

॥ नमस्ते ॥

FOLLOWING POINTS ARE COVERED

Statements of Second Law of Thermodynamics

- **KELVIN PLANCK STATEMENT**
- **CLAUSIUS STATEMENT**

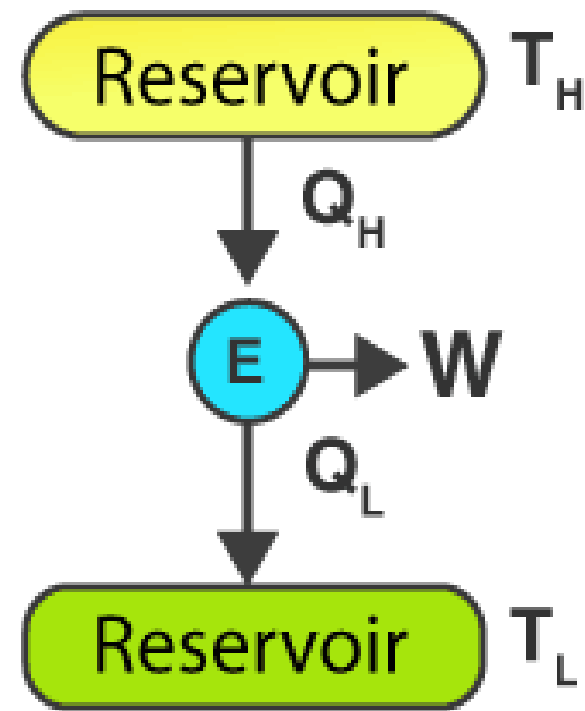
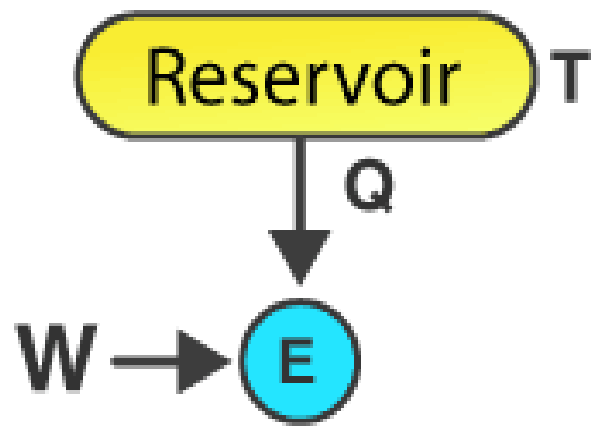
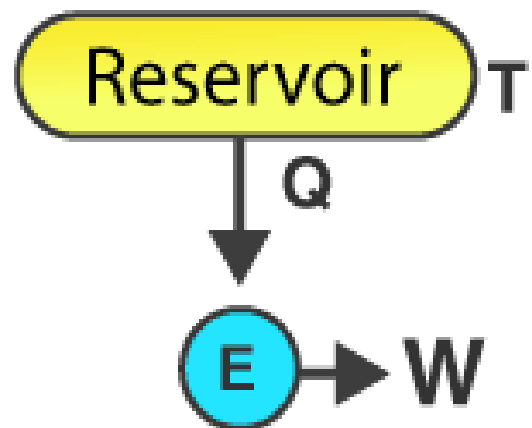
WHAT IS THE KELVIN PLANCK STATEMENT?

- It states that,

“It is impossible to construct a device which operates on a cycle and produces no other effect than the transfer of heat from a single body in order to produce work.”

- This means that it is impossible to construct an engine whose sole purpose is to convert the heat from a high-temperature source/reservoir into an equal amount of work.
- This is a special case of the second law of thermodynamics.

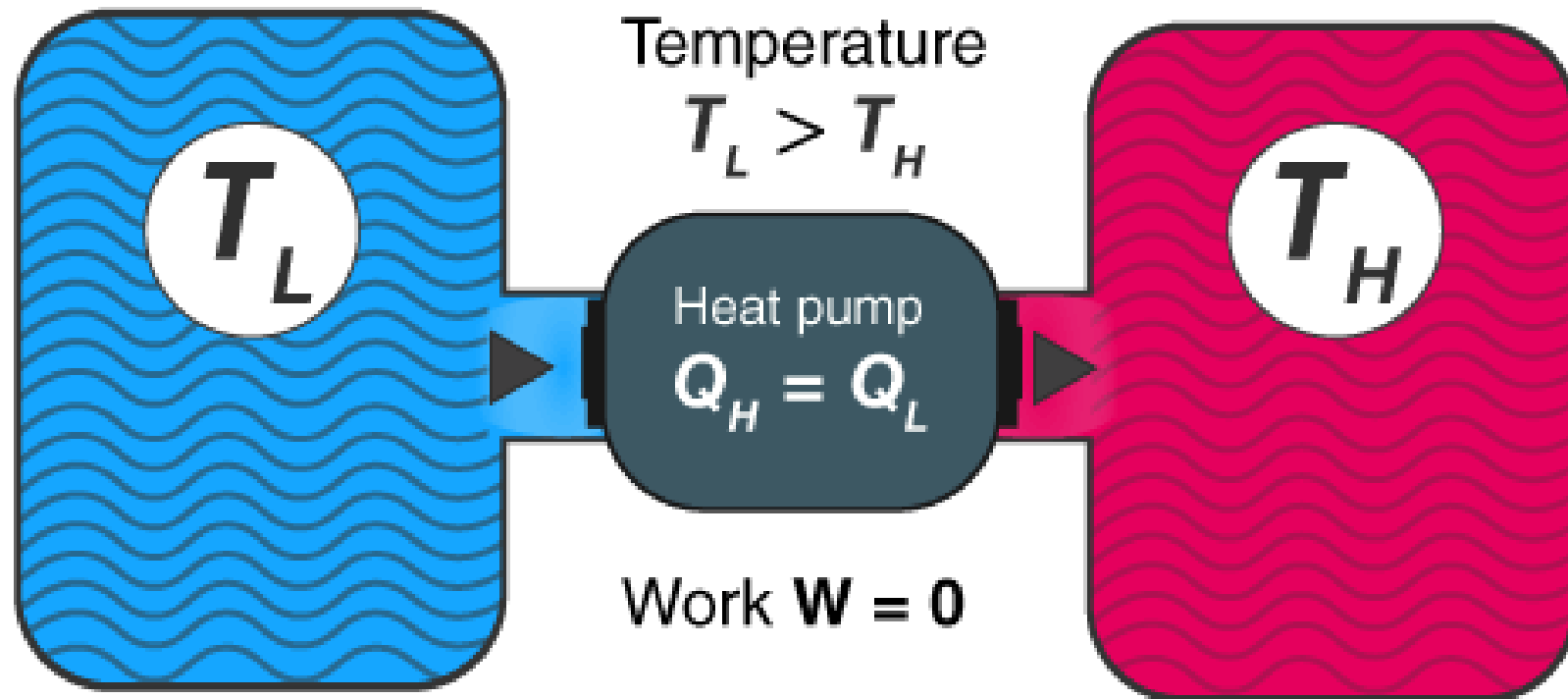
KELVIN PLANCK STATEMENT



WHAT IS THE CLAUSIUS STATEMENT?

- It states that,
“It is impossible to design a device which works on a cycle and produces no other effect other than heat transfer from a cold body to a hot body.”
- Heat cannot spontaneously flow from a cold system to a hot system without external work being performed on the system.
- It is impossible that heat transfer from a low temperature to a high temperature without external help.

CLAUSIUS STATEMENT OF THE SECOND LAW

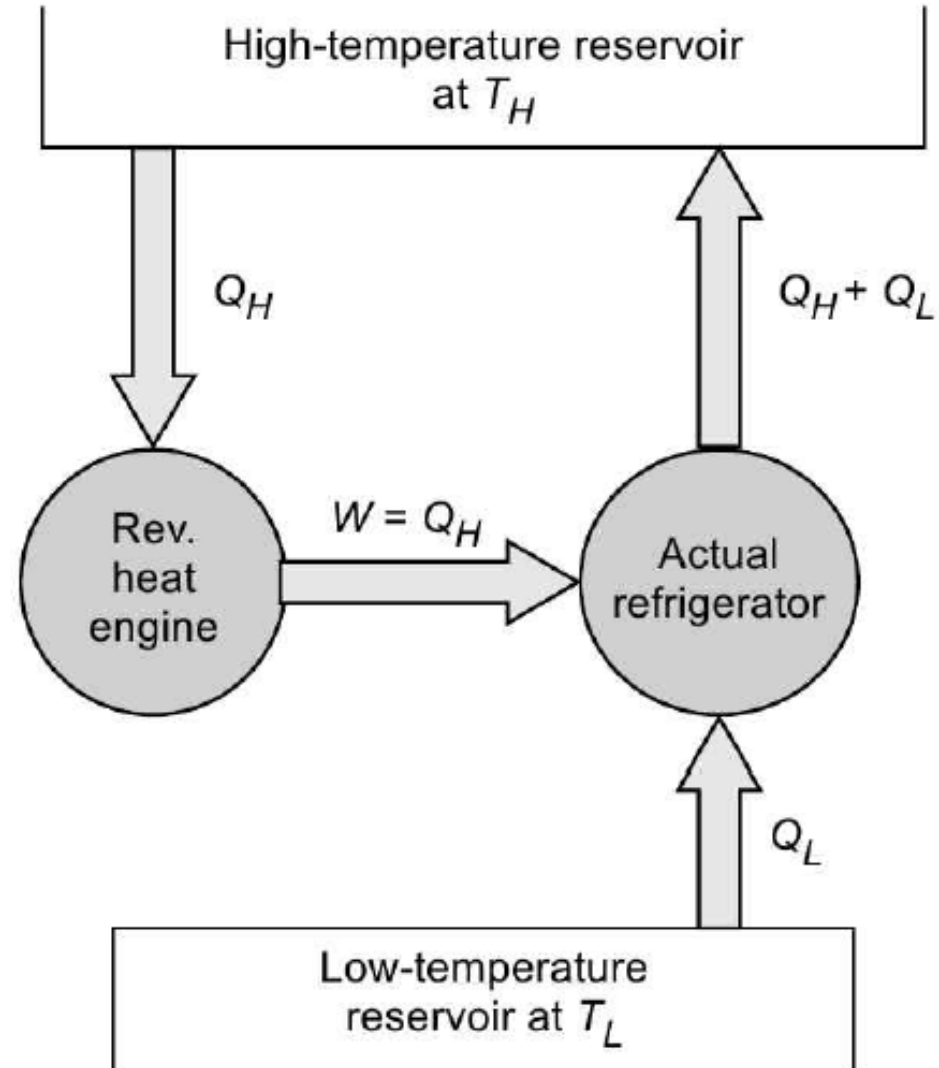


This scenario is Impossible

EQUIVALENCE OF TWO STATEMENTS

- Any device that violates one statement also leads to violation of other statement .
- Consider the Heat engine (PMM 2) and actual refrigerator.
- Operating High temperature $T-H$ & Low temperature $T-L$.
- The Heat engine receiving heat from $Q-H$ from the high temperature reservoir at $T-H$ and it converts all heat into the Net Work.
- It does not reject any amount of heat to low temperature reservoir .
- Thus Violating kelvin Plank Statement of Second law.

Equivalence of Heat Engine & Refrigerator



- Let assume the work produced by the engine is supplied to a cyclic refrigerator that removes heat $Q-L$ from a low temperature reservoir at $T-L$ and discharge heat in amount $Q-H + Q-L$ to a high temperature reservoir at $T-H$.
- Now if the refrigerator and heat engine are grouped together They constitute the a device Whose sole effect is to transfer heat energy $Q-L$ from the low temperature reservoir to the high temperature reservoir without any work input from outside.

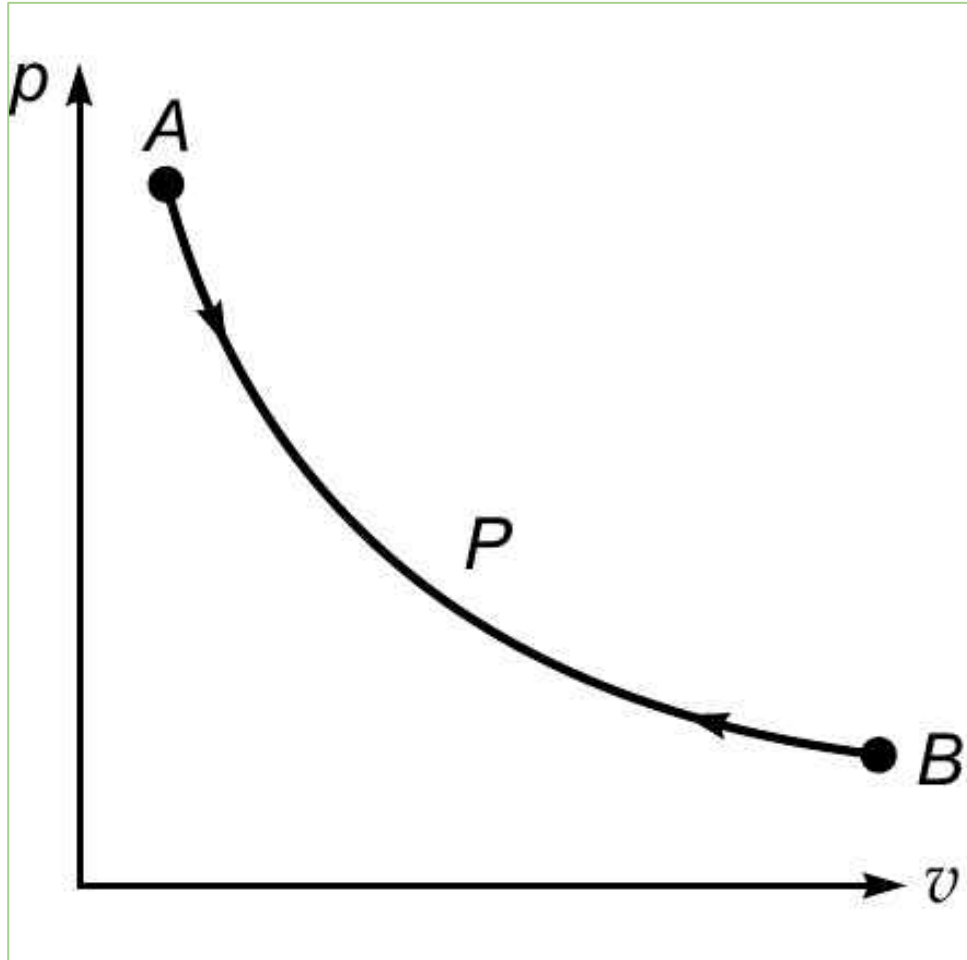
Perpetual Motion Machine Second Kind (PMM 2)

- According to First Law of thermodynamics is that Heat Can be Converted into the work.
- If total Heat supplied is converted into Net Work by any machine then machine efficiency will be Hundred percent. This machine is called Perpetual Motion Machine Second Kind (PMM 2).
- PPM 2 absorbs heat from single temperature reservoir and converts completely into work. This violate the second law thermodynamics.
- Heat is low grade energy and it cannot be completely converted into work.

REVERSIBLE PROCESS

- A Reversible process is defined as a process that once have taken place in a direction , can be reversed without leaving any trace on either system or Surrounding.
- In this process System and Surrounding restored to their initial states without producing any change in in universe.
- This is possible when All heat is converted into net Work without any wastage
- If Cup of coffee cools due to its heat transferred to the surroundings, It can not be heat up again by recovering the from the surrounding without any external effect.
- Actual Reversible process is not occur in the nature.

REVERSIBLE PROCESS



- Let the initial state of the system be represented by A and Let the system be taken to final state B by the path APB.
- If system and Surrounding both are restored to their initial states without any change in the universe
- i.e. The system returns by the same path then the process APB is called a Reversible Process.



Today's Amazing Fact???????

- A Scorpion can hold its breath up to 6 days.
- Can Survive one year without food.
- Glow under Moon Night & UV rays
- Can Climb Any Surface



धन्यवाद

Prepared By
Mr.Pankaj Salunkhe
(M.Tech Design , B-Tech Aerospace, DME)

www.pankajsalunkhe.weebly.com