

Chemical Engineering 436 Process Control Terminology - Answers

Objective: To learn the principal parts of a control system and become familiar with some basic control strategies.

Activity: Teach a neighbor the following concepts, based on your reading. Note any questions so that we can discuss these in class.

1. What are the key components of a control system? (Hint: see PPC, Fig. 1.5)

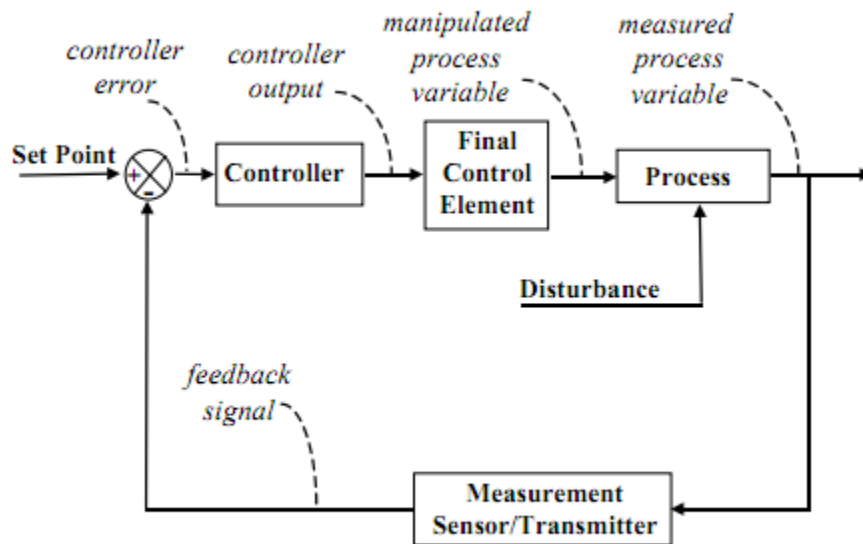


Figure 1.5 - General control loop block diagram

2. Vocabulary (mainly from PDC, Ch. 1)

Set point – value of desired control variable

Controlled variable – variable you want to control

Manipulated variable – variable that you or the controller actually adjusts

Disturbance variable – variable (measured or unmeasured) that causes the controlled variable to change

Feedback control – measured = controlled, but different variable is manipulated

Feedforward control – controlled is not measured, often an inlet variable is

measured and manipulated

Analog control – signal that is continuously updated

Digital control – signals at discrete times
(e.g. updated every 1 sec)

Final control element – device that actually makes the change

Manual control – a person makes the change, Controller OP remains constant

Automatic control – let a program make the changes, OP is calculated by the controller

The final control element in nearly all chemical process control loops is a valve.

3. Other issues to consider (see PDC, Chapter 1)
- What are the advantages and disadvantages of feedback control?

Advantages: simple, all disturbances

Disadvantages: never perfect, doesn't anticipate disturbances but must measure the deviation first

- What are the advantages and disadvantages of feedforward control?

Advantages: Anticipate changes and proactively adjust MV to compensate, almost always used to improve a base feedback controller

Disadvantages: If you don't have a feedback controller, there may be offset because you are not measuring the variable you are trying to control. Can be more complicated.

- Can feedback control ever provide perfect control at the set point? Why or why not?

Yes, if there are no disturbances or measurement noise.

- What does a controller do?

A controller takes the error between the measured variable and set point and sends a signal to the control element to try to correct the error.

- What motivation exists for the use of process control?

Money – more production, more stability, quality control

Automate process to reduce manual work-load

Safety and environment

4. Scope of this class:
 - a. Continuous systems
 - b. Single input, single output (SISO) systems

5. Instrumentation (PDC)
 - a. First letter corresponds to the controlled variable
 - F**low
 - L**evel
 - P**ressure
 - C**oncentration
 - T**emperature

 - b. Second letter specifies controller or transmitter
 - T**ransmitter
 - C**ontroller

Examples: FC = Flow controller, TT = Temperature transmitter