"ACQUAINTANCE WITH ENERGY UNITS"

BY STEVE BAER, [ZOMEWORKS]

One could test the efficiency of a turbine by checking with a very accurate thermometer the temperature difference between the incoming and outgoing water. Heat in such situations is a measure of the mistakes and inefficiencies of the generating mechanisms.

James Joule was the first person to measure the equivalent amount of mechanical energy to a given amount of thermal energy. He did this in the 1840's by means of churning water mechanically, by falling weights and measuring temperature rises.

Joule also visited waterfalls with a thermometer, but had difficulty because of spray at the bottom. As we have seen, there are no large hydroelectric plants in the United States high enough to warm the rivers that power them even one degree fahrenheit. Why then, is there all the fuss about thermal pollution of rivers by coal, oil or gas fired power generating plants? The rivers are too small and the generating plants are too big. In an electric generating plant, for each unit of energy delivered as electricity, about two units have to be produced as heat.

WATERFALLS OF LEAD, COPPER, FREON AND MERCURY

If, instead of water going over the 778 ft. high falls, we had lead bbs, the lead bbs would warm 32 degrees F; a waterfall of copper bbs would be 11 degrees F. warmer; a waterfall of mercury would be 30 degrees F. warmer; a waterfall of freon would be 4 degrees F. warmer, and one of hydrogen .29 degrees F. warmer. Wood balls would rise 2 degrees F. There differences are because different materials have different reluctance to change temperature. A pound of lead changes its temperature 32 times as much as a pound of water on absorbing the same amount of heat. This quality of a material is spoken of as its specific heat. Equal volumes are more nearly equivalent since generally it is light materials with high specific heats and heavy materials, such as lead, with lower specific heats.

A 50 WATT DOG

How much energy is used by burning a 100 watt light bulb? A 100 watt light bulb uses 1/10 of a kilowatt (1000 watt) hour of electricity each hour. One kilowatt hour is equivalent to 3413 BTUs. You can't compare watts to BTUs, but only watt hours. For BTUs are a measure of heat or energy and watts are a measure of the flow of energy. BTUs are the British measure of heat, calories are the metric measure of heat. Who has ever heard of a man's diet described as so many BTUs per day? Different terms and units settle in different fields and, thus, discourage comparisons between the one and the other. The diet of an automobile and a man are certainly very distinct. The one is gasoline and the other food, but in terms of energy, they can be compared quite accurately. Who ever heard of someone's metabolism as so many watts?

In a way it is more comfortable to give the light bulb and hot plate species their own terminology to describe their energy diets and again to fuel up at the gas station with gallons rather than with BTUs or calories. It places a protective distinction around the human and his necessities. The heating and ventilating engineer finally comes to look at people as 100 watt light bulbs - big people burning even better than that and this extends, of course, to other animals. Thus, it makes sense to let the dogs inside on a cold night, not just for their sake, but to help heat the house. They may be creating heat at 50 or 100 watts.

GRAM CALORIES AND KILOGRAM CALORIES

A gram calorie is the quantity of heat required to raise 1 gram of water one degree Centigrade. Gram calories are the calories you see referred to in the physics and chemistry books, but are not the calories used in describing a person's diet. Those calories are kilogram calories, being equal to 1000 small calories. A diet of 3000 small calories a day would not be enough energy to warm up the liquids you drink.

One kilogram calorie equals 3.97 BTUs. Then a 3000 kilogram calorie a day diet is approximately 12,000 BTUs/day which is equal to about 3½ kilowatt hours of electricity a day or the rate at which a 150 watt light bulb burns. A south facing window in a house can easily pick up 1000 BTUs/ ft. squared during a winter day. So we see that a 3' x 4' window can admit as much energy each day as that required to feed a man.

TRIBAL MESSENGER 2 APR 1973