



Practical exercise 1

Milk reception operation

Objectives

This exercise helps students about understanding various milk reception activities.

Introduction

Milk should be chilled to 4°C immediately after milking and be kept at this temperature all the way to dairy processing plant. Breaking of cold chains causes the growth and multiplication of micro-organisms and spoils the raw milk. Milk is transported from producer to collecting centre, where milk is collected from individual producers followed by cooling and subsequently sent to the dairy for processing. Milk is collected at different places in a milk catchment area such a collection at dairy cooperative society followed by sending to dairy processing plant as such or after chilling of milk. Milk is also collected at chilling centre where the production and processing sites are far away. Milk is collected at chilling centres where milk is cooled and stored under refrigerated conditions and sent milk at by refrigerated milk tankers to dairy processing plant. Nearby producers directly send the milk to dairy processing plant immediately after production. Large organized dairy farm produce milk which is cooled and stored in bulk chillier before sending the milk through insulated road tankers to dairy processing plant. The milk collected from cooperative dairy society collection centres, chilling centres etc is chilled at dairy processing plant and stored in insulated silos to keep the milk temperature below 5°C to prevent microbial growth and spoilages of milk. The collection and flow of milk from producers to dairy processing plant is depicted in Figure 1.1.

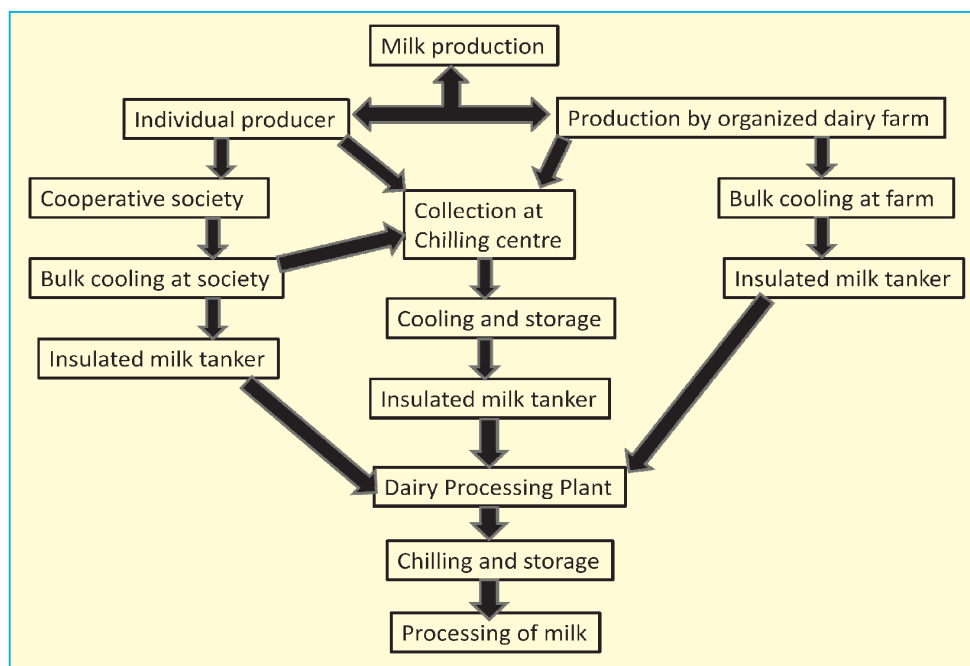


Fig.1.1. Flow of milk from producers to processing plant

Collection from small producers

Milk is transported by various sizes container, the most common being of 10 to 50 litres capacity. It is done just before arrival of collecting truck. Milk collecting centres is established in regions where there is no good road to the dairy farm, when water and/or electricity are not available on the farm, or when the milk quantities are too small to justify investment in cooling facilities. Another alternative is that neighbouring farmers deliver their un-cooled milk in milk can to a larger farm for cooling and subsequent transfer to chilling centres or dairy processing plant. The can-collecting lorry follows a planned schedule path so that it always arrives at each collection point in time and ultimately transports the milk to processing plant immediately. Each farm/ producers has unique code number, which is stamped on cans and it is used to trace the milk for making payment. Subsequently, milk is collected at processing plant after conducting thorough tests. It is then chilled and stored in insulated silos until processing.

Bulk collection

When milk is collected by tanker, it may be possible to drive all the way to the farm milk room. The insulated tanker is loaded from the farm cooling tank or bulk cooling tank at bulk cooling centre at society level or chilling centres. The tanker is fitted with a flow meter for measuring the volume of milk or volume is measured by difference of volume



of initial and leftover milk. The tank of the bulk collection vehicle is divided into a number of compartments to prevent the milk from splashing during transportation.

Milk reception

Dairies have special reception departments to handle the milk brought in from the farms. The first thing done at reception is to determine the quantity of the milk. The quantity is recorded and entered into the weighing system that the dairy uses to weigh the intake and compare it with the output. The quantity of the intake can be measured by volume or by weight (Fig.1.2).

After weighing raw milk is pumped to storage tanks to await processing. The empty cans are conveyed to a cleaning station, where they are washed with water and detergent to remove all traces of milk.



Fig.1.2. Milk weight balance

Tanker reception

Tankers arriving at the dairy drive straight into a reception hall, often large enough to accommodate several vehicles. The milk is measured either by volume or by weight (Fig.1.3).

The volume of milk is recorded by fitting a flow meter during emptying of tanker. Measuring can be improved by fitting an air eliminator before the flowmeter. The tanker outlet valve is connected to an air-eliminator and from this the



Fig.1.3. Milk tanker for transportation of milk under chilled conditions



milk – free from air – is pumped through the flowmeter, which continuously indicates the total flow. The milk is pumped to a storage (silo) tank directly or through suitable chillers for cooling the milk before storage in silo.

Measurement of weight of milk is done in two ways: A) Weighing the tanker before and after unloading and then subtracting one value from the other and B) Using special weighing tanks with load cells in the feet. The tanker is driven onto a weighbridge at the dairy. Operation may be manual or automatic. When empty, the tanker is weighed again and the tare weight is deducted from the previously recorded gross weight. After this the milk is pumped to a silo tank. Tankers are cleaned every day, as a rule at the end of a collection round. Cleaning can be carried out by connecting the tanker to a cleaning system while in the reception area, or by driving it to a special cleaning station.

Chilling and storage of raw milk

The temperature of milk may increase to above 4°C during transportation. The milk is usually cooled to below 4°C in a plate heat exchanger after reception of milk at dairy processing plant and stored in insulated storage tank (silo tank) till processing. The untreated raw milk – whole milk – is stored in large vertical tanks – silo tanks – which have capacities from about 5,000 litres up to 1,00,000 litres (Fig.1.4). Silo tanks are of double-wall construction, with insulation between the walls. The inner tank is of stainless steel, polished on the inside, and the outer wall is usually of welded sheet metal.



Fig.1.4. Milk storage silos



Sampling of milk during milk collection

Quality control in the dairy industry must cover all the quality aspects of milk and milk products throughout the total milk chain from the dairy cow to the consumer. Quality control and assurance must begin at the farm. Farmers must use approved practices of milk production and handling. Also all regulations regarding the use of veterinary drugs on lactating animals and against adulteration of milk, etc. must be observed.

Milk Sampling

Accurate sampling is the first prerequisite for fair and just quality control system. Liquid milk in cans and bulk tanks should be thoroughly mixed to disperse the milk fat before a milk sample is taken for any chemical tests. Representative samples of packed products must be taken for any investigation on quality. Plungers and dippers are used in sampling milk from milk cans.

Sampling milk for bacteriological tests require a lot of care. On the spot sterilisation may be employed using 70% Alcohol swab and flaming or scaling in hot steam or boiling water for 1 minute.

Sample Preservation

Chemical Tests

Milk samples for butterfat testing may be preserved with chemicals like Potassium dichromate (1 Tablet or ~ ml 14% solution in a 1/4 litre sample bottle is adequate.) Milk samples that have been kept cooling a refrigerator or ice-box must first be warmed in water bath at 40°C, cooled to 20°C, mixed and a sample then taken for butterfat determination. Other preservative chemicals include Sodium acid at the rate of 0.08% and Bronopol (2-bromo-2-nitro-1, 3-propanediol) used at the rate of 0.02%.

If the laboratory cannot start work on a sample immediately after sampling, the sample must be cooled to near freezing point quickly and be kept cool till the work can start. If samples are to be taken in the field e.g. at a milk cooling centre, ice boxes with ice packs are useful.



Labelling and Records Keeping

Samples must be clearly labelled with name of farmer or code number and records of dates, and places included in standard data sheets. Good records must be kept neat and in a dry place. It is desirable that milk producers should see their milk being tested, and the records should be made available to them if they so require.

Milk sampling at milk collection centres

All milk from different farmers must be checked for quantity, wholesomeness, acidity and hygienic quality.

After the milk has left the farm where it is produced, the first control takes place when it arrives at the collection centre or at the platform of the dairy plant. Information is required about the quantity, quality, hygiene, composition, water content, etc. This is needed to determine the payment that the producer will receive for his or her milk. The level of information required depends on many factors. To get an impression about the quality of the supplied milk a sample is taken and placed in sample bottles with preservatives added. Potassium dichromate is usually added to keep the samples in a good condition. Always try to keep milk samples as cool as possible.

Milk must be thoroughly mixed before sampling to make sure that all ingredients and substances are dispersed throughout the container. The next procedures are recommended at the Collection Centre.

1. Agitate the milk at least ten times with the full length of a plunger or dipper. Immediately after this take the sample of the required volume, put it into a sample bottle and close it. To make sure that a sample will represent all the milk well, one can take half of the required sample from the lower portion and half from the upper portion of the milk can.
2. If no plunger is available, agitate the milk as good as possible with a dipper with a long enough handle. Take half of the sample from the lower portion and half from the upper portion of the milk can.
3. Sampling from a smaller milk container can be done after turning the container ten times upside down. Take care that the container is closed well. Make sure that the samples are labeled and that all information about the sample is carefully recorded to avoid confusion. Some examples of milk tests are briefly described below, with



an emphasis on simple and cost effective methods. These focus on milk reception tests (the platform tests) that can be carried out at Milk Collection Centres.

Milk reception at dairy factories

Milk from individual farmers or bulked milk from various Milk Collection Centres must be checked for quantity plus bacteriological and compositional quality. Also tests on the presence of antibiotics are carried out regularly.

Activities

- Visit a milk collection centre/ dairy plant reception dock and observe and note down the activities.

REVIEW QUESTIONS

1. What is the importance of chilling of milk after collection?
2. What is the need of sampling of milk during reception?
3. What do you mean by bulk milk chiller?
4. What is importance of platform tests?
5. How is the milk for chemical analysis preserved?