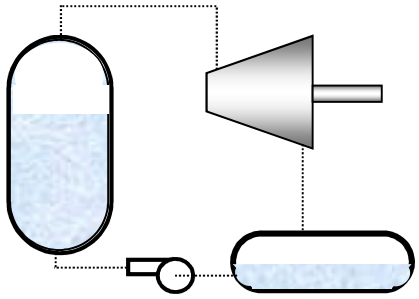
EXAMPLE: (Almost) ideal Rankine cycle

A Rankine cycle operates with a boiler pressure of 8 MPa and a condenser pressure of 10 kPa. Otherwise the cycle is ideal. The liquid entering the pump is saturated, and the vapor entering the turbine has a temperature of 700°C. The mass flow rate of steam through the cycle is 1 kg/s.

a) Sketch the cycle on a *T*-*s* diagram.
b) Calculate:
    1) the power into the pump,
    2) the heat transfer into the boiler,
    3) the power out of the turbine, and
    4) the heat transfer rejected by the condenser.
c) Find the efficiency of the cycle.



EXAMPLE: (Almost) ideal Rankine cycle

Repeat the last problem, but increase the boiler pressure to 10 MPa.

EXAMPLE: (Almost) ideal Rankine cycle

Repeat the problem again, but this time let the adiabatic efficiencies of the pump and the turbine be 70% and 90%, respectively.