Short free 'taster course' Number 3.

How to calculate how much you are paying per hour for each piece of electrical equipment you use.

Disclaimer

The documents and presentations that make up this learning package do not constitute either fully or partially the full and final information on all aspects of electrical installation work. They do not show full representation of Health and Safety aspects or full knowledge of any job descriptions.

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Introduction

You may be curious to know just how much you are paying each hour for various items of electrical equipment. This document will attempt to show you how to calculate the cost in pennies per hour.

Your electricity meter clocks up how many units of electricity you use on a day-to-day basis. Your meter is called a 'kilowatt hour' meter. This is because units of electricity are measured (metered) in kilowatt hours. Electrical power is measured in Watts and since 1 kilowatt (1kW) is equal to one thousand Watts (1000W) it follows that you use one unit of energy when an appliance uses 1000W continuously for a full hour.

This involves a little bit of calculation therefore you will probably need a calculator. You will also need a recent electricity bill from which you can see how much the supply company is charging you for each unit of electricity used, that is, each kilowatt hour used. The calculations are not difficult so please do not be put off without attempting the examples.

Most electrical appliances have their power rating written on the appliance itself such as a 60W lamp (light bulb) or on the packaging or instructions which come with the equipment. You can also find out by phoning the manufacturer or on the internet.

Find the power usage of the appliance. This will be a number followed by a "W" which stands for watts, or by "kW" which stands for kilowatts (thousands of watts).

If the units are in kW that's fine we don't need to carry out any changes. If the units are W then divide by 1000 to get the power usage in kW. Say an item is rated at 2000W then 2000 / 1000 = 2kW. Likewise if the item was rated at 500W then 500 / 1000 = 0.5kW (half a kW). Once we have the kW value of the item we can then go on to find the running time and cost in kWh (kilowatt hours).

We will attempt to explain what all this means using three examples involving three different items of electrical equipment:-

1. A 1kW electric fire
2. A 3kW immersion heater
3. A 100W lamp

Example 1 A 1kW electric fire

A 1kW (1000W) electric fire is normally constructed using one bar, that bar being rated at 1kW.

Let us say you have the fire on for 1 hour. You will then have used up 1kW x 1hr = 1kWh or 1 unit of electrical energy. Remember 1 unit of energy as recorded on you kWh meter is 1 kilowatt hour (1kWh).

You then need to look at your electricity bill to see how much you are being charged per unit. For example, if you are being charged 12 pence per unit you are being charged 12p per kWh (kilowatt hour).

Running the fire for one hour will cost you:-

1kW x 1 hr = 1kWh. Then 1kWh x 12p = 1 x 12p = 12 pence in total.

Running the fire for two hours will cost you:-

1kW x 2 hr = 2kWh. Then 2kWh x 12p = 2 x 12p = 24 pence in total.

Running the fire for half an hour (0.5 hours) will cost you:-

1kW x 0.5 hr = 0.5kWh. Then 0.5kWh x 12p = 0.5 x 12p = 6 pence in total.

Example 2 A 3 kW immersion heater

Running the immersion heater for one hour will cost you:-

3kW x 1 hr = 3kWh. Then 3kWh x 12p = 3 x 12p = 36 pence in total.

Running the immersion heater for two hours will cost you:-

3kW x 2 hr = 3kWh. Then 6kWh x 12p = 6 x 12p = 72 pence in total.

Running the immersion heater for half an hour (0.5 hours) will cost you:-

3kW x 0.5 hr = 1.5kWh. Then 1.5kWh x 12p = 1.5 x 12p = 18 pence in total.

Example 3 A 100W lamp

First we convert 100W to kW. As before divide the watts by 1000 to bring it to kilowatts:-

100 /1000 = 0.1 kW. That is 1 tenth (0.1) of a kilowatt as 100 Watts is 1 tenth of 1000 Watts.

Running the lamp for one hour will cost you:-

0.1kW x 1 hr = 0.1kWh. Then 0.1kWh x 12p = 0.1 x 12p = 1.2 pence in total.

Running the lamp for two hours will cost you:-

0.1kW x 2 hr = 0.2kWh. Then 0.2kWh x 12p = 0.2 x 12p = 2.4 pence in total.

Running the lamp for half an hour (0.5 hours) will cost you:-

0.1kW x 0.5 hr = 0.05kWh. Then 0.05kWh x 12p = 0.05 x 12p = 0.6 pence in total.

Hope you followed all that ok. There now follows an alternative method using the current being drawn in the system in case you have values for current (Amps) and not power (Watts).

Alternative calculation using amps.

If you cannot work out the power consumed by the appliance but have information on how much current is consumed you can do an alternative calculation as follows.

Example 1 1kW electric fire

The relationship between amps and watts is give by the formula:- Watts = Amps x Volts

If you only know the current in amps which the appliance draws then since the voltage supply of a household is normally 230 Volts we can simply find the Watts as follows:-

Let’s assume we have an appliance which draws about 4.3 Amps then:-

Watts = Amps x Volts Watts = 4.3A x 230V = 989W (about 1kW)

We can then carry out the rest of the calculation using the method in Example 1 above:-

Running the fire for one hour will cost you:-

1kW x 1 hr = 1kWh. Then 1kWh x 12p = 1 x 12p = 12 pence in total.

Self assessment questions to check your understanding of the text:-

Q.1 How many kilowatts is equivalent to 2750 Watts:

a) 0.275kW b) 2.75kW c) 27.5kW d) 275kW

Q.2 The unit of electrical energy is given as:

a) W b) A c) kW d) kWh

Q.3 What would be the cost of running a 100W lamp for 5 hours when the unit price is 15 pence:

a) 1.5 pence b) 7.5 pence c) 15 pence d) 75 pence

Q.4 What would be the cost of running a 60W lamp for 5 hours when the unit price is 15 pence:

a) 45p b) 4.5p c) 90p d) 9p

Q.5 Having two 100W lamps and two 60W lamps lit for 3 hours at a cost of 12P per unit would cost a total of:

a) 11.52p b) 1.152p c) 576p d) 57.6p

Answers below

Answers

Q.1 (b) Q.2 (d) Q.3 (b) Q.4 (b) Q.5 (a)

Explanations

Q.1 There are 1000 Watts in 1 kW therefore $\frac{2750}{1000}$ Watts = 2.75 kW (kilowatts)

Q.3 1 kWhr = 15 pence and 1 kW = 1000 Watts

$\frac{100 \text{ Watts}}{1000 \text{ Watts}}$ = 0.1 kW therefore 0.1 kW x 5 hrs = 0.5 kWhrs

0.5 kWhrs x 15 p per kWhr = 0.5 x 15 = 7.5 pence

Q.4 1 kWhr = 15 pence and 1 kW = 1000 Watts

$\frac{60 \text{ Watts}}{1000 \text{ Watts}}$ = 0.06 kW therefore 0.06 kW x 5 hrs = 0.3 kWhrs

0.3 kWhrs x 15 p per kWhr = 0.3 x 15 = 4.5 pence

Q.5 2 x 100 + 2 x 60 = 320 Watts therefore $\frac{320 \text{ Watts}}{1000 \text{ Watts}}$ = 0.32 kW

0.32 kW x 3 hrs = 0.96 kWhrs therefore 0.96 x 12 p = 11.52 pence