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Restructuring Sweden's Milk Processing Industry

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Wholesome & Value Added Dairy & Food Products
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Restructuring Sweden's Milk Processing Industry

New Powder Factory in Vimmerby

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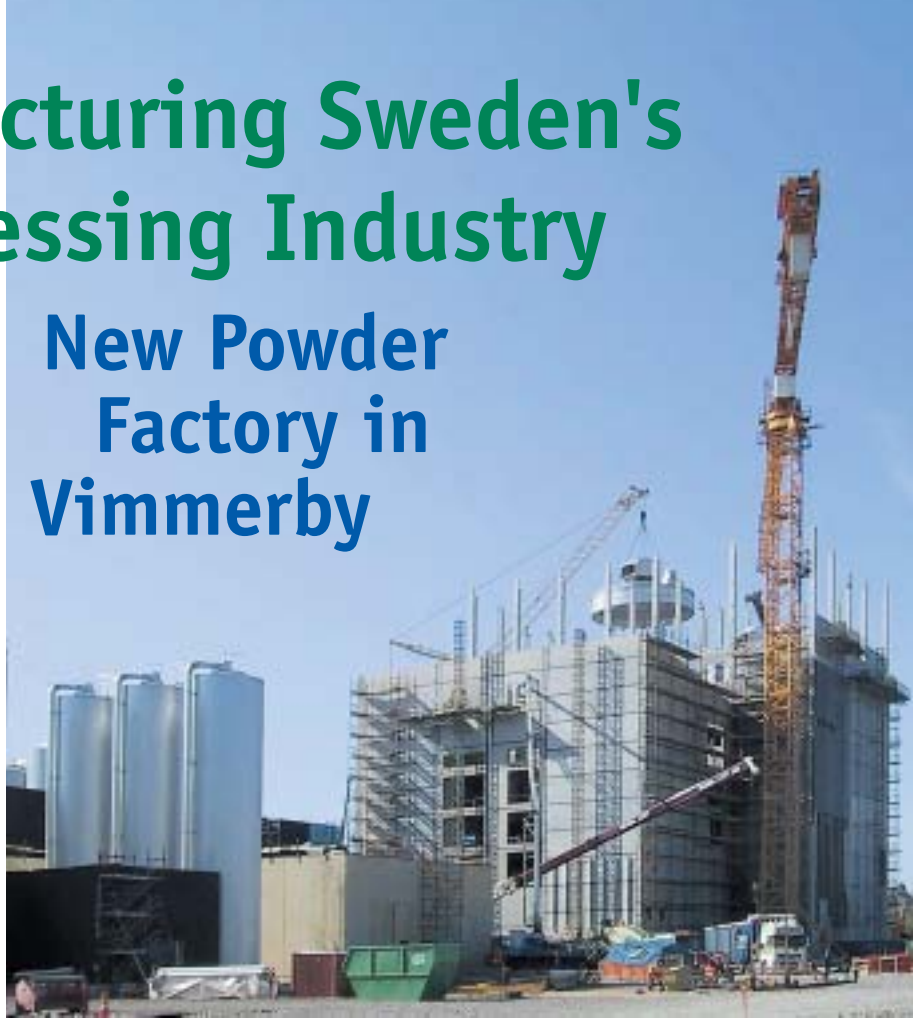


Part of drying chamber being lifted into the building.

When Arla in Sweden - with its 7500 dairy farmers - in the spring of 2000 merged with MD Foods in Denmark - with 8600 dairy farmers - they formed the largest dairy group in Europe, Arla Foods, www.arlafoods.com, with more than 6 bio. kg of milk each year. It corresponds to approx. 80% of the total milk production in the two countries.

The two management groups were planning ahead in the way of restructuring their production sites, of which some were found to be either obsolete in size or location, or simply too old. Already the year after, in 2001, the new Board of Directors presented their structural and strategy plan for both Denmark and Sweden.

In Denmark, the AKAFA and ARINCO sites have already been expanded with two Multi-Stage Dryers from Niro A/S, a member of the GEA Group.

In Sweden, the capacity to produce, mainly skim milk powder, and utilize surplus milk was insufficient. As also the cheese production had to be restructured, it meant that on the island of Gotland another evaporator and Multi-Stage Dryer from Niro A/S was installed in the existing powder factory at Visby dairy, already a part of the new Arla Foods Group.

Protection of the environment

Part of the plan for Sweden was further a completely new green-field powder factory for instant whole milk for export, and Vimmerby in the southern part of Sweden was chosen as the new site. It is well situated in terms of transport and the proximity to milk. However, this location also gave the possibility of building a plant fuelled by locally supplied biomass in form of wood chips. Together with local breweries in the area and the authorities of Vimmerby, a waste water treatment plant was built for the effluents. From this plant biogas is produced, and then combusted in an existing energy plant. Condensate from the evaporators will - after having been used for preheating the drying air - be irrigated on a nearby "wet land", made available by the authorities of Vimmerby. Thus, focus was also on an environmentally correct solution.

In spring of 2005, when the new factory is ready, it will process close to 400,000 tons of milk annually, resulting in almost 50,000 tons of instant whole milk powder.

The GEA Group

The contract for the processing equipment for the Vimmerby site was awarded by Arla Foods to the GEA Process Engineering Division headed by Niro A/S, Copenhagen, Denmark.

Milk reception and pre-treatment

For the reception, pre-treatment and storage of the milk, engineered and supplied by GEA Liquid Scandinavia in Skanderborg, Denmark, special attention was paid to low flow velocities in the pipes for the product and high velocity during CIP to optimize both production and cleaning. Due to the use of Tuchenhagen double-seal mix-proof valves, this process can be done simultaneously and independently, without risk of mixing CIP liquid with product. Road tankers and equipment for raw and pasteurized milk each has its own CIP plant to avoid cross contamination. From each of the storage tanks for pasteurized and standardized milk, two evaporators can be fed independent of each other.

Ariel view of the Vimmerby factory.

Evaporators

The evaporators will be designed and delivered by Niro's evaporator division in France. They are with mechanical recompression of the vapours discharged from wrap-around separators on the first two effects, followed by a thermal recompression of the vapours from the last effect to save energy. Preheating of the product is done in a direct contact heater with no heat surface in order to prevent thermophile bacteria to develop.

The above mentioned design with wrap-around separators for the first two calandrias has a very good separation efficiency, even at low pressure drop, resulting in optimal energy utilization. A further big advantage of the wrap-around design is reduced space requirements and smaller total surface from where heat is lost due to radiation.

After preheating of the product, it is possible to heat-treat the product in a direct contact heater with a regenerative flash vessel for gentle heating at low Δt, even to high temperatures. All applied energy which is not used to heat up and evaporate the milk is used elsewhere in the factory.

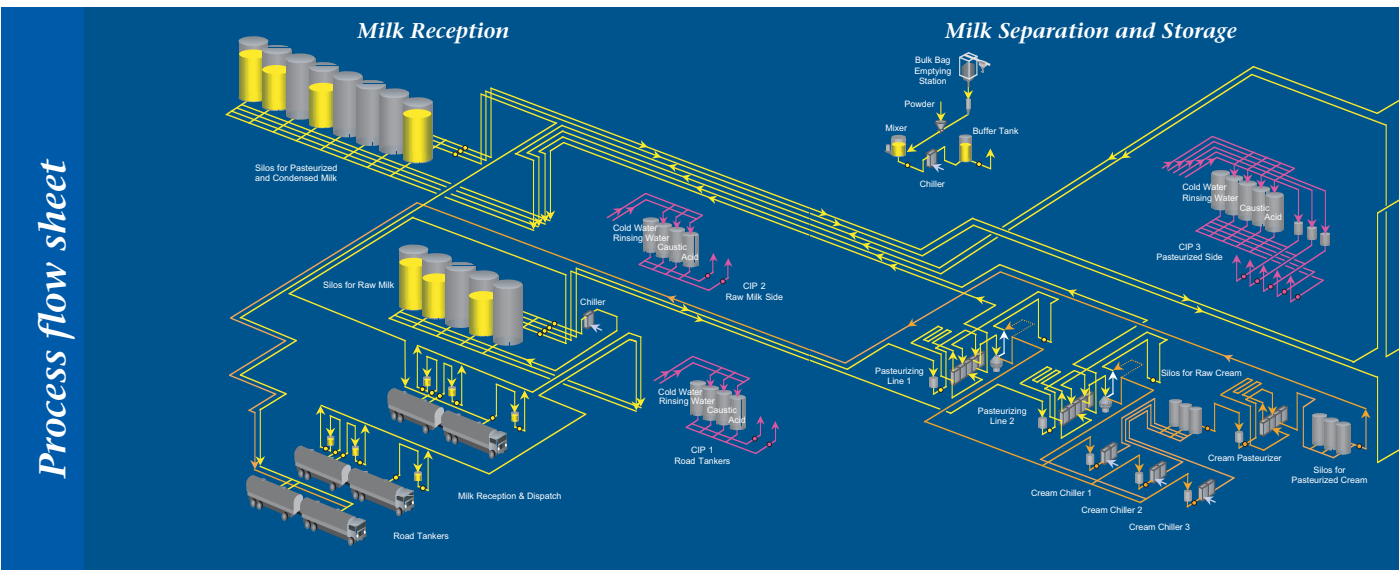
Spray dryers

The two MSD spray-drying plants selected by Arla Foods are being designed and delivered by Niro A/S Denmark. This type of dryer is the state of the art setting the quality standard for instant whole milk powder on the world market.

When the concentrate is discharged from the evaporator at 48% TS it is passed through a spiral-tube heat exchanger with corrugated tubes where the product is heated by water passing counter-currently with the product to minimize the Δt for a lenient heating and continuous operation.

The two MSD plants are equipped with nozzle atomization. The main drying air - heated by warm evaporator condensates and steam - is introduced at high velocity through a specially designed air disperser into the drying chamber, where water is evaporated from the concentrate to approx. 10% residual moisture. The remaining moisture is dried in an integrated fluid bed where drying air is introduced through a special perforated plate, which is unique in its design. The Niro BUBBLE PLATE™ - approved by USDA - is sanitary because of the fabrication technique of the holes. It ensures a very good emptying of the bed. The Multi-Stage dryer operates at a high drying air inlet temperature, but low exhaust air temperature. This makes it a very economical dryer, as the applied energy is utilized very efficiently. The final drying and cooling of the powder takes place in a VIBRO-FLUIDIZER®.

The exhaust air containing some powder particles is passed through CIP-able bag filters, the Niro SANI-CIP™ filter. The bag filter is of the reverse jet type and made of stainless steel. It consists of a cylindrical bag housing with spiral shaped air inlet, clean air plenum on top, and a conical bottom with fluidized powder discharge. During operation the product collected on the outside of the filter material is removed by a compressed air jet stream blown into the inside of each bag by means of a specially designed reverse jet air nozzle



MA Project factory model.

(patented) positioned above the bag. This results in a very even discharge of powder. The frequency and duration of the cleaning sequence can be adjusted to suit actual running conditions. The result is a low pressure drop across the filter, i.e. reduced energy consumption and noise emission. The noise is further reduced in a specially designed sound absorber. Another special feature in the SANICIP™ bag filter is that the bags are wet-cleaned from the inside towards the dirty outside (patented) by means of a clean water spray, reducing the overall amount of CIP water considerably.

The fines discharged from the bag filter are returned to the drying chamber - either to the static fluid bed or to the nozzles - depending on the degree of agglomeration wanted in the final powder - or to the VIBRO-FLUIDIZER®, if non-agglomerated powders are produced.

Powder conveying and storage

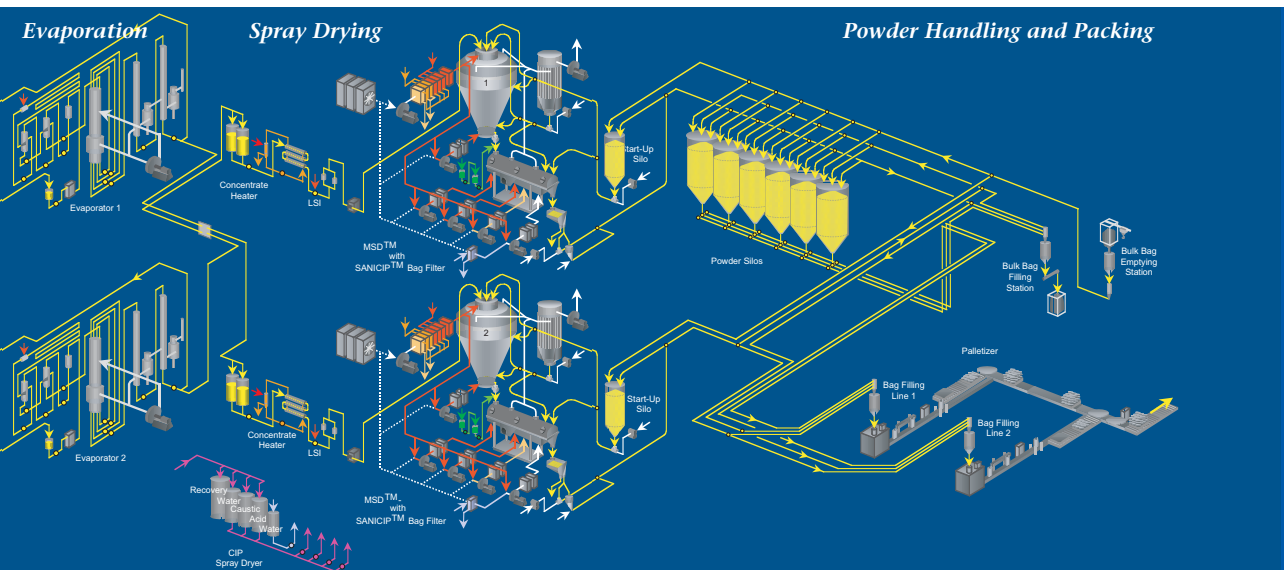
The conveying and storage of the final powder has been designed and delivered by the Australian COLBY company, now also a member of the GEA Process Engineering Division. From the dryers the powder is conveyed by a lenient dense-phase pressure conveying system to a number of silos for storage. The Colby system offers minimal break-down of agglomerates, as the conveying velocity is very low.

Dense-phase vacuum systems have been chosen to convey the powder from the silos to two bagging-off lines, alternatively to a Big Bag station. The powder can also be conveyed directly from the drying plants to the bagging-off equipment.

Bagging-off

The bagging-off equipment will be delivered by AVALON New Zealand, also a member of the GEA Process Engineering Division. They will be supplying two identical lines for 25 kg bags, each line consisting of bag presenter, AVAPAC™ In-Line bottom-up filler to reduce dust and with two additional filling steps to obtain good filling accuracy. After the filling the bags are heat-sealed before checked for weight and metal, and finally coded with batch number and other data before stacked on pallets on a common automatic palletizer.

In the new Vimmerby powder plant - now under construction by



Process flow sheet

Niro's erection company ACO - also the internal working environment for the 70 employees was given priority, e.g. by eliminating all manual heavy lifting.

Batch tracing system

But how to keep track of which milk and which treatment it has received in the factory, before it is in which bag? A comprehensive management system to monitor process parameters, quality, efficiency, and environmental aspects will be implemented in the new Vimmerby factory.

The implemented system by Rockwell Automation facilitates the generation of electronic batch record information, which encompasses collecting, storing, processing and reporting production information. This reporting functionality allows milk powder producers to gain insight in their processing operation to improve quality, consistency and increase production throughput.

In order to trace material and processing data the standard solution uses an industry specific approach within the S88 framework. In a complex manufacturing situation, it is possible to trace product genealogy by means of material batches and process batches.

Process batches transfer material from one state to the next, an example is that raw milk becomes pasteurized and standardized milk by passing it through a pasteurizer and a centrifuge separating the surplus cream. Material batches gather information on a conceptual collection of material defined as lots. A lot is a unique amount of material having a set of common traits; an example is a tanker delivering an amount of milk, which would comprise a material lot. The raw milk properties are then stored within the associated batch journal; an example property is the name of the farm that produced the raw milk. Forward and backward reporting of this material batch is achieved as the material is processed and traced though the manufacturing facility. A material batch also collects data from one or many processing batches combined in the product from the material batch.

The raw data comprising the batch journal data and continuous process data are consolidated to produce formatted reports published onto corporate intranet websites for audiences that require this data on their desktops. By analyzing a wide range of process data such as pasteurizer start and stop times with temperatures, pressures, and flow rates and operator actions, managers can utilize the data to reduce process variability and improve consistency. The data gathering and reporting processes within the system means that material can be traced through the system from either direction providing complete tracing from raw material to finished product.

With this new plant, Arla Foods will in the spring 2005 have a "state of the art" factory producing instant whole milk powder matching even the best quality product on the export market. □

Complete Milk Powder Factories

Why risk working with several suppliers, when you can entrust your dairy factory to just one? Niro unites innovation with proven industry experience in dairy processing, including milk, whey, and formulated products. We bring superior and reliable quality to every part of a successful processing line, from reception and storage over pasteurisation, evaporation, and spray drying, to powder handling, storage, and bag filling systems. So stay away from unnecessary risks – choose one process supplier. Choose Niro.

Niro is a world leader in industrial drying, with spray drying, freeze drying, and fluid bed processing as core technologies. The Niro companies are part of the Process Engineering Division of the GEA Group.

GEA Niro A/S

A company of mg technologies group

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