# Vapor Power Cycles

## 5.1 Carnot Vapor Power Cycle:

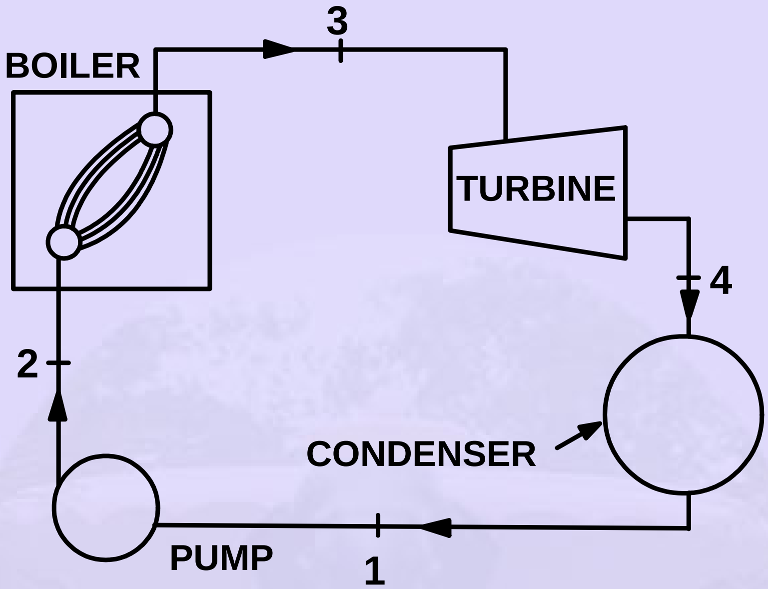


Fig.5.1(a). Carnot vapour cycle

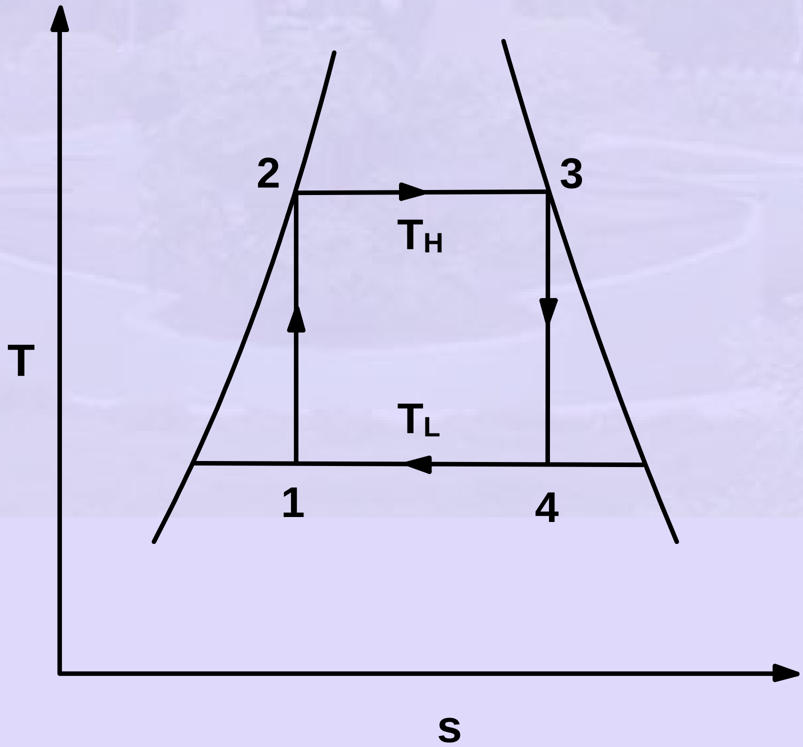


Fig.5.1 (b)T-s diagram

**Process 1-2:** Reversible adiabatic compression process from $P_1$ to $P_2$.

**Process 2-3:** Reversible isothermal heat addition process at constant temperature $T_H$.

**Process 3-4:** Reversible adiabatic expansion process from $P_3$ to $P_4$.

**Process 4-1:** Reversible isothermal heat rejection process at constant temperature $T_L$.

Saturated vapor leaves the boiler at state 3, enters the turbine and expands to state 4. The fluid then enters the condenser, where it is cooled to state 1 and then it is compressed to state 2 in the pump. The efficiency of the cycle is as follows:

$$\eta_{carnot} = \frac{T_H - T_L}{T_H} = \left[1 - \frac{T_L}{T_H}\right]$$

Practically, it is very difficult to add or reject heat to or from the working fluid at constant temperature. But, it is comparatively easy to add or reject heat to or from the working fluid at constant pressure. Therefore, Carnot cycle is not used as an idealized cycle for steam power plants. However, ideal cycle for steam power plant is Rankine cycle in which heat addition and rejection takes place at constant pressure process.