

AUTOMATIC INTERMITTENT HEATING

Many liquid heating systems operate intermittently with adequate temperature control using a Manual Hydroheater. However, some systems (makeup water heating, batch pulping, filter press backwashing, etc.) have variable heating demands upon start up. These systems require automatic temperature control.

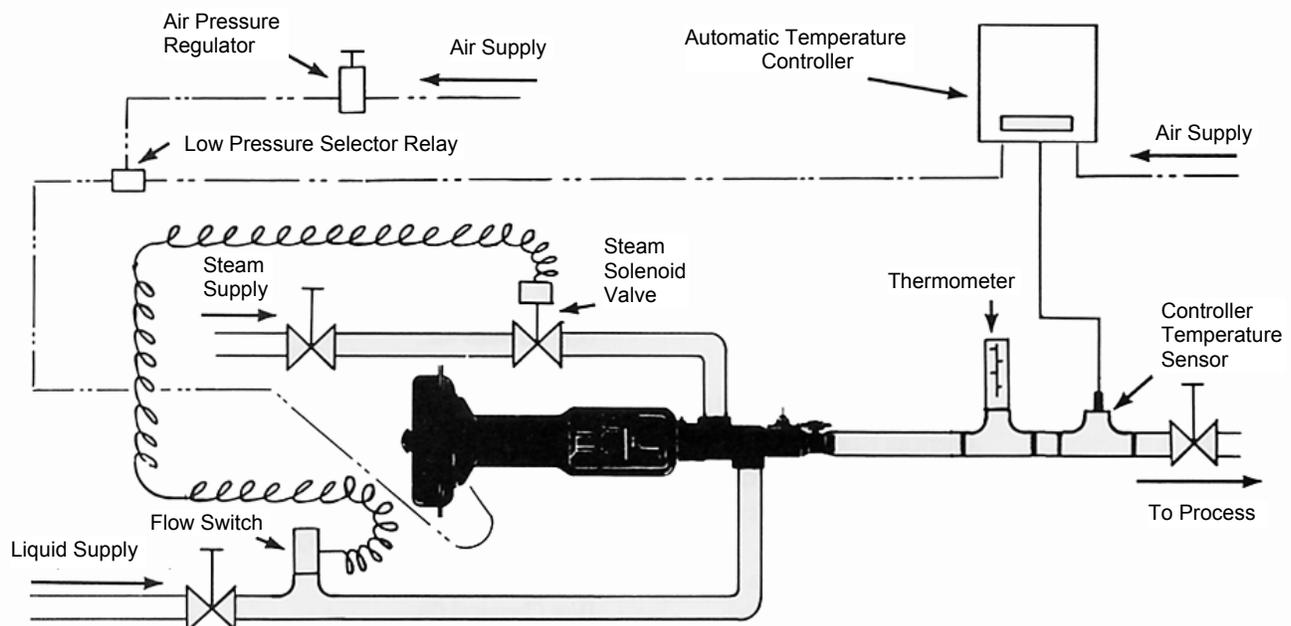
SYSTEM OVERTHOOT MINIMIZED

The simplest intermittent heating system utilizing automatic temperature control includes an Automatic Hydroheater, a Temperature Controller and a steam solenoid valve operated by a flow switch in the liquid supply line. The steam solenoid valve automatically stops steam flow when the liquid flow stops, even though the temperature controller may be calling for more steam. If the liquid flow is controlled by a solenoid valve downstream of the Hydroheater, the steam solenoid valve can be wired in parallel with this valve to provide simultaneous steam and liquid flow shutoff. This is the simplest system and is used

when time between flow shutoff and start up is short. However, if the shutoff time permits the temperature sensor to cool very much, the liquid temperature will overshoot the set point temperature during the controller settling time.

OTHER ADVANTAGES

When used in conjunction with a two-response temperature controller (proportional and automatic reset), the Automatic Hydroheater will provide accurate, reliable, cost effective temperature regulation. With internal steam flow modulation, the Hydroheater offers the advantages of simplicity, dependability and therefore, low initial and long-run costs. Other types of steam injection devices that use an external steam control valve can complicate the system resulting in increased installation and maintenance costs, and less accurate temperature control.



TIGHT CONTROL POSSIBLE

Overshoot can be significantly reduced by the use of a low pressure selector relay in the controller output signal line as shown in the diagram. The air pressure regulator output is adjusted until it is slightly higher than the normal output of the temperature controller to the Hydroheater air actuator. Since the selector relay output is the lower of the two input pressures, it will limit the overshoot to an acceptable level during startup. Even tighter control can be obtained by modulating the regulator output in proportion to the liquid flow rate at start up.

If necessary the low pressure selector relay can be effectively removed from the line by driving the signal in the regulator line to at least 15 psig. This can be accomplished by bypassing the air supply regulator with solenoid selector valves. This will allow the automatic temperature controller to provide tighter temperature control once the system has settled out.

ADJUSTMENTS

There are two basic adjustment procedures that can be followed to set the air pressure regulator output. The first method uses the discharge temperature of the Hydroheater and the second method uses the

output pressure from the automatic temperature controller. In the discharge temperature method, the controller set point is set much higher than the actual operation set point. The air regulator (shown in the figure) output pressure is then increased until the discharge temperature of the Hydroheater is somewhat higher than the required discharge temperature. The controller set point is then brought down to the actual value so that it is controlling the discharge temperature of the heater.

The controller output pressure method, requires a pressure gauge on the air pressure regulator discharge. With the air pressure regulator output set at 15 psig, the system is started and allowed to settle out. The output pressure of the automatic temperature controller is observed for several minutes, then the air pressure regulator output is adjusted to be slightly greater than normal temperature controller output.

The low pressure selector relay will now limit the signal to the air actuator to the preset amount. This limits the amount of overshoot when the automatic temperature controller is settling out after startup.