



One of the things that makes life at Dixon so interesting is staying attuned to the diversity of the products needed by our customers. We are constantly intrigued by the sophistication of the industries we serve. Fire protection, construction, mining, chemicals and petroleum all have their different requirements and methods of operations. Each has its own story waiting to be told.

In this edition of *BOSS*, we would like to introduce you to another area of our business—the dairy industry. We service these folks with Bradford sanitary/hygienic couplers. Moving milk from the cow to the kitchen table is a complex process that requires dedicated professionals and quality equipment. We are proud to make our contribution to this effort. —R.L. Goodall

Between Cow

A tall, clear glass filled with white milk, set against a solid yellow background. The glass is slightly tapered, and the milk surface is visible at the top. The lighting is soft, creating a gentle shadow on the right side of the glass.

and Kitchen

MILK IS PRODUCED IN EVERY COUNTRY
IN THE WORLD. ITS JOURNEY TO YOUR
REFRIGERATOR IS FAST AND FURIOUS.

BY DAVID HOLZEL

When you pick up a bottle of milk from your supermarket's refrigerator, it should practically moo. Two days before it was delivered to the store, that milk was still in the cow.

Historically, milk's perishability has made it among the most local of industries, yet its easy conversion into other foods makes it a significant item of international trade.

And new technologies are even expanding the distance between cow and kitchen, says Ed Jesse, professor of dairy economics at the University of Wisconsin, in the heart of the United States' dairy country. "The localized nature is a bit of an artifact. Better transportation and longer shelf life are changing that."

The world's cows produced 595 million tons (540 million metric tons) of milk in 2004, according to the International Dairy Federation. (Milk is measured by weight as well as volume. A gallon of milk weighs 8.62 pounds and a liter weighs 2.2 kg) The European Union is the top producer of milk, followed by North America and Asia.

The process that takes raw milk and transforms it into a beverage fit for drinking is pretty much the same the world over, Jesse says. But that's where the similarities end. Farm size varies from a single cow to a herd of 3,000. And those cows can produce anywhere from 22,000-24,000 (lbs.) per cow per year, according to the International Dairy Federation.

The cost of production varies, too—from \$9 (U.S.) per 220 pounds (100 kg) of milk in Argentina to \$79 (U.S.) for the same amount in Switzerland.

MAKING MILK IN A HURRY

The milk that is produced from a cow is 101° F (38° C). It travels through stainless steel pipes to refrigerated vats, where it is cooled and stored between 36° F and 38° F. Sterile refrigerator tanker trucks then transport the raw milk to the processing plant. These trucks hold 40,000-50,000 pounds (18,140-22,680 kg) of milk, says Steve Larson, managing editor of Hoard's *Dairyman Magazine*, published in Wisconsin.

"So any time you see one of those big shiny trucks driving by, it'll contain 4,000 to 5,000 gallons [15,140-18,930 liters] of milk," he says.

After the truck pulls up to the plant, its load is tested for acceptable levels of bacteria, as well as for fat and protein content and contamination by antibiotics. The raw milk is then pumped through chilled tubes into holding tanks, called silos, which keep the milk below 40° F (4° C), according to creamland.com.

The raw milk goes through a four-step process – clarification, separation, pasteurization and homogenization—to become the milk purchased at a local grocery store.

Clarification, performed in a centrifuge, removes bacteria,





WE ALL SCREAM FOR ICE CREAM

spores, dirt and other solids from the milk.

Separation can take place at the same time as clarification. Centrifugal force separates the fat from the skim milk, pulling the less dense fat globules (cream) to the center of the centrifuge, and the denser skim milk to the edges, where it is drained off.

Pasteurization extends the life of the milk by killing harmful, but not all, microorganisms through exposure to heat. Before Louis Pasteur developed the process in the 1860s, drinking contaminated milk often led to sickness or death. Pasteurization involves either heating the milk to 145° F (62.8° C) for at least 30 minutes or to 161° F (71.6° C) for at least 15 seconds.

The boxes of milk that don't need refrigeration have been completely sterilized through ultra-high temperature (UHT) pasteurization. This process heats the milk to over 200° F (93.3° C) for a few seconds.

Homogenization involves "passing the milk under pressure through a very fine nozzle to evenly disperse the fat globules in milk," according to creamland.com. Without being homogenized, the cream in a container of milk would clump together. The proportion of cream reintroduced to skim milk determines whether the final product becomes 1 percent, 2 percent, whole or other types of milk.

Once homogenization is completed, each type of milk goes into a separate refrigerated storage tank before it is packaged.



Let's face it, ice cream is so rich, so soothing, so scrumptious that if it didn't exist, someone would have to invent it.

In fact, no one knows who invented it. Legend has it that Chinese emperors enjoyed ices flavored with fruit wine and honey 3,000 years ago. Stories abound of Alexander the Great and Roman emperors doing likewise. But then, they had armies they could send on a whim to the mountains to bring back ice for what would be known today as Sno Cones. The plebeians and hoi polloi were denied this royal fare.

During the Renaissance, a dessert resembling sherbet was developed in Europe. Closer to ice cream, it contained milk, egg white or gelatin, as well as fruit juice and water. Such "cream ices" remained the province of royalty and the elite through the 18th century. It's easy to see why—President George Washington spent \$200 on ice cream during the summer of 1790, according to the International Dairy Foods Association. Was that one scoop or two?

At the time, ice cream was made by hand in a bowl—no wonder it was so expensive. The bowl was suspended inside another container filled with ice and salt, a combination which lowered the cream mixture below the freezing point. A New Jersey woman named Nancy Johnson is said to have invented the first hand-crank ice-cream maker in 1847. And four years later, a Baltimore, Maryland, milk dealer named Jacob Fussell decided to rid himself of extra milk inventory by manufacturing ice cream commercially. Finally, ice cream was ready to meet the masses.

It takes 12 pounds of milk to make one gallon of ice cream. Today's manufactured ice cream contains at least 10 percent fat. Sweeteners and stabilizers, which prevent large ice crystals from forming, are part of the recipe. So are emulsifiers, which provide a smoother texture to the final product.

These ingredients are blended, then pasteurized, and finally homogenized and frozen. Nuts, fruits and chocolate chips are added to the batch as needed, and the final product is packaged and sent to a "hardening room" with sub-zero temperatures.

The results would have amazed Alexander the Great.

— David Holzel

Source: International Dairy Foods Association



YAKETY YAK

If cow milk isn't to your taste, how about yak's milk? Or milk of mare?

Milk production is found in all countries, according to the International Dairy Federation. And while cow's milk is preferred hooves down—it is seven times more popular than its closest competitor, the buffalo — numerous other animals continue to be prized for their milk.

Almost half of all other types of milk are found in Asia. Some 90 percent of buffalo milk is produced in India and Pakistan, for example.

Sheep and goats' milk is produced primarily in Europe, where it is used in specialty products. And according to CNN, small moose dairies exist in Sweden and Russia. Camels, donkeys and reindeer are also used for their milk.

And for those not watching their cholesterol: A nice cold glass of seal's milk is more than 50 percent fat.



At the Borden milk processing plant in Houston, Texas, an operator calls electronically to a particular storage tank when it is time to package that type of milk. The liquid is piped to a filler bowl, a stainless steel container with nozzles, according to Howard Depoy, the plant's manager.

"If we were filling cartons, the operator would insert the carton flats into the machine," he says.

One by one, the machine heats the bottom of each carton, activating a resin that seals that side. The carton is then conveyed under the nozzles, which shoot milk into the container through the open top. Now filled, the carton moves on. The top is heated using what Depoy calls "squeezing jaws," to seal the carton.

When plastic jugs are filled, they're brought on overhead conveyers to be filled from another part of the plant. "As they exit the filler, the bottles are spun around and a cap is automatically applied," Depoy says.

Both types of containers are stamped with the packaging and expiration dates, then put in cases and conveyed to a cooler set at 35° F (2° C). The cases of milk are loaded onto trucks and hauled to market no more than two days later, he says.

CURDS AND WHEY

When the spider of nursery rhyme fame spoiled Little Miss

Muffet's meal, she was seated on her tuffet and enjoying a bowl of curds and whey. Today, curds and whey are better known as cottage cheese—made most simply by heating skim milk at a low temperature until it begins to clump, or curdle, and then refrigerating it. The clumps are the curds; the remaining liquid is the whey.

(A tuffet is a low stool, by the way.)



Dixon Sanitary offers the following products for the dairy industry:

- Actuated valves
- Clamps
- Gauges
- Tubing
- IX nipples
- Sight flow
- Elbows
- Tees
- Special fabrications
- Reducers

OTHER PRODUCTS MADE FROM MILK INCLUDE:

Cheese – All cheeses begin with curdled milk. The variations in cheese are due to different kinds of bacteria and molds used in production, the level of fat content and the length of the aging process. It takes 10 pounds of milk to make one pound (or 4.5 kg to make 0.45 kg) of cheese. Greece is the largest cheese-consuming nation, according to the International Milk Federation – 63 pounds (28.7 kg) per capita.

Butter is made by churning fresh cream, with an 80 percent fat content. Butter is most popular in France, where 17 pounds (7.8 kg) are consumed per capita.

Yogurt is produced by bacterial fermentation. The United States leads the way in yogurt consumption – 189 pounds (85.8 kg) per capita.

Cream is the fat separated out during the milk production process. In addition to being the major component of butter, it is also processed into heavy cream for whipping (35 percent fat), cream for coffee (18 percent or 10 percent fat) and other products.



Buttermilk has no relation to butter. It is generally made from skim or low-fat milk which is fermented with bacteria that convert milk sugars into lactic acid. The lactic acid is what gives buttermilk its sour taste and thick texture.

Sour cream is made by the same process as buttermilk, but uses cream instead of skim or low-fat milk.

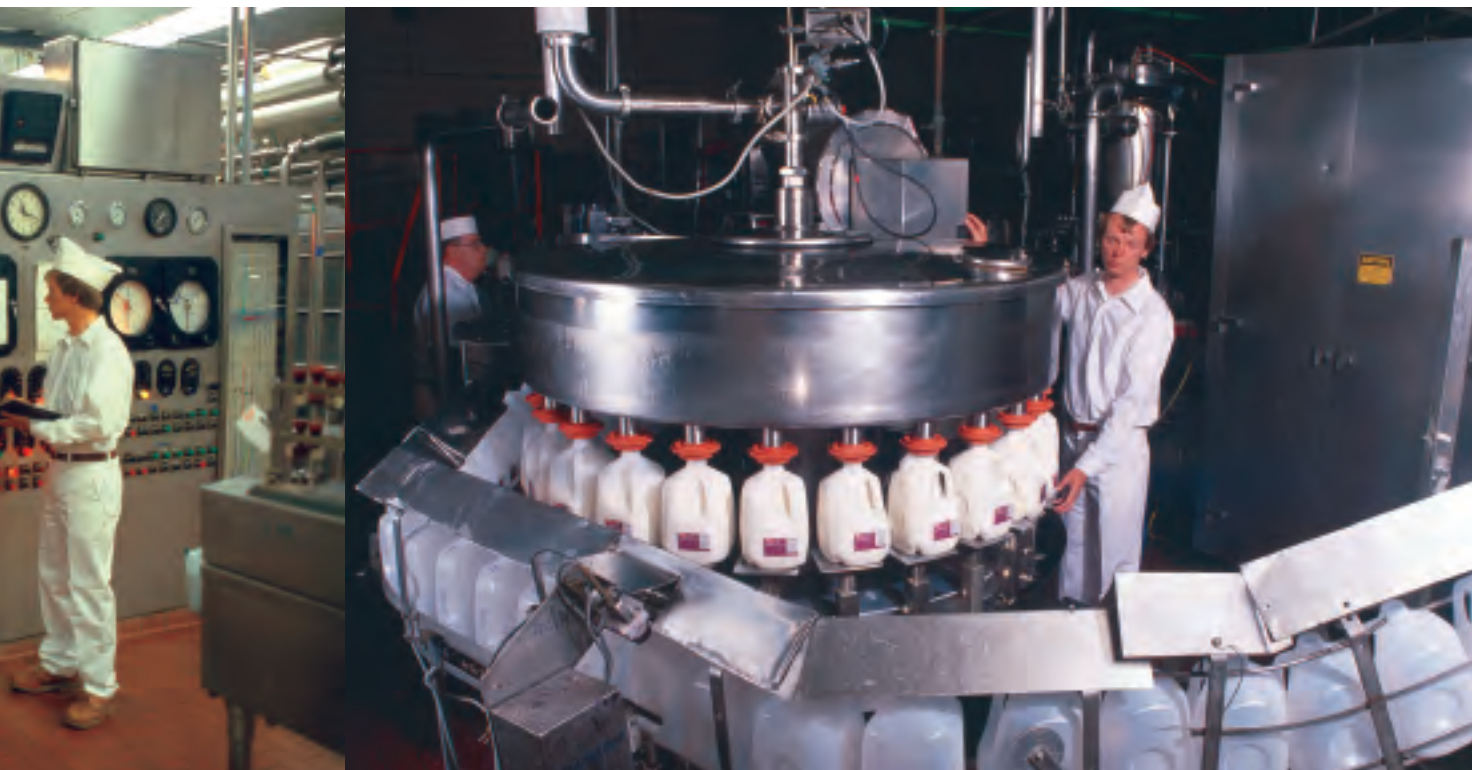
While some milk products are relatively perishable, others are fit for international trade.

Cheese is a well-known example. Some 1.5 million tons (1.37 million metric tons) were traded worldwide in 2003, according to the International Dairy Federation.

But the most important product in the international dairy trade is whole milk powder – an estimated 1.87 million tons (1.7 million metric tons) of it were bought and sold in 2003. That year, the volume of skim milk powder traded was 1.4 million tons (1.3 million metric tons).

Highly nutritious, universally consumed and capable of transforming itself into a variety of foods, milk appears to be the indispensable food. Improved transportation and technology will only make it more so. The cow already knows what to do.

Dixon employee, Larry Ford, an ex-dairyman, contributed to this story.



FACTS & FIGURES

How Much Milk?

They do enjoy their milk in Finland. More than any other place on Earth, in fact. In 2003, the average Finn drank 385 pounds (174.5 kg) of milk, the International Dairy Federation reports. Icelanders are nearly as thirsty, drinking 372 pounds (168.8 kg) per person.

European Union countries are the world's biggest per capita consumers of milk. In the United Kingdom, the rate per person in 2003 was 241 pounds (109.6 kg); Australia 221 pounds (100.3 kg); Canada 208 pounds (94.5 kg); and the United States 189 pounds (85.8kg).

One of the biggest changes in the public's taste for milk is the shift away from whole milk (it contains 3.5 percent milkfat) to low-fat milk. By far, most drinkers opt for milk containing 1 percent or 2 percent milkfat. "They count for over half of all milk consumption," says Ed Jesse, professor of dairy economics at the University of Wisconsin.

Consumption of skim milk which, contrary to what you might believe, is not entirely fat-free (it contains a smidge, about 0.1 percent, of fat), has gone up since the heyday of whole milk, but its popularity seems to have reached a plateau, he says.

COWS MILK : SUMMARY FOR SELECTED COUNTRIES
1,000 Metric Tons

Fluid Milk Consumption	2000	2001	2002	2003	(P) 2004	(F) 2005
Canada	2,913	2,909	2,884	2,830	2,850	2,887
Mexico	3,915	4,075	4,080	4,352	4,345	4,400
United States	26,890	26,850	27,003	27,250	26,950	27,075
Argentina	2,300	2,350	1,990	2,050	2,150	2,200
Brazil	12,690	12,390	12,295	12,391	12,526	12,750
Peru	750	750	745	715	650	675
European Union ¹	36,226	36,385	34,471	34,217	33,998	34,141
Romania	3,435	3,500	3,460	3,662	3,770	3,755
Russia	14,156	14,140	14,350	13,350	13,000	13,000
Ukraine	3,100	3,200	3,300	3,450	3,400	3,350
India	33,000	33,300	33,500	34,000	35,500	38,500
China	3,813	4,463	5,678	7,661	10,315	11,606
Japan	4,971	4,941	5,002	5,035	4,965	4,965
Australia ²	1,992	1,920	1,966	1,982	2,019	2,050
New Zealand ³	346	355	355	360	360	360
Total Selected Countries	150,497	151,528	151,079	153,305	156,798	161,714

Figures supplied by the United States Department of Agriculture, Foreign Agricultural Service from various counselor and attache reports, official statistics and results of office research, released April 2005.

Notes:

(p) Preliminary.

(f) Forecast.

(1) Based on deliveries

(2) Year ending May 31 of the year shown.

(3) Year ending June 30 of the year shown. FAS/CMP/DLP Dec., 2004

