

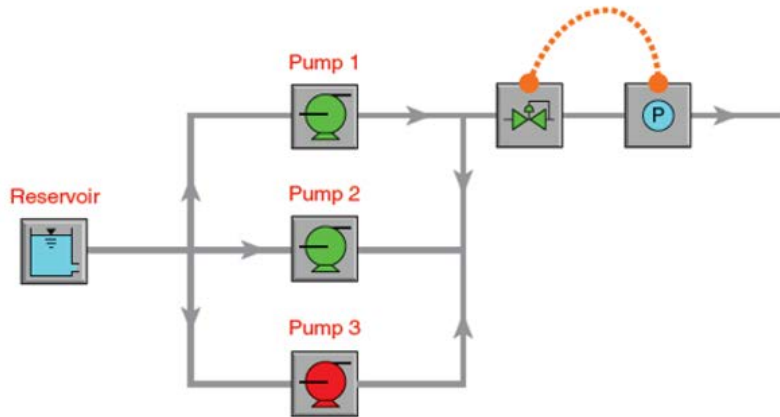
**PUMP SYSTEM ASSESSMENT
PROFESSIONAL
EXAM PREPERATION ONE DAY COURSE**

GROUP EXERCISE BOOK

D1 T2 K7

QUESTION 36.

The control valve in the system below is normally operating only 90% - 100% open (20 hours), but for two hours twice per day (four hours total) it regulates flow by closing to 20% open. What is the opportunity to save energy by optimizing this system?



- Reduce the pump speed twice per day, allowing the control valve to operate more closed
- Increase the pump speed twice per day, allowing the control valve to operate more open
- Reduce the pump speed twice per day, allowing the control valve to operate more open
- Reduce the pump speed during normal operation, allowing the control valve to operate more open

D1 T4 K20

QUESTION 37.

The total head developed by a rotary pump is directly proportional to:

- a) System Head
- b) Pump Speed
- c) Slip
- d) Flow Rate

D1 T4 K18

QUESTION 38.

Which of the following is the BEST method of direct, non-intrusive flow measurement in a system with significantly aerated and multi-phase liquid?

- a) Doppler ultrasonic
- b) Transit-time ultrasonic
- c) Orifice plate
- d) Venturi

D1 T5 K3

QUESTION 39.

The flow from a centrifugal pump in a closed loop circulating system is regulated to be constant by a flow control valve. If the control valve continually opens wider from 45% to 60% over a five year period, what is most likely the cause?

- a) Pump internal clearances have worn
- b) The level in the tank has increased
- c) The level in the tank has decreased
- d) The valve position indicator is broken

D2 T9 K27

QUESTION 40.

A pump with a 75 horsepower electric motor is operating 6000 hours per year with an average of 35 horsepower motor input power, power factor of 0.6 and motor efficiency of 82%. To supply the same pump load, what would be the simple payback be by replacing the 75 horsepower motor with a 40 horsepower model that was 94.1% efficient and operated at a power factor of 0.85? The cost of electricity is \$0.10 per kWh, the local utility provided a \$500 incentive for energy efficiency savings and \$300 incentive for improved power factor, and the motor acquisition and installation cost was \$7500.

- a) 2.4
- b) 3.4
- c) 3.8
- d) 4.1

QUESTION 41.

Which of the following is not a primary consideration in setting the low flow side of a pumps?

- a) Allowable Operating Region (AOR)
- b) Hydraulic pressure loading
- c) Thrust reversal
- d) Reduced efficiency
- e) High temperature rise

QUESTION 42.

What sealing arrangement is most appropriate for a volatile and hazardous liquid pump at 200 F (95 C) and 750 psi (5200 kPa) suction pressure?

- a) Unbalanced elastomeric bellows type mechanical seal
- b) Balanced split type pusher mechanical seal
- c) Unbalanced metal bellows type mechanical seal
- d) Balanced elastomeric bellows type mechanical seal

D1 T1 K3

QUESTION 43.

Which of the following is the most important design or application consideration for a reciprocating pump to operate reliably?

- a) Discharge piping configuration
- b) Suction piping configuration
- c) Low viscosity liquid
- d) High viscosity liquid

D1 T1 K1

QUESTION 44.

Which item is the primary reason positive displacement pumps are used in metering/dosing applications ?

- a) Performance and efficiency is less effected by various liquid properties
- b) Their flow is easily metered with use of a bypass valve
- c) A consistent volume is delivered with each shaft rotation
- d) Pulsating flow generated from reciprocating pumps is not a problem in metering applications

D1 T4 K3

QUESTION 45.

Relative to maximizing the pump suction pressure, which type of valve would be least appropriate in the suction line of a pump ?

- a) Globe valve
- b) Butterfly valve
- c) Full port ball valve
- d) Gate valve

D1 T2 K3

QUESTION 46.

Which is the best valve selection for control purposes?

- a) 70% open with 10 psid at rated condition
- b) 25% open with 10 psid at rated condition
- c) 70% open with 1 psid at rated condition
- d) 25% open with 1 psid at the rated condition

D1 T6 K2

QUESTION 47.

A pump motor is rated for 50 hp, is 95% efficient, and has a service factor of 1.25. During the assessment, motor input power readings of 35 kW, 40 kW, 42 kW, 45 kW, 47 kW, 50 kW and 55 kW were recorded. What readings are in the motors service factor?

- a) 35 kW, 40 kW, and 42 kW
- b) 40 kW, 42 kW, and 45 kW
- c) 45 kW, 47 kW, and 50 kW
- d) 47 kW, 50 kW, and 55 kW

D2 T8 K24

QUESTION 48.

A batch process operates 12 times a day. Each batch operates for 1 hour and is then off for 1 hour. The batch process was not available for two weeks in March, and two weeks in November due to unexpected maintenance. What is the availability of the batch process for a 52 week period?

- a. 50%
- b. 74%
- c. 92%
- d. 94%

D2 T7 K16

QUESTION 49.

A pump's discharge pressure varies between 90 and 100 psig. What range of bourdon tube pressure gauge should be selected for the application?

- a) 0 – 100 psig
- b) 0 – 125 psig
- c) 0 – 150 psig
- d) 0 – 200 psig

D2 T7 K17

QUESTION 50.

What is the head loss for a fitting that is 8 inch (203 mm) inside diameter with 1000 gpm (227 m³/h) and a K value of 0.5?

- a) 0.22 ft (0.07 m)
- b) 0.32 ft (0.10 m)
- c) 0.42 ft (0.13 m)
- d) 0.52 ft (0.16 m)

D1 T2 K26

QUESTION 51.

Which pump is best for unloading heavy crude with a viscosity of 2000 centistokes that requires 3,000 gpm (680 m³/hr), and 100 psi (690 kPa) differential pressure?

- a) Air operated diaphragm pump
- b) Double Case Between Bearing Centrifugal (BB5)
- c) Twin screw pump
- d) API 610 Overhung Centrifugal (OH2)

D2 T9 K18

QUESTION 52.

Select the instrument that provides the required accuracy of 0.5% of reading with a measurement of 100, that provides the lowest cost?

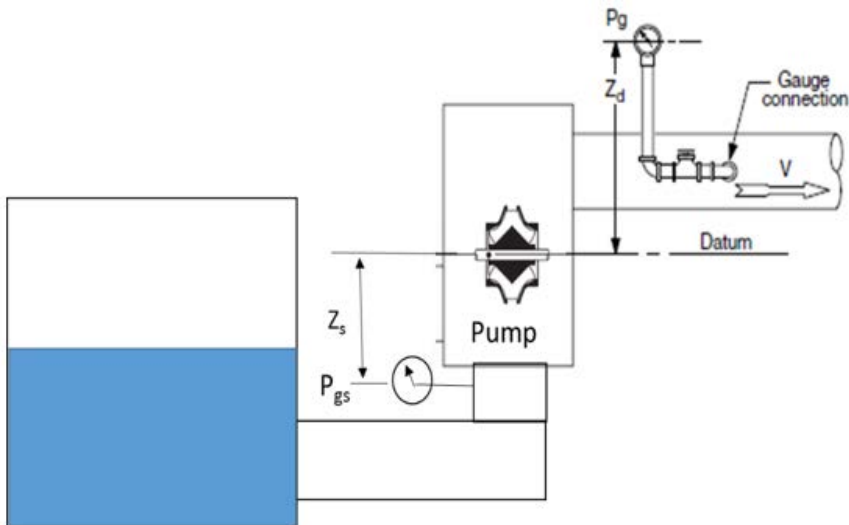
- a) Accuracy 0.25% full scale, range 0 – 200, price \$1,000
- b) Accuracy 0.1% full scale, range 0 – 150, price \$1,500
- c) Accuracy 0.5% full scale, range 0 – 150, price \$700
- d) Accuracy 0.2% full scale, range 0 – 150, price \$1,300

D2 T7 K17

QUESTION 53.

- For the system shown what is the NPSHA?
- Density 958 kg/m^3 (59.8 lb/ft^3), (specific gravity 0.96)
- $P_{gs} = 20.7 \text{ kPa}$ (3 psig)
- Flow rate = $0.83 \text{ m}^3/\text{s}$ ($29.3 \text{ ft}^3/\text{s}$)
- $Z_s = 1 \text{ meter}$ (3.28 ft)
- $Z_d = 2 \text{ meters}$ (6.56 ft)
- $P_g = 414 \text{ kPa}$ (60 psig)
- Atmospheric pressure = 100 kPa abs (14.5 psia)
- Vapor pressure = 99.0 kPa abs (14.4 psia)
- Suction pipe inside diameter = 0.457 meters (1.5 ft)
- Discharge pipe inside diameter = 0.457 meters (1.5 ft)

- 1.2 meters (4 ft)
- 2.6 meters (8.4 ft)
- 3.1 meters (10.2 ft)
- 4 meters (13.1 ft)



D1 T1 K3

QUESTION 54.

For reduced speed operating considerations, which type of pump would be considered a constant torque load?

- a) High pressure 8000 RPM Between Bearing Centrifugal Pump
- b) Axial flow 600 RPM vertically suspended pump
- c) Mixed flow 1800 RPM double suction pump
- d) 3000 RPM untimed screw pump

D2 T9 K19

QUESTION 55.

Which operating condition generally will not cause a pump to operate at lower than expected flow rate?

- a) Air entrainment in the liquid
- b) Wrong direction of rotation
- c) System head higher than expected
- d) System head lower than expected

D1 T2 K7

QUESTION 56.

If the velocity of flow in a section of pipe doubles, then the friction head loss in the system:

- a) Drops in half
- b) Remains the same
- c) Doubles
- d) Quadruples

D1 T4 K17

QUESTION 57.

What is the effect on increasing liquid temperature on the net positive suction head available?

- a) Increasing liquid temperature does not impact the NPSHA
- b) Increasing liquid temperature increases the NPSHA
- c) Increasing liquid temperature reduces the NPSHA
- d) It depends on the type of liquid



D1 T6 K18

QUESTION 58.

What is the most cost effective type of instrument for measuring pump head in a Level 2 Assessment?

- a) Pressure gauge
- b) Pressure switch
- c) Pressure transducer with a transmitter assembly
- d) Pressure reading is not required for a Level 2 assessment

D1 T5 K23

QUESTION 59.

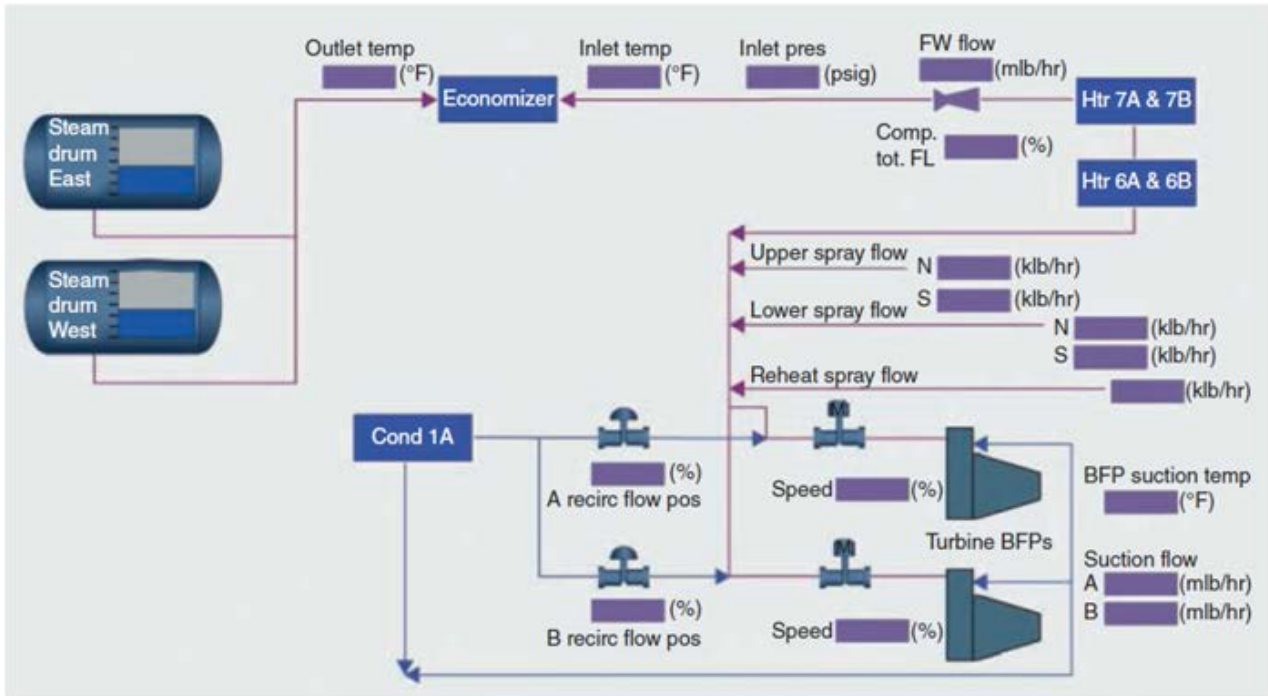
When reviewing a pump system with operating personnel, which key information gathered from the operator indicates the greatest need for a more detailed review is need?

- a) The pump bearings are hot, the pump is noisy, and bearing failures occur unexpectedly
- b) The pump runs at 70% of maximum speed and operating outside the preferred operating region
- c) The discharge valve is 100% open, and the pump speed is 60%
- d) The pump operates 50% of the time, and the motor is operating at the high end of the service factor

D1 T2 K12

QUESTION 60.

The image provided is an example of what type of drawing:

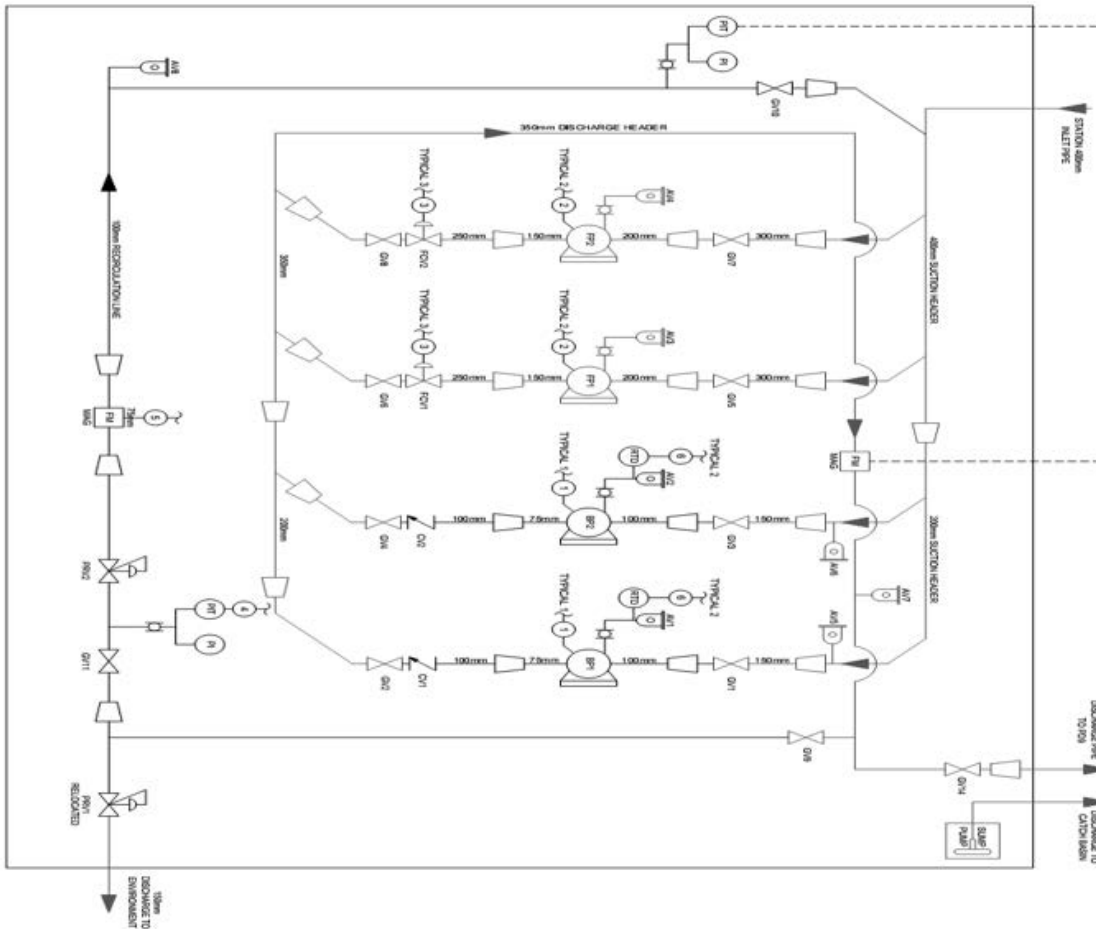


- Isometric drawing
- Piping & Instrumentation Diagram
- Process flow diagram
- Engineering drawing

D1 T5 K10

QUESTION 61.

Per the diagram, how many pump discharge check valves are present?



- a) 1
- b) 2
- c) 3
- d) 4



D2 T9 K11

QUESTION 62.

Piping isometrics show _____

- a) expected operation for all conditions including startup, shutdown, normal, and maximum
- b) design flow rates, piping diameters, valves, and sensors
- c) pipe lengths, design flow rates, elevations, fittings, and valves
- d) pipe lengths, pipe diameters, elevations, fittings, and valves

D1 T4 K3

QUESTION 63.

Submergence is increased by:

- a) increasing the liquid level above the source (suction to pump) tank outlet.
- b) increasing the source vessel's (suction to pump) height above the pump suction nozzle.
- c) shortening the pump suction pipe length.
- d) using a slower speed pump to provide the same flow.



D1 T1 K3

QUESTION 64.

A centrifugal pump draws flow from an open tank and discharges to a second (receiver) open tank located at an elevation 25 feet above the first tank. The pump operates on a variable frequency drive to maintain the level in the suction side tank, the total head of the system can be reduced by:

- a) increasing the liquid level in the source tank
- b) moving the pump closer to the receiving tank
- c) increasing the liquid level in the receiving tank
- d) Raising the speed of the pump

D1 T5 K9

QUESTION 65.

For a low horsepower and low cost commodity pump with no external support systems that is installed in a non-critical system with redundancy, what type of maintenance strategy would likely result in the lowest life cycle cost:

- a) Run to failure (Reactive)
- b) Predictive
- c) Continuous monitoring
- d) Preventative, during scheduled outages

D2 T9 K6

QUESTION 66.

In the multistage pump shown, what labeled position has highest shaft torque?

- a) Before the first stage impeller
- b) At the shaft midpoint
- c) Following the final stage
- d) At the thrust bearing

