Science/Env Sc Assignment 1

1. Read the article on Introduction to Energy.
2. Compile a list of key concepts of energy from the article.

REMEMBER TO LABEL YOUR HAND-IN ASSIGNMENT WITH:

- **TITLE - Sc 10/Env Sc 120 Assignment 1 - Key Concepts Of Energy**
- **Date - "*Today's date*"**
- **Your Name**

INTRODUCTION TO ENERGY

The concept most central to all of science and life itself is energy. It comes to us in the form of electromagnetic waves from the sun and it is captured by plants and binds molecules of matter together. A knowledge of work and energy has led to the development of simple machines right up to the complex technology of today. At all levels of study, the student will eventually face the study of energy. It is the goal of this science course to introduce the student again to the concept of energy as it is understood in a scientific concept and to develop an understanding and appreciation of the interaction of energy in everyday life and in life processes. These ideas are developed in a context where the student should become more scientifically literate by honing skills in observation, acquiring and interpreting data, critical thinking, predicting and problem solving, and communication.

Everything in the universe is either energy or matter. Einstein realized that one could become the other and vice versa, immortalized in his famous equation E=mc. E is energy, m is mass (matter) and c is the velocity of light. It means that energy and matter are equivalent.

This understanding is the basis of nuclear bombs and power in which matter is changed to energy. For us humans, energy is the means for doing work. Picking up a book, watching TV or launching a Space Shuttle all need energy. Without it there could be no life, for all life uses energy.

Energy, so far as were are concerned, comes from only two sources: the Sun and the decay of radioactive elements inside the Earth. The Sun radiates its warmth out to all the planets, but ours happens to be about the right distances away to be able to support Life. In fact, Life seems to control the temperature of the planet like a thermostat. This is part of the Gaia theory, eloquently put forward by the well-known independent scientist, James Lovelock.

But what about oil, gas or coal, which also come from inside the Earth? They were formed because of the energy from ancient sunshine from millions of years ago driving life on Earth. These have formed “fossil fuels” or “non-renewable” energy sources.

Energy is the power that we use to do things, whether it be thinking about building a ship or actually building it. Building it needs large amounts of energy to power blast furnaces to make the steel, mills to roll it and electricity to weld it to form the ship’s structure. That ship, when built, has engines which push it through the water. Most energy is not available to us in a usable form. We have to convert it into another form to make it work for us. Here are two examples:

1. A fast-flowing river is full of energy we can’t use. If you dam it and install turbines, you get electricity.
2. Coal is just black rock with one odd property...it burns. If you burn it, you can warm your home, cook food or raise steam in a boiler - to make electricity.

Life needs energy. Life’s energy is self-perpetuating only so long as there is sunshine. Plants can convert it and store it for their next generation (as in potato tubers, groundnuts, rice or peas). Animals eat the plants or each other, die and decompose, freeing nutrients for plants again. It is a sustainable cycle. For hundreds of thousands of years, humans have merely been a part of this cycle. Then we got clever and discovered that we could use energy other than from our own muscles to do work for us.

First, we discovered that wind could drive our ships and water could power our mills. Later, we found that coal could make heat and steam for machinery. Then came oil and gas and nuclear power, all needed in increasingly large amounts to fuel our endless appetite for being comfortable and doing things with as little effort as possible. So we heat our homes, schools and workplaces in the winter. In the richer countries, most people have a car so that they can travel about. Transports guzzles huge amounts of energy - all so that we can have goods and services when we want them.

We need to be able to measure the different kinds of energy - for reasons both of convenience and practicality. These units are usually kilowatt hours (KWh). All foods have an energy value quoted in kilocalories (kcal) and kilojoules (kJ). Joules are direct measurements of energy as are calories. 1 calorie is just over 4 joules and is the amount of heat you would have to use to raise the temperature of 1 gram of water by 1 degree Celsius. This is a pretty small amount of heat which is why you usually see heat measurements in kilojoules.

Watts measure power which is the amount of energy used over time: so 1 watt = 1 joule per second. A 100-watt light bulb uses 100 joules every second. Many appliances like electric motors have their power needs stamped on an identity plate. Small motors like those in electric drills ro mixers are usually no more than a few hundred watts.

Larger appliances like electric stoves may consume several thousand watts (when all its heating coils are switched on), usually labeled kilowatts or kW. A big car may generate and use 75 kW (about 100 horsepower). Very large electricity generators may yield thousands of kilowatts (millions of watts) and so their rating is in mega (million) watts or MW. One large power station may produce more than 1000 MW or 1 gigawatt (GW).

Thermal power stations (which use fossil fuels or nuclear fission to generate heat to make steam), may be categorized by MWe or MWth. This simply refers to the overall heat output and overall electricity output. On closer investigation, you would notice that the total heat output is almost three times the electrical output. This is due to the inherent inefficiency of this type of energy conversion caused not by incompetent engineers but by a fundamental law of physics (see the first and second laws of thermodynamics in your text). This means that around 65% of the heat is wasted - dumped into the atmosphere usually through cooling towers.

Most units of energy and power measurement that we use today are SI units (Systeme International, which originated in France) though some countries continue to use their own parallel systems involving units like B.T.U. (British Thermal Unit = 1055 joules), and horsepower (746 watts). The simplicity of the metric system means that measurement units run in tens, hundreds, thousands and millions.

(Source: http://www.oneworld.org/energy/whatis.html)

Attachments

- FORMS OF ENERGY
- WHAT IS SCIENCE
- Env Sc 120 Course Outline 2018.doc
- Science 10 Course Outline 2018.doc