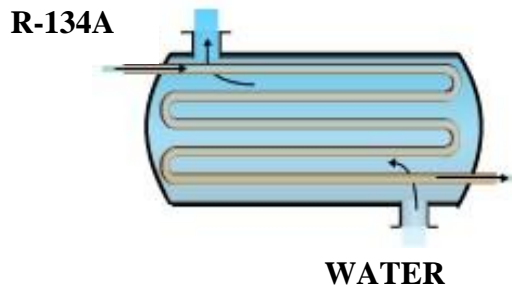


Supplemental Problems 7



A. A Heat Exchanger

Refrigerant-134A flows in tubes with an inlet state of 900 kPa and 75°C. The mass flow rate of the R-134A is 0.1 kg/s. **The refrigerant is to be cooled by water in an insulated condenser (a Heat Exchanger) until it exits as a saturated liquid at the same pressure.** The cooling water enters the condenser at 10°C, and leaves at 30°C. The inlet pipe and exit pipe for the R-134A both have a diameter of 2 cm. Determine:

- The mass flow rate of the condenser cooling water (kg/sec).
- The INLET volumetric flow rate for the refrigerant, cubic meters/sec
- The heat exchange capacity of this heat exchanger, kW

B. A Gas Turbine

A turbojet has a compressor inlet at 80 kPa and 260 K (state 1) and the outlet (state 2) is at 3300 kPa, 780 K. The temperature after combustion, entering the turbine (state 3) is at 3300 kPa and 1500 K. The turbine outlet (state 4) into the nozzle is at 400 kPa and 900 K. The nozzle exit is at 80 kPa and 640 K (state 5). The working fluid is AIR, with a mass flow rate of 100 kg/sec. Determine:

- The turbine and compressor Power, kW
- The nozzle exit velocity, m/s

