**Energy Efficiency Problems**

**Efficiency** is a measure of how much work or **energy** is conserved in a process.

In many processes, work or **energy** is lost, for example as waste heat or vibration.

The **efficiency** is the **energy** output, divided by the **energy** input, and expressed as a **percentage**.

A perfect process would have an **efficiency** of 100%.

**Percent Efficiency = Energy Output x 100**

**Energy Input**

Sometimes we will assume **100 % Efficiency** of a device because this is General science!

100 % efficient means that **all Energy In = all the Energy Out**.

And the **Law of Conservation of Energy** says this is true but...

What it should state is all of the energy in = all of the energy out--**both useful and useless energy.**

So if 100 J of electrical energy goes into an **electric mixer** then 100 J of mechanical energy and sound energy and heat energy come out.

But...only the mechanical energy is useful energy--I want my mixer to mix.

I do not need my mixer to heat up my cold hands!!

Thus:

**Percent Energy Efficiency = Useful Energy Out x 100**

**Energy In**

**Percent Energy Efficiency = Energy Produced or Used x 100**

**Energy Consumed**

**Percent Energy Loss = Energy Lost x 100**

**Energy In**

**Problem 1** An electrical device converts 1350 J into 780 J of useful energy.

What is the percent efficiency of the device?

What is the percent energy loss of the device?

**Problem 2** A device that is used to generate heat energy consumes 1.5 x 104 J of energy while producing 3.6 x 102 J of sound energy.

What is the percent efficiency of the device?

**Problem 3** What does 1 W mean if marked on an appliance?

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What does 1 MW "Power" plant mean?

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If a 1 MW "Power" plant is 65 % efficient and runs for 20. h per day.

i) How much energy is generated during that time period in kWh?

ii) How much energy is "lost" during that time period?

**Problem 4** My microwave, connected to a household 120 V source and using 12.5 A of current, takes 115 s to boil 250 mL of 25.0 o C water. How efficient is it?