Silicon Valley of yoghurt. According to official figures, from being a niche product, Greek yoghurt now holds 36 % of the 6.5-billion-dollar US market for yoghurt. The boom in yoghurt and soft cheese products is also making its presence felt directly in the incoming orders. Whereas a soft cheese separator was previously in demand only occasionally in the USA, over 80 fresh cheese installations from us have been ordered by various manufacturers from North America in the last five years alone.

dmz: The USA is not the only country in which the variety Greek yoghurt is opening up new markets. What is the situation in South America?

Christian Frahm: Greek yoghurt and soft cheese of all varieties have great potential and not only in the USA. In Brazil a new factory is currently being built, for which GEA Process Engineering is supplying the entire system and GEA Westfalia Separator Group is supplying the separators. As yet, only trials on the basis of dried milk powder have been conducted in South America. However, these products are not comparable with Greek yoghurt made with fresh milk.

The unique feel of creamy, fresh-milk yoghurt in the mouth with its high protein content makes the difference. The first-time market launch of Greek yoghurt by a large international manufacturer will be very popular in Brazil.

dmz: And what are the prospects in Asia?

Christian Frahm: South Korea is leading the way here. The sales volumes of yoghurt in this country are still relatively small but that will change with the introduction of Greek yoghurt. The expected growth should come strongly from this new sector. Chinese and Japanese manufacturers are also showing an interest in our new process and there is already one plant in operation in Australia.

With their positive properties and diverse marketing varieties, these products offer good opportunities for the development of new ideas including with a regional focus and therefore for generating additional value added.

Well-ried centrifuge technology

The production of such a demanding quality with its relatively high content of protein will be successful in an excellent way preferably by centrifuge technology. First of all skim milk is heated to a high temperature and is kept hot for several minutes. Then, for fermentation a thermophilic yoghurt bacteria culture is added to the coagulation tank. After intermediate straining, which is integrated in the valve block of the GEA Westfalia Separator Group, the thickish milk is passed directly to a nozzle separator which separates the milk into whey and yoghurt. After cooling, many ingredients, such as fruit, syrup or cream can be added to the finished product subsequently.

Nozzle separators without partial ejection and losses

The process of producing Greek yoghurt or »strained yoghurt« differs from the production of quark cheese primarily in that yoghurt cultures are added and in that a dry substance, which is popular at present, is included of less than 18 %, which is usual for fresh cheese. The separators always used for the production of strained yoghurt are nozzle separators



Greek yoghurt is currently experiencing a boom in demand.

of type KDB. These nozzle separators operate without partial ejection which means that there are no losses in the production. Machines with partial ejection loose about 10 to 20 kg of product during each ejection process. This can add up to hundreds of kg of product on each working day.

Another important advantage is the long operating time of at least 16 hours without intermediate cleaning. The general low requirements on CIP cleaning for the separator, which can be carried out together with the periphery, set this process apart positively from alternative concentration technologies – especially with respect to operating costs.

KDB nozzle separators offer the possibility of adding various requested dry substances by setting the infeed quantities and varying the diameters of the nozzles. Thus, they can be used flexibly for different milk products. All in all, they are able to produce strained yoghurt products and other types of cream cheese very cost effectively at a high efficiency.

The GEA Westfalia Separator Group supplies the nozzle separators together with the required peripheral equipment. All process components for inlet and outlet control including the double strainer are integrated on a stainless steel frame such as valve block and cleaning unit. These units are pre-mounted, have been test-ed in the works of the manufacturer and permits easy installation and quick commissioning on site.



For the production of strained yoghurt separators of type KDB are used. These nozzle separators operate without partial ejection which means that there are no losses in the production.

SIG Combibloc's environmental performance: Projects show first results

Ambitious goals: reduced consumption, even more packaging with FSC® label

When you work toward an objective, it pays to look back on what has already been achieved. This applies equally to SIG Combibloc as it seeks to reduce the environmental footprint of its carton packs, filling machines and production processes still further, to ensure that its packs, which are already among the most environmentally friendly for long-life food, can become even better. Targeted individual projects show first results at SIG Combibloc and can be clearly seen in the company's environmental performance.

In 2009, SIG Combibloc set itself the goal of reducing CO₂ emissions in its packaging materials plants world-wide by 40%, its energy consumption by 35% and its specific waste production by 25% by 2015; in addition, it aims to increase the proportion of carton packs carrying the label of the Forest Stewardship Council® (FSC®) to 40% by 2015. »We have focused on the points of adjustment that are demonstrably the most significant, so as to achieve the greatest possible benefit for the environment with our products and manufacturing processes. And we are on track with this. We have made marked progress thanks to focused environmental commitment at our various locations world-wide«, says Rolf Stangl, CEO of SIG Combibloc.

Independent and critically verified life-cycle assessments by prestigious specialist institutions assist SIG Combibloc in analyzing the environmental impacts of its carton packs and to make constant improvements in this regard. The results of up-to-date scientific

life-cycle assessments for packaging for UHT milk (2012), non-carbonated soft drinks (2011) and long-life food products (2009) provide SIG Combibloc with a valid dataset including an assessment of carton packs compared to alternative packaging from an environmental per-



SIG Combibloc has set itself the goal of constantly reducing the environmental footprint of its carton packs, filling machines and production processes, and of making its carton packs even better, as particularly environmentally friendly packaging for long-life food. Targeted individual projects are showing first results at SIG Combibloc and can be clearly seen in the company's environmental performance.

Photos: SIG Combibloc

spective for each market sector in which the company provides packaging solutions. All of these studies confirm that, compared to other packaging, carton packs generate significantly less CO₂ and

use less primary energy and fossil resources. The main reason for the good environmental performance of carton packs is the high proportion of cardboard used, which is made from wood, a bio-based, sustainable and renewable raw material.

Says Michael Hecker, Head of Group Environment, Health & Safety at SIG Combibloc: »You could say that these studies have helped us to generate important knowledge regarding potentials for improvement. This also affects our production processes. We have already been able to make a noticeable reduction in our energy consumption, which in turn has a positive effect on reducing our CO₂ emission rate. We are making improvements in areas such as infrastructure in our buildings and cooling systems. This will also contribute to an even greater reduction in energy consumption and CO₂ emissions at our production facilities.«

FSC® certification: more trail-blazing

By obtaining FSC certification for its carton packs, SIG Combibloc is making equally good progress toward its goal of increasing the proportion of FSC-labelled carton packs worldwide to 40% between 2010 and 2015. »At 16% by mid-2012, we were clearly in the target zone, still six months before the half-way point«, says Hecker. »Seeing the FSC logo on our carton packs reassures consumers that the raw cardboard manufacturer is processing the corresponding volumes of wood that are sourced from an FSC-certi-

fied, exemplary forest management system, and other controlled sources.« The go-ahead was given in 2009: by late 2009, SIG Combibloc was the first manufacturer of carton packs to have certified all of its production facilities world-wide in accordance with the FSC criteria for a continuous Chain of Custody (CoC), which it maintains to this day. This enabled SIG Combibloc to offer its customers world-wide carton packs that are allowed to carry the »FSC Mix« label (trademark license code FSC®C020428).

The first of SIG Combibloc's carton packs with the FSC label appeared in all of the German branches of the Lidl retail chain. These were the first FSC-labelled carton packs for fruit juices and iced teas anywhere in Europe. After the FSC-labelled packaging subsequently made a successful start in other parts of Europe, the first carton packs for yoghurt drinks carrying the FSC label were made available in China, the result of a joint effort with the lead-ing Chinese dairy group Yili. These were followed by the first FSC-labelled carton packs from SIG Combibloc for juices and fruit juice drinks in the USA and UHT milk in South Africa. These were marketed by Johanna Foods, one of the largest suppliers and co-packers of juices and fruit drinks in the US, and DairyBelle, South Africa's oldest and leading dairy business.

Today, SIG Combibloc carton packs with the FSC label are on the market in Europe, Asia, North and South America and Africa, accounting for more than 1,600 different product packs in 21 countries.

WWF praises commitment

The FSC standards are recognised and supported by international environmental protection organisations, such as the World Wide Fund for Nature (WWF). Says Johannes Zahnen, in charge of forestry policy and business partnering at WWF Germany: »We believe that labelling carton packs achieved a particular result in terms of the perception of the FSC label and what it means, both in the food sector and among consumers.«

Studies in various regions of the world



About 75% of a carton pack is cardboard, which is made from wood, a renewable resource. If forests are managed properly and responsibly, this natural raw material can be a virtually inexhaustible resource. SIG Combibloc is committed to the standards of the Forest Stewardship Council® (FSC®), which is dedicated to responsible and exemplary forestry management world-wide. SIG Combibloc's goal is to increase the proportion of FSC-labelled carton packs worldwide to 40% by 2015.

have shown that the FSC label is enjoying increasing familiarity. In Germany, where the first carton packs with the FSC label in the fruit juice and iced tea sectors were marketed in Europe, spontaneous familiarity with the FSC label was about 28% in 2011 (Source: »Facts and Figures on FSC® growth and markets«, published by FSC®, April 2012). According to the study, as many as 43% of consumers in the UK claimed to be familiar with the FSC logo, compared to only 19% four years previously. A similar dynamic can be observed in other parts of the world, too: in Hong Kong, for instance, 29% of consumers recognised the FSC label in 2011, compared to 16% in 2010.

Says Zahnen: »We believe that the FSC-labelled carton packs have played a key role in increasing this familiarity level. We need companies with clearly defined, ambitious objectives. Only by having goals in front of you can you direct them with bold and motivated steps. It is excellent that SIG Combibloc has made a clear commitment to FSC and is working actively toward achieving this goal. It is important that SIG Combibloc continues to take an active role in driving this process forward, motivating its suppliers, enthu-

sing its customers for the subject and finally also giving consumers the opportunity of choosing the better product. Increasing awareness of the significance of responsible forestry management will also mean that the food sector will commit in greater numbers to FSC-certified packaging. Of course, there is a long way to go before the FSC® logo appears on all of SIG Combibloc's carton packs, but it is still achievable.«

Recycling – active world-wide

SIG Combibloc's commitment to developing and expanding national collection and recycling systems is also bearing fruit. Says Rolf Stangl: »Recycling is a fundamental element in SIG Combibloc's environmental sustainability strategy. This is why we are actively committing to developing collecting and sorting systems and implementing the corresponding recycling technologies world-wide, for instance in China, Thailand, Brazil and the UK. The use of wood, as a sustainable raw material, means that used carton packs are a valuable source of material for high-quality paper products. This is resource-efficient and saves raw materials.«

»No Shortage of Experience« – The Dairy Industry in Consolidation Finish

Oliver Göbl, Dr. Christoph Willers

Mergers in the German dairy industry will continue in the coming years. The main drivers are: the arrival of foreign competitors on the German market, a high degree of self-sufficiency, and the industry's structural weakness. Companies involved in mergers are seeking opportunities to improve their international competitiveness in the near future. And there is a particular focus on the cooperative sector. These are the findings of a recent study undertaken by RölfsPartner Management Consultants.



Dr. Christoph Willers is senior manager at Rölfs RP Management Consultants and leads the agriculture & food industry team. His focus in strategy- and process-consulting is sustainable organization and the adaptation of management systems across the entire value chain.



Oliver Göbl is member of the management board at Rölfs RP Management Consultants. As partner, he is in charge of the agriculture & food industry team. For nearly 20 years, Oliver Göbl has advised companies in the fields of strategy and organization, particularly during growth and consolidation phases.

Players in the food industry have learned to cope with the merger phenomenon and its impact. This has led to similar assessments year by year: the concentration process will continue and the number of independent producers will shrink further. Therefore, the consolidation process often gives the impression of being an omnipresent force of nature that influences the industry's annual M&As and insolvency statistics mercilessly. After all, opportunities and strategic options play only a subordinate role for the parties involved in these transactions.

Objectives of the study

The study by RölfsPartner investigates structural developments in food-related

sectors in depth. The objective was to come up with answers to the following questions by analyzing individual subsectors: What are the challenges companies are faced with? What are the motives and drivers that will define future mergers? What are the dynamics likely to be? What strategic patterns might arise during M&A processes?

In order to evaluate consolidation activities and, hence, derive conclusions, six key drivers have been identified. The purpose of this approach is to facilitate comparisons between the different subsectors:

- **Operational weakness:** corporate performance along the value chain.
- **Vulnerability:** opportunities and risks with regard to the continued existence of the companies.

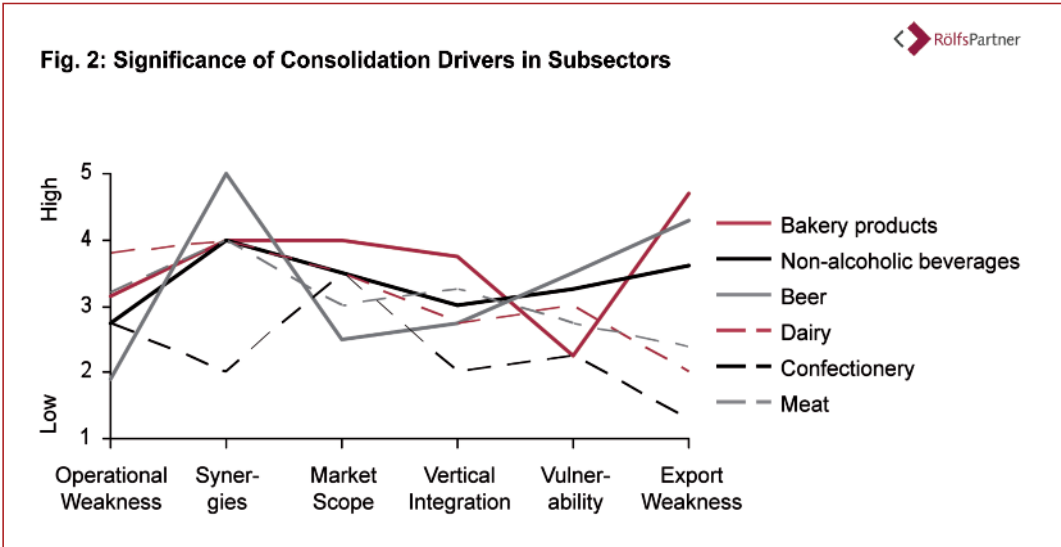
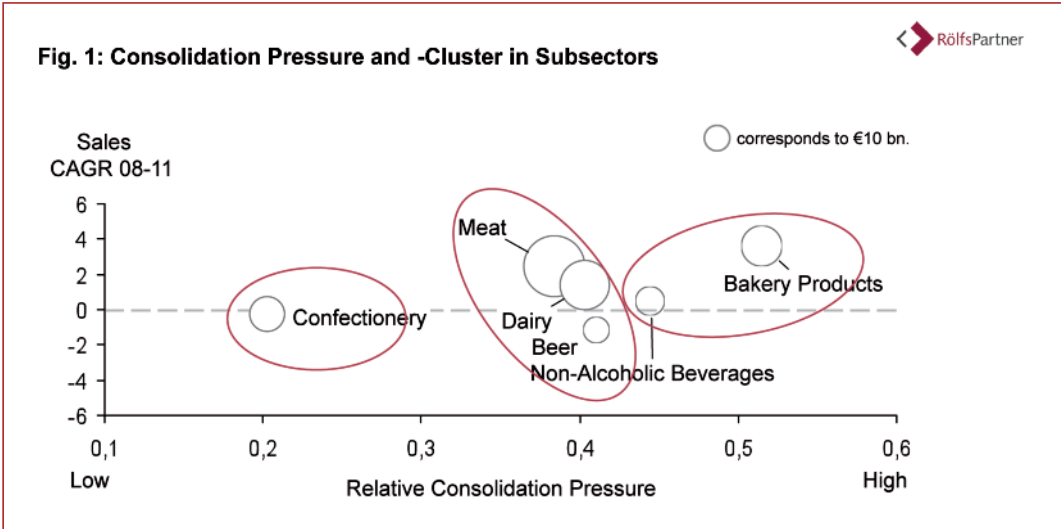
- **Synergies:** changes in the competitive landscape through mergers and resulting economies of scale.
- **Vertical integration:** vertical integration trends in the retail trade (producers' competency leadership is in decline).
- **Market scope:** targetable market volume based on segment size and complexity.
- **Export weakness:** potential in the opening up of international markets.

Consistent inconsistency of food subsectors

A comparison of the study's findings across food industry subsectors reveals significant variations in the merger progress achieved so far, as well as variations in expected merger dynamics. The assessments of consolidation drivers and the relative consolidation pressures show major fluctuations. This suggests that the subsectors are in different phases and therefore must be considered separately. Within the food industry, the dairy industry – next to the meat and beer sectors – faces a medium consolidation pressure.

Structural weaknesses cause consolidation pressure

The dairy market is the second largest subsector in the German food industry with sales of around EUR 25 billion. In 2011, milk supply hit a record high with almost 30 billion kg of raw milk, which accounts for approximately one-fifth of total EU production. In Germany, there has been a downward trend in the number of



dairy cattle, especially among smaller farms, but this is compensated for to some extent by the bigger dairy herds managed by large farms. Spurred on by M&A activity, the total number of milk producers has declined significantly, whereas large-scale producers continue to grow in size. About two-thirds of milk processing is handled by dairy cooperatives, although their number has decreased steadily over time.

Milk producer prices have now recovered from historical lows in 2009, when farmers were being paid just EUR 0.22 per liter of raw milk. Recent years have shown that growing export markets (EU exports amount to around 26% of global milk production) are a key factor for the industry's health. Notable incremental export growth rates were also recorded in

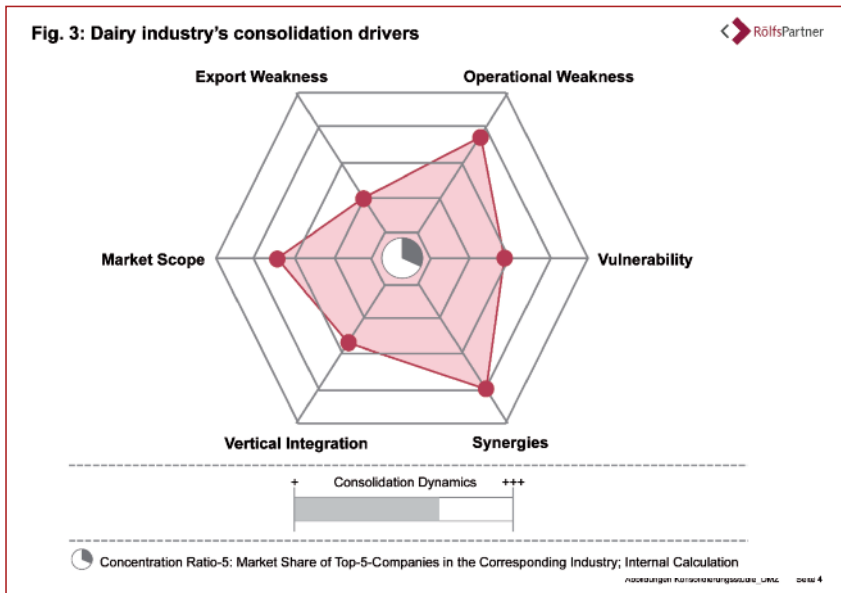
the cheese sector. Although many overseas markets are still untapped, German dairies need to speed up in order to gain a first-mover edge over their international competitors.

The three major German dairies in terms of volume – Deutsches Milchkontor (DMK), Müller Group und Hochwald – account for 11.5 billion kg of milk production annually, which is roughly the volume produced by the worldwide leader Nestlé (Switzerland). These three companies account for 40% of the aggregate milk processing market in Germany, whereas the remaining market share is split between approximately 200 other companies. DMK – revenue EUR 4.6 billion – is the only German dairy that has established a strong position alongside other top international dairies, even though leading

companies (Nestlé, Danone, Lactalis) generate three to four times as much revenue.

International growth will be essential

M&A activities over the past few years involving both national and international players are indicative of movement in the dairy market and also a willingness to reshape the competitive landscape. Furthermore, considerable interest is being shown in the German dairy market as a whole as well as in selected targets of the industry. Foreign competitors have not only been assessing possible acquisitions – they have taken concrete steps. For instance, in 2012 Arla sent a clear signal by merging with Milchunion Hocheifel



- Diversified dairy groups
- Efficient product specialists
- Regional suppliers (complementing retailers)

Diversified dairy groups

This type will be composed of large dairies offering at least three or more core businesses. They will have internationally competitive sizes and cost structures as well as solid bargaining powers in relation to retailers. Besides covering the domestic market, diversified cooperatives will expand into profitable overseas markets – mostly with international partners.

Efficient product specialists

Next to these diversified flagships, a number of efficient product specialists will penetrate specific dairy market segments successfully, offering a lean product portfolio. However, short-term market volatility has a greater impact on efficient product specialists, which need to put measures in place during better times in order to counter weaker future periods.

Regional suppliers complementing retailers

Assuming that regional suppliers can achieve optimal production costs, they can prosper in the long run. These suppliers will frequently supplement large retailers thanks to competitive production costs and cost efficiencies in the logistics sector.

Forecast

For various reasons, merger activities in the German dairy industry are set to continue. On the road to increased profitability, dairies are confronted with the challenges of realizing further market and cost synergies as a result of mergers. This in turn will lead to global competitiveness and create a foundation for growth in new markets. Foreign competitors will not be forced off the German market easily, however – their interest in over 80 million potential consumers is simply too great. International alliances will compete with German solutions; strategic combinations appear to be the ideal road to success.

(MUH). In 2011 it had already taken over the Hansa Milch and Allgäuland dairies – the target for 2015 is total sales revenues of around EUR 10 billion.

A considerable proportion of exports finds its way to the rest of Europe, in particular, by way of German discount chains. Since domestic suppliers are also used for some foreign markets, export activities only offset the dependence on large retailers to a limited degree. Generally, dairy giants are looking for growth opportunities outside of Europe – mainly in Asia, the USA and Africa. Despite steady growth rates in Chinese milk production, China is the largest importer of dairy products, just ahead of Algeria and Russia. As a result of increased liberalization in Asia, Ammerland and DMK, for instance, have been setting up their own distribution channels in Asian countries. On the other hand, the private dairies Ehrmann and Müller have already established factories in the US in order to compete in the yoghurt market.

Slight competitive edge over retail

The dairy industry has not been able to establish a major competitive edge over retailers. In fact, every year about two-thirds of 300 newly introduced products simply disappear from shelves after a short display time. Standardized dairy products are highly interchangeable due to low levels of

innovation and differentiation, which in turn has led to a steady rise in discount dairy products and to their high market share (> 50%) compared with other product categories. This burden is predominantly carried by private dairy brands. Only a few private dairies – such as Bauer, Ehrmann, Meggle, Müller and Zott – differentiate their products in some categories and have built up significant brand positions.

High merging dynamics

With a market share of 32%, the level of concentration of the Top 5 companies relative to total market volume is comparatively small. In addition, gross margin and profitability are relatively small compared with other subsectors. Structural weaknesses in the entire sector and the corresponding need for investment and restructuring pose serious problems for smaller dairies due to a lack of financial resources. In addition, synergies have the effect of a powerful driver of dynamics in the dairy sector. Not only do mergers create high synergy opportunities, they also appear to play a crucial role in improving international competitiveness.

The future belongs to three strong groups

As expected, three basic types of groups will have established themselves in Germany's dairy industry in the future:

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