Milk Homogenization – What's it all about?

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Frequently in our everyday conversations we throw around words or expressions without knowing what they actually mean. This is true when it comes to the food we eat and the beverages we drink. Take the term "homogenization" for instance. We see it on milk containers all the time, but have you ever stopped to think about what is involved in the actual process?

Milk, as it comes from the cow, contains about 3.5% butterfat or milk-fat on a weight basis. In Canada, whole milk is standardized to 3.25% butterfat to ensure consistency for the consumer. By removing some or all of the butterfat, dairies can produce 2%, 1%, and skim milk products. The milk-fat that has been removed can be used in making such things as various enriched creams and other dairy products.

Milk-fat tends to take the form of small, spherical globules that are dispersed throughout the watery portion of the milk. This forms what is referred to as an oil-in-water emulsion. As you may know, oils tend to float on water due to the fact that they are less dense than water and they do not dissolve in the water itself. Because of their relatively large size, the milk-fat droplets can rise to the surface of the milk and come together to form a layer of cream.

One way of preventing the milk-fat from separating is to create droplets so small that they are essentially trapped in the milk and have no real buoyancy. This is where the homogenization process comes into play.

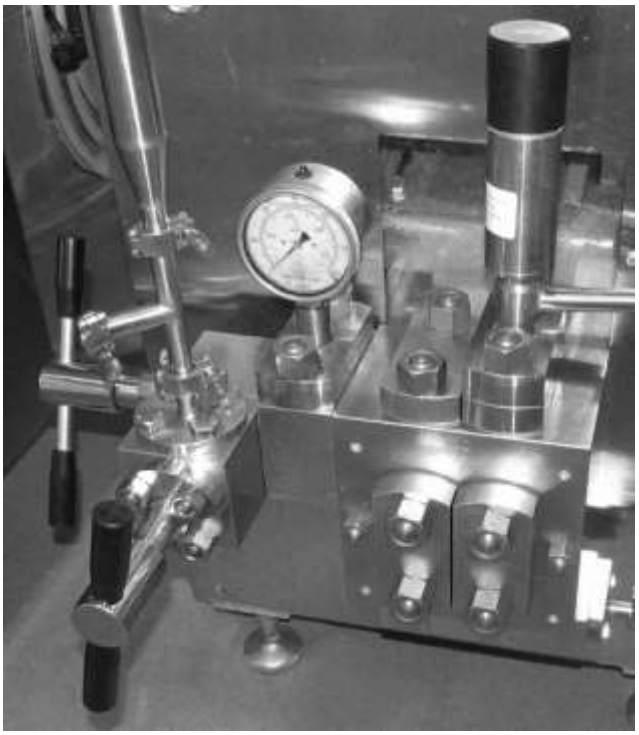
Homogenizers were first patented in 1899 by Auguste Gaulin in France. They are rather simple in the concepts that they employ, but the results are quite striking.

After being pasteurized under the regulated time and temperature conditions, non-homogenized milk is pumped at high pressure into a stainless-steel valve assembly that has a small opening through which the milk must pass. As it travels through the narrow gap, the velocity of the milk increases greatly. This creates a mechanical shearing action on the milk-fat globules that breaks them into much smaller-sized droplets. There is also some effect from the milk physically striking the valve surfaces. Most homogenizers also include a second valve to make sure that any clusters of the small droplets are broken up and totally dispersed throughout the milk.

Once homogenized, the oil-in-water emulsion is stable enough so that the tiny milk-fat droplets will remain in suspension until the milk is consumed.

Just as an aside: I remember my mother telling us how the cream would rise to the top of the milk bottles before homogenization became a standard practice. During the winter, when the milkman (remember them?) left the milk on the porch, it would start to freeze. The ice-cold cream was then pushed upwards and out the neck of the bottle with the cardboard bottle cap sitting on it like a little hat.

Dairy science has come a long way since those days as we continue to see major advances in processing technology and product development. Consumers now enjoy a variety of high-quality dairy products that is simply mind boggling.



The black handles on the left of this photo are used to adjust the openings of the valves on this two-stage homogenizer unit.