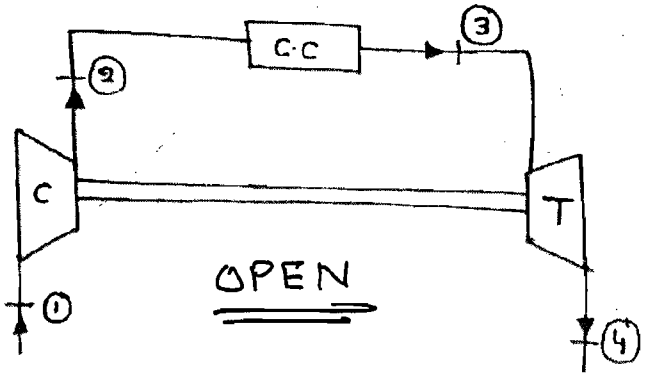
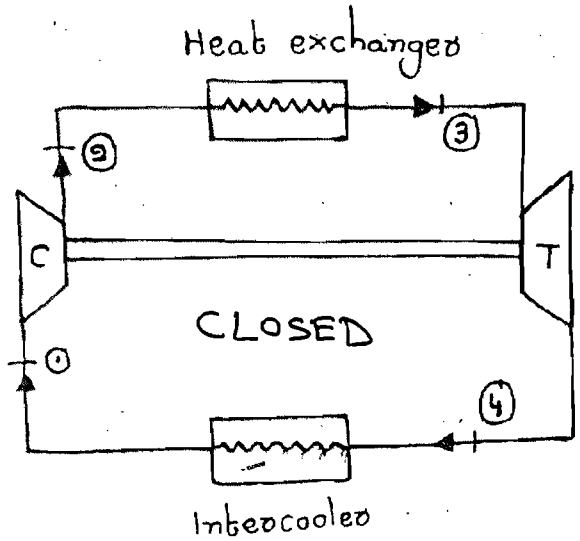
GAS TURBINE

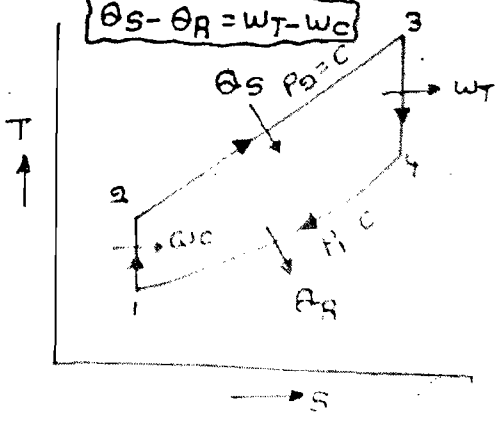




$E_{in} = E_{out}$

$\theta_S + W_C = W_T + \theta_R$

$\theta_S - \theta_R = W_T - W_C$



Compression work [W_C] :- 1-a-b-2-1

Turbine work [W_T] :- 4-a-b-3-4

W_{net} :- $W_T - W_C$

W_{net} :- Area → 1-2-3-4-1

Brayton cycle is a practical working cycle for Gas turbine P.P & Consist of (4) process.

1-2 :- Reversible adabatic Compression of air or gas from lower press to higher press in a Compressor

2-3 :- Constant press heat addition process either directly in the "C.C" or indirectly in a H.E.

3-4 :- Reversible adabatic expansion from higher to lower pressure in Gas Turbine.

4-1 :- Constant press heat rejection process either directly to atmosphere or indirectly in an intercooler.

* Advantages of closed cycle:-

- More efficient & Compact b/w the same Max & Min temperature.
- Any lower Grade fuel can be used as the working substance is not p mixed with fuel.
- Any Better properties working substance like Helium, argon gas can be used.
- It can work at low atmospheric pressure.
- There is no problem of Turbine blade erosion.

* Disadvantages of closed cycle:-

- Cycle becomes Complicated, Costly, Bulky.
- leak proofing of Below atmospheric cycle is very difficult.
- Bcz of being bulky cannot be used for aircraft application.

* Air standard Assumptions:-

- Air is the working substance throughout & its chemical Composition doesn't change.
- cp, cv, r value is remaining Constant throughout [cold air assumption]

- changes in K.E & P.E are neligable.
- Compression & Expansion process are adiabatic.
- There is no loss of pressure while flow takes place through various components.

Back work Ratio [r_{bw}]:-

Work Ratio [r_w]:-

Specific Fuel Consumption :-

Mass flow rate of fluid required to produce 1 kw of power output.

- Air Rate [A.R] :-

Mass flow rate of air required produce 1 kw of power output