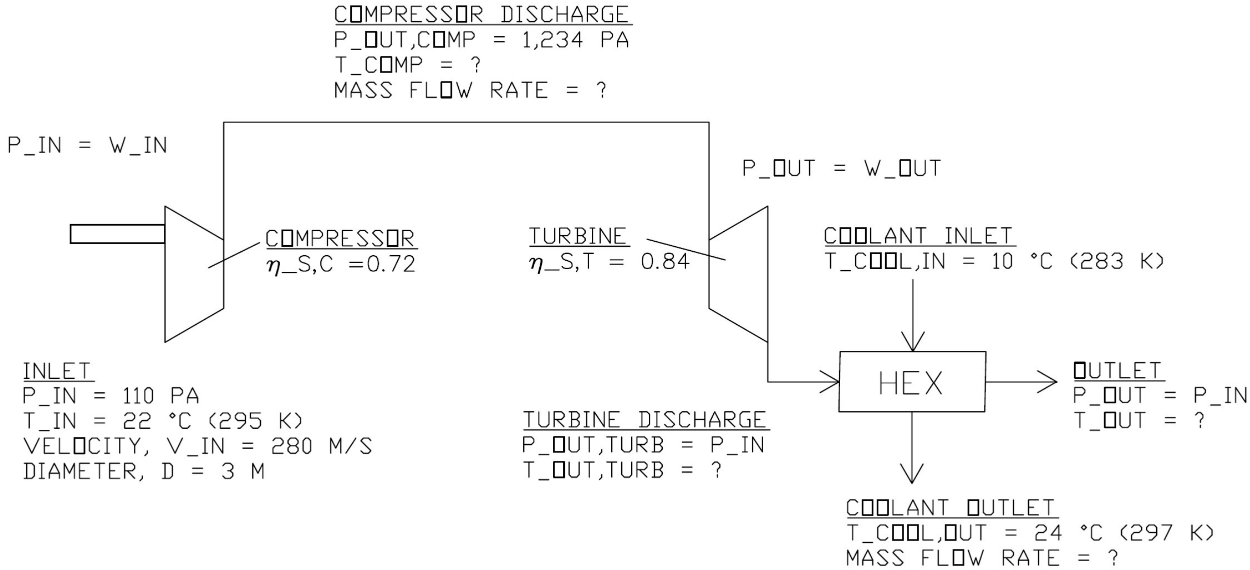
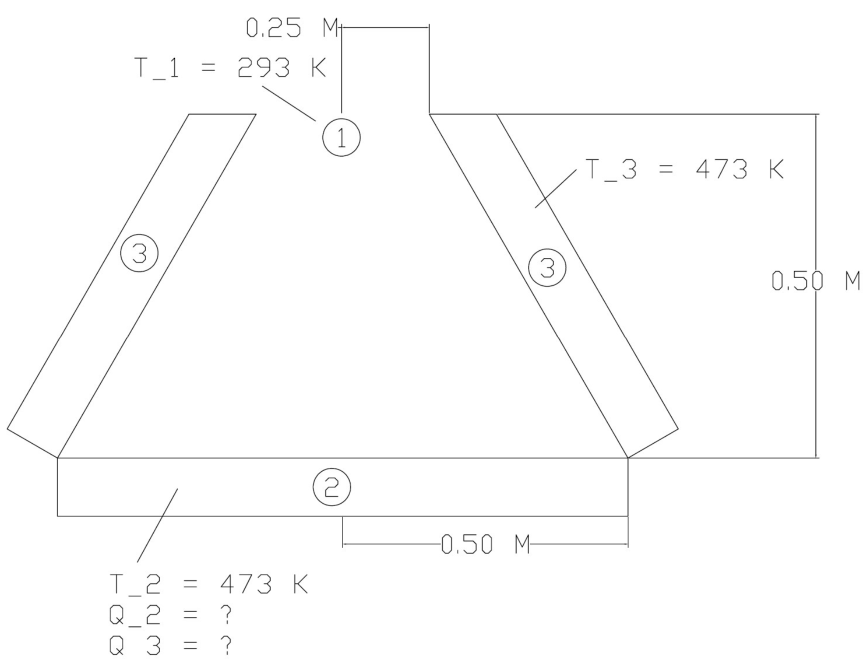
1. <u>HEX is counterflow type</u>



2. <u>Assuming:</u>

- Uniform irradiation
- Uniform radiosity
- T_H = constant
- Black bodies



How does your answer change if you assume nonuniform irradiation distribution of furnace surfaces?

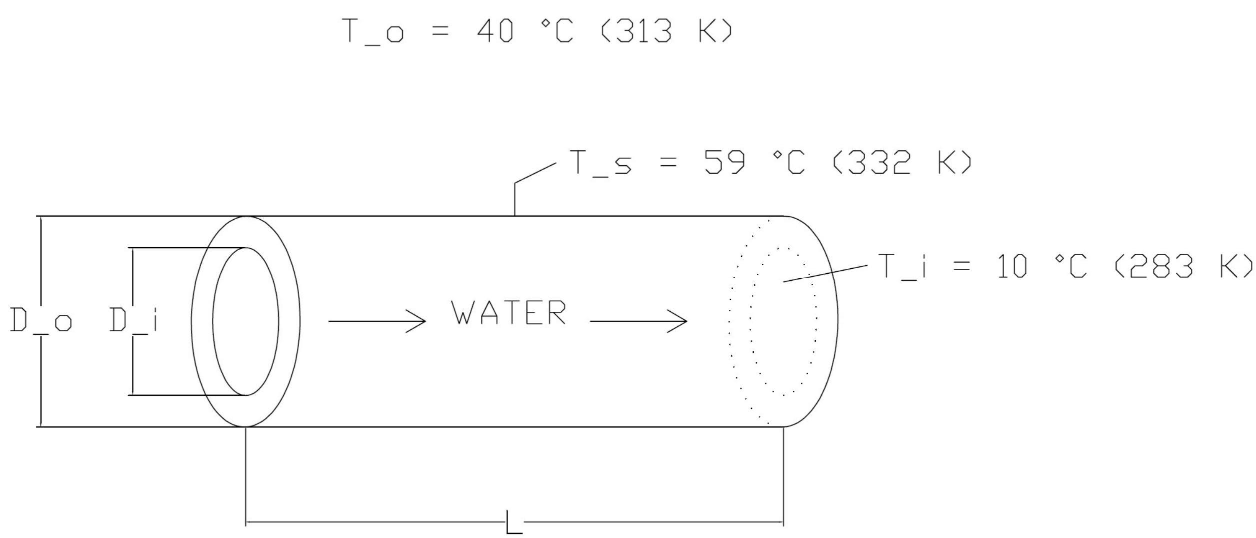
3. In a low pressure (100 Pa) environment how is the free convection heat transfer coefficient different than at atmospheric?

4. <u>Assuming:</u>

- $\dot{m} = 0.2 \frac{kg}{s}$
- D_o = 10 cm
- D_i = 6 cm
- q" = 5,000 $\frac{W}{m^2}$

<u>Find:</u>

- h_o = ? (assuming uniform heat flux, q")
- h_o_alt = ? (assuming constant surface temperature, T_s)



5. Minimal drag designs, speed regime feature design and control

Across a normal shock wave does the following increase, decrease or stay the same

- Total energy
- Total pressure
- Total temperature
- Static temperature
- Static pressure
- Density
- Velocity
- Mach #

6. Compressor 2^{nd}-stage has:

- P_{in} = 200 Pa
- $\frac{P\_out}{P\_in}$ = 1.5
- T_{in} = 22 °C (295 K)
- $\eta_{comp,s}$ = 0.82
- $\dot{m}_{comp}$ = 6 $\frac{kg}{s}$

Find:

- Power required = ?
- T_{out} = ?

7. What is the blade Reynolds # for NACA 63210 compressor blade airfoil profile given the following?

    - Chord length = 4 cm
    - Velocity = 290 m/s
    - T = 27 °C (300 K)
    - P = 150 Pa.

8. <u>Assuming:</u>

- Uniform supersonic
- Ideal
- Calorically perfect gas
- $C_p = 1.3$
- $M_1 = 2.3$
- $\theta = 17$ ° (i.e. corner or turning angle)

What is the following post shock?

- Mach # = ?
- Deflection angle, β = ?   (i.e. oblique shock or shock wave angle)
- Static pressure ratio across the shock wave?
- What if $\theta > 30$ ° ?

OBLIQUE SHOCK