A SIMPLE PNEUMATIC TESTER FOR CHECKING AND SETTING PRESSURE SWITCHES FOR HTST BOOSTER PUMP CONTROL

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Milk plant operators frequently desire to use an auxiliary booster pump between the raw milk constant level tank and the raw milk inlet to the regenerator to facilitate flow in HTST pasteurization equipment. For this reason, specifications were developed and incorporated in the 1953 Milk Ordinance and Code (1) for the utilization of such an auxiliary pump. These specifications are as follows:

"No pump shall be located between the raw milk inlet to the regenerator and the raw milk supply tank, unless it is so designed and so installed that it can operate only when milk is flowing through the pasteurized milk side of the regenerator, and when the pressure of the pasteurized milk is higher than the maximum pressure produced by the pump. This may be accomplished by wiring the booster pump so that it cannot operate unless (a) the metering pump is in operation, (b) the flow-diversion valve is in the forward-flow position, and (c) a sanitary pressure switch located at the pasteurized milk outlet from the regenerator is so set and sealed as to complete the circuit only when the pasteurized milk pressure exceeds, by at least one pound per square inch, the maximum pressure developed by the booster pump."

Appendix H, Testing of Pasteurization-Plant Equipment, of the 1953 Milk Ordinance and Code, calls for checking by the health officer of the setting of pressure switches "upon installation, monthly thereafter, after any change in the pump or the switch circuit, and whenever the switch seal is broken." It is necessary to make frequent checks, as specified, of the pressure switch cut-in point because the thin diaphragm of the switch can easily be damaged, or ruptured, through careless handling or in cleaning operations. Moreover, short-circuiting of the switch may occur from moisture or other means. When this happens, the operation of the booster pump is uncontrolled and improper relative regenerator pressures will result during certain stages of operation.

DESCRIPTION OF TESTING DEVICE

The pneumatic testing device and procedure herein described affords a convenient and relatively inexpensive way to check pressure switch settings in a short time and with a minimum interference with plant operations. The assembled testing device is shown in Figure 1. As may be seen, it consists of a 2 in. 7BX tee, with two additional 13H nuts, one of which is provided with a 16A cap drilled and tapped for a 0.5 in. galvanized iron nipple for the air connection. A hose connection is made to a compressed air source in the plant, by means of a snap-on fitting. The air pressure is then controlled by means of a pressure reducing valve (range 0-60 psi), followed by a 0.5 in. globe-type bleeder valve, and connected as shown by means of 0.5 in. galvanized iron tees and nipples. Two pressure gauges (range 0.30 psi) with 2½ in. dials are installed, one between the pressure-reducing valve and the connection to the bleeder valve, and the other between this connection and the inlet to the 2 in. sanitary tee. The pressure switch to be tested is disconnected from the HTST pasteurizer and is connected to the side outlet of the sanitary tee. The pressure switch to be tested is disconnected from the HTST pasteurizer and is connected to the other outlet of the sanitary tee. A Vogt sanitary pressure gauge is connected to the other outlet of the sanitary tee.

TESTING PROCEDURE

Determination of Booster Pump Pressure

This determination should be made under operating conditions which will provide the maximum discharge pressure by the booster pump. Operate
the pasteurizer with water, with the flow diversion valve in forward-flow position, the metering pump operating at minimum speed possible, and the booster pump operating at its rated speed. If vacuum equipment is located between the regenerator and the metering pump, it should be by-passed while this determination is being made. The pressure in psi at the discharge of the booster pump may be determined by means of a pressure gauge or suitable manometer (2). The reading in psi plus at least one psi is the required setting for the pressure switch.

Checking and Setting of Pressure Switches

In most HTST installations an adequate compressed air supply is located at or near the single-service packaging operations. Many plants also have compressed air available in the machine shop, frequently a convenient location for making the checks. In connecting the compressed air supply to the testing device care should be taken to avoid exposing the pressure switch and the sanitary pressure gauge to excessive air pressure which might damage them. This can be done by first closing off the pressure regulating valve and opening fully the bleeder valve. After the air connection is made, the position of these valves can be changed slowly so as to raise gradually the pressure in the testing device to the desired level. The valves can then be manipulated slowly so as to increase the air pressure to the cut-in point of the pressure switch, which will light the test lamp. (If the switch is short-circuited the lamp will be lighted before air pressure is applied.) This should be about 2 psi or more greater than the maximum pressure of the booster pump, as determined under above. Such a setting will insure compliance with the milk code requirements, as the cut-out pressure in most pressure switches is not more than 0.5 psi lower than the cut-in pressure. The sanitary pressure gauge used in the testing device should be the same as that used for determining the maximum booster pump pressure, or, alternately, the two gauges used should be calibrated against each other in the testing device. Periodic checks against a manometer should also be made.

If the setting is found to be satisfactory, notation should be made under Test No. 21, of the PHS Pasteurization Plant Equipment Tests Form (PHS-723-San.-Rev.4-53), and the pressure switch should be ressealed, if the seal had been broken.

If the setting of the pressure switch is found to be too low, or unsatisfactory, it should be reset as follows: Remove the seal and cap from the switch and loosen the set screw on the adjustment knob. Rotate the adjustment knob as necessary and recheck, by increasing the air pressure, until the test light goes on at or above the required setting. Tighten set-screw and recheck cut-in air pressure, readjusting if necessary until satisfactory results are obtained, replace cover and seal the pressure switch. Test results should be recorded as previously indicated.

Only a few minutes are required to set up, check, adjust, and seal the pressure switch. The cost of the device is less than twenty dollars, exclusive of the sanitary fittings and the Vogt sanitary pressure gauge. The fittings often may be obtained without cost from discarded fittings in processing plants. It is considered preferable for the milk sanitary to have a Vogt sanitary pressure gauge, which may be calibrated periodically against a mercury manometer. Alternately, any satisfactory sanitary gauge available in the plant may be used. The testing device also may be used for checking one pressure gauge against another.

References