

**INDIVIDUAL SUPPLEMENTAL PROBLEM Set A-2**

Problem A4. [ 25 total project problem points ] **DUE Wednesday, September 24, 2008**

A **450** meter long carbon steel pipe of **4**-inch nominal diameter is to be used as a steam line. The pipe is butt-welded and its schedule number is **80**.

- (a) Estimate the **maximum steam pressure** that can be used safely in this pipe.
- (b) Estimate the **purchased cost of the pipe** in current dollars.
- (c) Estimate the **installed cost of the insulated pipe** in current dollars.

Problem A5. [ 25 total project problem points ] **DUE Wednesday, September 24, 2008**

Using the fact that the fixed capital investment for a **50,000** tons/year sulfuric acid plant in 1985 was **\$1,500,000**. What should be the 2<sup>nd</sup> quarter 2008 selling price of sulfuric acid, produced at a rate of **75,000** tons/year, to reflect the normal **0.7** turnover ratio for the bulk chemical industry?

**INDIVIDUAL SUPPLEMENTAL PROBLEM Set A-3**

Problem A6. [ 80 total project problem points ] **DUE Friday, September 26, 2008**

A preliminary estimate is to be made of the total cost for a completely installed pipe and pumping system. A pipeline is to be used for the steady delivery of **275** gallons per minute of water at **75 °F**. The total length of the line will be **1,000** feet, and it is estimated that the theoretical horsepower requirement (100% efficiency) of the pump is **10.0** hp. Using the additional data below, estimate the **current** and forecasted 3<sup>rd</sup> quarter **2009 total installed cost** for the pipe and pumping system.

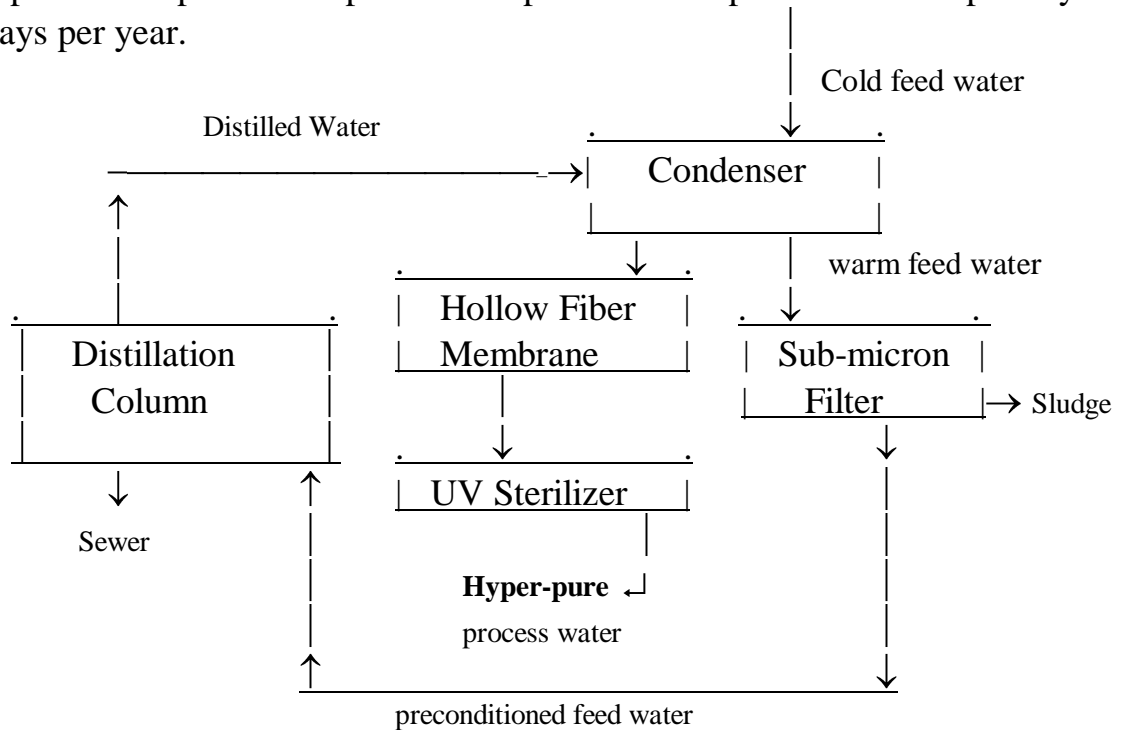
- (a) Materials of construction -- **black steel** (standard weights are satisfactory)
- (b) Number of fittings (equivalent to tees) -- **40**
- (c) Number of valves (gate) -- **4**
- (d) Insulation (85% magnesia) -- **1½** inch thick
- (e) Pump -- **centrifugal** (no standby pump is needed)
- (f) Motor -- **AC**, enclosed, 3-phase, 1800 rpm

Problem A6 part II. [ 20 total project problem points ] What would be the **current total installed cost** if a **3x5** pump system was used instead of the single pump in the above design? In addition to providing routine process water, this is a fire protection system and risk of water supply failure must be minimized. The five pumps, each sized for 40% of the capacity needed, would have three operating at any given time with one on 'hot' stand-by and one in reserve or undergoing maintenance.

### INDIVIDUAL SUPPLEMENTAL PROBLEM Set A-3

Problem A7. [ 25 total project problem points ] **DUE Friday, September 26, 2008**

A semi-conductor fabrication plant requires a new 'hyper-pure' water purification process system as shown in Figure A7 below. Estimate the **2<sup>nd</sup> Quarter 2008 Fixed Capital Investment** for a 600,560 pounds per day of hyper-pure water production plant. The process will operate 24 hours per day 340 days per year.



State all assumptions and explain your reasoning.