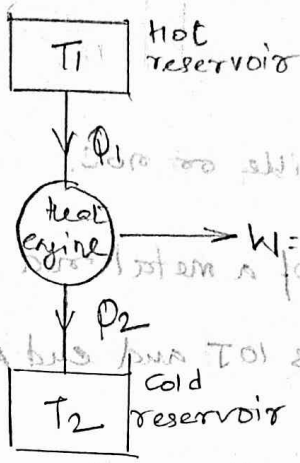
Kelvin planck statement.

The Kelvin planck statement says it is impossible to construct an operating device working on a cyclic process which produces no other effect than the extraction of energy as heat from a single thermal reservoir and performs an equivalent amount of work.



$\eta_{th} = \frac{W_{net}}{Q} = \frac{Q_1}{Q_1}$

$= 100\%$

which is impossible.

$W_{net} = Q - Q_2$

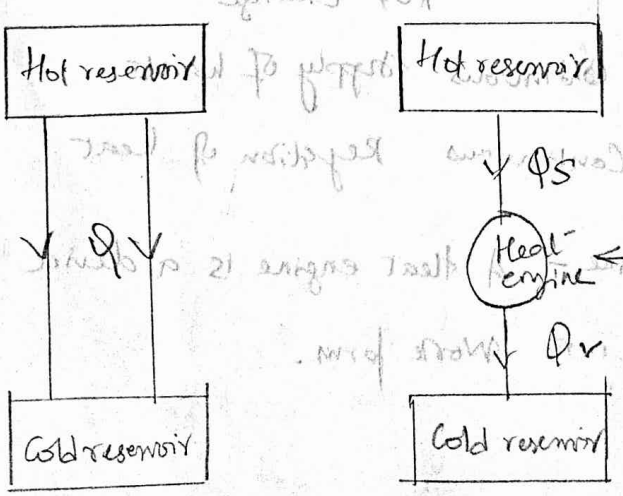
$\eta_{th} = \frac{\text{Work done}}{\text{Heat Supplied}}$

$= \frac{Q_1 - Q_2}{Q_1}$

$\eta_{th} = \frac{T_1 - T_2}{T_1} = 1 - \frac{T_2}{T_1}$.

Clausius statement

Heat always flows from high temperature body to low temperature body. Similarly to pump heat from low temperature body to high temperature body we need heat pump which requires energy, thus work must be done to do the so.

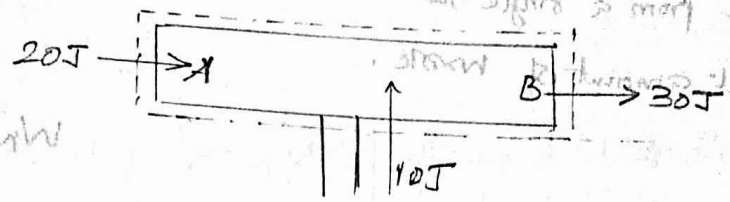


Unit - III

SECOND LAW OF THERMODYNAMICS

Second law deals with the Concept of entropy.

According to First law, Heat can be convertible to work and work can be Convertible into heat. It does not Specify such a



Conversion is possible or not.

(e.g.) Heating of a metal rod at it Centre. The heat Supplied at Centre is 10J and end A absorbs 20J and end B rejects 30J.

According to 1st law Input = output.

A is absorbing means, end is hotter than Surroundings, end B is rejecting heat that is Hotter than the Surroundings. When we heat the Rod it is impossible, but it obeys I^st law

This leads to development of irreversibility which depend on entropy. It govern the direction in which a process can take place.

Thermal reservoir — Add or remove heat, temperature will not change

Source - Continuous Supply of heat

Sink - Continuous Rejection of heat

Heat engine - A heat engine is a device which converts heat energy into Work form.