ENERGY OF A SYSTEM

The change in the total energy of a system in engineering thermodynamics is considered to be made up of three macrosopic contributions

1. Change in kinetic energy

2. Change in gravitational potential energy

3. All other energy changes lumped together in internal energy

Mathematically, the change in total energy of a system is expressed as

This can also be written as

Closed systems can also interact with their surroundings in a way that cannot be categorised as work.

For example, when gas in a rigid container interacts with a hot plate, the enery of the gas is increased even though no work is done.

This type of interaction is called energy transfer by heat.

Q is used to denote an amount of energy transferred across the boundary of a system in a heat interaction with the surroundings.

Heat is a path/process function.

SIGN CONVENTIONS

When heat is transferred into a system, it is taken to be positive while the reverse is negative

Q>0: Heat transfer to the system

Q<0: Heat transfer from the system

The rate of heat transfer is denoted by . The energy transfer by heat during a period of time can be found by integrating from to

If a system undergoes a process involving no heat transfer with its surroundings, that process is called an adiabatic process