

Pumping B Experiment Supplemental Information

DWC

9/3/13

General Information for the Pumping B Experiment

1. You will characterize a Sherwood Model 111-J centrifugal pump using ANSI standard methods for pump testing.
2. The motor that drives the pump is a DC motor. A power supply, mounted on a pedestal above the pump, is used to control the speed of the pump and measure electrical input power. On the end of the motor shaft is a tachometer to measure the shaft speed.
3. The motor housing is mounted in bearings that allow it to rotate freely. A lever mounted on the side of the motor housing is connected to a spring scale. This lever prevents the motor from spinning, and the scale reads the force required to resist the tendency to rotate. This device is called a Prony brake and is used to measure the pump input power.
4. The experiment was also designed and built for measuring flow in branched piping systems and measuring pressure drops in pipe and fittings. We will not use this additional piping for your pump tests. Close the valves to the branched piping set up and use the shortest piping route from the pump discharge to the weigh tank.
5. At the beginning of your time in the lab you will do the following:
 - a) Read, re-read, understand, and follow the instructions for operating the pump speed control and power supply so that the fuses are not blown and electrical equipment is not damaged.
 - b) Check the water level in the supply tank and add water if necessary. The starting level should be within about 3 inches from the top of the tank.
 - c) Be careful not to splash water on any electrical boxes, the power supply, or the motor.
 - e) Set the pump speed and run the pump for a couple minutes to flush any air out of the system before recording any data.
 - f) To turn on the pressure gauges, push the on/off button. You may have to turn them back on as there is an auto-shut-off feature built into the gauge.
 - g) Begin collecting data. Be careful to not overflow the water in the weigh tank.
 - h) Be sure to close the valve at the bottom of the supply tank, the fresh water supply valve, and the valves to the pressure sensors when you are done.

Expectations for Proposal

1. You must state exactly what data you will record and how you will use these data to meet the experiment objectives. The sample calculations must include units, starting with the units of the instrumentation you will use to collect your data. Calculations can be done neatly by hand or typed.
2. Obtain a copy of the Pumping B Supplemental Materials packet. The information on the pump, instrumentation, and Prony brake are included in the packet.

3. Follow the guidelines in the lab manual for proposal writing.
4. For the check-in and proposal I expect to see the following in addition to what is stated above.
 - a.) Tell me how you will calculate NPSH, discharge head, and flow rates. I want to see sample calculations with units. Use the manufacturer's data and your good judgment to get values for your sample calcs.
 - b.) Use American engineering units for all your calculations. One horsepower is equal to 550 foot-pounds per second.
 - c.) Tell me how you will determine the head (in feet) for your system.
 - d.) Tell me how you will make a pump curve with total head in feet on the y axis, and flow in gallons per minute of water on the x axis at the assigned rpm's.
 - e.) Tell me how you will calculate the pump input power, electric driver input power, pump output power, pump efficiency, and overall efficiency.
 - f.) Tell me exactly how you will use the affinity laws, show sample calculations, and explain their applications and limitations.