Forms of Energy: Thermal Energy

The energy associated with the random motion of atoms and molecules.


Image: Sandia National Laboratories

Thermal energy is what we commonly think of as heat. It is the **energy** associated with the movement of molecules and therefore is a type of **kinetic energy**. Thermal energy can be transferred from one object to another and such processes occur on a stove when we cook food. Many forms of energy can be converted to thermal energy. In fact most all types of energy conversions create thermal energy as a byproduct. Burning **fossil fuels** (**coal**, **natural gas**, **oil**, gasoline) converts **chemical energy** to thermal energy and can be used to heat homes and cook food.

Thermal energy can also be converted to **mechanical energy** in an automobile engine or be used to provide power for industrial machinery. Thermal energy is often used to create steam from water and used to force the rotation of **turbine** systems used to create **electrical power**.

Thermal energy is dependent on the total amount of molecules in motion. There is a difference between the concept of thermal energy and heat. While a cup of coffee can be quite hot with a very high temperature it only has a limited amount of thermal energy. A bathtub of warm water has far more thermal energy than the cup of coffee due to its increased volume. The total mass and volume of material heated is very important when considering thermal energy. Temperature values alone do not accurately represent the thermal energy of a given system.

Glossary

Chemical energy: The potential energy released by breaking the bonds in molecules

Coal: A solid fossil fuel mined from the Earth's surface and underground which is often used to produce electricity through combustion. There are several different qualities of coal including anthracite, bituminous, and lignite

Electrical power: Electrical energy used to conduct work; the measure of the rate of electrical energy used by a circuit. This is usually measured using a unit called a Watt (W)

Energy: The ability to do work

Fossil fuels: Highly combustible substances generally found underground that were formed as the result of high levels of heat and pressure on decaying organic matter from millions of years ago. Fossil fuels include liquid **oil**, solid **coal**, and gaseous **natural gas** and are often burned to generate energy and power

Kinetic energy: Energy as the result of motion

Mechanical energy: The energy an object has from its motion or its potential for motion

Natural gas: A fossil fuel gas which can be recovered from underground and combusted as a fuel source. Increasingly used to generate electricity

Oil: Also known as petroleum; a viscous and combustible fossil fuel liquid found underground which can be refined into different products including fuels which are often burned for transportation or other energy needs

Thermal energy: Kinetic energy associated with the movement of molecules; commonly produced from combustion. Heat is the transfer of thermal energy from bodies of higher kinetic energy to lower kinetic energy

Turbine: A device which harnesses the kinetic energy of an incoming force (often steam, water, or air) to spin rotors and create mechanical power. In electrical power generation the spinning motion of turbine rotors is used to turn

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