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# EXPERIMENT 3 CHILLING AND STORAGE OF MILK

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## 3.1 INTRODUCTION

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Milk deteriorates fast under ambient conditions with time, as the micro-organisms grow in a logarithmic manner. The initial high microbial load and the long time involvement between production and processing make it necessary to chill the milk immediately at the production /collection centres, before it reaches the dairy plant. Chilling is very effective in checking the growth of micro-organisms. Chilling of milk can be achieved by the use of ice, chilled water, brine water, liquid refrigerant etc. in surface cooler, bulk milk cooler, roto-freeze, shell and tube coolers, plate coolers, and intermittent absorption units.

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## 3.2 OBJECTIVES

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- understand importance of chilling of milk.
- use the correct method and temperature of chilling to avert growth of micro-organisms present in milk.
- maintain the quality of raw milk received.

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## 3.3 EXPERIMENT

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### i. Principle

Depending upon the chilling equipment, milk is chilled by extracting heat from it by circulating cooling medium indirectly. Cooling medium commonly used is chilled water, brine, ice-water or liquid refrigerant. Once milk is cooled down to below 4 or 5° C, the chilled milk is stored in insulated / refrigerated storage tank till dispatched to the main dairy.

### ii. Requirements

Chiller, milk pump, tipping tank, milk storage tank, chilled water tank, inter-connecting pipes and fittings, thermometers, cold milk filter etc.

### iii. Procedure

- i) Weigh the quantity of milk to be chilled.
- ii) Dump the milk into the tipping tank/vat.

- iii) Circulate chilled water through the chiller by starting the pump.
- iv) Collect the chilled milk in the milk storage tank.
- v) Note the temperature of the chilled milk.

#### iv. Observations

Record the following observations:

- i) Quantity of milk to be chilled ..... Kgs
- ii) Temperature of raw milk ..... °C
- iii) Temperature of chilled water ..... °C
- iv) Temperature of chilled milk ..... °C
- v) Time of chilling started ..... hour
- vi) Time of chilling completed ..... hour
- vii) Total time taken ..... hour
- viii) Quantity of milk chilled/hour ..... Kgs/hour
- ix) No. of storage tank ..... Nos.
- x) Temperature of milk in the tank ..... °C
- xi) Temperature of milk in the tank after 1 hour ..... °C
- xii) Rate of rise in temperature ..... °C /hour
- xiii) Remarks

#### v. Results

- i) Rate of chilling milk = ..... Kg/hour
- ii) Rate of rise in temperature = ..... °C/hour  
during storage of chilled milk
- iii) Quantity of chilled water = ..... Kg
- iv) Refrigeration requirement = ..... Tons.

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### 3.4 PRECAUTIONS

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- i) Record the initial and final temperature of milk and chilled water accurately.
- ii) Circulate chilled water to ensure that chiller is operating satisfactorily and temperature of chilled milk be close just above 0° C.
- iii) Clean the plates of the chiller to ensure proper circulation of chilled water.