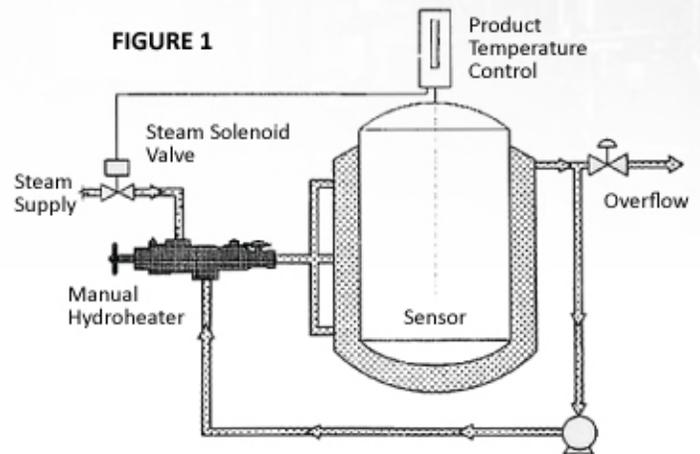


# Jacketed Kettle and Reactor Heating

Hydroheaters are used extensively on jacketed reactors and kettles because they give all the benefits of efficient direct steam contact jacket water heating and, in addition, provide the control that eliminates the violent steam and water hammer experienced with other units. The initial temperature rise can be as fast as the available heat transfer surface, product heat sensitivity and water circulation rate will allow. No floor space is required because Hydroheaters are installed in the vessel piping where convenient.

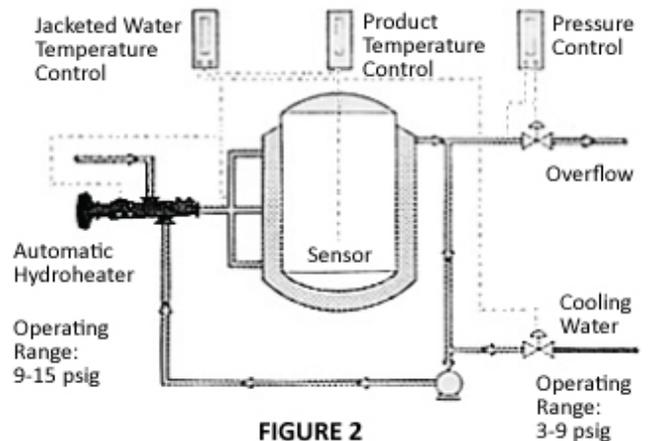
## Heating Only - Vented Vessel

For simple processes where only heating is required the Hydroheater would be piped as shown in Figure 1. The operator raises the Temperature Controller "setpoint" to start heating. An electrical signal from the Controller will keep the Steam Solenoid Valve open until the hatch reaches the "set point" temperature. Thereafter the batch may be held at this temperature or the batch might be quickly cooled down. In this case the Temperature Controller could have additional contacts to control the cooling period. Water is generally recirculated on large production vessels to conserve energy. But on smaller pilot plant reactors single pass heating is quite common.



## Endothermic and Exothermic Reactions

For processes that start with heating and then become exothermic requiring cooling, the cascade control system shown in Figure 2 is required. The master Controller measures the batch temperature and resets the jacket water Temperature Controller as the reaction changes. The Automatic Hydroheater, receiving its output from the jacket water Temperature Controller, can terminate heating before the cooling water flows through it into the vessel jacket. When the reaction slows down, the Automatic Hydroheater can quickly start heating again. The Pressure Control will modulate the overflow valve as required to maintain the jacket loop pressure.



## Thermal Shock Avoided

Hydroheaters can reduce the thermal shock on glass lined reactors by tempering the cold water at the beginning of the cooling cycle. An excessive temperature difference between the jacket water and the glass lining can cause the lining to crack and necessitate expensive repairs.

## Precise Temperature Control

Some reactions may change from heating to cooling and back to heating several times. The Automatic Hydroheater can maintain the recycled water temperature within close limits because it is an integral part of the control system. It modulates the steam flow while it is heating the water. The faster speed of response with Hydroheater's instantaneous heating results in the jacket water temperature following the set point as rapidly as changes are called for by the master batch Temperature Controller. Steam flow is controlled from 100% flow for maximum "come up", down to "no flow" during cooling periods. The precise temperature control obtained has enabled users to operate at optimum temperature conditions to obtain the greatest yield from the batch.