Second Law Of Thermodynamics

The second law of thermodynamics put restrictions upon the direction of heat transfer and achievable efficiencies of heat engines. The first law of thermodynamics states that the energy of the universe remains constant, though energy can be exchanged between system and surroundings, it can't be created or destroyed.

While the first law of thermodynamicsgives information about the quantity of energy transfer is a process, it fails to provide any insights about the direction of energy transfer and the quality of the energy. The first law cannot indicate whether a metallic bar of uniform temperature can spontaneously become warmer at one end and cooler at others. All that the law can state is that there will always be energy balance if the process occurs.

It is the second law of thermodynamics that provides the criterion for the feasibility of any process. A process cannot occur unless it satisfies both the first and second laws of thermodynamics.

What is the Second Law of Thermodynamics?

The second law of thermodynamics states that any spontaneously occurring process will always lead to an escalation in the entropy (S) of the universe. In simple words, the law explains that an isolated system's entropy will never decrease over time.

Nonetheless, in some cases where the system is in thermodynamic equilibrium or going through a reversible process, the total entropy of a system and its surroundings remains constant. The second law is also known as the Law of Increased Entropy.

Second Law of Thermodynamics Equation

Mathematically, the second law of thermodynamics is represented as;

$\Delta S_{univ} > 0$

where ΔS_{univ} is the change in the entropy of the universe.

Entropy is a measure of the randomness of the system or it is the measure of energy or chaos within an isolated system. It can be considered as a quantitative index that describes the quality of energy.

Meanwhile, there are few factors that cause an increase in entropy of the closed system. Firstly, in a closed system, while the mass remains constant there is an

exchange of heat with the surroundings. This change in the heat content creates a disturbance in the system thereby increasing the entropy of the system.

Secondly, internal changes may occur in the movements of the molecules of the system. This leads to disturbances which further causes irreversibilities inside the system resulting in the increment of its entropy.