1-COP = refrigerating effect watt / work input to compressor watt

And this definition is describe the efficiency of the compressor & COP is fractional value between 0-1, or percentage value between 0% & 100%, if this compressor is works as convert all mechanical work to refrigerating effect then we can say that this compressor is works perfect & there is no energy loss from compressor during the mechanical process.

2- EER is energy efficiency ratio : its idea is same as COP , ratio between refrigerating effect for compressor in watt to power of motor in watt.

- types of energy

Energy is the ability to do work, there is two types of energy, the first one is stored energy in system inside boundaries such as potential energy, kinetic energy, & internal energy. The second one is outside boundaries such as heat & work. We will discuss all of these in details.

- stored energy:

1- potential energy can be studied in two ways : microscopic & macroscopic ways, our study on macroscopic, this potential energy is storing inside the object or fluid in molecular configuration, and its depend on position with relative to ground, its equal product of gravitational force and height or distance.

adiabatic process in piston cylinder device work is done from system to surrounding , so when we decrease temperature of gas inside system pressure inside will decrease also (Note : relation between P & T are proportional), and this cause expansion of gas with decrease in internal energy, conversely for reversible adiabatic compression when pressure increase temperature & internal energy also increase, then cause increase in work which is equal same energy that added to internal energy.

5-polytropic process : it can be defined by the comparison of isothermal and adiabatic processes. An isothermal expansion processis the process in which the energy to do work is supplied from an external source , whereas in an adiabatic process , this energy is supplied entirely from the gas itself.

- Control volume or open system is a system that it can be transfer mass & energy from It to surrounding or from surrounding to It, here some important equations for open system :

Ei + (dq/dt) = Ef + (dE/dt)cv + (dw/dt).

Ei : initial energy in joule.

Ef : final energy in joule.

dq/dt : rate of change of heat energy transfer in watt.

(dE/dt) : rate of change of energy in watt.

(dw/dt) : rate of change of work energy in watt.

oxygen, titanium dioxide , propylene oxide & vinyl acetate need 10% - 15% oxygen for the manufacture.

-also used in glass manufacturing , jet aircraft , & coal gasification .

✔ -Applications of Argon

-Argon gas is maintained from Air at which contains 0.0093% of argon by volume. Its inert gas ,it had wide range in industry , & its used in cryogenic at high temperature..

-decarburisation process to produce low carbon stainless steel .

-MIG welding.

-Light bulb industry to fill argon gas inside light bulbs, to gives longer life.

- Refrigeration systems

A- Non cyclic refrigeration systems: This a process is complete by refrigeration and evaporation by dry ice.

B-Cyclic refrigeration system : this done by :

1-Air Refrigeration cycle .

2-Vapor Compression refrigeration cycle.

3-Vapor Absorption cycle.

C-Other refrigeration systems : Those done by :

1-thermoelectric refrigeration cycle

,where refrigerant is air, for any Refrigeration cycle , this cycle should contains Evaporator, Condenser, compressor, & Expansion Valve. We will discuss now about Carnot Refrigerator.

- Carnot Refrigeration Cycle

Carnot Refrigeration cycle are include four 4 process :

- 1st process : Reversible Adiabatic compression process where Air is compressed from P1 to P2 & T1 to T2 without any transfer of heat energy from system to surrounding, so in this process pressure increase to make temperature rise in this cycle.

- 2nd process : Isothermal Compression Process where Air is Compressed after 1st process from P1 to P2, but here at constant Temperature ,so here pressure increase cause some amount of heat energy to transfer from system to surrounding.

- 3rd process :Reversible Adiabatic Expansion Process where this process same as 1st process but here Expansion not compression at adiabatic system ,so there is no any heat energy transfer from or to system , Expansion of Air in piston cylinder device is done by decrease in pressure and temperature from P2 to P1 & T2 to T1 without any heat transfer because it is adiabatic system to move piston slowly upward (Expansion).

- 4th process : Isothermal Expansion Process Where this process same as 2nd process but here Expansion not compression at isothermal process which temperature remains constant , work done in piston cylinder device to move piston up ward ,this moving of piston occur because there is release of heat energy from the surrounding to system.