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Continuing Education Course #431  
Centrifugal Pump Selection

1. How does a centrifugal pump move fluid?
  - a. Positive displacement
  - b. Negative displacement
  - c. Spinning impeller
2. What is another name for a centrifugal pump?
  - a. Radial flow pump
  - b. Mixed flow pump
  - c. Axial flow pump
3. What are the three different types of impellers for a centrifugal pump?
  - a. Fast, medium, slow
  - b. Open, semi-enclosed, enclosed
  - c. Thin, semi-thick, thick
4. What is a common industry guide for the design of pumping systems?
  - a. Hydraulic Institute Standards
  - b. NFPA 820
  - c. AWWA Standard E503
5. When should the design criteria be defined during the design process?
  - a. Near the end of the design process
  - b. Anytime is acceptable
  - c. Near the beginning of the design process
6. Which of the following is NOT a design criteria?
  - a. Peak design flow of 1,000 gpm at 40 psi
  - b. Salvage value
  - c. Pass solid sphere of minimum 3" diameter
7. What do you call the design flow that includes potential future developments?
  - a. Average design flow
  - b. Ultimate design flow
  - c. Peak design flow
8. Which are methods for measuring flow rates on an existing pump station?
  - a. Install a flow meter, use flow source data, or use pump run times
  - b. Install a flow meter, use pipe diameter, or use pump run times
  - c. Install a flow meter, use consumption data, or use motor voltage.

9. Which is NOT a benefit of a duplex pump arrangement?
- a. Simple design
  - b. Covers greater range of flows and pressures
  - c. Low construction cost
10. When may three or more pumps be justified?
- a. Large flows, large peak factor, large pressure range
  - b. Small flows, large peak factor, large pressure range
  - c. Large flows, large peak factor, small pressure range
11. Which is a benefit to variable speed control?
- a. Simple controls and programming
  - b. May allow fewer pumps
  - c. Controls have longer life when outdoors
12. What is a process flow diagram?
- a. Elevation view with hydraulic grade line
  - b. Preliminary site plan
  - c. Schematic showing major components and piping
13. Which should be larger: NPSHr or NPSHa?
- a. NPSHr
  - b. NPSHa
  - c. Should be equal
14. What is a system curve?
- a. Plot of TDH versus flow
  - b. Plot of TDH versus pressure
  - c. Plot of pump operating points
15. Which condition justifies plotting two system curves?
- a. Pumping from a wet well with a high and low water surface elevations
  - b. Having a long pipeline
  - c. Pulling a lift
16. Which formula represents TDH?
- a.  $TDH = \text{minor losses} + \text{pipe friction} + \text{static}$
  - b.  $DH = \text{minor losses} + \text{major losses} + \text{static}$
  - c.  $DH = \text{minor losses} + \text{dynamic losses} + \text{static}$
17. What is a common method for calculating minor losses?
- a. NPSH
  - b. Hazen-Williams
  - c. K-Value Method
18. Which are the inputs for the Hazen Williams equation?
- a. Pressure, friction coefficient, flow rate, pipe diameter
  - b. Pipe length, friction coefficient, flow rate, pipe diameter
  - c. Pipe length, K-Value, flow rate, pipe diameter
19. For a pump station with different size pumps, how can the system curves be calculated?

- a. Assume branch losses are equal, modeling, or pump curves with branch losses
  - b. Iterative calculations, modeling, or pump curves with branch losses
  - c. Iterative calculations, modeling, or estimate the flow in each branch
20. If the low flow point cannot be achieved by reducing the pump speed, what can be done?
- a. Use a combination of large and small pumps
  - b. Increase the pump size
  - c. Decrease the number of pumps
21. What tool can be used to identify pump models that meet the required flow and pressure?
- a. Efficiency calculator
  - b. Review charts of pump capacity ranges
  - c. Process flow diagram
22. When comparing two pump curves, which factors should be considered?
- a. Efficiency at average flow, inlet size, and slope of the curve
  - b. Stall condition, runout condition, and slope of the curve
  - c. Efficiency at average flow, preferred operating range, and slope of the curve
23. What method is used to calculate reduced speed pump curves?
- a. Affinity Laws
  - b. Bernoulli's Equation
  - c. Reynolds Number
24. How do you calculate a combined curve for two pumps in parallel?
- a. Add the pump heads for each flow
  - b. Add the pump flows for each head value
  - c. Add the pump flows and heads
25. For a hydraulic profile, what does the vertical rise at a pump represent?
- a. Head losses in the piping
  - b. Static losses
  - c. TDH of the pump

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