

Feedback control

A feedback control action takes the following steps:

1. measure the value of the output (flow , pressure ,liquid level ,temperature, composition) using the measuring device . let C_m is the value indicated by the measuring sensor.
2. Compare the measured value (C_m)to the desired value C_{sp} (set point) of the output . let the error (deviation) be $E = C_{sp} - C_m$.
3. The value of the error signal (E) is supplied to the main controller. The controller in turn changes the value of the manipulated variable (m) in such a way as to reduce the magnitude of the deviation (E). The controller does not affect the manipulated variable directly but through another device (control value) ,as the final control element.

Element of the feedback control loop

1. Process : the material equipment along with the physical or chemical operations which take place (tanks , heat exchangers , reactors , separators , etc.
2. Measuring instrument or sensors : for example , thermocouples (for temperature) , bellows ,or diaphragms (for pressure or liquid level) , orifice plates (for flow) and gas chromatographs or various types of spectroscopic analyzers (for composition) .
3. Controller : also includes the function of the comparator . This is the unit with logic that decides by how much to change the value of the manipulated variable . It requires the specification of the desired value (setpoint).
4. Final control element :usually ,a control valve or a variable-speed metering pump . This is the device that receives the control signal from the controller and implements it by physically adjusting the value of the manipulated variable .
5. Transmission lines :used to carry the measurement signal from the sensor to the controller and the control signal from the controller to the final control element . These lines can be either pneumatic (compressed air or liquid)or electrical.
6. Transmitter .
7. I/P converter.

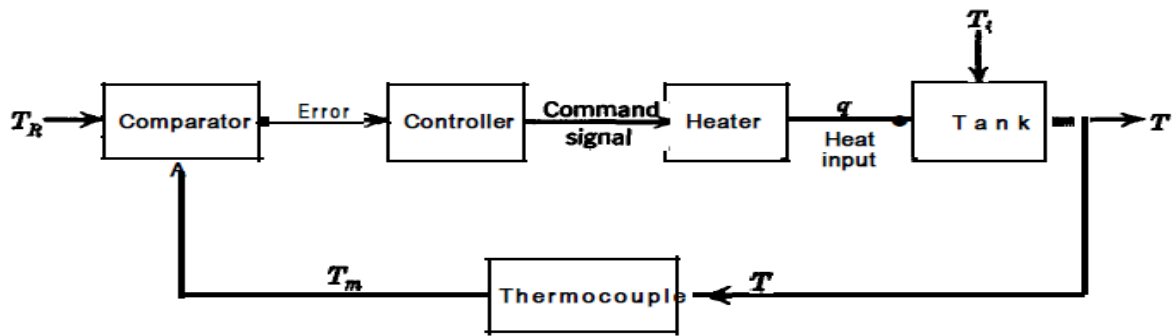


Fig.31 Block diagram for control of heated-tank system

Examples of control systems

1- Control of heating tank system

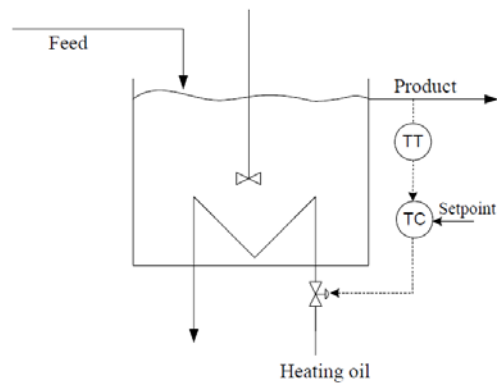


Fig.32 Control of heating tank system

2- Level control

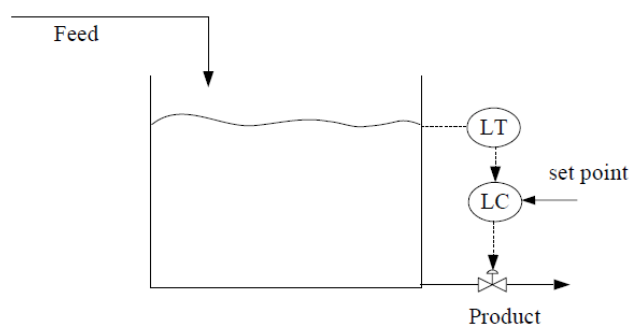


Fig.33 Level control

3-Composition control

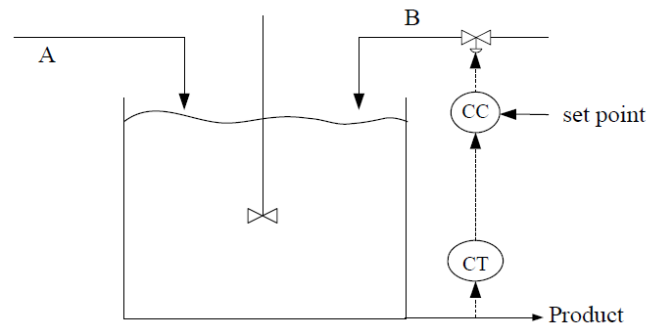


Fig.34 Composition control