



Why cold milk separation is hot again

DAIRY, SEPARATION

Separation can be performed on milk either hot or cold. Hot milk separation is the more common of the two, but the cold approach has long been popular in some parts of the world. Nowhere is the cold separation tradition stronger than with us at Tetra Pak, who have been using hermetic, airtight, separators to cold-separate milk for more than 65 years.

Separating milk into cream and skimmed milk is a fundamental dairy process. The resulting skim, or standardized milk and cream, are the base ingredients for most dairy products – from consumption milk to cheese, milk powders or yoghurt.

Hot milk separation is done at a temperature of about 50°C, while cold separation is typically at 10°C or lower. Because hot milk is less viscous than cold milk, it can pass faster through the separator, enabling higher production volumes – and is sometimes preferred by dairies for this reason. Separators working on hot milk are typically integrated into a milk pasteurizer enabling cream separation, in line fat content standardization and pasteurization in one processing unit.

Nevertheless, cold milk separation has other benefits. It may, for example, allow longer production run time by avoiding heat-induced fouling at lower temperatures. It also reduces the potential growth of thermophilic thermotolerant bacteria, which are capable of surviving high temperatures.

Unlike hot milk separation, cold milk separation is an independent processing step at lower temperature that is often combined with in-line fat content standardisation. In any case, both skim milk and cream will typically have to be pasteurized or adequately heat treated at later stages of the production line.

More than 65 years of knowledge

Our expertise in the area dates as far back as 1953, when we began using hermetic separators for cold milk separation. Hermetic – or airtight – separators prevent air ingress during the separation process.

Only a hermetic design can handle high cream concentration at low temperature while avoiding air inclusion. Other separator designs allow air intake, which creates a risk of churning inside the separator and negatively impacts on cream quality. In fact, it is impossible to accomplish true cold separation at below 10°C in a separator that is not hermetically sealed.

“If you want to run cold separation you need a hermetic separator – and this is a field where Tetra Pak are the experts,” says Keith Ortman, Tetra Pak Centrifugal Separation Product Manager in the US and Canada.

“If you try to cold separate in a semi-open separator, the incorporation of air into cold cream leads to fat churning, which causes clogging. It can quickly become like trying to pump cold butter.”

The skimming efficiency challenge

Achieving high skimming efficiency can be difficult when conducting cold separation at the typical temperature of 10°C or lower, says Andrzej Holanowski, Tetra Pak Senior Dairy Technologist. Nevertheless, it is possible.

“In a semi-open separator, you need to raise the temperature above 15°C or 20°C. This may allow for higher capacities, but it requires heating and cooling and may expose lukewarm cream at its most vulnerable state to potential shear-related damage,” Holanowski says.

“We want our installations of cold milk separators to run at 10°C or lower because we know we’re able to achieve good skimming efficiency at that temperature thanks to our airtight design and special machine configurations.”

Although hot milk separation is traditionally preferred in many markets, cold separation has long been favoured in some regions, like e.g. North and Central America, New Zealand and Australia, for reasons varying from the organizational to the technical.

Why is this – and how can cold milk separation benefit your production? One advantage, for powder and cheese manufacturers in particular, is that cold separation can reduce the growth of thermophilic thermoduric bacteria.

“You want as few of these bacteria as possible in your milk powder to meet quality requirements,” says Keith Ortman. “And if you use milk powder to make infant formula you need the highest quality possible. Large producers sometimes see cold milk separation as a way to improve the microbiological quality of their product.”

Strict rules surround infant formula production. As the regulations get tighter, the higher microbiological quality argument may work in favour of cold milk separation.

Some like it cold

Ortman sees increasing demand for cold milk separation in North America, where a trend towards low-spore milk powder has encouraged producers to use cold milk separators to keep milk temperature low.

Cold separation can also offer operational savings in a key area: cleaning. A cold separation line typically needs to be cleaned once a day, whereas the wet part of a hot separation line requires more frequent cleaning due to heat-induced fouling at higher temperatures.

Cleaning is a time-consuming and costly process that requires production downtime. It should be stressed, however, that as for any line, cleaning need depends on the product’s properties and hygienic requirements.

Cold milk separation also poses some challenges. Separation efficiency may be slightly lower than for hot milk (though this is temperature-dependent). Also, a cold milk separator has lower capacity than an equivalent separator running on hot milk.

Also, maximum cream fat content of 40 percent at 4°C is slightly higher at more elevated temperatures, while cold-separated milk is more sensitive to variations in process conditions such as fat crystallization status or dispersed air content, especially when integrated with in-line fat standardization unit.

When to choose cold separation?

So when – and how – should you as a [dairy](#) producer choose between cold and hot milk separation? The answer, according to Simon Beazleigh, Key Components Sales Engineer at Tetra Pak Oceania, is that it depends on your process.

“Customers are often faced with replacing an old milk separator that has come to the end of its life. These machines are typically 30 years old and would have been designed for hot milk,” he says.

“We always work with the customer to see if they should continue with hot milk or to change to cold milk. This will always depend in the individual circumstances, and that’s where our experience comes in.”

Simon adds: “If the infrastructure is in place to support hot milk I would recommend the customer to continue to run hot milk. If the customer has the opportunity to redesign their process, cold milk could be the way to go – depending on the end-product.”

When it comes to new plant installations and upgrades, processors have basically two choices. They can opt for pre-treatment with hot milk separation combined with in-line fat standardization and pasteurization. This application works for all dairy products.

Alternatively, they can choose pre-treatment with cold milk separation combined with in-line or in batch fat standardization. This option, which also works for all dairy products, offers powder and cheese producers a way to reduce thermophilic thermoduric bacteria and spores in their end-products.

Ultimately, the choice will depend on a variety of different factors, ranging from technical specifications to product types. The best way is to talk to a hot and cold milk separation expert like Tetra Pak for hands-on support in choosing the solution that works best for you.

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