

**ABE 304**  
**Bioprocess Engineering Laboratory**

**PRELAB: PUMP CONFIGURATIONS AND FLOW THROUGH A PIPE**

**BACKGROUND**

**You need to address the following topics for your pre-lab report:**

1. Background paragraph on centrifugal pump operation and operating principle.
2. Importance of calculating friction losses in a pumping-piping system.
3. Equations necessary for analysis (include *all* what you need to address each of the aims for this module, *Re*, Colebrook, frictional losses etc.)

The pre-lab report will approximately 2 pages in length and will cover topics 1-3 above. The pre-lab needs to be saved as a single document and uploaded to Blackboard.

Prepare your lab notebook before coming to class:

1. A preliminary procedure and experimentation summary needs to be written your lab notebook.
2. Chart in laboratory notebook for record keeping. Each team member is required to have a chart and keep their own data records during lab. The TA will check the lab notebooks for the necessary charts on the first day of lab. Team members will not be able to participate in the experiment until they have a blank data chart in their lab notebooks.
3. Each person will need to create a detailed sketch of the apparatus in their lab notebook during the lab period. The sketch should include dimensions of the apparatus. This sketch will be used to create a computer-drawn schematic for the final lab report.

**DATA ACQUISITION**

- Chart for characteristic curves data acquisition. Q vs.  $\Delta P$  at least 10 points in *triplicate* for *each* of three pumping configurations. You should create data tables in your lab notebook *prior* to lab to fill in during the experiment.

	Pumping Configuration: Parallel					
	Trial 1		Trial 2		Trial 3	
N Measurement	Q (gpm)	$\Delta P$ (psi)	Q (gpm)	$\Delta P$ (psi)	Q (gpm)	$\Delta P$ (psi)
1	0	12	0	11	0	12
2	3	10	3	10	3	10
3	6	9	6	9	6	8
-	-	-	-	-	-	-
10	27	1	27	0	27	1

- Chart for friction losses data acquisition. Q vs.  $\Delta P$  at least 12 points (with duplicates) for *each* of four piping configurations. You should create data tables in your lab notebook *prior* to lab to fill in during the experiment.

The following situations might happen, therefore, be aware to modify and adapt the range of measurement to have the 12 points in the range where you will see pressure drops, nonetheless, always record the pressure at the maximum and minimum Q.

- o For the 1" pipe the pressure drop will be very low and probably only detectable near to the maximum flow (20 to 35gpm).
- o For the 3/4" and 1/2 " straight pipes the detectable pressure drop will be around the mid-range of the flow range.
- o For the 1/2" coiled pipe the detectable pressure drop will be around lowest flow range (1 to 15 gpm)

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The following is only an example; adjust the flows to have detectable  $\Delta P$ s to measure.

1"		3/4"		1/2" straight		1/2" coiled	
Q (gpm)	$\Delta P$ (psi)	Q (gpm)	$\Delta P$ (psi)	Q (gpm)	$\Delta P$ (psi)	Q (gpm)	$\Delta P$ (psi)
1	0	1	0	1	0	1	1
5	0	5	0	5	2	5	7
15	0	15	2	15	8	15	-
20	1	20	-	20	-	20	-