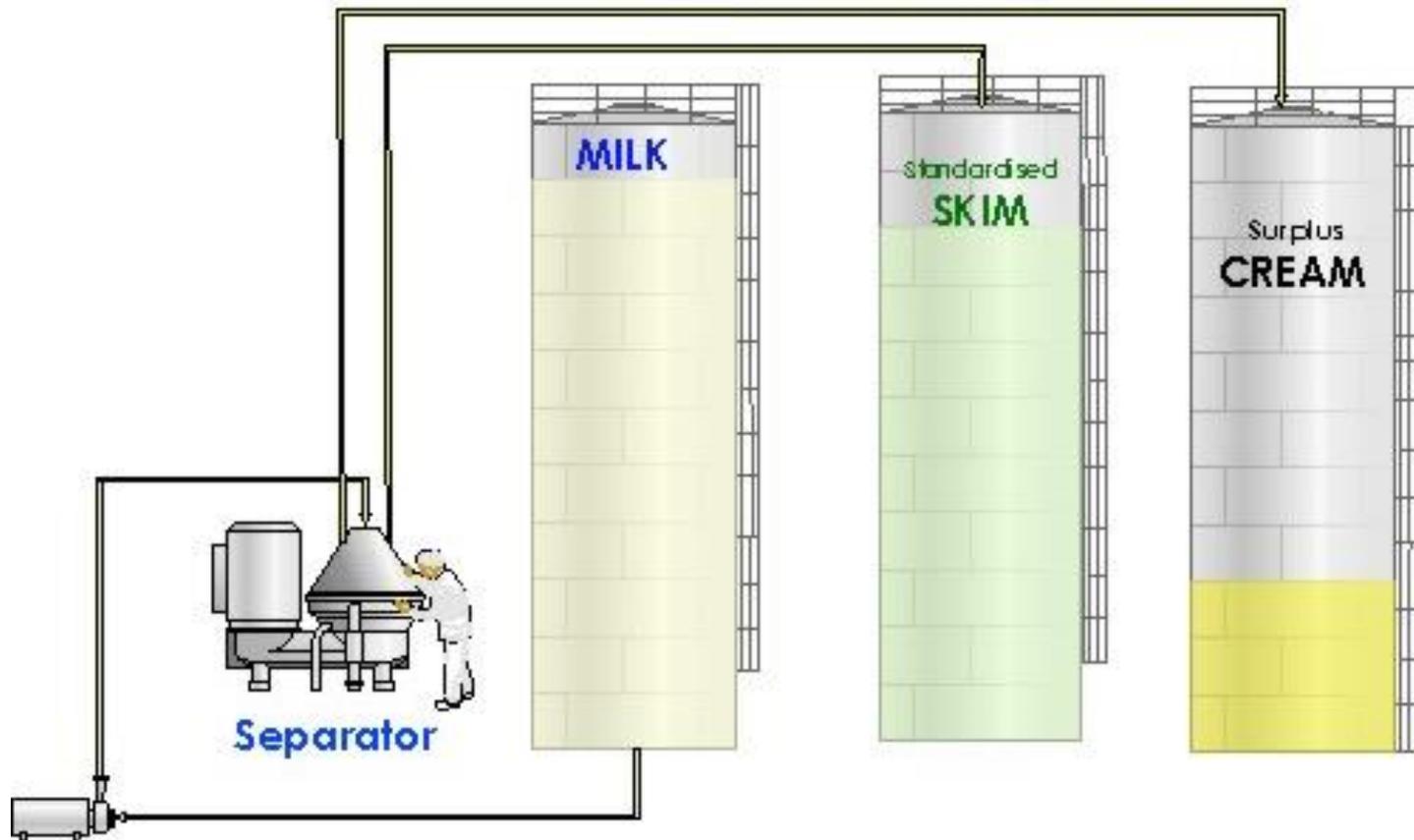
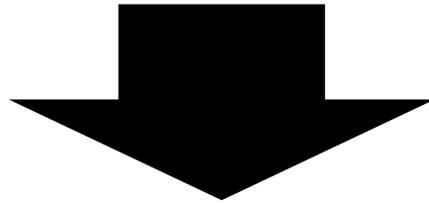


Planning and Operating a Cream Production Unit: Standardization of Cream



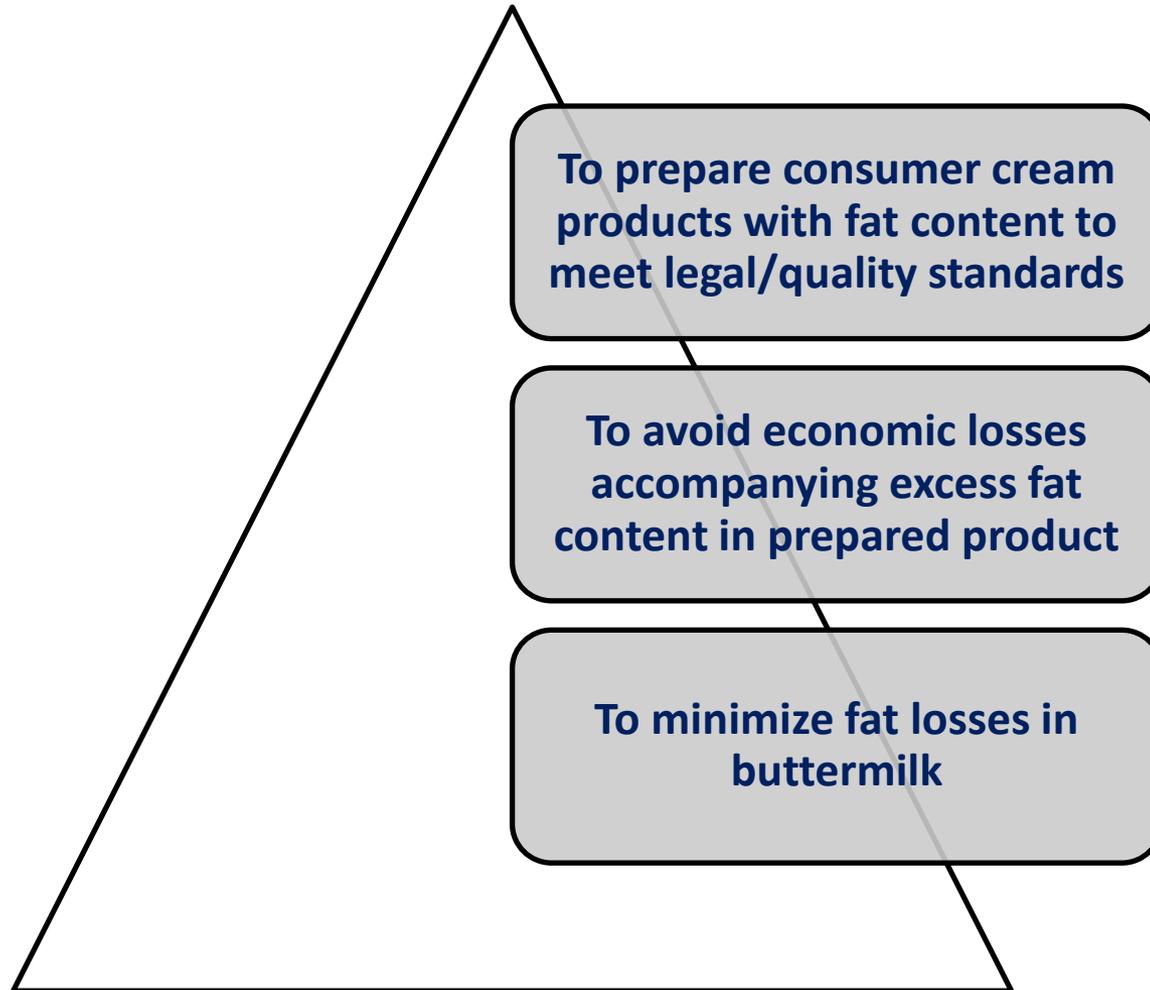
- 1. Important factor in standardization of cream: Fat content.**
- 2. In market cream: (Provided conditions)**
 - **Fat content is higher than specified requirement, then financial returns will suffer.**
 - **Fat content is low, cream may not meet regulatory requirements and lack desired functional properties (viscosity or whipping).**
 - **Too low a fat content will result in a high buttermilk volume; this will not give returns as much as the skim-milk.**



Standardization means adjusting the fat content in cream to a desired level so as to meet legal requirements of the cream and have ease in churning in butter manufacture and minimize fat losses in buttermilk.

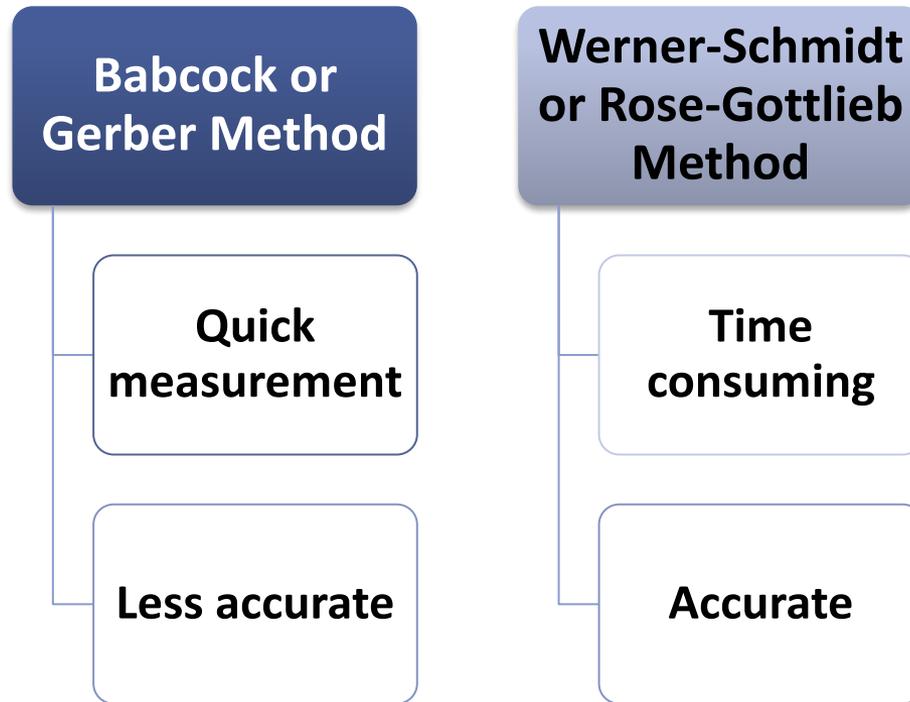
Purpose of Standardization

Standardization of cream refers to the adjustment (raising or lowering) of the fat of cream to desired value, so as to conform to the legal or other requirements of the process.



Methods of Fat Estimation in Cream

Fat content should ideally be controlled as it leaves the separator. The separator is adjusted to give a slightly higher fat content than required and suitable diluent (skim-milk) is added to obtain the required fat content. Such dilutions can be calculated by using Pearson's square. **Important consideration: Measurement of fat content**



In dairy factories, Milko-testers, Milko-scans give rapid measurements of good accuracy.

Calculation for Standardization of Cream

Example 1. 5,300 litre quantity of cream with a fat content of 42.3 per cent is available. Cream with a fat content of 40 per cent is required. How much skim-milk should be added assuming that skim-milk contains 0 per cent fat.

$$\text{Quantity of fat in cream} = 5300 \times 0.423 \times p \text{ kg} = 2241.9 p \text{ kg}$$

where p is the density of the cream.

The total amount of cream that would have this quantity of fat as 40 per cent of its content would be

$$2241.9p \times 100/40 = 5605p \text{ kg} = 5605p/p' \text{ l}$$

where p' is the new density of the cream.

305 (=5605-5300) litres of Skim milk shall be added to 5300 litres of cream to obtain 5605 litres of standardized cream.

Alternatively, the Pearson square method can be used with more convenience as shown below: (to be calculated)

Example 2. If in the above example whole milk with 4.2 per cent fat content were to be used as a diluent, the calculations will be as shown below:

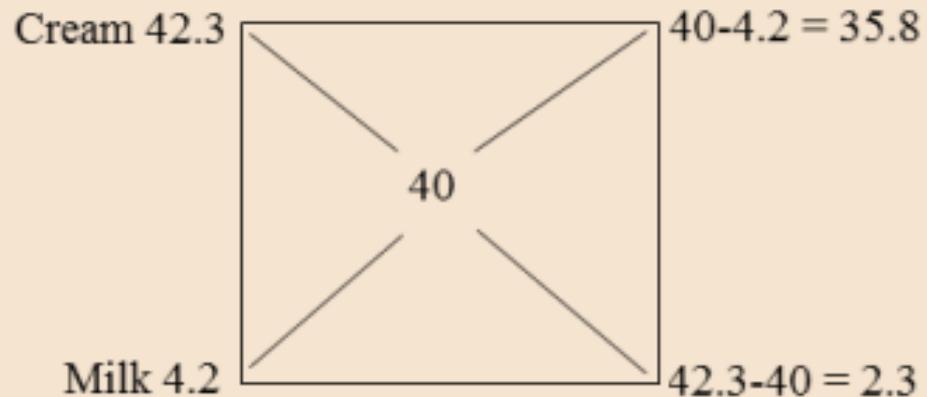
The essentials of the method are shown in Fig.8.2. The fat content of the cream used is set in the top left-hand corner of a square (42.3 per cent) with the fat content of the diluent at the bottom left-hand corner (4.2 per cent). The required fat content is then placed at the intersection of the square's diagonals (40 per cent) and the proportions of the cream and the whole milk are simply obtained by subtraction along the diagonals.

$$\text{Cream required} = 40 - 4.2 = 35.8 \text{ parts} \quad \text{Whole milk required} = 42.3 - 40 = 2.3 \text{ parts}$$

Thus the amount of whole milk added to 5300 I of cream should be

$$5300 \times 2.3/35.81=3411$$

i.e. the cream should be made up to 56411 with whole milk.



Pearson's square as a means of calculating proportions of components for standardising

- 1. Calculation should be based on weight rather than volume.**
- 2. However, if the change in fat content between the original and the standardised cream is not too great, then the approximation of equal density can be made.**
- 3. In high volume factories, it is convenient to produce cream of a required fat content directly from the separator. This can be done purely by adjusting the flow of skim-milk and cream via back pressures for a fixed flow of incoming milk. Provided the fat content of the milk is known, the back pressures on the cream and skim-milk lines can be adjusted with special valves to provide the required proportional flow of skim-milk and cream.**
- 4. The important factors in such an operation are that standard conditions prevail during separation and that flow regulators are accurately calibrated.**

5. Sophisticated operations require an accurate measurement of milk fat content as the cream leaves the separator.
6. Convenient method of ascertaining the fat content of cream is to measure its density. For example, in the temperature range 40-80°C, density (kg/m³) can be computed:

$$D = 1038.2 - 0.17T - 0.003T^2 - \phi (133.7 - 475.5/T)$$

Where T = Temperature in °C

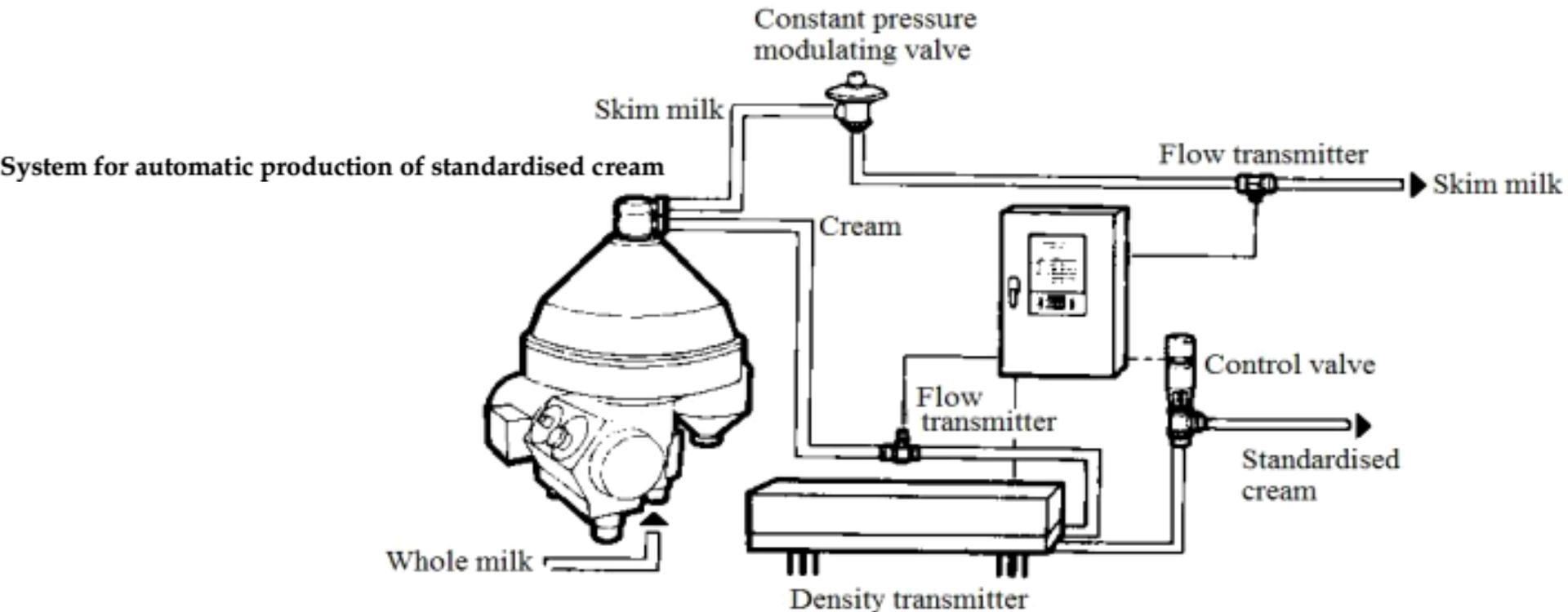
ϕ = Fractional fat Content

or

$$\text{Density of cream} = \frac{\text{Fat \%} \times \text{Density of fat} + \text{Skim milk \%} \times \text{Density of Skim Milk}}{100}$$

100

7. As cream density is largely influenced by fat content and the use of an in-line densitometer can provide a constant monitor on fat content. For standardization, constant density is required. A U-shaped tube of liquid is counterbalanced by weights and any movement of the tube through losing balance can provide a signal to a controller to restore the balance.
8. It also contains density measurement as a means of direct standardization.



The major perturbations of such systems are changes of milk feed silos, which may change milk composition as well as feed pressure to the separator and de-sludging of the separator. The efficiency of a system depends on the rapidity of response to such changes and reestablishment of the required conditions through design and tuning of the feedback control loops.

System for automatic production of standardised cream and milk

