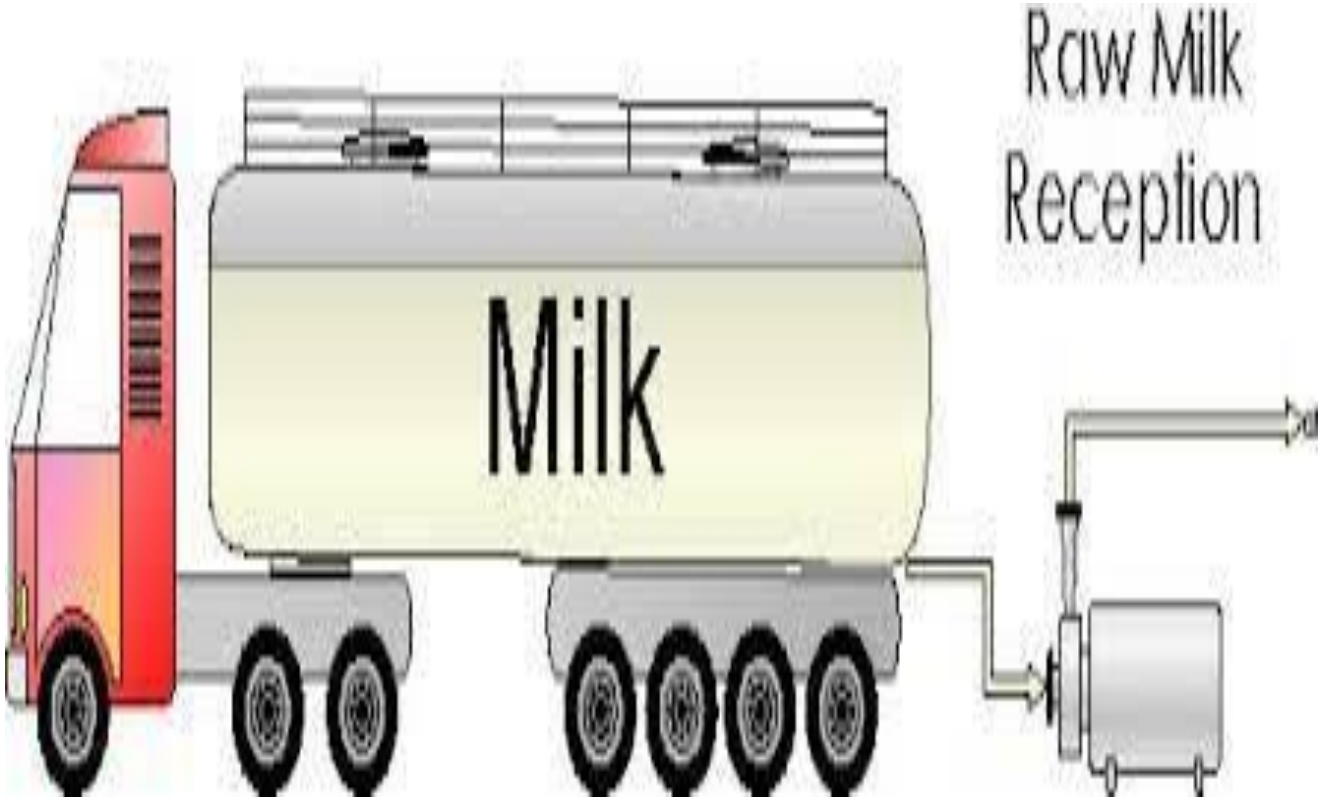
Unit I - Topic 3

Milk reception- Platform test - Cooling and storage of raw milk

Introduction

The handling of milk inside the plant is the key element in maintaining its quality. On arrival of milk is graded for acceptance/ ejection, weighed, sampled for testing, cooled and stored under refrigeration until next unit operation for preliminary processing in the dairy plant.



Milk Reception

Milk may be delivered to the dairy plant in cans or tankers (road or rail). The milk received in these systems has to be sampled, graded, emptied, measured (weight or volume) and bulked to provide continuous supply of milk to the pasteurizer. represents milk reception.

In the absence of mechanical aids, the cans are off-loaded manually to the tipping point, where the lids/covers are removed and the milk inspected. They are then tipped manually and both cans and lids pass on to a can-washer via a 'Drip saver' or 'Drain rack'. Where a higher throughput is required, the procedure is mechanized and the cans are unloaded directly from the truck onto the conveyor (power-driven or by gravity roller) and the tipping, sampling and weight recording may be completely automatic.

The milk is tipped into the weigh tank/pan. Such weigh tank is suspended from a weighing machine, the dial displaying the weight. Two weigh tanks may be used for quick reception. The discharge valve has a large diameter to permit rapid emptying. The milk is discharged into a 'Dump tank' placed immediately below the weigh pan. From here milk may be pumped continuously to a raw milk storage tank, normally situated at a height to enable gravity flow to the pasteurizing plant.

The reception of milk from large rail or road tankers is primarily a matter of providing a

covered area under which emptying and subsequent cleaning can take place. The tanker outlet must be connected to sanitary piping. The milk may be removed by a milk pump, placed at a level lower than the tanker, or a compressed air line may be connected to the top of the tanker and the milk forced out by pneumatic pressure. Cleaning and sanitization of the tanker should follow immediately after emptying is complete. The measurement of milk delivered by tankers is carried out using a weigh bridge or flow-meter.

If milk is received from chilling centers, it has already been graded, weighed, sampled and cooled. It may be weighed and sampled again, or the center's report may be used. The latter procedure applies especially to tanker deliveries.

Milk reception should be done in a planned manner to avoid delay in processing. If the milk is received continuously during the scheduled period, operations in the plant will not be interrupted and employees in the various sections will be fully occupied. The aim should be to complete milk reception within 3-4 hours, especially in tropical countries. Delay in processing may lead to deterioration of milk awaiting dumping, increase labor costs and may increase the operating cost of the can-washer.

Market milk requires milk of a prime quality (from the standpoint of aesthetic quality, health, flavor, sanitation, keeping quality). The quality of the incoming milk greatly influences the quality of the processed milks (or manufactured products).

It is well known that the sanitary quality of milk on the RMRD depends on its background on the farm, viz. healthy cows, clean milk production, clean utensils, prompt cooling and refrigerated transport. However, there is a need for systematic and thorough inspection of

all milk supplies every day by conscientious and experienced milk graders.

When milk is received at the dairy plant, it should be at 5°C or below. The milk should be clean, sweet, possessing pleasant flavor, free from off-flavors and reasonably free from extraneous material viz., antibiotics, pesticides and other chemicals or metals. Abnormal milk should not be accepted. Acid development is objectionable even from standpoint of heat stability.

Milk Reception Operations

The operation of receiving milk may be subdivided into Unloading, Weighing, Sampling, **Grading and Testing.**

Unloading

The truck carrying the filled cans is brought alongside the unloading platform. The milk cans are then unloaded manually. The milk cans are then assembled for grading in a definite order, according to each supplier, viz. the contractor or patron. If a milk tanker is used, it is first properly positioned so that pipe fitting connections can be made conveniently in the Tanker bay.

Grading

It is well known that the quality of the finished product depends on that of the raw material used. This refers to the classification of milk on the basis of its quality, for price-fixation. The milk grader is the key man for the proper selection of milk. The principle of grading is based on organoleptic (sensory) tests such as those for appearance, smell (odor), and taste, acidity sediment etc. are included under platform tests.

Note - The term 'Platform Tests' includes all tests which are performed to check the quality of the incoming milk, to decide regarding its acceptance/rejection. They are performed on each can/tanker of milk with the objective of detecting milk of inferior or doubtful quality, preventing it from being mixed with high grade milk.

The technique of grading milk is as follows:

Milk tanker (road/rail)

The grading has already been done at the milk collection-cum¬-chilling centre. As milk is chilled (< 5°C), it is not possible to detect off-odors. The appearance is noted, as testing of raw milk is usually avoided. After thoroughly mixing it for 5-10 min, a sample is taken for laboratory testing.

Milk can

The main tests applied to each can of milk consist of appearance, smell and temperature (touch); other tests such as taste (seldom carried out with raw milk) and sediment might be used to substantiate the initial findings. Tests involving time, laboratory facilities and special techniques are done by the quality control technician, for which a sufficiently large sample is taken.

Platform tests

Appearance

Observing each can of milk for any floating extraneous matter, off color, or partially churned milk. The milk should be normal in color, free from churned fat globules and reasonably free from any floating extraneous material.

Smell (Odour)

This furnishes an excellent indication of the organoleptic quality of milk that can be ascertained quickly (in seconds). In making the test, the cover of each can is removed, inverted and raised to the nose. The headspace in milk can is smelled. By replacing the lid and shaking the can vigorously, the test may be repeated. An experienced milk grader with a 'trained nose' decides the acceptance/rejection of the milk. The milk should be free from any off flavors.

Temperature

The temperature at which milk is delivered is often an indication of its quality. A daily check on the temperature of milk is helpful in keeping check on the quality of milk. With practice, the grader can tell with a high degree of accuracy whether the milk is sufficiently cold by touching the side of the can. A temperature of 5°C or below is satisfactory.

Sediment

The sediment test shows the visible foreign matter contained in the milk. It need not be made daily, but should be carried out often. For this purpose a reliable sediment tester (such as an off-the-bottom sediment tester) is used. Any method by which maximum sediment is obtained should be considered satisfactory. A low sediment is desirable. Sediment test is performed to judge the cleanliness of milk. There is no correlation between the amount of sediment and the bacteriological quality of milk. Measured quantity of milk is filtered or centrifuged and checked for sediment. A good quality milk gives no visible dirt whereas poor quality milk shows dark or blackish deposits on the filter pad. The milk is graded for its quality on the basis of BIS standards.

Acidity

'Natural' or 'apparent' acidity of milk is desirable which does not adversely affects its heat stability. However, 'developed acidity' (Natural + Developed = Titratable acidity) adversely affects the quality of milk which cannot be processed in pasteurizer.

Lactometer reading

The addition of water to milk results in lowering its density. Hence, this test is applied for detection of adulteration of milk with water. The reading for cow and buffalo milk should be about 28 to 30 and 30 to 32 respectively, when measured at 15.5°C.

PROCEDURE

- **CLOT ON BOILING**
- Take 5 ml of milk in a test tube.

- Place it in a water bath at boiling for 5-6 min
- Remove it and examine for any precipitated particles on the sides of the test tube.
- **HEAT STABILITY**
- Take 5ml of milk in a test tube.
- Add 0.6ml of 0.1N HCL to the milk, place it in water bath 5-6 min.
- Remove it and examine for the presence of curd particles.

Result

CLOT ON BOILING TEST: Negative COB indicate no developed acidity and absence of bacterial growth.

HEAT STABILITY: Absence of precipitate particles indicate the heat stability of milk is good.

Storage of Milk: Importance and Methods of Cooling!

Importance:

Milk drawn from a healthy cow is sterile but it contains bacteria that have entered the teat canal through the teat opening. They are pushed out during milking process. The number of bacteria varies from animal to animal. For milk contains greater number of bacteria than stripping.

Milk gets easily contaminated with dirt, bacteria and odours. Milk furnishes an excellent medium for the growth of bacteria, particularly when not properly cooled. They produce chemical changes rendering it unpalatable.

Pathogenic bacteria can also very well multiply in milk. Therefore, milk may serve as a medium for dissemination of infectious diseases. Hence the quality and conditions of production of milk can be judged on the basis of microbial contents.

Handling the Milk Prior To Storage:

Milk should be removed to the milk house immediately after it is drawn because the contamination may also take place if it is left in the barn, the milk should then be strained into cans. If the cows are carefully milked, straining may not be necessary.

It is impossible to strain bacteria out of milk. However, it is desirable to filter the milk to remove hairs, particles of feed or bedding or dirt, etc. that may have into milk during the production. A single service pad type strainer may be used for this purpose.

Necessity of Cooling Milk before Storage:

It is impossible to produce milk without some bacteria. Therefore efforts should be to prevent multiplication of the bacteria that have gained access.- This can be achieved by cooling the raw milk.

Methods of Cooling:

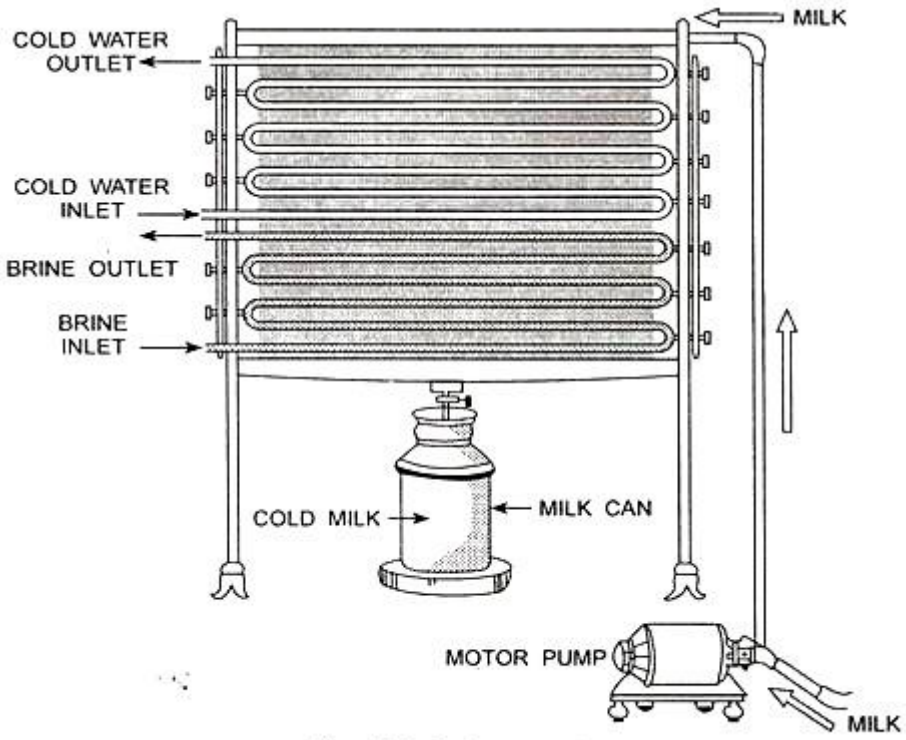


Fig. 18.1. Surface cooler.

1. Indigenous method:

Milk venders who collect milk from villages are issued licence on the agreement that they will put the wet cloth around the can of milk to keep milk cool during the period of transportation by bicycle or cart, etc.

Scientific method:

There are four methods used under this. These are as follows:

(i) Use of surface coolers/surface tubular coolers.
(ii) Cabinet coolers in vertical position.
(iii) Plate type chillers
(iv) Double tube coolers.

Storage of Milk in Tanks:

Modern storage tanks for milk are of two type's viz. horizontal and vertical cylindrical shape of 10,000 litre capacity. In countries of temperate climate where milk is not stored for more than 24 hrs. the insulation of tanks is not necessary. In tropical regions of warmer climate 7 to 10 cm cork insulation is desirable to maintain minimum temperature 4°C. Milk kept at low temperature will have longer keeping quality suitable for processing in dairy plant