Use of thermal energy

Use of thermal energy

You might not have thought much about thermal energy since the days of your junior high science class, but this force of nature surrounds us every day. From your morning cup of coffee to the methods by which you power your home appliances, thermal energy is a part of your life whether you realize it or not.

The concept of thermal energy has been accepted for more than a century now. Still, the science behind it was met with doubt and skepticism when first proposed by the English physicist James Prescott Joules in the 1850s.

Joules proposed the radical theory that energy can take different forms -- including heat -- and these forms of energy were interrelated. He supported his idea by proving that heat has a mechanical equivalent, and the two could be converted from one to the other.

Joules" work led to the establishment of the thermodynamics law known as conservation of energy, which states that energy is never destroyed. There are two main categories of energy: potential energy and kinetic energy. Potential energy is stored energy dependent on an object"s position or composition. Thermal energy is a type of kinetic energy or the energy of movement.

The first law of Thermodynamics considers the effects of pressure, volume, and temperature have on systems such as steam engines. By using mathematical relationships, we can understand how energy is exchanged within these systems as either heat or the ability to do work.

This relationship between different types of energy, including mechanical energy, came to prominence during the Industrial Age when engineers tried to improve the efficiency of steam engines .

A steam engine is also known as a heat engine. It uses the energy provided (heat) and turns it into "work" -- in this case, mechanical energy -- to drive the pistons. The first law of thermodynamics also assumes that a system"s total energy never changes; it just changes form.

This understanding was crucial to defining thermal energy. Thermal energy results from the "random motion of molecules" in a substance, set in motion by their internal energy. Thermal energy is measured by the warmth or coolness of that substance due to the molecules" kinetic energy.

Thermal energy is considered the sum of all the kinetic energy and potential energy that make up a physical system. This total thermal energy is also known as the total internal energy of a system. Its kinetic energy can take three forms:

Though heat and thermal energy are often considered synonymous, strictly speaking from a scientific

perspective, they are not precisely the same. Thermal energy refers to the movement of molecules within an object or substance. Every object or substance has thermal energy -- the sun is the largest thermal energy source in our solar system.

Heat is the transfer of energy from one object or substance to another, a flow of thermal energy. A working stove top has heat energy, as does any pot or kettle you put onto it. The stove can transfer heat to the pot, and the pot will then transfer heat to its contents.

Temperature is something else entirely. Temperature is an object"s hotness or coldness measured at a specific time. Temperature is a measure of the average kinetic energy of the molecules that comprise a substance. Temperature alone cannot do any useful work; it is simply the current temperature of an object.