ABE 440
Bioprocess Engineering Laboratory
PRELAB: MIXING AND HEAT TRANSFER

BACKGROUND

Read Mixing and Heat Transfer Lab Manual.
Read Geankopolis Sections 3.4, 3.5J, 4.1A, 4.1C, 4.1E, 4.5, and 4.13

1. Provide a brief description of the main types of impellers commonly used in industry for mixing operations.
2. U is the overall heat transfer coefficient; for our system there are resistances that contribute to U, What are they and how is U calculated?
3. How can q_{accu} be calculated? Being q_{accu} the **rate** of energy accumulation in the solution within the vessel.
4. In this laboratory we will use a batch system with nearly perfect insulation. What would be the simplified form for Equation 7 found in your lab manual?
5. After the simplification, replace the terms q_{in} for the Equation 8 (lab manual) and q_{accu} for the equation you found in question 4. The resulting equation will be the center of your heat transfer data analysis.

The pre-lab report will approximately be 2 pages in length and will cover topics 1-5 above. This assignment is due on Blackboard by the due date. The pre-lab needs to be saved as a single document and submitted to Blackboard.

Your individual lab notebook will be checked for: brief background, experimental procedure, and data tables. The schematic of the mixing set-up needs to be included in your final report. The schematic should include: the design of the impellers, inlets of steam (with valves), pressure gauges, thermometers and other fittings you consider relevant (steam traps, cool water inlet etc). Also, include the volume and area of the vessel and jacket (either calculated by yourselves or from the designer), and material of the equipment.

DATA ACQUISITION

Power consumption- Heat transfer & agitation: The following table is an example of a chart for data acquisition for the experiment. You will perform the experiment using five different agitation speeds.

Agitation Speed (rpm):	
Power Consumption (W):	
Steam Pressure:	
Temperature (°C)	Time (min:sec)
30	0:00
40	1:20
-	-
80	15:30