EXPERIMENT 7 STUDY OF BATCH PASTEURIZER AND HIGH TEMPERATURE SHORT TIME (HTST) PASTEURIZER

Structure

7.1 INTRODUCTION

Equipment in which pasteurization is done is called a pasteurizer. The pasteurization of market milk refers to the process of heating every particle of milk to at least 62.8°C (145°F) for 30 minutes or 71.7°C (161°F) for 15 seconds in approved and properly operated equipment i.e., pasteurizer. Pasteurization is immediately followed by cooling of milk to 5^{o} C (40°F) or below.

A batch pasteurizer is normally a double-jacketed vat fitted with a mechanical agitator and thermometer with the provision of hot water and chilled water inlets and outlets where heating, holding and chilling of milk are accomplished. A modern HTST pasteurizer essentially consists of a plate heat exchanger to form heating, regenerating, holding and cooling sections with some accessories like flow diversion valve (FDV), temperature control systems, electrical panel, filter/ clarifier etc. In some plants, instead of having a holding section, a holder tube is provided whose length and the diameter is so adjusted that the milk takes at least 15 second to pass through.

7.2 OBJECTIVES

- learn the different parts of pasteurizer
- study the functions of different components of pasteurizers.
- know dismantling, assembling, cleaning and sterilization of pasteurizers.

7.3 EXPERIMENT

i. Principle

A. **Batch Pasteurizer:** A batch pasteurizer accomplishes the functions of heating milk to 62 to 65°C (minimum 62.8°C) holding at this temperature for a minimum period of 30 minutes and cooling to below 5 °C in a closed vessel. Normally,

this is done in a vat. For efficient heat transfer, vats may be provided with heating coils, spraying tubes, double jacket and/or agitator. Automatic temperature control and temperature recording system may also be provided. Design and material of construction of equipment are considered by taking into account the convenient in cleaning and sanitization.

B. **H.T.S.T.Pasteurizer:** It is a heat exchanger in which each particle of milk, under ideal condition, should be raised instantaneously to 71.7°C, maintained at this temperature for 15 seconds and instantaneously cooled below 5°C. Modern HTST pasteurizer is the best practical compromise on the problem and succeeds in raising the temperature of milk through the last heating stage to the required temperature and, at the same time, cooling to the desired temperature in a few seconds only. The component equipments of a pasteurizer consist of float controlled balance tank, raw milk pump, flow controller, plate heat exchanger, filter/clarifier, flow diversion valve, thermal limit recorder & recorder transmitter, check thermometer, temperature controller, thermograph sand controls.

ii. Requirements

Batch pasteurizer, HTST pasteurizer, set of spanners, screw drivers, trays, buckets, milk cans, brushes, detergents etc.

iii. Procedure

A. Batch Pasteruizer

i) Open the lid of the vat and observe various accessories attached inside and outside the vat.

ii) Fill the open tank with water and open the steam valve to heat it and prepare the detergent solution.

iii) Flush out left-over milk in the pasteurizer with cold water.

iv) Disconnect the various pipelines and put them in hot water tank.

v) Separate the plates in the parts placement tank (P.P.T.) and clean them with a soft scrubbing brush.

vi) Scrub the inner jacket of the vat with the brush and detergent solution.

vii) Clean the pipelines with pipe cleaning brush thoroughly and sterilize.

viii) Assemble them properly after cleaning and sterilizing.

ix) Fill the vat of the P.P.T. or multi purpose vat with 100 liters of chlorinated water (200 ppm) and circulate through pipelines and plate heat exchanger for 5 to 10 minutes and check for leakage.

B. HTST Pasteurizer

1) Dismantle the following parts of the pasteurizer

   i) Interconnecting pipe lines.

   ii) Holding tube

   iii) Flow diversion valve

   iv) Filters

   v) Balance tank

   vi) Plates

   - hot water section
   - regeneration section

- cold water section
- chilled water section

iv. Observations

A. Batch Pasteurizer

i) Make of the batch pasteurizer:

ii) Capacity of the batch pasteurizer:

B. HTST Pasteurizer

i) Make of the equipment:

ii) Number of sections in the pasteurizer:

iii) Plate design:

iv) Location of flow diversion valve:

v) Material used in plate construction

vi) Design of the holder tube and flow diversion valve

vii) Holding tube or plates for holding hot milk:

viii) Number of plates in each section:

a) Heating:

b) Holding:

c) Regeneration:

d) Cooling:

ix) Length and diameter of holding tube:

x) Show the flow of milk by a suitable sketch:

v. Results

7.4 PRECAUTIONS

1. Avoid over-tightening of nuts and plates.
2. As a rule, thoroughly clean the plant after and before use.
3. Use a cleaning in place (CIP) system, if possible.
4. Ensure that flow diversion valve, time-temperature recorder, float controlled balance tank, centrifugal pump, etc. are functioning properly.