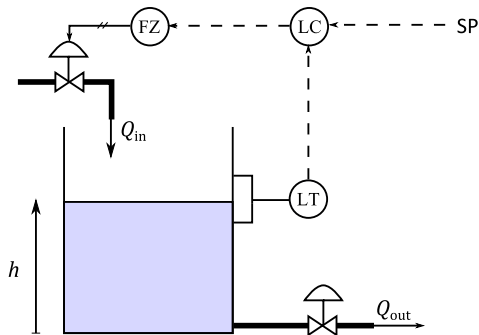


## 1 Proportional-mode Level Control

Controller type - P control.



- Control valve - linear, with flow scale factor
- $\lambda = 10 \text{ m}^3/h$  per percent of controller output;
- $K_c = 10\%$  per %
- Load change: to  $Q_{out} = 700 \text{ m}^3/h$
- Initial conditions:
  - controller out:  $out = 40\%$
  - $Q_{out0} = 400 \text{ m}^3/h$

1. Calculate the new controller output and offset error.
2. Provide controller characteristic.

### Comments

What is the new position of the valve (new  $Q_{in}$ ) for the change of  $Q_{out}$  compensation?

## 2 Proportional-mode Temperature Control

For a P controller temperature of the process varies with the range of  $50 - 150 \text{ }^\circ\text{C}$ .

$SP = 80^\circ\text{C}$ .

With initial conditions output of the controller  $u_0[\%] = 50\%$ .

1. Find the proportional offset resulting from load change, if new  $u = 60\%$  and proportional gain  $K_c$  is:
  - (a)  $0.5 \text{ } [\% / ^\circ\text{C}]$
  - (b)  $1 \text{ } [\% / ^\circ\text{C}]$
  - (c)  $2 \text{ } [\% / ^\circ\text{C}]$
  - (d)  $5 \text{ } [\% / ^\circ\text{C}]$
2. Provide the controller characteristic.