

Coping with an increasing milk supply

By David Bower and Vagn Westergaard

Taking in 9 million litres per day, the Clandeboye site becomes the second largest processing site for the New Zealand's new Fonterra Group.

At 3.6 million, it has the same population as Eire, a similar landmass, and a reputation for scenery and agriculture. But in dairying, New Zealand has a reputation that is out of proportion with its size and South Pacific location and one that almost certainly will grow. The country's percentage of the world's dairy production is in the low single digits, yet it owns some 40% of the global dairy export market through brands such as Anchor, Fernleaf and Anlene. During recent years the dairy industry in New Zealand, as in the rest of the world, has undergone a major restructuring, evident in the formation this year of Fonterra Co-operative Group from the country's two biggest producers, New



Clandeboye site.

Zealand Dairy Group and Kiwi Co-operative Dairies. The industry's statutory marketing arm, the New Zealand Dairy Board, will also be fully integrated with Fonterra. Fonterra, at USD 5 billion turnover, will become the world's ninth largest dairy company, processing 95% of NZ milk. It will produce 7% of New Zealand's Gross Domestic Product and fully 25% of export revenues. The company represents some 14,000 farmers producing 12.3 billion litres of milk a year.

Patterns of farm milk production are also changing in New Zealand – with most of the suitable land in the North Island already in dairy



Multi-stage drying plant with integrated fluid bed. Three Vibro-Fluidizers® for products after drying/conditioning are placed below – only two are visible in the photo.

production. The South Island has acquired some 145 new farms in 2001 alone, yielding an additional 2 million litres per day of milk for processing at the peak of the season.

This has led to a heavy pressure on the milk processing factories to absorb an increasing milk flow.

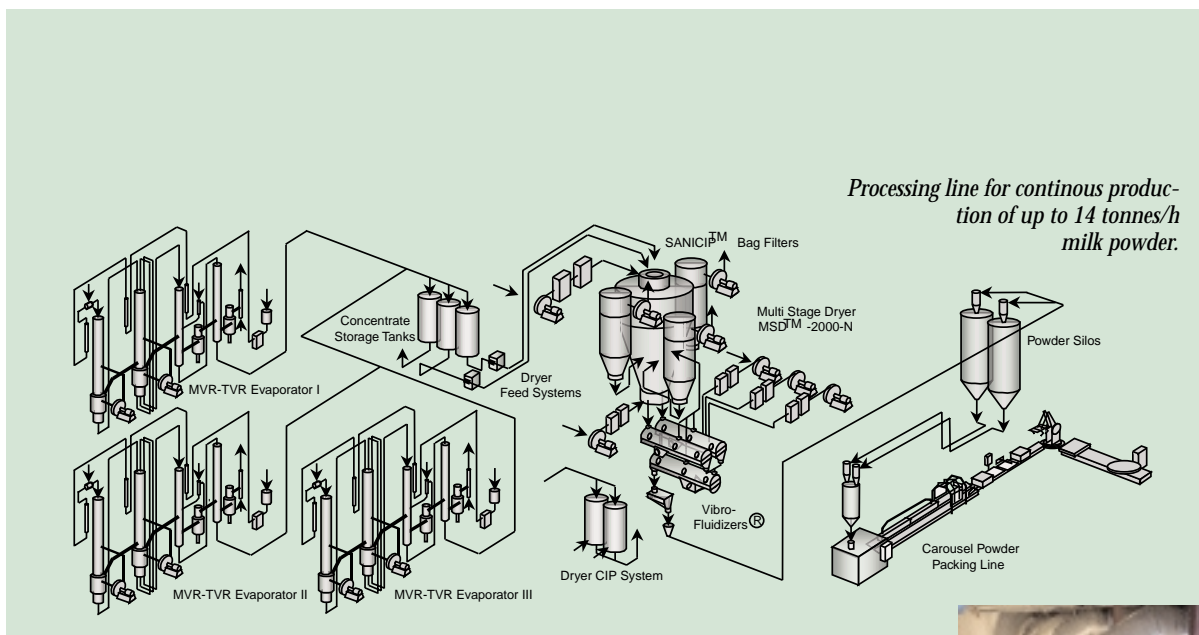
Clandeboye

The Clandeboye site near Timaru on the South Island's east coast was first established as a cheese plant. In 1996, Niro (NZ) Limited installed UF equipment, evaporator, and a big Tall-Form dryer to process WPC-80 from whey from Cheddar cheese production, at a rate of some 2 million litres of whey per day. The next plant on the site was installed and commissioned by Niro (NZ) in a record time of less than one year. That plant processes 3 million litres of milk per day in two MVR evaporators and a big COMPACT™ Dryer. Niro (NZ) with other Niro companies designed, delivered, erected and commissioned the new plant on a turn-key basis, in partnership with Ebert Construction.

To cope with the continued increase in milk production in the area, the powder production capacity at Clandeboye again had to be increased. In August 2000, and for the third time in a row, Niro (NZ) was chosen to build, on a turn-key basis, a most advanced powder plant, which incorporates a number of "firsts" for the factory.

Evaporators

In August 2001 – 12 months after the contract was awarded – the plant is on stream. The new plant features three MVR evaporators and a Multi-Stage drying plant for 24 h continued operation with automatic nozzle change-over. In order to operate continuously with such a big installation, three evaporators are needed, each with 50% of the dryer capacity. Each is designed as a four-body unit, the two first with MVR recompression and



Processing line for continuous production of up to 14 tonnes/h milk powder.

the last two with TVR recompression. The MVR calandrias are equipped with a new development in separators – the so-called “wrap-around” separator. This new type has a very high efficiency at a low pressure drop, resulting in condensate with a low BOD5. The low pressure drop ensures that most of the Δ -t generated by the MVR compressors is used for the evaporation on the heating surface available from an impressive 32 km of tubes in each of the evaporators. Another advantage of the wrap-around separator is a saving in the space requirements for the calandria/separator of more than 33%. The preheating system is designed to ensure low development of thermo- and mesophile bacteria, even during a 20 h operation.

Drying plant

The spray drying plant is a Multi-Stage unit with a nozzle atomization unit designed with interchangeable nozzles for the continuous operation. The primary drying air – heated in an steam heater – is introduced into the drying chamber around the nozzles at the ceiling. To ensure the best drying economy the final drying takes place in an integrated fluid bed, and cooling of the powder is done in external Vibro-Fluidizers. All the process air is cleaned in the newly developed SANICIP™ CIP-able bag filters. This 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 from the inside of each bag. The bags are clean-blown individually by means of a specially designed reverse jet air nozzle (patent pending) positioned above each 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. Venturis as used in traditional CIP-able bag filters are avoided leading to a cleanable air exhaust plenum. 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 clean water.

Packing

The final powder is conveyed by means of a NuCon vacuum system to two silos, each of 150 m³. Final powder packing in 25 kg bags takes place in an AVAPAC™ carousel bagging line with four twin-bag heads for a capacity of 18 tons per hour, or 12 bags per minute. The filling takes place in three steps:

- ◆ First step: 90-95% of the target weight is done through vertical auger metering using the bottom-up filling system to minimize “false air” in the bags and at the same time minimize



6 MVR compressors for 3 falling film evaporator plants.

- ◆ Second step: Coarse top-up within 0.1 kg of the target weight.
- ◆ Third step: Fine top-up to the desired weight. Powder quantity controlled by load cells to an accuracy of 10gm standard deviation.

This three-step filling method results in an accuracy of $\pm 0.1\%$ of the target weight. From the filler, the bags are heat-sealed before checked for weight and metal and then stacked on pallets using a robotic palletizer. With this new modern installation on stream in a record time just before the milk season starts in the southern hemisphere, the Clendeboye site, which can now handle 9 million litres per day, becomes the Fonterra Group’s second largest processing site. ■

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