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The U.S. dairy industry is pasteurizing the life out of the milk supply, says one engineer turned 'dairy evangelist.' Could Snowville Creamery's minimal processing approach hold the key to reversing the white stuff's 30-year market decline?

By Bob Sperber, Plant Operations Editor | 05/21/2010

You wouldn't drop an extra couple ounces of breakfast cereal into each box just to make sure you meet the minimum package weight. You wouldn't set a filler to give away six extra ounces of milk with every gallon. So why are dairy plants pasteurizing milk far in excess of sterilization requirements, in the process wasting energy and degrading the taste of the finished product?

So asks Warren Taylor, a process engineer turned self-proclaimed "dairy evangelist" preaching the gospel of minimal processing. His small Snowville Creamery in Pomeroy, Ohio, pasteurizes milk at 165°F for less than 20 seconds, far below what conventional dairies do but safely above the FDA's Grade A Pasteurized Milk Ordinance (PMO) minimum requirement of 161°F for 15 seconds.

Why?

"It's logarithmic," he says. "Every 10 degrees you raise your process temperature produces 10 times the heat effect, or 10 times the minimum pasteurization value." Strictly speaking, he says, any pasteurizing is a compromise to product quality because some desirable enzymes and bacteria are lost at the PMO-mandated pathogen-kill level.

Processors didn't always pasteurize their raw milk at such high temperatures – or at all. But for years, the trend in large dairies has been toward more intense, not more gentle, processing.

"I've seen higher temperature requests for standard HTSTs [high-temperature/short time pasteurization units] since Sept. 11, 2001," says George Tholl, director of operations/research & development for **AGC Heat Transfer** (www.agcheattransfer.com), Bristow, Va., a maker of plate heat exchangers. That's when processors became "even more cautious, and went above and beyond the requirements of the PMO, consistently bumping-up their time-temperature profiles."

Cook anything too hot or too long, and you risk some nasty results:

- Degraded quality in terms of taste, color, texture, mouthfeel and healthfulness.
- Reduced yields, throughput and capacity if a plant is running near its peak.
- Spikes in energy use, and bills, due to wasteful heating and cooling.
- Lost profits from over-spending, compounded by competitive disadvantage.

Meet the evangelist

"We don't consider ourselves to be a value-added processor. We are a value-preserving processor," says Taylor. The way he sees it, the dairy industry has for decades "focused on making the cheapest milk possible," churning-out a tasteless commodity that has led to a 30-year decline in U.S. fluid milk consumption.

After three decades as a dairy engineer for Safeway Stores' dairy division; supply-side firms Waukesha Cherry-Burrell and Ecolab's Klenzade Engineering; and later as a consultant to some of the nation's leading milk processors, Taylor could have set his career out to pasture and retired.

Instead, he set cows out to pasture, opening Snowville Creamery in December of 2007. A world apart from the high-volume dairies he worked in since the 1970s, it's a small operation in which cows are pasture-grazed, not confinement raised, and a "same day dairy" philosophy sends milk from udder to grocery shelf within 48 hours. This puts 18 Whole Foods stores in the metro-Washington market at the edge of his distribution range; a fine place for someone who wants to change the way milk is made, as well as marketed under federal authority.

Taylor's a small-scale producer-processor. Snowville's operation, currently packing about 9,000 gallons weekly, is a far cry from the plants he used to design. In the 1990s, for example, he designed the process at Santee Dairy in Los Angeles "to handle about 300,000 gallons of milk a day, and it was capable of being expanded," Taylor says. "Now my process room measures 600 square feet. Every major piece of equipment isn't much more than a few arms' lengths apart."

The milk he produces has a color closer to raw milk than the snow-white product on shelves today, and it's not homogenized; the cream separates to the top. He believes conventional pasteurization practices, which kill most of the good bacteria along with the bad, are cooking the quality out of milk.

"I consider Warren part of the 'radical middle,'" says Sally Fallon Morell, president of the Weston A. Price Foundation and its Campaign for Real Milk



Look to the Future

As president of Snowville Creamery, Warren Taylor wants to change the way milk is made, the way it tastes and even the way it's regulated.

The dairy industry imploded in the 1990s, when dozens of independent regional dairies, many of them of significant size, were acquired by either Dean Foods or Suiza Dairy. Half of their operating plants were closed, with the surviving plants working closer to

(www.realmilk.com). She promotes the sale of raw milk that isn't pasteurized but is subject to appropriate technology, testing, handling and sanitation practices. Currently, 28 states allow some limited form of raw milk sales, 10 of which allow retail sales (details at www.farmtoconsumer.org/raw_milk_map.htm).

While Taylor has one foot in sustainable, local and minimal processing philosophies, he's still a relatively mainstream operator, evident by his adherence to the Pasteurized Milk Ordinance.

"The closer you can operate to the minimum time and minimum temperature of the PMO, the less chemical damage you're doing to the product," agrees Bill Snow, technology group manager for **SPX Flow Technology** (www.spflowtechnology.com), the Charlotte, N.C., parent of equipment brands APV, Waukesha Cherry-Burrell and Lightnin Mixers.

On Taylor, he says, "Warren has nothing to hide. He's trying to promote this as a better way to do processing. As long as he meets the minimums of the PMO, and can prove it to the regulatory authorities, I support what he's doing."

Tweaking time & temperature

The typical high-volume dairy pasteurizes its milk at approximately 175°F for 30 seconds, well above the PMO's minimum requirement of 161°F for 15 seconds for high temperature/short time (HTST) processing. In contrast, Taylor pasteurizes his milk at 165°F for less than 20 seconds.

Taylor says reduced time-temperature profiles impart a flavor boost at some expense to shelf life. After about two weeks, Taylor admits the taste and complexity of his product begin to break down and taste "like anyone else's store-bought milk, which never changes – it tastes just as bland after three weeks as it does the day it was bottled."

Fighting words? Maybe. The consensus of Big Dairy seems to be that minimal processing imparts no discernible quality benefit.

Chris Galen, spokesman for the National Milk Producers Federation

Tetra Pak Launches OneStep Technology For Processing Aseptic

capacity and covering greater distances, in part because of the longer shelf lives enabled by higher-temperature pasteurization.

Then privately held Suiza undertook a reverse-acquisition of publicly traded Dean. The result is the biggest dairy company in the world, Dean Foods, at \$12.5 billion the [No. 6 company on the Food Processing Top 100](#).

Taylor hopes for a return to days of old. "I see a future where dozens of plants all over America are serving local communities with minimally processed milk." He calls it a movement of producers, processors and marketers toward premium-quality milk products.

Such a future is financially feasible by his calculations. An operation of his scale, he says, costs \$1-2 million, and must generate gross, annual sales of \$3-6 million to recoup its

(NMPF), chalked-up taste differences to a consumer "placebo effect" in [a National Public Radio report last December](#). "If you're paying six or seven or eight dollars a gallon versus \$3, you might think it tastes better simply because it cost more," he said. But the same broadcast had shoppers sampling Snowville's minimally processed milk, with one likening it to the milk her mother used to get "from a farm near us when we were growing up ... it's really good." Taylor employs more than 24 in-store samplers and says a steady stream of feedback and letters confirms the taste advantage.

Why do large processors gravitate toward higher-heat processes? Perceptions of safety, consistent quality, shelf-life and distribution range all play into current processing methods:

- From Ford Motor Co. to McDonald's, the U.S. marketplace was built on the ability to offer a consistently uniform product.
- Any change that reduces shelf life represents a potential expense, forcing marketers to change their "sell-by" dating practices, and/or forcing them to restructure their cold-chain distribution practices.
- There are inherent marketing risks in introducing a more expensive product in a category of commodity products with low brand differentiation.
- Pasteurization time-temperature profiles have been escalating for so long that considering a reduction may be so out-of-the-box that it's perceived as a safety risk.

So far it appears that no major dairy processor has moved to minimize pasteurization profiles. On the contrary, many continue to explore still-higher-heat processes using ultrapasteurized or ultra-high temperature (UHT) milk processed at approximately 283°F for four seconds. UHT milk in combination

White Milk

Tetra Pak recently launched OneStep technology, a Tetra Lactenso Aseptic solution that incorporates UHT white milk production within a single, high-throughput process.

OneStep technology eliminates the need for pasteurisation, pre-treatment and intermediate storage. In one unbroken step raw milk is preheated, clarified, separated, standardised and homogenised, before undergoing UHT treatment and regenerative cooling, and then being transferred to two aseptic buffer tanks.

In addition to shortening the time it takes to process raw milk, OneStep technology also incorporates aseptic buffering, enabling completely automated and continuous UHT operations, with fewer process steps and smaller hold-up volumes in the line.

More information about Tetra Pak is available at www.tetrapak.com

investment. "Snowville is at \$2.5 million year and we're breaking even. But we need to do \$5 million to have a three-year payback on our \$2 million investment."

The dairy has been growing at an average 10 percent a month. Taylor plans to expand Snowville Creamery's business to produce and process 20,000 gallons of milk a week, up from the current 9,000.

with aseptic packaging provides more than six months of non-refrigerated shelf life.

AGC's Tholl notes that HTST milk "tastes better than UHT milk, which has never been widely accepted in America due to its burnt flavor," which owes to caramelized sugars. "It's been accepted by European consumers, but they've never had the consumption levels of the U.S."

Taylor, predictably unimpressed with UHT, notes it imparts "millions of times more heat effect than HTST," which itself is less than ideal for preserving the flavor of milk, he says.

The latest rapid heating and cooling advances, however, are aimed at narrowing the gap between UHT and HTST milk. For example, direct steam technologies are said to now produce UHT milk "that is virtually indistinguishable from pasteurized [HTST] product in terms of flavor and color," says SPX' Snow.

If it's clear what Taylor is doing, how he's doing it may need a bit of demystifying. The mechanical processes in Snowville's processing room are all conventional, including items such as AGC plate heat exchangers and Waukesha Cherry-Burrell sanitary valves and pumps. Taylor says the greatest single factor in reducing his time-temperature profile is the fact that it's scaled-down with, for example, 1-in. piping instead of the 4-in. pipes a larger dairy would use.

Snowville's process instrumentation and controls are similarly conventional but scaled-down. Most of the dairies Taylor worked on maintain six to 10 control loops on their pasteurization and clean-in-place systems, although one leading national processor's state-of-the-art system topped 20 control loops linked to centralized supervisory controls.

Today, his little operation uses two standalone controllers: one to control the flow of hot water through the heating section and another for temperature control. A dedicated, programmable controller manages the HTST process, and variable frequency drives run most motors pumps and agitators as well as the separator and homogenizer used for ice-cream mix.

Controlling process variability between Snowville's much-tighter range of upper and lower limits, then, owes much to the scale of the process. Still, high-volume dairies might find value in considering the potential value in tweaking their own parameters for greater process efficiency and product quality.