

Pumps and Maintenance

Questions

- 1) Where would you find information on when to lubricate a pump?
- 2) What problems can develop if too much grease is used in lubricating an electric motor?
- 3) Why should a pump with a mechanical seal never run dry?
- 4) What factors influence the rate of brush wear in an electrical motor?
- 5) What should you check if a pump would not start?
- 6) What would you check if the flow rate from a pump is lower than expected?
- 7) Under what conditions might a centrifugal pump be started against a closed discharge valve?
- 8) What should be done before stopping an operating pump?
- 9) What could cause a pump shaft or motor to spin backward?
- 10) Why should the position (open or closed) of all valves be checked before starting the pump?
- 11) What is the most important rule regarding the operation of a positive displacement pump?
- 12) What could happen if a positive displacement pump is started against a closed discharge valve?
- 13) How can you tell if a new pump is delivering design flows and pressure?

- 14) What is the most common maintenance problem associates with water-level float controls?
- 15) What is a cross connection?
- 16) Is a slight water-seal leakage desirable for a pump with packing gland when it is running?
- 17) What should be done to a pump before it is shut down for a long period of time, and why?
- 18) What should be checked if pump bearings are running hot?
- 19) What are some of the common causes of shear pin failure in reciprocating pumps?
- 20) Why would you use a stethoscope to check an electric motor?
- 21) How would you clean belts on a belt drive system?
- 22) How can you determine if a chain in a chain-drive unit has the proper slack?
- 23) What maintenance is required on gate valves?
- 24) What maintenance is required on sluice gates?
- 25) How would you maintain a portable gas detector?
- 26) Why should inactive gate valves be operated periodically?
- 27) What methods are available for cleaning a plugged pipe?
- 28) How would you clean a plugged pump?

29) What is flow measurement?

30) What is the basic flow formula?

31) If a flow meter does not read properly, what items should be checked as potential causes of error?

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Answers

- 1) Pumps should be lubricated in accordance with the manufacturer's recommendations.
- 2) It may cause bearing problems or damage the windings.
- 3) A pump with a mechanical seal (or any other seal) should never run dry because water is required for seal lubrication.
- 4) The rate of brush wear varies with the brush pressure. At light pressures, electrical wear dominates because the brush can jump off the rings, sparking occurs, and the filming action on the ring becomes erratic. At higher pressures, mechanical wear is dominant because of high friction losses, needless heating and abrasion.
- 5) If a pump will not start, check for blown fuses or tripped circuit breakers and then determine the cause. Also check for a loose connection, or thermal unit.
- 6) You should check for something causing the reduced rate of discharge, such as pumping air, motor malfunction, plugged lines or valves, restricted suction, impeller problems, etc.
- 7) Normally a centrifugal pump should be started after the discharge valve is opened. Exceptions are Treatment processes or piping systems with vacuums or pressures that cannot be dropped or allowed to fluctuate greatly while an alternate pump is put on line.
- 8) Before stopping an operating pump: Start another pump (if needed); and Inspect the operating pump for developing problems, required adjustments, and problem conditions.
- 9) A pump shaft or motor will spin backward if wastewater being pumped flows back through the pump when the pump is shut off. This will occur if there is a faulty check valve or foot valve in the system.
- 10) The position of all valves should be checked before starting a pump to ensure that the wastewater being pumped will go where intended and to insure an open valve on discharge line.
- 11) The most important rule regarding the operation of positive displacement pumps is to NEVER start the pump against a closed discharge valve.
- 12) If a positive displacement pump is started against a closed discharge valve, the pipe, valve or pump could rupture from the excessive pressure. The rupture will damage equipment and possibly seriously injure or kill someone standing nearby.

- 13) Measure the flows and pressures and compare them with the pump performance curve supplied by the manufacturer.
- 14) Scum and debris interfere with their operation and must be removed from water-level float controls.
- 15) A cross connection is a connection between two piping systems where an undesirable water (water from water seal) could enter a domestic drinking water supply.
- 16) Yes. A slight leakage is desirable when the pumps are running to keep the packing cool and in good condition.
- 17) Before a prolonged shut down, the pump should be drained to prevent damage from corrosion, sedimentation, and freezing. Also, the motor disconnect switch should be opened to disconnect the motor.
- 18) If pump bearings are running hot, check for under- or over-lubrication. If properly lubricated, check the alignment of the pump (or motor) and check for badly worn bearings.
- 19) Shear pins commonly fail in reciprocating pumps because of
- (1) a solid object lodged under the piston,
 - (2) a clogged discharge line, or
 - (3) a stuck or wedged valve.
- 20) To listen to an electric motor for whines, gratings or that is uneven noise.
- 21) Belts are cleaned with a rag moistened with a non-oil base solvent.
- 22) The proper slack in a chain can be achieved when a slight sag or looseness is observed on the return run of the chain.
- 23) The most common maintenance required on gate valves is oiling, tightening, or replacing the stem stuffing box packing.
- 24) The most common maintenance required on sluice gates is testing for proper operation, cleaning and painting, and adjusting for proper clearance.
- 25) To maintain a portable gas detector: Be sure the battery is charged periodically, and calibrate using known standard gas concentrations obtained from the detector manufacturer.
- 26) To prevent sticking.

27) Plugged pipelines may be cleared by the use of pressure methods, cutting tools, high-velocity pressure units and as a last resort, dismantling the plugged section and removing the obstruction.

28) To clean a plugged pump, isolate the pump from the remainder of the plant by valving-off the plugged pump and tagging and locking-out the power supply to the pump. Remove the pump inspection plate and remove material causing blockage.

29) Flow measurement is the determination of the rate of flow past a certain point, such as the inlet to the head-works structure of a treatment plant. Flow is measured and recorded as a quantity (gallons or cubic feet) moving past a point during a specific time interval (seconds, minutes, hours, or days). Thus we obtain a flow rate or quantity in cu ft/sec or MGD.

30) Quantity = cross sectional Area X Velocity, or $q = A \times V$.

31) Potential causes of flow meter errors include foreign objects fouling the system or the meter may not be installed in the intended location. (Liquids should flow smoothly through the meter and flow should not be changing directions, nor should waves be present on the liquid surface above the measuring device.) Also, check the primary sensor, transmitter, receiver, and power supply.