Chapter 3

Milk Reception Operations at Dairy Plant

Objectives

To know the procedure of sampling and testing of milk at dairy reception dock

Introduction

The quality of incoming milk greatly influences the quality of the processed milk. It is well known that the initial quality of milk on the receiving dock depends on the production and handling of milk at the farm. When milk is received at dock it should be clean, sweet, pleasant flavor, obtained from healthy animal, produced under hygienic conditions, free from colostrums and other contaminants, promptly cooled (5°C or below) and transported in refrigerated conditions. Abnormal milks (obtained from diseased animal or altered composition) and milk exhibiting high developed acidity should be rejected at the dock as it reduces the heat stability of milk and creates problem during subsequent processing.

Milk may be delivered to the milk plant/dairy in cans or tankers via road or rail (Fig.3.1 to Fig.3.3). The milk in these containers has to be graded, emptied, measured by weight or volume, sampled and bulked to provide continuity of supply to the subsequent processes.

Milk Reception

At the dock the milk coming from villages or chilling centers which has been stored in bulk coolers (Fig.3.4), comes either in cans or insulated tankers are unloaded by manual

Fig.3.1. Milk reception dock

Fig.3.2. Stainless steel milk tanker

Fig.3.3. Milk received in cans

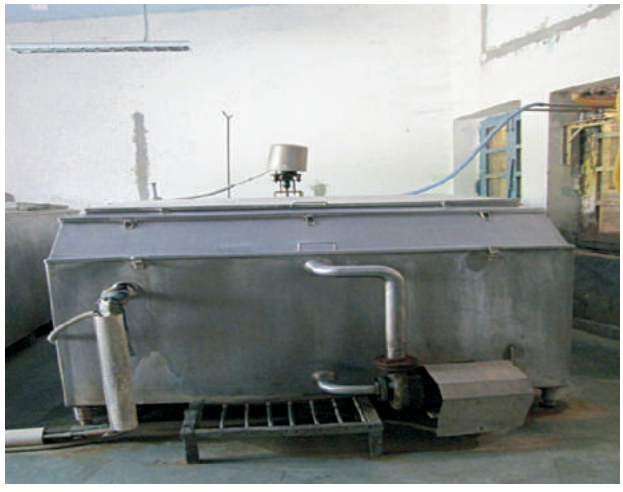

Fig.3.4. Milk stored in bulk coolers at chilling centers

or mechanical process. In manual process the cans are unloaded to the tipping point, where the leads/covers are removed and the milk is inspected. They are then tipped manually and both cans and lids passed on to a can-washer via a drip saver or drain rack. In case of high throughput required the procedure is mechanized and the cans are unloaded directly from the truck on to the conveyor (power-driven or by gravity-roller) and the tipping, sampling and weight-recording may be completely automatic. The milk received is then weighed and stored in large capacity storage tanks or silos. If the milk is received from milk chilling centers, it has already been graded, weighed, sampled and cooled. It may be weighed and sampled again or the Centers report may be used.

Milk reception should be planned and the equipment so chosen that intake operations are properly carried out. This is especially very important where large volumes of milk are received. Delays in process cause deterioration of milk, which may increase labour cost and

operating cost of the can-washer. The deliveries of milk should follow a schedule. The aim should be to complete milk reception within 3-4 hours especially in Indian conditions.

Operations

The milk reception operation includes unloading, grading, sampling, weighing and testing of milk.

Unloading

Once the milk filled cans and tanker enters in to the dairy premises the primary objective is to unload the cans and tankers to avoid any delay in receiving operation. The milk cans are assembled in definite order according to each supplier. If a milk tanker is being used, it is first properly positioned so that connections can be made conveniently.

Grading

This refers to the classification of milk on the basis of quality. Milk of poor grade has to be rejected. Grading also helps in price fixing of milk. The grading is based on organoleptic or sensory tests such as smell, taste, colour and appearance, acidity and sediment test. These are included under platform tests. Platform tests are those tests which are performed to check the quality of the incoming milk on the receiving platform so as to make a quick decision regarding acceptance or rejection of milk at the dock.

Sampling

Drawing of accurate and representative sample of milk for subsequent chemical and bacteriological is very important. While strict precautions regarding sterility of stirrer, sampler, container etc., are required for obtaining a bacteriological sample, dryness and cleanliness of the above equipment should suffice for a chemical sample.

The prerequisite of sampling is thorough mixing of the milk with plunger or stirrer, which can be operated manually or mechanically in the milk in cans or tankers (Fig.3.5). in case of milk in can a representative sample may also be drawn after quick dumping of the milk in to the weigh tank, whereby it gets mixed so thoroughly that a representative sample may be taken without further mixing in labeled sample bottle (Fig.3.6). The sample may be individual, composite (mixture of two or more individual lots of milk) and drip (representing the entire days supply). The samplers may be dipper, tube, automatic vacuum or drip. For chemical analysis many a times samples are preserved using suitable preservatives and

Fig.3.5. Plunger for mixing of milk

Fig.3.6. Milk in sample bottle for analysis

Fig.3.7. Milk samples for analysis stored in refrigerator

stored in a refrigerator before the analysis (Fig.3.7). The common preservatives used are mercuric chloride, formalin and potassium dichromate.

Weighing

This is an essential step in accounting for milk receipts and disposal, making payments for milk. The milk in-cans are dumped in to the weigh tank either manually or mechanically, where it get weighed and dumped in to dump tank (Fig.3.8 & Fig.3.9). The milk in tankers may be measured by volume by passing it through a flowmeter and its measurements are converted in to weight by multiplying the volume with an agreed density. Another common alternative to road tankers is to use of weigh-bridge, the tanker being weighed once when it is full, and again after it has been emptied.

Fig.3.8. Milk weighting tank

Fig.3.7. Milk dump tank

Testing

The quality of raw milk is tested in a quality control laboratory (Fig.3.10) or dairy dock at the dairy plant before its acceptance. These tests check the suitability of milk for further processing and human consumption. The milk is also graded on the basis of certain tests. The various routine tests employed for raw milk testing are summarized in table 3.1.

Fig.3.10 Quality control laboratory for milk testing

Among all the above tests which are summarized in table 3.1, smelling the milk in can at the receiving dock and COB, if needed, are routinely used to decide acceptability of the milk by the dairies in our country.

Clot-on-Boiling test is done by taking 2 ml milk in a test tube and boiling it over a burner flame. If precipitates or clotted particles appear, the milk is not accepted as it indicates developed acidity and such milk may clog pasteurizer plates. Certain dairies also fix the standards for level of acidity, above which the milk may not be acceptable.

The microbiological quality is also routinely tested by MBRT or RRT, standard plate count and coliform count. However, these tests are not used still for pricing the milk in India. The MBRT is very popular test in our country, as it has good correlation with the rate of souring under atmospheric handling that reflects the level of its keeping quality. The test has also reasonable correlation with the standard plate count at 37^0C. The test is based on the principle that when methylene blue in its oxidized from (blue) is added to milk, gets reduced (colourless) due to metabolic activity of micro-organisms. The time required for such reduction is related with the number and type of micro-organisms in milk.

Table 3.1 Quality control tests performed for milk at reception point and dairy plant

Name of test	Purpose	Significance
Platform Test		
Organoleptic test Acidity Sediment test Alizarin alcohol test 10 min. resazurin test Direct microscopic count (DMC)	To check taste, smell and physical appearance of the milk. Also determine heat stability and pH of milk to know suitability of milk for processing (making market milk and dairy products). To observe types of organisms present in milk	Indicate acceptability or rejection of milk. Milk which do not comply with the test or unable to maintain the pre-determined level/ standards have to be rejected
Microbiological quality tests		
Methylene blue reduction test (MBRT) Resazurin reduction test (RRT) Total plate count (standard plat count) Coliform count Thermoduric count Thermophilic count Psychrotrophic count Proteolytic count Lipolytic count	To determine extent of microbial load present in milk indirectly by dye reduction tests or enumerate number of organisms in milk by viable plate count methods. Also check specific group of organisms like coliforms, thermoduric & thermophilic (heat resistant bacteria), psychrotropic (cold loving bacteria), protein degrading and fat degrading bacteria present in milk	Milk having higher bacterial load or higher in particular types of group are either rejected or processed immediately
Others		
Test for mastitis Test for antibiotic residues	To know whether the milk is obtained from animal suffering from mastitis. Also to check antibiotics administered to animals are entered in to milk or not	Mastitis milk or milk containing antibiotics are not to be used or mixed with normal milk

REVIEW QUESTIONS

1. Which operations are carried out at milk reception dock?
2. What are platform tests? How COB is performed?
3. How milk samples are preserved before their chemical analysis?
4. How will you check microbial load in milk samples?
5. How will you check heat stability of milk?