

Engr 292 - Fluids & Thermodynamics

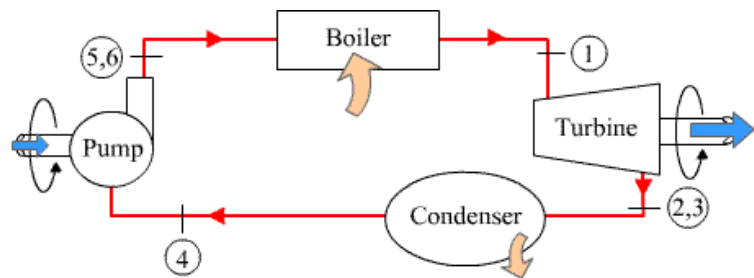
Assignment 3

Question 1

A power plant operates on a simple Rankine cycle producing a net power of 100 MW. The turbine inlet conditions are 15 MPa and 600°C and the condenser pressure is 10 kPa.

Version A: The turbine and pump each have an isentropic efficiency of 100% and there is no pressure drop as the water passes through the boiler

Version B: The turbine and pump each has an isentropic efficiency of 85% and there is a 5% pressure drop as the water passes through the boiler.

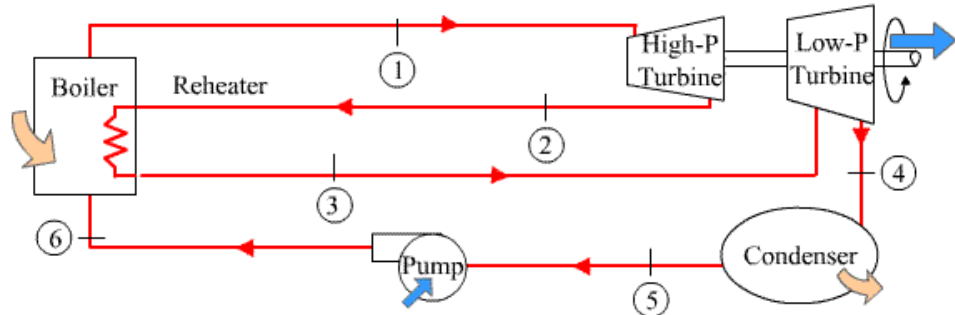


For each of these versions, determine:

- The plant's thermal efficiency,
- The mass flow rate of steam in kg/h, and
- The back work ratio. (Note: back work ratio = W_P/W_T)

Question 2

Consider a steam power plant that operates on a reheat Rankine cycle. Steam enters the high pressure turbine at 9 MPa, 600°C and leaves as a saturated vapor. The steam is then reheated to 500°C before entering the low pressure turbine, and is condensed in a condenser at 7.5 kPa. The mass flow rate is 150 kg/s.



Determine:

- The net power developed,
- The rate of heat transfer to the working fluid in the reheat process; and,
- The thermal efficiency,
- What would the rate of heat transfer be if steam were reheated to 550°C ?