NEW INSTALLATION

Spray dryer transforms milk into money

Dairy processor uses drying system to enter new markets.

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When New Zealand Dairies, Ltd. (NZDL) converted a vegetable-processing plant in rural Studholme, New Zealand, to the area's first milk-drying facility, shareholders chose drying equipment designed and manufactured by Anhydro, headquartered in Soeborg, Denmark, near Copenhagen. A Triple-A dryer and two MVR evaporators were installed by Anhydro's representative, International Process Systems, Ltd. (IPS), of Hamilton, New Zealand.

Spray dryer, its cone partially visible at left, has internal (foreground) and external (background) fluid beds for additional capacity, which improves the resulting powder's characteristics.

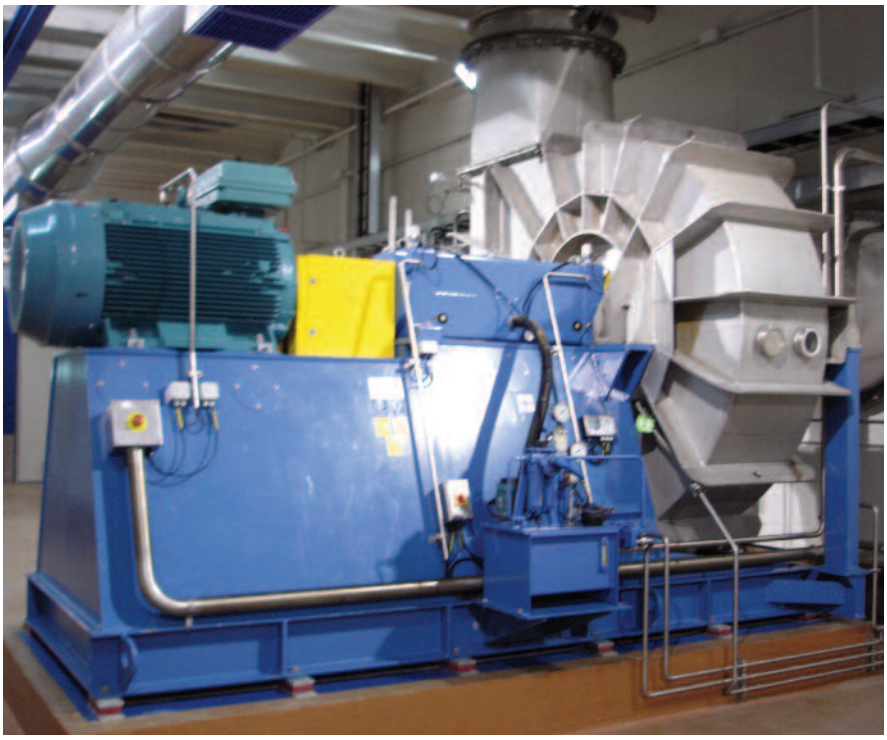
The dryer is a multistage dryer. This is a conical dryer—a type of dryer often used for heat-sensitive products (such as milk) in the foods and pharmaceuticals industries—that has an internal fluid bed added to the bottom of the cone to provide a second drying stage and an external fluid bed to provide a third drying stage. The additional drying provided by the fluid beds increases capacity and improves powder characteristics. The entire drying system comprises an air distribution and nozzle atomization system; drying chamber; recirculation system with cyclones and bag filters to recirculate fines and exhaust air with elevated humidity; and internal and external fluid beds.

The choice

"NZDL selected the Anhydro/IPS team for a number of reasons," recalls Terry Norwood, NDZL's operations manager. "NZDL visited Copenhagen and talked to Anhydro and others. Anhydro gave a better technical solution." Another reason was Anhydro/ IPS's "... ability to provide the complete task of design, build, installation, and commissioning of the plant. Local pricing confirmed IPS as a competitive solution."

The dairy processor, headquartered in Te Aroha, New Zealand, and a subsidiary of Russian food company Nutritek Group, specializes in the manufacture of whole milk powder (WMP). Operating 24/7 for approximately 220 days/year to accommodate seasonal fluctuation in bovine milk production, NZDL contributes to New Zealand's role as the world's leader in dairy exports by exporting a total of approximately 25,000 metric tons/year of various forms of WMP to Malaysia, Indonesia, China, other parts of Asia, Africa, and the Middle East. All of the plant's products are sold overseas.

"Most of the product that has been made on the plant has been regular and instant WMP," explains Norwood. This includes commodity powders, which "generally conform to quite generic specifications." Commodity powders can be used as a base ingredient from which to make other food products. In addition, "the powder can be customized (in terms of composition) to meet specific client requirements for nutritional powders for infants and growing children. Nutritional powders are made to tighter composition and microbiological specifications and may contain additional ingredients such as vitamins, minerals, and fatty acids."



The motor inside the blue unit powers one of the dryer´s two fans, shown at right.

The goal

NZDL's goals in opening the Studholme facility included entering the growth markets of Malaysia and Indonesia, and exporting commodity powders and high-end products such as nutritional powders. While originally focused on entering the high-end niche market of nutritional powders in Malaysia and Indonesia, the plant is currently more focused on producing commodity powders. Malaysia and Indonesia continue to represent growth markets for the company.

The process

All of NZDL's products are made from bovine milk. As Norwood describes the process, "Raw milk is collected and stored on site. It's then separated into cream and skim milk, and mixed back together in set proportions to create a standardized milk.

"This is then fed to the evaporator and evaporated from 14.5 percent TS [total solids, such as fat and protein] to 50 percent TS. The two evaporators are in parallel and one is in use at any one time. By swapping evaporators we keep the drying chamber operating for 24 hours a day for as many days as we need the processing capacity," he says.

After evaporation, the now-concentrated milk is pumped into the spray dryer, sprayed at high pressure (150 to 200 bar), and dried by hot air. "Changing the nozzle size, the concentrate pressure, and concentrate viscosity (total solids and temperature) adjusts particle characteristics, which also affects the drying characteristics of the particle," points out Norwood. "Many factors come into play in getting the powder characteristics where we want them."

Adjusting particle characteristics

One such characteristic is density. "The dryer system has proved to be highly flexible in this regard," says Norwood. "If a powder of low density is desired then agglomeration [of milk particles] is essential," he explains. "Recirculating fines can be returned to different parts of the dryer to provide either agglomeration or no agglomeration. Damage to the fines is not a consideration as the fines themselves are not agglomerated."

However, "agglomeration [must be] avoided when powder of higher density is desired. Agglomeration takes place when dry fines re-enter the drying chamber in the zone where the concentrated milk is still wet and sticky (at the top of the chamber). The fines stick to the wet concentrate to form agglomerated dry particles."

Preserving the sensory, nutritional, and solubility properties of milk in its powdered form is of paramount importance. "These [characteristics] are critical," stresses Norwood, "and the operators make the decision where fines will re-enter the dryer based on the powder properties desired."

The advantage of this drying system is that it produces a narrower particle distribution than is typically available with a multistage dryer. This narrower range, with a mean particle size of approximately 300 microns, enhances the milk powder's solubility. Once dried, the finished product is packed in 25-kg bags under nitrogen gas atmosphere.

The result: opportunity

The Studholme plant opened in October 2007 and, as of August 2009, the company's 5-year plan to recoup its investment in drying equipment was "running to plan if not better ..." reports Norwood.

"The new IPS/Anhydro plant has enabled NZDL to open a new market as well as collect some niche markets," he adds. "The quality of product has enabled the capture of some high-end market share. The quality of the commodity powders made on the plant has been very good, showing high uniformity of excellent physical, functional, and sensory characteristics.

"IPS is a very focused and competent team whom we still retain a relationship with. IPS remains a potential supplier for future capital project work." **PBE*I***

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