CASE HISTORY

Cryogenic blender enables CSK Food Enrichment to offer custom blends

Specialist in dairy ingredients is the first to install a new mixer cooled by liquid nitrogen.

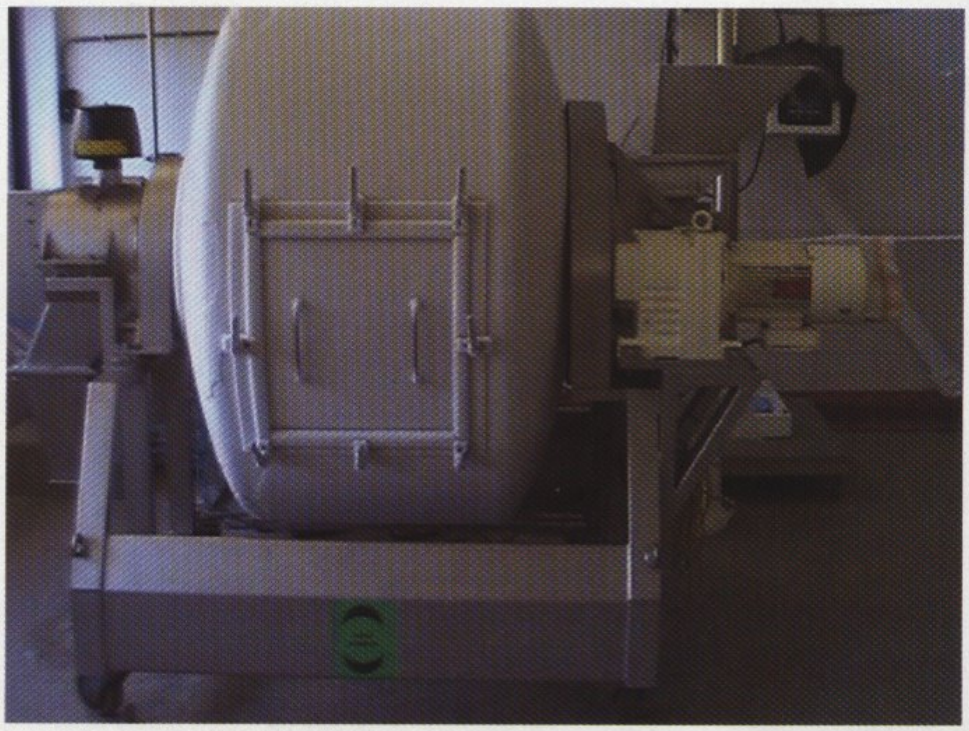
CSK Food Enrichment, Leeuwarden, Netherlands, specializes in supplying dairy ingredients that simplify and improve the making of cheeses, yogurts, and other goods. The total range of products includes starter cultures, extracts, cheese finishers, and additives.

Starter cultures are used in the cheesemaking industry to give the cheese its distinctive taste and appearance. For instance, adding different starter cultures to the cheese vat affects the number and size of voids, or eyes, within the cheese block. Therefore, it's important to use the correct combination of starter cultures to make the cheese look and taste as it should.

As living organisms, starter cultures reproduce quickly under the right conditions. Generally, the cultures grow well in a moist, warm environment. Unfortunately, undesirable microorganisms, such as bacteria, will also grow in this environment if proper hygiene isn't maintained. For that reason, most cheese makers don't make their own starter cultures, said Gisella Frijlink, commercial director at CSK. "It's very difficult to do in the factory itself because of the possibility of contamination," she said. Instead, the cheese makers rely on specialists like CSK to supply the starter cultures.

Cheese makers seek CSK's help

Traditionally, CSK supplied the starter cultures from its plant in Ede, Netherlands, where they were frozen in 125-millimeter cups and capped with aluminum-foil. "Inside it is one clump of ice, and you need a special device to add this to the bulk-starter tank," Frijlink said. "And that worked well and it was very aseptic." But lately, cheese makers have expanded their product range to include new cheeses with different tastes, different fat content, and "all kinds of different things," Frijlink said. "There is more added value to the cheese now." With these developments,



Once the mixer had demonstrated its ability to handle the starter cultures, CSK ordered a 1,000-liter mixer. In the meantime, the company is using a loaner mixer to make the custom blends.

the limitations of the 125-milliliter package became more apparent.

"If you use [the starter cultures] in 125-milliliter cups of ice, you sometimes need to add 50 cups directly into the cheese vat," Frijlink said. "Then it is very difficult to dose correctly." In addition, there were concerns about hygiene when so many packages are used. There was also the potential for a small piece of the aluminum cap to enter the cheese vat. "So you risk the dosage, hygiene, and aluminum contamination. All these are the risks when you add 50 beakers of [starter culture]," she said.

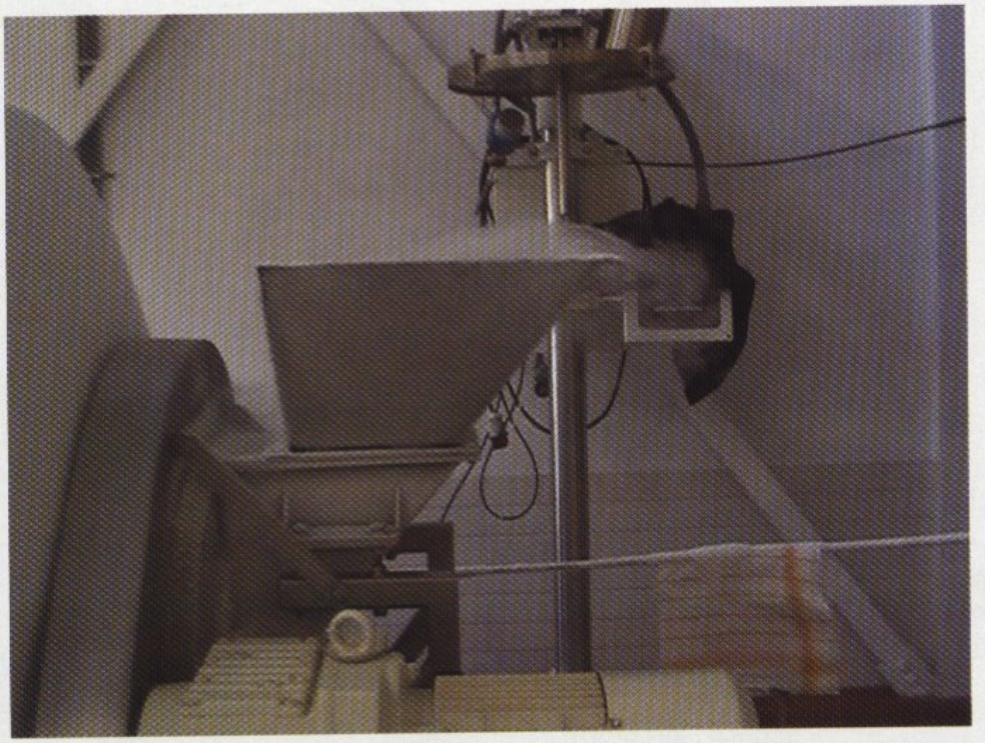
The cheese makers also recognized the risks and asked CSK for a better method of adding the starter cultures. In response, CSK began investigating how to make custom starter cultures and how to package them so that they would be easier and safer to use.

New process provides custom blends

The new process is installed at CSK's Ede plant, where the starter cultures are placed on a sterile, moist media at approximately 20°C. During a period of active growth, the starter cultures are transferred with a liquid to a drip pelletizer. Connected to the pelletizer is a supply of liquid nitrogen, which is about –196°C. As the pelletizer creates small droplets, they fall into the liquid nitrogen and freeze instantly. The frozen drops are then collected in 10-liter bags and stored in a freezer at –55°C. When CSK receives an order, a worker retrieves the necessary starter cultures, doses them into a blender, and packages them in the size requested. For delivery to the customer, CSK uses a special truck, "unique in all the world," Frijlink said, that keeps the cultures at –40°C. CSK can also ship the starter cultures in polystyrene boxes filled with dry ice.

Niek De Jong, project manager at CSK, led the design and construction of the cryogenic pelletizing and mixing process. It was a complicated task, he said, because everything needed double-wall construction. Much of the equipment was not available in the Netherlands. One exception was the blender, or mixer, supplied by Lindor Products of Dordrecht, Netherlands. "We were talking with our supplier of liquid nitrogen," De Jong said, "and we heard about [the new mixer]. When we saw it, we were really glad about it. You

"We were actually quite lucky to find this mixer in this way," says the project manager.



The mixer injects liquid nitrogen directly into the product. It evaporates quickly as it extracts heat from the product. A clean-in-place system of nozzles in the mixing chamber and at the inlet and outlet prevents contamination between batches.

know there are so many different kinds of mixers that we had looked at for some months. [The supplier] had just invented this low-temperature one. We were actually quite lucky to find this mixer in this way."

The mixer, called a cold-injection mixer, blends products while simultaneously injecting liquid nitrogen. (The mixer can also use liquid carbon dioxide.) The injection reduces the temperature of the product to as little as –70°C. Thanks to nozzles fitted to the mixing drum, the coolant is injected directly into the product and quickly evaporates while extracting heat from the product. Any moisture in the product is trapped almost instantly, so the product doesn't dehydrate. Fast freezing also minimizes the risk of a breakdown in the cellular structure of the product. And it minimizes the opportunity for bad microorganisms to grow. A temperature sensor in the mixing drum is connected to the injection system. When the temperature is low enough, it stops the flow of coolant. If the temperature begins rising again, more coolant is injected.

CSK custom-packages the starter cultures in cartons that are easy to open and dispense.

Equally important is the hygienic construction of the mixer, because "if any batch is contaminated, you can just throw it away," De Jong said. "It has to be sterile to prevent organisms, like bacteria, from growing." To make cleaning fast and easy, the mixer operates without impellers or other moving parts in the mixing chamber. Furthermore, nozzles in the mixing chamber and at the inlet and outlet clean all surfaces between batches. This is called clean-in-place, or CIP.

To make custom blends of starter cultures, workers retrieve the different bags of pellets from the freezer and add the pellets to the mixer by hand. Working by hand is not a problem, De Jong said, because most batches are 500 kilograms or less. Besides, he noted, the low temperature of the process made automatic operation much too expensive.

In order to start production immediately, the supplier offered CSK a loaner mixer, which the company is using until its own machine is ready. Production has gone smoothly with the loaner mixer, De Jong said, and CSK will receive its own mixer soon. He said that he expects to be in full production by June. "It's a very good production line. We are very satisfied." ***PBE International***

Cold-injection mixer: ***Lindor Products, Dordrecht, Netherlands.***

Tel: +31 78 655 0 655
Fax: +31 78 618 2 374
Website: www.lindor.nl

Write in No. 352