Fresh Milk Technology. Milk Separation

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The fat fraction separates from the skim milk when milk is allowed to stand for 30 to 40 minutes. This is known a `creaming'. The creaming process can be used to remove fat from milk in a more concentrated form.

Gravity separation. Fat globules in milk are lighter than the plasma phase, and hence rise to form a cream layer. The rate of rise of the individual fat globule can be estimated using Stokes' Law which defines the rate of settling of spherical particles in a liquid.

Centrifugal separation. Gravity separation is slow and inefficient. Centrifugal separation is quicker and more efficient, leaving less than 0.1% fat in the separated milk, compared with 0.5-0.6% after gravity separation. The centrifugal separator was invented in 1897. By the turn of the century it had altered the dairy industry by making centralised dairy processing possible for the first time.

It also allowed removal of cream and recovery of the skim milk in a fresh state.

The separation of cream from milk in the centrifugal separator is based on the fact that when liquids of different specific gravities revolve around the same centre at the same distance with the same angular velocity, a greater centrifugal force is exerted on the heavier liquid than on the lighter one. Milk can be regarded as two liquids of different specific gravities, the serum and the fat.

Milk enters the rapidly revolving bowl at the top, the middle or the bottom of the bowl . When the bowl is revolving rapidly the force of gravity is overcome by the centrifugal force, which is 5000 to 10 000 times greater than gravitational force. Every particle in the rotating vessel is subjected to a force which is determined by the distance of the particle from the axis of rotation and its angular velocity.

Hand separator. In order to understand how centrifugal separation works, we shall follow the course of milk through a separator bowl. As milk flows into a rapidly revolving bowl it is acted upon by both gravity and the centrifugal force generated by rotation. The centrifugal force is 5000 to 10 000 times that of gravity, and the effect of gravity thus becomes negligible. Therefore, milk entering the bowl is thrown to the outer wall of the bowl rather than falling to the bottom. Milk serum has a higher specific gravity than fat and is thrown to the outer part of the bowl while the cream is forced towards the centre of the bowl.

Standardisation of milk and cream. If fine adjustment of the fat content of cream is required, or if the fat content of whole milk must be reduced to a given level, skim milk must be added. This process is known as standardisation. The usual method of making standardisation calculations is the Pearson's Square technique. To make this calculation, draw a square and write

the desired fat percentage in the standardised product at its centre and write the fat percentage of the materials to be mixed on the upper and lower left-hand corners. Subtract diagonally across the square the smaller from the larger figure and place the remainders on the diagonally opposite corners. The figures on the right-hand corners indicate the ratio in which the materials should be mixed to obtain the desired fat percentage.

The value on the top right-hand corner relates to the material on the top left-hand corner and the figure on the bottom right relates to the material at the bottom left corner.

Butter-making with fresh milk or cream. Butterfat can be recovered from milk and converted to a number of products, the most common of which is butter. Butter is an emulsion of water in oil and has the following approximate composition: fat- 80%, moisture- 16%, salt- 2% , milk SNF -2%.

In good butter the moisture is evenly dispersed throughout the butter in tiny droplets. In most dairying countries legislation defines the composition of butter; and butter makers conform to these standards insofar as is possible. Butter can be made from either whole milk or cream. However, it is more efficient to make butter from cream than from whole milk.

Cheese-making. Cheese is a concentrate of the milk constituents, mainly fat, casein and insoluble salts, together with water in which small amounts of soluble salts, lactose and albumin are found. To retain these constituents in concentrated form, milk is coagulated by direct acidification, by lactic acid produced by bacteria, by adding rennet, or a combination of acidification and addition of rennet.

Sour-milk technology. Smallholder milk processing is based on sour milk. This is due to a number of reasons, including high ambient temperatures, small daily quantities of milk, consumer preference and increased keeping quality of sour milk.

Products made from sour milk include fermented milks, concentrated fermented milks, butter, ghee, cottage cheese and whey. Other products made are cheese and products made by mixing fermented milk with boiled cereals.

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