

HTST PASTEURIZATION

High temperature short time pasteurisers are usually continuous flow systems using heat exchangers. Generally plate type heat exchangers with regenerative heating, heating and cooling systems are used.

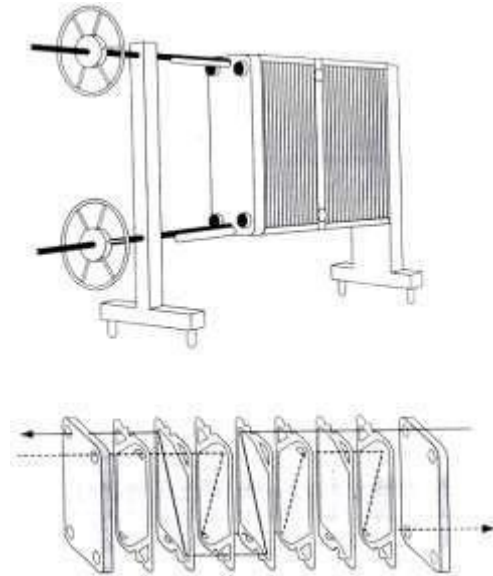


Fig. 5.4 Plate heat exchanger

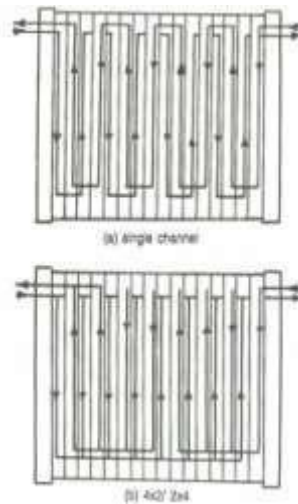


Fig. 5.5 Flow pattern in plate heat exchangers



Fig. 5.6 Types of plates used in plate type heat exchanger

Basic components of HTST pasteurization system

The HTST pasteurization process and its basic components are shown in Fig. 5.7. First from a constant level tank, milk is pumped by a booster pump into a heat exchanger to heat it with the help of pasteurized milk to about 60°C. As the pasteurized milk is used for heating the raw milk and there is no external heating source, we call that a regenerative heater. The regenerator reduces the actual heat requirement for pasteurization and hence is very important for the overall cost effectiveness of the system. Then the milk enters into the heater where the temperature of milk is raised to the actual pasteurization temperature. The milk then passes through the holder, where the milk temperature is maintained for the specific time so that pasteurization is completed. Then the pasteurized milk goes to the regenerator so that it gives away some heat to the raw milk. It is also simultaneously cooled so that the refrigeration requirement is reduced. After the regenerator, the pasteurized milk goes to a chiller, where the milk temperature is reduced to about 4-5°C.

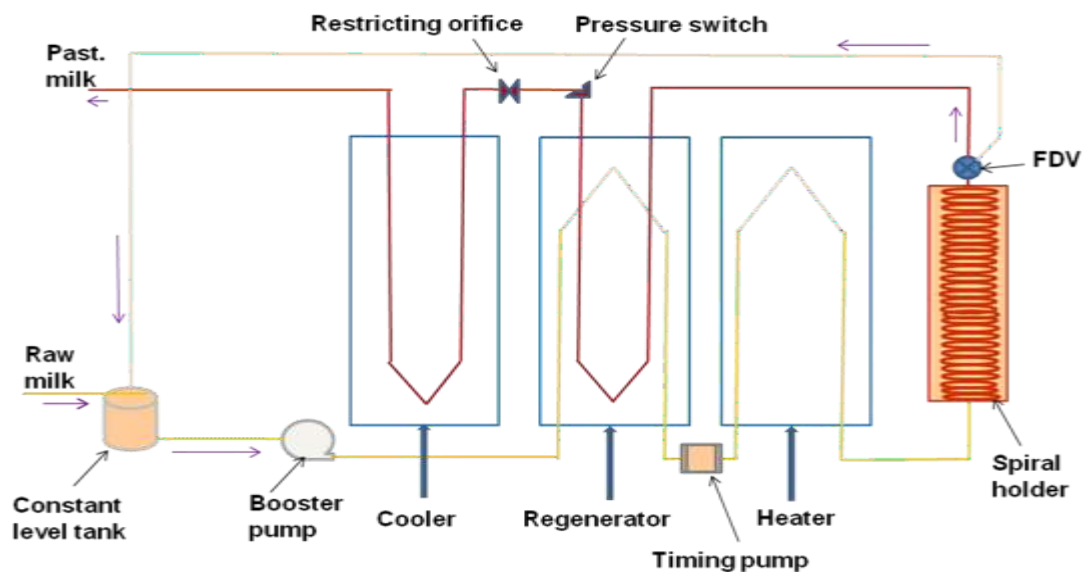


Fig. 5.7 HTST pasteurization process



Fig. 5.8 A HTST pasteurizer

For HTST pasteurization, the following controls are very important.

- Flow rate
- Temperature
- Pressure

Control for flow rate

- The flow rate is regulated by a metering or timing pump
- A positive displacement pump of rotary or piston type is used.
- Often variable speed drives are used to change the rate of flow when desired.
- Pump must be sized and perfectly driven such that flow rate does not exceed the actual, i.e. the holding time is not below legal minimum.

Control for temperature

- Control of temperature includes means for maintaining a uniform product temperature at or above the legal minimum at a safe value.
- It should divert the flow back to the system if the temperature at the end of holder is below legal minimum.
- Usually a safety thermal limit recording controller is used. (It makes a continuous record of the temperature and marks the time when the flow diversion valve operates.)

Control for pressure

The pressure control is important in the following three sections.

- In the regenerators
- In the flow diversion valve
- In the diverted milk lines (for homogenization, etc.)

Pressure related problem in the regenerator

The different causes and effects of pressure related issues in a pasteurization system are given in Fig. 5.9. As it can be seen, the centrifugal booster pump takes care of the pressure related problems in the regenerator. Besides, there are three more devices as the timing pump, pressure switch and the restrictor, the functions of which are given below.

- Timing pump: It assures that the pasteurized product side is always under higher pressure than the raw side in the regenerator.
- Pressure switch: It will allow the pump to run only when the pressure in pasteurized side is at least 1 psi more than the raw side.
- Restrictor: It is an additional device to satisfy the minimum 1 psi difference if the cooler section does not produce enough back pressure on the pasteurized side.

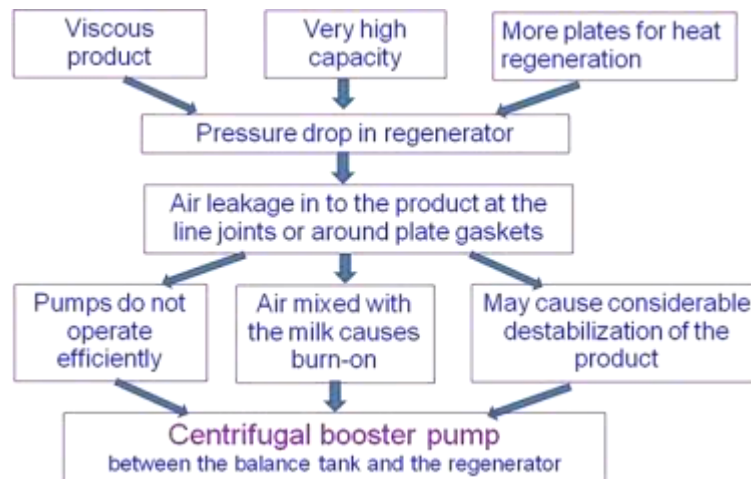


Fig. 5.9 Use of booster pump in a pasteurization system

Pressure management in the flow diversion valve

- The thermal limit recorder not only makes a record of the temperature of the milk, but also indicates, records and controls the action of the flow diversion valve.

Pressure management in diverted milk line

- The other pressure management is needed on the diverted milk line, since it may affect the holding time during diversion.
- If the holding time during diverted flow is shorter than that in forward flow, a restricting orifice should be placed in the divert line.

Main parts of HTST pasteurizer

Now that we have discussed the process and the controls required during the process, we can write down the main parts of HTST pasteurizer as follows.

- Constant level tank
- Regenerator
- Booster pump

- Timing pump
- Heater
- Holder
- Flow diversion valve
- Pressure switch
- Restricting orifice
- Cooler

Important accessories

- Leak detector valves at all inlet and outlet pipes.
- Air space heaters (Air space heating is done by introducing steam above the level of the product).

Advantages of HTST pasteurization

- Uniform treatment.
- Temperature is regulated at close limits and overheating is prevented.
- Economical than batch systems (due to regenerative heating).

Disadvantages

- The system is complicated.
- Not portable.
- Installation cost is more.