

CHAPTER 7

PID Controller Selection

1. Effect of controller's mode

(a) P-Controller

- Accelerates the feedback response
- Produces an offset except for liquid level and gass pressure in a vessel.

(b) I-Controller

- Eliminates offset
- Produce sluggish response and sometimes oscillatory response
- Increasing k_c may lead to instability.

(c) D-Controller

- Introduces stabilizing effect in the closed-loop response

2. Model Selection Guidelines

Choosing the PID controller might be the best choice, however it requires tuning three parameters, k_c , τ_I , τ_D , otherwise:

1. If possible use P controller **when** acceptable offset is tolerated or process is integrator.

Example: Liquid level control, gas-pressure control

2. If a simple P-controller is not acceptable, use a PI controller for fast response processes

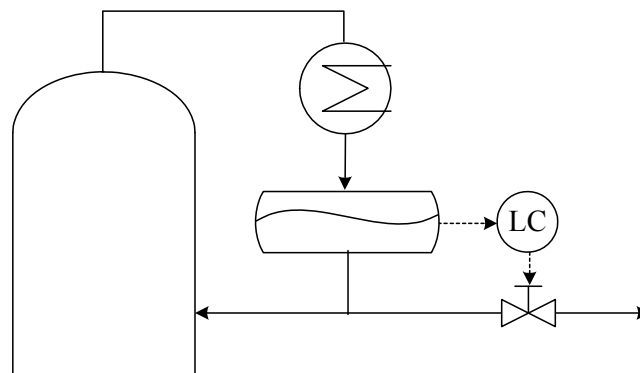
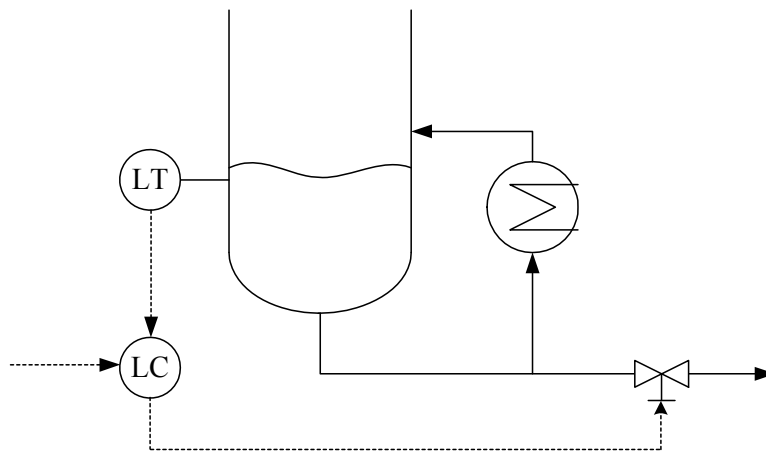
Example: Flow controller

3. If closed loop response is slow, use PID controller to speed up the response and retain robustness.

Example: Temperature control, composition control

3. Examples of process control

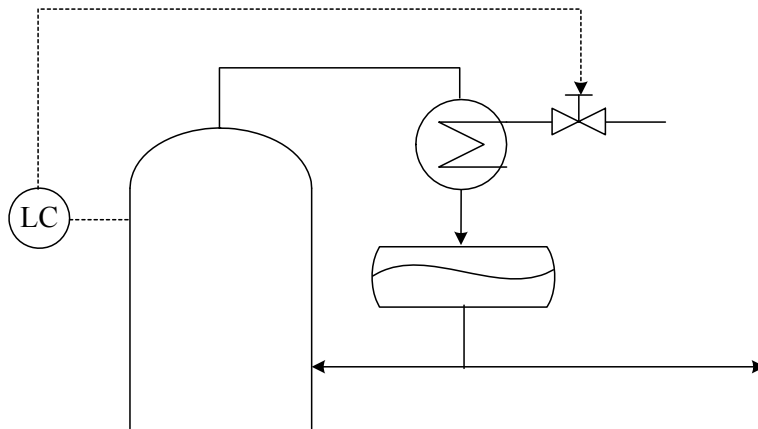
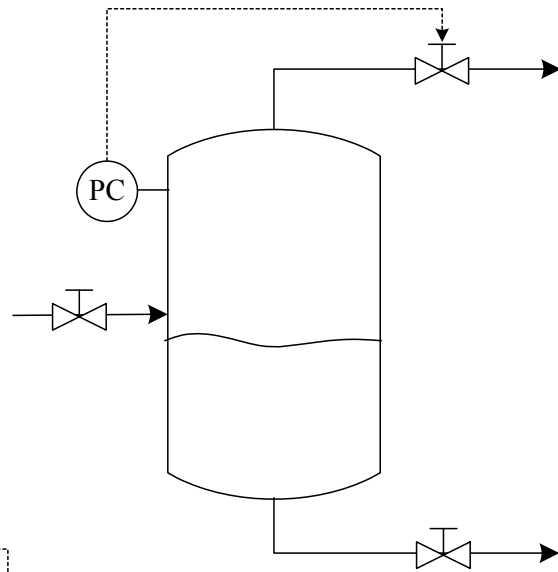
(a) **Liquid Level** → use **P-controller**



(b) Pressure Control

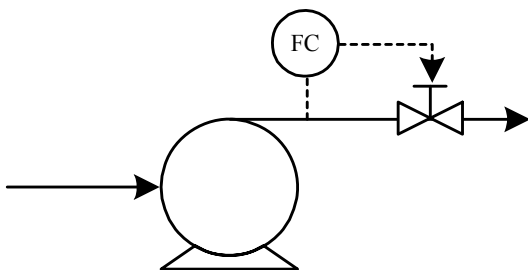
Fast response → P-controller is good enough

Slow response
PI → slower
→ PID

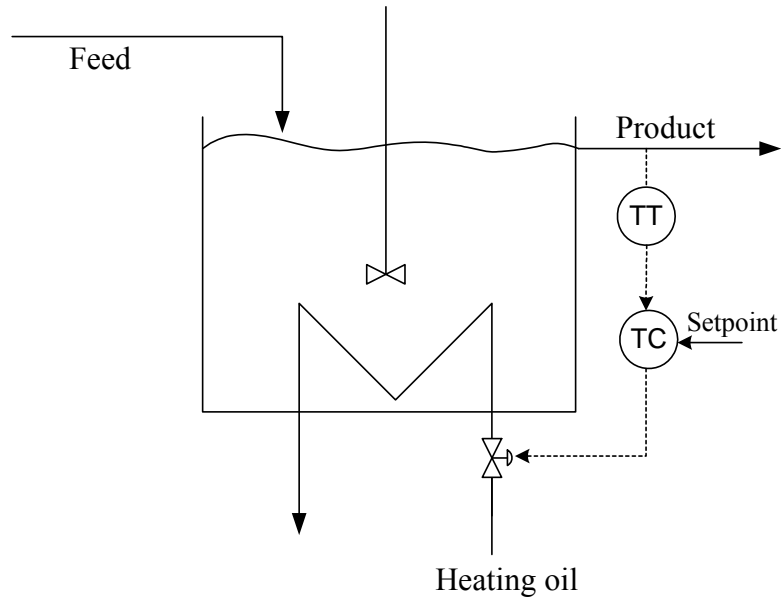


(c) Flow control

Fast → PI control



(d) Temperature Control



P control → Offset

PI control → no offset but sluggish response since the open loop system has slow response

PID control → best solution

(e) Composition Control

Similar to Temperature control