EI30 Sizing Selecting and Applying Process Control Valves
Pre-Instructional Survey

1. An improperly sized or selected control valve can cause:

   a. Process inefficiency
   b. Poor product quality
   c. Increased maintenance costs
   d. all of the above

2. Which of the following is not a function of a control valve?

   a. Dispensing
   b. Distributing
   c. Dispersing
   d. Dissipating

3. Which of the listed items is necessary when the piping is too large for the selected valve?

   a. FK
   b. FL
   c. FP
   d. FD

4. In a continuous process, the control valve should have good:

   a. Flow characteristics
   b. Pressure relief characteristics
   c. Shut off capability
   d. High gain characteristics

5. A control valve actuator must overcome:

   a. Fluid forces acting on the valve plug
   b. Frictional forces
   c. Fluid forces on the valve stem
   d. All of the above

6. A valve positioner:

    a. Precisely positions the control valve stem
    b. Is a proportional controller
    c. Uses its input signal as its set point
    d. All of the above

7. Control valve actuators are used:

    a. On both linear and rotary motion valves
    b. Linear motion valves
    c. Rotary motion valves
    d. All linear motion and some rotary motion valves

8. Double ported throttling valves have upper and lower seat rings:

    a. Of the same size to cancel the fluid forces in the valve body
    b. Of different sizes to make the valve self-cleaning
    c. Of different sizes to allow for disassembly of the valve
    d. Of the same size to minimize valve noise

9. Which of the following valves will have the best leakage rating?

    a. Ball valve
    b. Diaphragm valve
    c. Sliding gate valve
    d. Globe valve

10. Which of the following is unacceptable for high temperature?

    a. Single seated globe valve
    b. Angle type globe valve
    c. Multi-orifice gate valve
    d. Weir type diaphragm valve

11. Which of the following is best suited for corrosive slurries?

    a. Globe valve
    b. Angle Valve
    c. Ball Valve
    d. Saunders Valve

12. Which of the following is not a rotary motion control valve?

a. Ball valve
b. Plug valve
c. Clamp valve
d. Butterfly valve

13. Which valve type offers the highest flow capacity?

a. Butterfly valve
b. Globe valve
c. Ball valve
d. Diaphragm valve

14. Butterfly valves:

a. Have good flow characteristics
b. Are less likely to aid cavitation
c. Are generally limited to less than 12 inches in size
d. Are a good choice for high pressure shut-off applications

15. Ball valves:

a. Are suitable for tight shut-off applications
b. Are suitable for corrosive slurry applications
c. Are generally installed so that flow tends to open them
d. Are generally installed so that flow tends to close them

16. Which of the following is not a characteristic of diaphragm actuators?

a. Limited valve stroke length
b. Low cost
c. High break-away friction
d. Can be either direct acting or reverse acting

17. Which statement is true?

a. Air springs cannot be used with piston actuators
b. Increasing the air pressure on a direct acting diaphragm actuator causes the stem to move upward
c. The lower chamber of a reverse acting diaphragm actuator is vented
d. Piston actuators can operate at higher air pressures than diaphragm actuators

18. Which of the following actuator types is unable to move to a fail-safe position in the event of a power failure?

a. Electromechanical
b. Double-acting piston
c. Reverse acting diaphragm
d. Direct acting diaphragm

19. The coefficient represented by X_{TP} is used when calculating valve coefficients for

a. Laminar Flow
b. Gas Flow
c. Transitional Flow
d. Gas valves with inlet and/or outlet reducers

20. Primary control valve trim consists of:

a. Stuffing box parts, such as the packing follower, springs, and lantern ring
b. Removable parts of the valve that come in contact with the process fluid
c. Components designed to contain pressure, such as the valve body, bonnet, and flanges
d. Actuator and positioner

21. Volumetric Flow through a concentric orifice plate is

a. Inversely proportional to differential pressure.
b. Inversely proportional to orifice size.
c. Proportional to the square root of differential pressure.
d. Directly proportional to orifice size.

22. A control valve's flow coefficient (C) is defined in the US system of units as:

a. The number of U.S. gallons of water at 60 degrees fahrenheit that will flow through a control valve that is 100% open with a pressure drop of 1 psi.
b. The coefficient that will result with a flow rate of 1 U.S. gallon of water per minute at 60 deg. F.
c. The coefficient that will occur at a flow rate of 100 gallons per minute at design pressure.
d. The coefficient that describes the relationship between valve travel and capacity.

23. The flow characteristic of a control valve is:

a. The relationship between flow coefficient and pressure drop ratio factor
b. The relationship between valve capacity and valve travel
c. The relationship between flow capacity and differential pressure
d. The relationship between flow capacity and supply pressure with the valve fully open

24. Which of the following would not be a consideration in selecting control valve trim?

a. Flow characteristics
b. Cavitation
c. Seat tightness
d. Actuator type

25. Secondary control valve trim consists of:

a. Stuffing box parts, such as the packing follower, springs, and lantern ring
b. Removable parts of the valve that come in contact with the process fluid
c. Components designed to contain pressure, such as the valve body, bonnet, and flanges
d. Actuator and positioner

26. In a bolted packing box assembly, which component actually provides the valve stem seal ?

a. The stuffing box
b. The lantern ring
c. The packing
d. The packing follower

27. Which of these packing materials would be suitable for a high temperature application?

a. Neoprene
b. Grafoil
c. Teflon
d. Elastomer

28. Which of the following stem seal systems would not be appropriate in an application where leakage must be avoided?

a. Bellows stem seal
b. Double packing stem seal
c. Internally pressurized bellows stem seal
d. V-Shape Teflon packing with external lubrication

29. A butterfly valve with a symmetrically aligned disk becomes disconnected from its actuator. Flow will tend to make the valve:

a. Close
b. Open
c. Remain in position

30. A butterfly valve with an offset disk becomes disconnected from its actuator. Flow will tend to make the valve:

a. Close
b. Open
c. Remain in position

31. Cavitation in a control valve:

a. Is a source of noise, but otherwise not a problem
b. Is caused by liquid boiling when its pressure is reduced
c. Is a two-stage process involving the formation of vapor bubbles and their subsequent collapse

32. Reducing valve outlet pressure will:

a. Increase the severity of cavitation
b. Increase the severity of flashing
c. Have no effect if the inlet pressure remains constant

33. The difference between cavitation and flashing is that:

a. Cavitation can cause damage, while flashing cannot
b. Flashing can cause damage, while cavitation cannot
c. When flashing occurs, the vapor bubbles do not collapse, while during cavitation they do collapse
d. Cavitation increases flow rate, while flashing does not

34. Calculations of flow through a control valve are based on:

a. The presence of only laminar flow
b. The presence of only turbulent flow
c. The presence of both laminar and turbulent flow

35. Which of the following is the best practice for installing a control valve?

a. If reducers are required they should be the same at the inlet and outlet of the valve.
b. Should always include a hand wheel.
c. Always use a valve positioner on sliding stem valves.
d. Ensure the valve is sized to be the same size as the piping.

36. In sizing a control valve, one should choose :

a. A valve the same size as the piping in which it will be installed
b. A valve somewhat larger than required to provide a margin for good control
c. The smallest valve size that will provide suitable performance
d. The largest valve size that will provide suitable performance

37. Throttling the high pressure flow of a fluid at high temperature through a control valve will

a. Increase fluid temperature downstream.
b. Decrease fluid temperature downstream.
c. Increase fluid temperature upstream.
d. Increase fluid temperature upstream.

38. Under normal circumstances the process by which the piping geometry is compensated for should include

a. the bernouli coefficients.
b. the specific heat ratio.
c. the ratio of differential pressure to the absolute inlet pressure.
d. an analysis of the vena contracta point.

39. Which of the following forces must an actuator overcome ?

a. Fluid forces exerted on the valve plug
b. Spring forces
c. Friction
d. All the above

40. Which of the following forces is not a consideration in sizing an actuator ?

a. Dynamic unbalance
b. Stem force and stem unbalance
c. Body temperature and pressure rating
d. Packing friction and seat tightness

41. Which of the following auxiliary devices can provide for "split ranging" ?

a. lock-up relay
b. positioner
c. limit switch
d. trip relay

42. Which of the following is the major contributor to friction in a linear or rotary style control valve ?

a. stem guide material
b. differential pressure
c. seat and disk material
d. packing and seal material

43. It is necessary to install a control valve and actuator unit with its stem horizontal. What can occur if the control valve and the actuator are not supported properly?

a. packing leakage
b. seat leakage
c. increased hysteresis
d. all of the above

44. Which of the following could occur if a control valve is installed with improperly aligned piping?

a. Flange leakage
b. Seat leakage
c. Increased hysteresis
d. All of the above

45. Which of the following manual valves is not related to control valve maintenance?

a. Upstream and downstream isolation valves
b. Bypass valve
c. Inlet drain valve
d. Outlet drain valve
e. All of the above
f. None of the above

46. What could be the effect of selecting a control valve significantly larger than required?

a. No effect - this allows for system expansion later
b. Cavitation
c. excessive noise
d. Reduced system turndown

47. Which of the following is not a consideration when sizing a valve for compressible fluids?

a. L
b. M
c. Z
d. Y

48. Which of the following valve types would be suitable for controlling the flow of a slurry?

a. Double-seated globe
b. Butterfly
c. Knife edge gate
d. Diaphragm

49. The phenomenon where the volumetric rate of flow through a control valve can not be increase by reducing the downstream pressure while maintaining a constant inlet pressure is a possible definition of

a. the minimum differential pressure ratio.
b. the ultimate flow coefficient.
c. chocked flow.
d. the maximum differential pressure ratio.

50. Which of the following is not a consideration when sizing valves for incompressible fluids?

a. fluid density
b. size of valve, piping, inlet and outlet fittings.
c. the viscosity of the fluid at the operating temperature.
d. pressure, temperature and metallurgical characteristics of the valve.

EI30 – Sizing, Selection and Applying Process Control Valves

Pre-Instructional Survey Answer Key

1.	D	26.	C
2.	C	27.	B
3.	C	28.	D
4.	A	29.	A
5.	D	30.	B
6.	D	31.	C
7.	A	32.	B
8.	C	33.	C
9.	A	34.	B
10.	D	35.	A
11.	D	36.	C
12.	C	37.	B
13.	C	38.	A
14.	A	39.	D
15.	A	40.	C
16.	C	41.	B
17.	D	42.	D
18.	A	43.	D
19.	D	44.	D
20.	B	45.	F
21.	C	46.	D
22.	A	47.	A
23.	B	48.	C
24.	D	49.	C
25.	A	50.	D