Auxiliary Raw Product (Booster) Pump Installation in Conventional H.T.S.T. Pasteurization Systems

Introduction

A booster pump is utilized to supplement the timing pump in moving raw milk from the constant level tank through the regenerator. It may be used to provide pressure on the suction side of a homogenizer which is being used as a timing pump. It may be used to reduce excessive vacuum, and subsequent “flashing,” or vaporization, in the regenerator section, particularly when the constant level tank is located unusually distant from the timing pump. Improper installation of a booster pump could result in contamination of pasteurized milk with raw milk across plates in the H.T.S.T. regenerator.

Installation Requirements

No pump can be located between the raw milk inlet to the regenerator and the raw milk constant level tank, unless it is designed and installed to operate only when milk is flowing through the pasteurized product side of the regenerator, and when the pressure of the pasteurized product is higher than the maximum pressure produced by the pump. A booster pump may be installed between the constant level tank and raw milk inlet to the regenerator only if all the following conditions are met:

1. The booster pump is interwired with the timing pump so that the booster pump can operate only if the timing pump is operating.

2. The booster pump is interwired with the flow diversion device so that the pump can only operate when the valve is in the forward flow position.

3. The booster pump is wired through an automatic pressure control device which will not allow the pump to operate unless the pasteurized milk pressure in the regenerator exceeds, y at least one pound per square inch, the maximum pressure developed by the booster pump. This device must be provided with means for sealing by the health department so that authorized setting will not be changed.

4. The pasteurized milk, between its outlet from the regenerator and the nearest point downstream open to the atmosphere, should rise to a vertical elevation of at least 12 inches above any raw milk in the H.T.S.T. system and shall be open to the atmosphere at this or a higher elevation. All raw milk in the regenerator will drain freely back into the constant level raw milk tank when the raw milk pump(s) are shut down and the raw milk outlet from the regenerator is disconnected.

Pressure Control Devices

The following pressure control methods may be used to satisfy the requirements of item 3 above (milk on pasteurized side of regenerator under at least 1 p.s.i. greater pressure than milk on the raw side of the regenerator):
1. **Differential Pressure Controller** – A sanitary pressure indicator with differential pressure switch provides a visual indication of both the raw and pasteurized pressures while allowing the booster pump to operate when the required pressure differential is maintained. A pressure sensor on the raw side is located at or downstream from the booster pump discharge and the pressure sensor on the pasteurized side is located at or downstream from the pasteurized regenerator outlet.

2. **Pressure Switch** – A pressure switch is installed at or downstream from the pasteurized outlet of the regenerator and is set to cut-in the booster pump when the pressure on the pasteurized side of the regenerator is at least 1 p.s.i. greater than the maximum pressure capable of being developed by the booster pump. A visual indication of the operating pressures on both the raw and pasteurized sides of the regenerator must be accomplished as follows:

   a. When a sanitary pressure gauge/switch is installed at or downstream from the pasteurized outlet of the regenerator, an accurate sanitary pressure gauge must also be installed at or downstream from the booster pump discharge.

   b. When a pressure switch is installed at or downstream from the pasteurized outlet of the regenerator, an accurate sanitary pressure gauge must be installed at that point in the system. A second accurate sanitary pressure gauge is also required at or downstream from the booster pump discharge.

Any change in equipment affecting pressures would require resetting and resealing the pressure switch.

3. **Time Delay Switch** – Suitable time-delay relays with settings adjustable up to several minutes are available through most of the larger manufacturers of electrical equipment. The time-delay relay provides automatically a predetermined elapsed length of time between the moment when the flow diversion valve assumes the forward flow position and the moment when the booster pump is energized. The time lapse required is that necessary for the forward flow of milk through the regenerator, cooler and subsequent piping to rise to a height sufficiently above the H.T.S.T. unit to provide a pressure at least 1 p.s.i. greater than the maximum pressure change in equipment affecting the flow rate (i.e., new booster impeller) would require re-evaluation and sealing of the time delay.

All three methods of regenerator pressure control must be tested every three months by the health department. A differential pressure controller is the most common automatic pressure control device in use on pasteurization equipment and is preferred by our department.