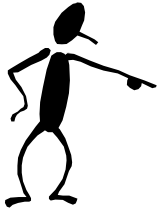


FEEDFORWARD CONTROL & CASCADE CONTROL

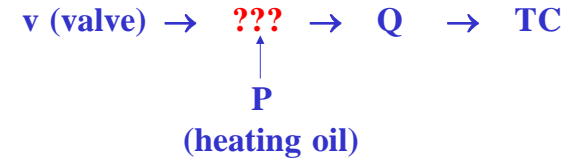
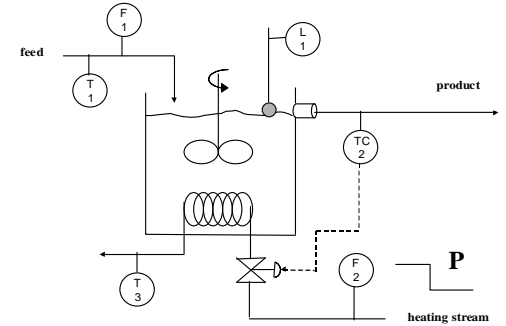


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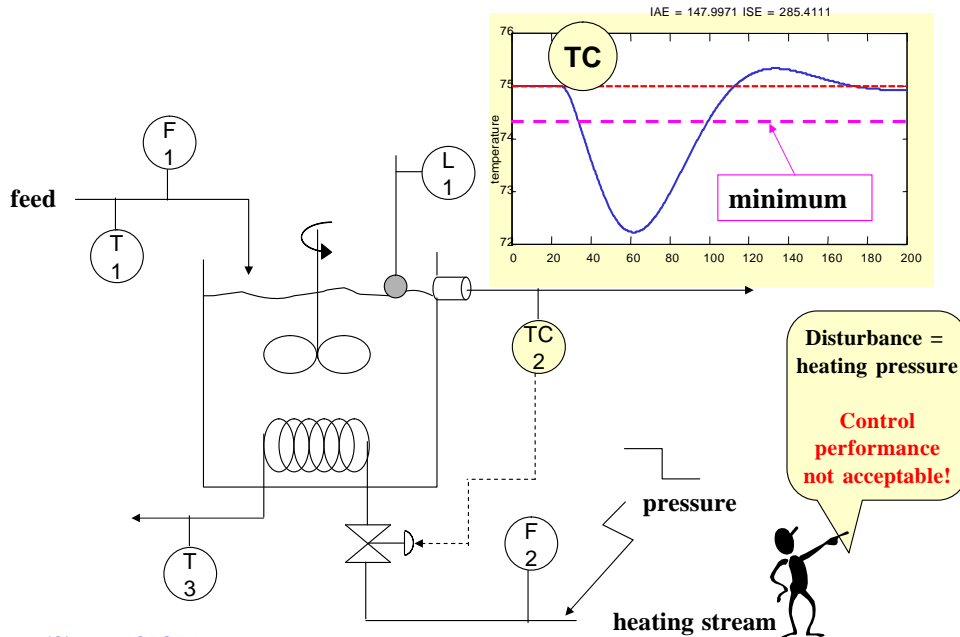
- Identify situations for which cascade is a good control enhancement
- Identify situations for which feedforward is a good control enhancement

CASCADE CONTROL (REACTOR)

- Causal relationship from P disturbance to T (without control)
- What measurable effect always occurs when P changes?

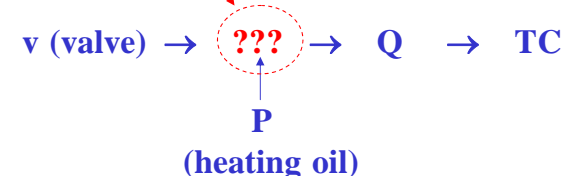
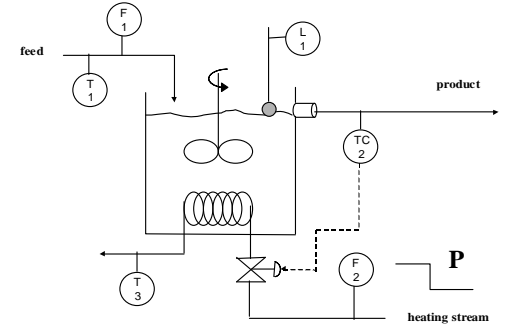


CASCADE CONTROL (REACTOR)



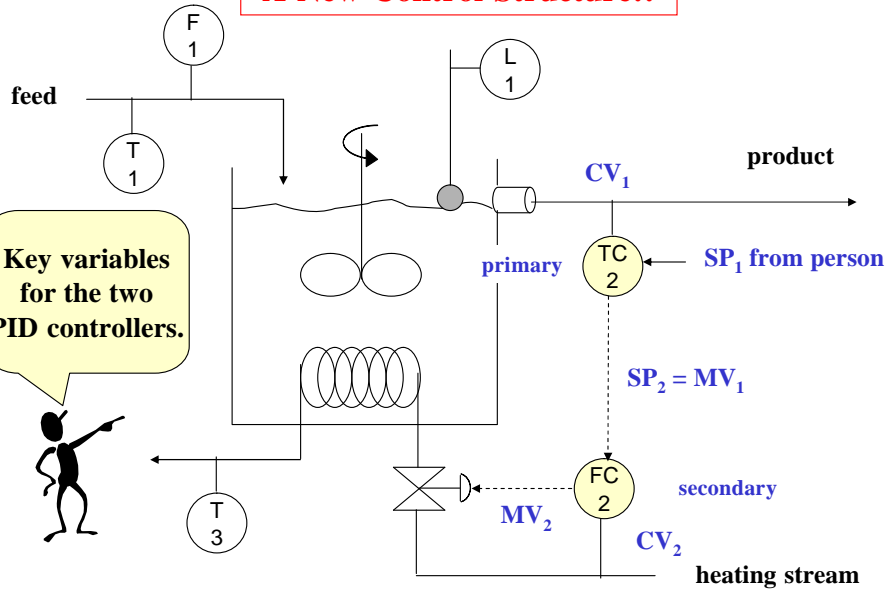
CASCADE CONTROL (REACTOR)

If we can maintain this variable approximately constant, can we reduce the effect of the disturbance?



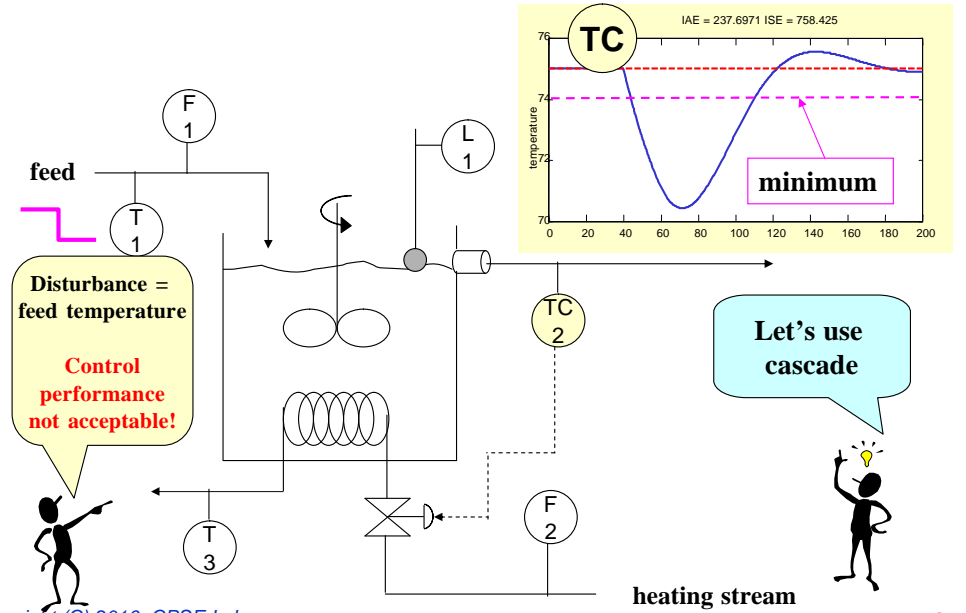
CASCADE CONTROL (REACTOR)

A New Control Structure!!



Key variables for the two PID controllers.

FEEDFORWARD CONTROL



Disturbance = feed temperature
Control performance not acceptable!

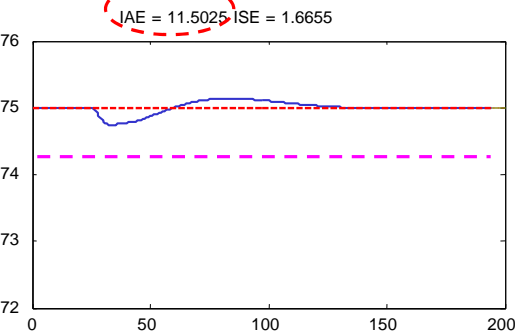
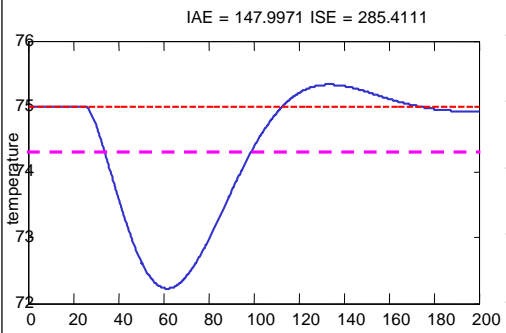
Let's use cascade

CASCADE CONTROL (REACTOR)

Control Performance Comparison for CST Heater

Single-Loop

Cascade

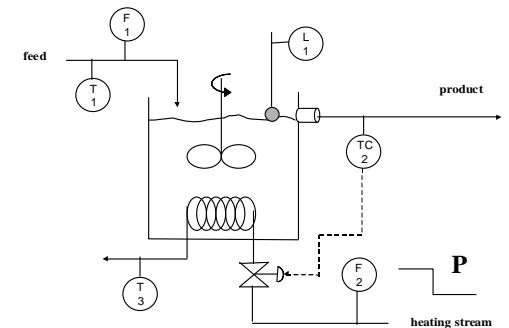


Much better performance! WHY?



FEEDFORWARD CONTROL

- Causal relationship from T_0 disturbance to T (without control)
- How can we manipulate valve to compensate?



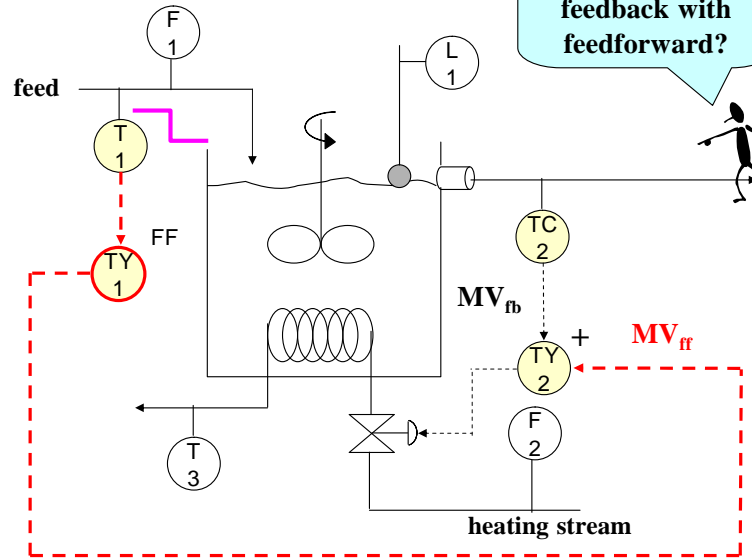
v (valve) \rightarrow Q \rightarrow TC

T_0 (Feed temperature) \rightarrow TC

FEEDFORWARD CONTROL

How do we combine feedback with feedforward?

FF highlighted in red

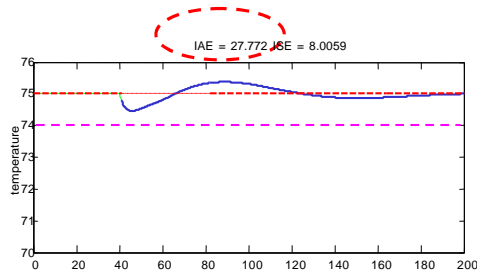
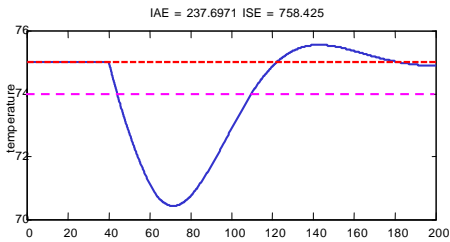


FEEDFORWARD CONTROL

Control Performance Comparison for CST Heater

Single-Loop

Feedforward with feedback



Much better performance!
WHY?

