

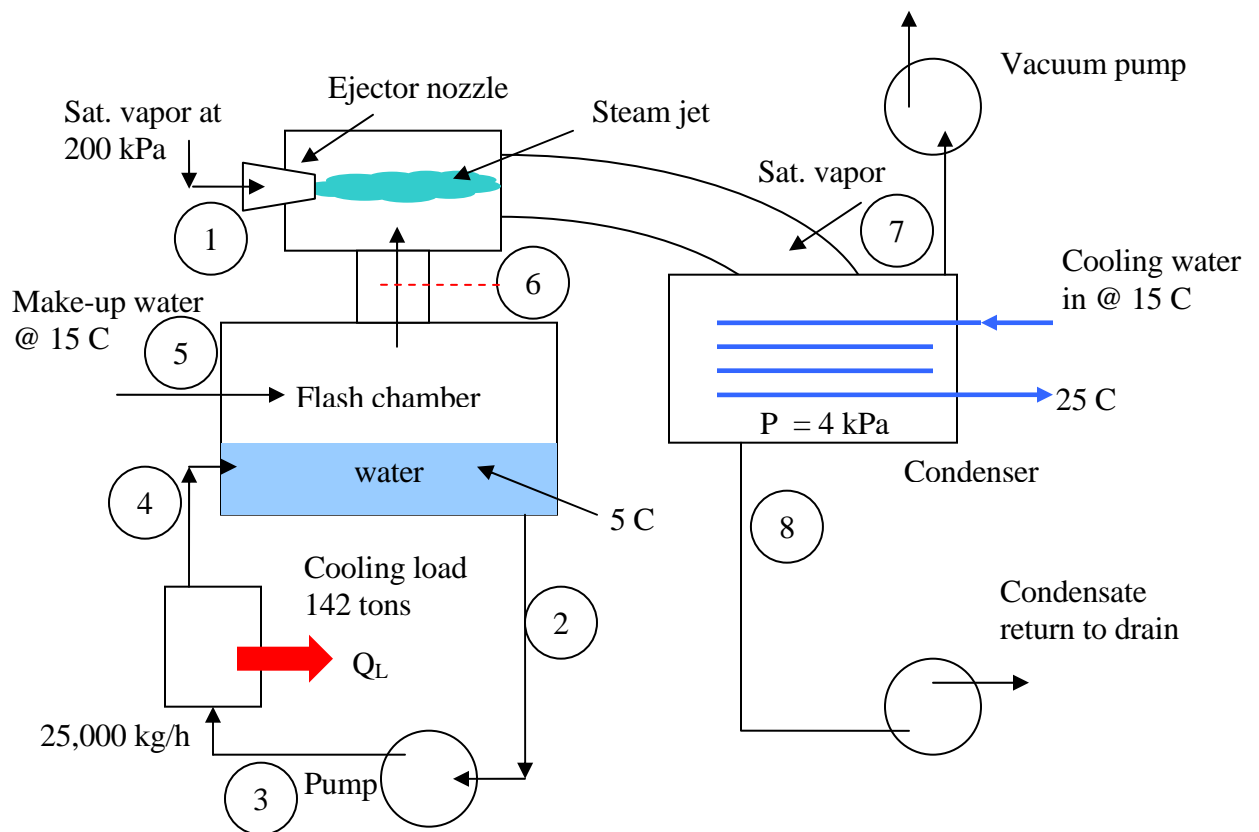
MECH 461

Assignment #3 (Refrigeration)

Assignment date: Tuesday Jan 29, 2011

Problem 1:

Figure below shows a steam jet refrigeration system that produces chilled water in a flash chamber. The chamber is maintained at a vacuum pressure by the steam ejector, which removes the vapor generated by entraining it in the low-pressure jet and discharging into the condenser. The vacuum pump removes air and other non-condensable gases from the condenser shell. For the conditions shown on the figure, determine the make-up water and cooling water flow rates in kg/h.



Note: 1 ton (of refrigeration) = 211 kJ/min.

Problem 2:

The schematic diagram of a two evaporator refrigeration cycle is shown in the figure below where refrigerant R-134a is used. The arrangement is used to achieve refrigeration at two different temperatures with a single compressor and a single condenser. The low-temperature evaporator operates at -18°C with saturated vapor at its exit and has a refrigerating capacity of 3 tons. The higher-temperature evaporator produces saturated vapor at 3.2 bar at its exit and has a refrigerating capacity of 2 tons. Compression is isentropic to the condenser pressure of 10 bar. There are no significant pressure drops in the flows through the condenser and the two evaporators, and the refrigerant leaves the condenser as saturated liquid at 10 bar. Calculate:

- 1) the mass flow rate of refrigerant through each evaporator, in kg/min
- 2) the compressor power input, in kW
- 3) the rate of heat transfer from the refrigerant passing through the condenser, in kW.

