Chapter 6
Clarification

Objective

To improve physical quality of milk by clarification. Removal of extraneous matters presenting milk improves overall acceptability.

Introduction

Filtration is for removal of material lighter than milk such as wood, cellulose, packaging material residue etc., whereas clarification is done to remove components heavier than milk. Milk clarification is the process of removing undesirable foreign matter such as dirt, curd particles, blood corpuscles, epithelial cells, bacteria sediment, sludge etc from the milk. To some extent bacteria also get removed as slime during the clarification process. Clarification cannot be considered an effective means of bacteria removal.

Principle and Methods

Clarification of milk is done by the principle of centrifugal separation. The principle can be understood by a simple experiment. Take water in cylindrical container (Fig.6.1a). Add sand to water until the water becomes turbid (Fig.6.1b). The container is then rotated about its axis at a very high rpm (Fig.6.1c). Due to centrifugal force, heavier sand particles separate out towards the periphery of container (Fig.6.1d). Same principle is applied for clarification of milk. For clarification milk is passed through a centrifugal clarifier.

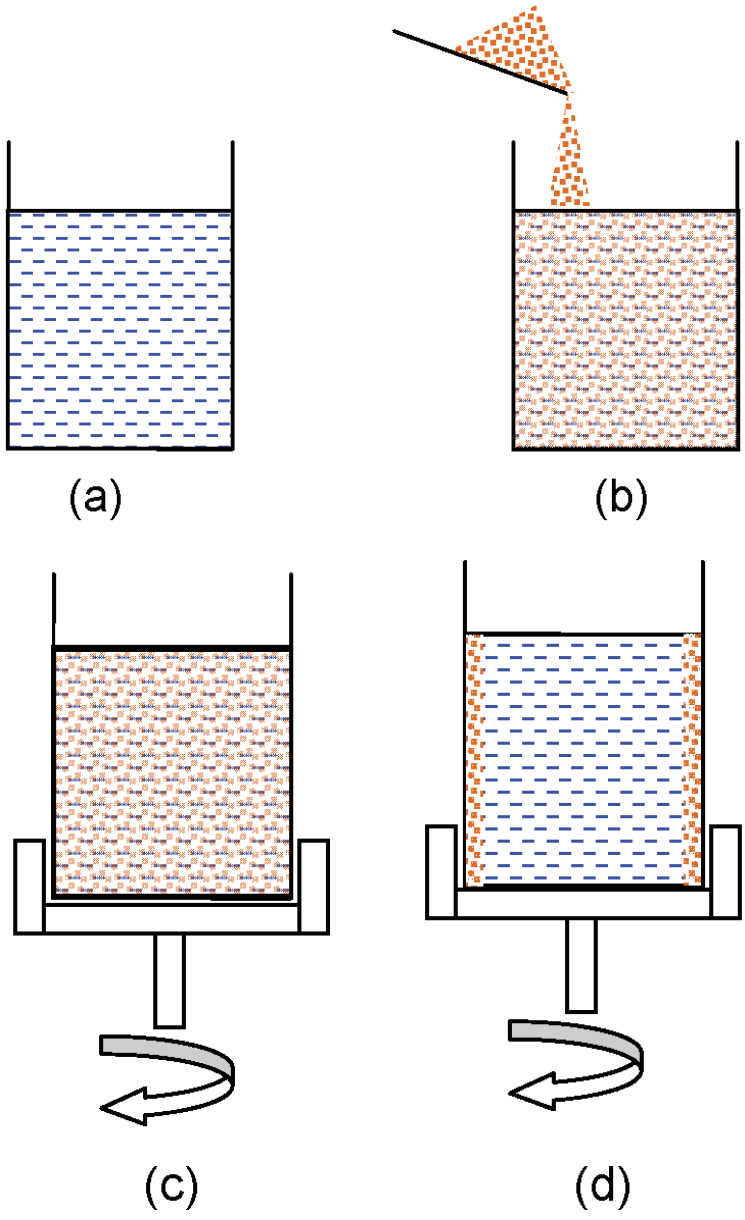

Fig.6.1. Experiment to demonstrate centrifugal separation

Equipment

The clarifier consists of conical discs stacked over each other which rotate inside the clarifier bowl. Milk is introduced into the separation channels at the outer edge of the disc stack, flows radially inwards through the channels towards the axis of rotation and leaves through the outlet at the top (Fig.6.2). Particles, which are more dense than the continuous milk phase, are thrown back to the perimeter. The sludge gets collected in the space around the disc and milk being lighter moves up towards the outlet. The amount of solids that collect will vary, however, it must be manually removed from the centrifuge at

regular intervals. From the studies it has been established that warm clarification of milk, e. g. at 50 to 55°C is preferred to cold clarification.

Modern clarifiers are of self-cleaning type which allows for continuous operation (Fig. 6.3a). The clarifier bowl has discharge ports which open up periodically. These discharge ports remain closed under pressure. Release of pressure opens the port and sludge is evacuated from the space (Fig.6.3b). Such desludging results in about 0.05-0.10% of milk being lost.

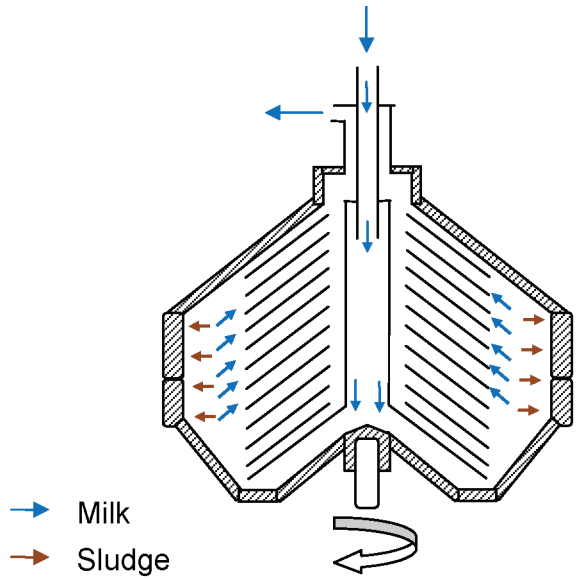

Fig.6.2. Clarifier

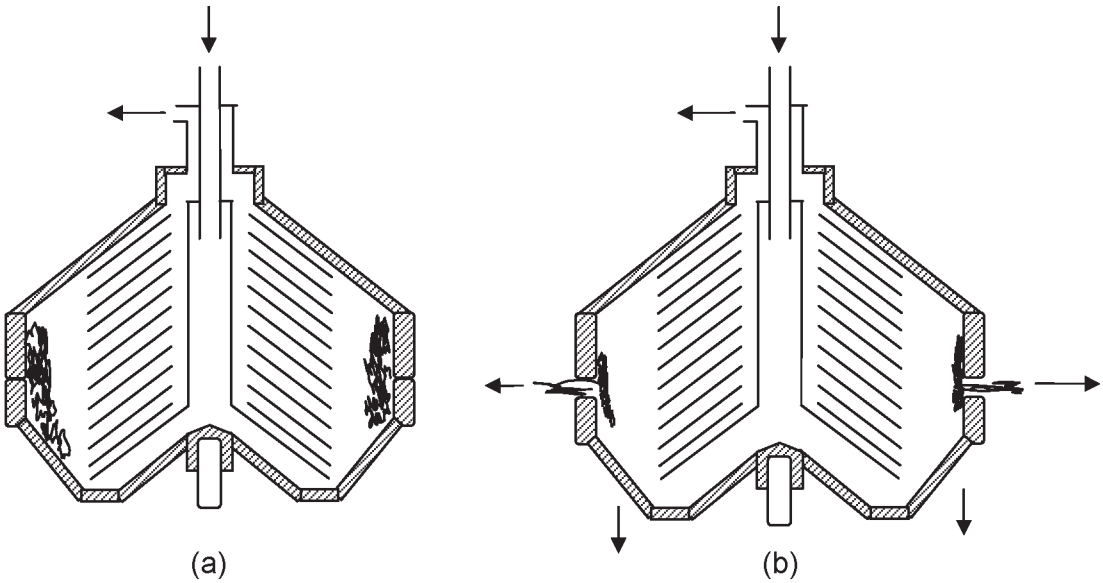

Fig. 6.3 Self desludging clarifier

REVIEW QUESTIONS

1. What is the primary purpose of clarification?
2. Briefly describe principle of clarification?
3. With a neat diagram explain working of clarifier.
4. With a neat diagram explain working of self clearing clarifier