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Lighting your Home Efficiently

When electric lighting was developed, around the end of the 19th century, it was seen as a safer and more convenient way to light homes than the previous Victorian gas lamps and the design of lamps that developed early on became the norm until fairly recently. They became produced in vast numbers and cheap and to make by mass production.

However, as the cost of electricity has increased dramatically in recent years and shows every sign of continuing to get more expensive, the efficiency of all electrical equipment is coming under scrutiny, including electric light bulbs.

Although effective and convenient, a typical tungsten filament bulb is only around 5-6% efficient, with most of the electricity used, producing heat rather than light. Whilst it could be argued that the heat is still useful, putting a heater on the ceiling where it will be the least effective is not the most sensible thing to. It's the heat that discolours the lamp shade and ceiling and makes the electrical cable insulation brittle and break and reduces the life of the bulb.

There are more modern alternatives which produce light more efficiently although some types may have less some desirable characteristics, but we can choose the best ones to suit what we want, almost anything is available.

These is considerable confusion around the range of lamps currently available with packaging showing watts, lumens, hours and colour temperature as well as the type of connection, voltage and shape or design. None of this is new, it's just that we never looked before or it never used to be an option.

The following is a list of light bulb characteristics and what they mean;-

Voltage

"240v"- most UK homes electricity is rated at around 240volts

"12v"- low voltage fittings are used in some areas for extra safety, usually bathrooms. (Low voltage doesn't mean low energy)

Connection

"B22" (Bayonet Cap)- most traditional UK lamp holder connections with 2 pins on the side of the cap which you push into the fitting and twist to lock in position.

"B15" (Small Bayonet Cap)- smaller diameter bayonet used for some smaller bulb designs

"E27" (Edison Screw)- used in most continental imports with a screw thread into the fitting.

"E14" (Small Edison Screw)- smaller diameter screw cap for some smaller bulb designs

“GU10”- typically used with ceiling recessed down lights for 240 volt fittings with two short rods with enlarged ends which push into the fitting and twist to lock in position

“MR16”- typically used in low voltage (12v) ceiling recessed fittings with 2 pins in the cap base which push into the fitting.

Shape

“GLS”- traditional bulb shape

“Candle”- narrower shape to resemble candle flame

“Globe”- round globe shape

“Golfball”-small round globe

“Spot”- silvered to create a directional beam can also be used for down lighters

“Flood”- wide angle to illuminate a wide area can also be used for down lighters

Wattage

The number of Watts indicates how much power is needed to make the bulb work; it isn't a measure of the strength of light given off.

Lumen

This is a measure of the strength of light that's given off from the bulb. For example, a typical 60W tungsten filament bulb gives off around 850 lumens of light. Other types of light bulb may need less power to give off the same amount of light and therefore use less electricity.

Colour temperature (degree Kelvin)

White light can have different appearances and this defines how we see the light.

“Warm white”- 2700K has a yellowish tinge, similar to a traditional tungsten filament bulb

“Cool white”- 4000K has a bluish appearance similar to some car headlights

“Daylight”- 6000K is exceptionally bright white and used in applications to simulate daylight

Life

All bulbs regardless of type have a limited life expectancy, usually affected by the amount of heat given off and the number of times it's switched on and off. Not surprisingly the ones that get the hottest (tungsten filament) have the shortest and the modern LEDs have the longest. This is usually quoted in hours or years.

Different characteristics of lamp technologies

“Tungsten Filament”

- Least efficient at around 2%
- Instant full light output and dimmable
- Cheapest to buy but the most expensive to run.
- Available in most designs and sizes and fit just about all types of light fitting
- Burn out quickly with life expectancy of around 1000 hours

“Tungsten Halogen”

- About a quarter more efficient than tungsten so still less than 3%
- Instant full light output and dimmable
- 2-3 times more expensive than tungsten
- Available in most designs and sizes and fit just about all types of light fitting
- Life expectancy up to 4000 hours

“Compact Fluorescent Lamp” (CFL)

- About 80% better than tungsten but still no more than 12% efficient
- Similar price to halogen
- Basic shapes include stick and spiral tubes but others have covers to look like most traditional bulb shapes but generally larger than tungsten bulbs
- Typically slower to reach full brightness and may be slower in cold areas and some can flicker
- Dimmable versions are available but more expensive
- Life expectancy around 10,000 hours

“Fluorescent Tube”

- Up to 15% efficient if used with electronic ballast otherwise only 9%
- Different design to bulbs being a single tube up to 1.8m long
- Some start-up flicker and can be slower in cold locations
- Slightly more expensive than halogen
- Not normally dimmable
- Life expectancy up to 15,000 hours

“Light Emitting Diode” (LED)

- Most efficient for normal domestic applications at up to 20%
- Around 50% more expensive than CFL for similar design and output although higher outputs are more expensive
- Instant full light, no flicker and most are dimmable.
- Probably more design choice than CFL including clear bulb types
- Life expectancy 25,000 hours +

Nearest Equivalent of common household light bulbs (based on manufacturers' information)

| Lamp type/ power | 100W | 60W | 40W | 25W candle | 50W (GU10) |
|-----------------------|----------------|----------------|----------------|---------------|----------------|
| Tungsten | | | | | |
| Power | 100W | 60W | 40W | 25W | 50W |
| Light output | 1250 lumens | 750 lumens | 600 lumens | 250 lumens | 300 lumens |
| Lamp cost (typical) | £0.75 | £0.75 | £0.75 | £0.75 | £2.00 |
| Energy cost/1000hrs*1 | £15.00 | £9.00 | £6.00 | £3.75 | £7.50 |
| Lamp life (typical) | 1,000hrs | 1,000hrs | 1,000hrs | 1,000hrs | 1,000 hrs |
| Halogen | | | | | |
| Power | 70W | 42W | 30W | 18W | 35W |
| Light output | 1200 lumens | 600 lumens | 405 lumens | 220 lumens | 300 lumens |
| Lamp cost (typical) | £1.65 | £1.65 | £1.65 | £2.60 | £4.60 |
| Energy cost/1000hrs*1 | £11.25 | £8.70 | £4.50 | £3.45 | £7.25 |
| Lamp life | 2,000hrs | 2,000hrs | 2,000hrs | 2,000hrs | 2,000 hrs |
| Life time saving*2 | £9.00 | £2.10 | £3.75 | £2.10 | £4.50 |
| CFL | | | | | |
| Power | 20W | 13W | 11W | 6W | 11W |
| Light output | 1100 lumens | 830 lumens | 600 lumens | 235 lumens | 350 lumens |
| Lamp cost (typical) | £4.00 | £4.00 | £4.00 | £7.50 | £9.00 |
| Energy cost/1000hrs*1 | £3.00 | £1.95 | £1.65 | £0.90 | £1.65 |
| Lamp life (typical) | 10,000hrs | 10,000hrs | 10,000hrs | 10,000hrs | 10,000hrs |
| Life time saving*2 | £126.75 | £77.25 | £50.25 | £35.25 | £76.50 |
| LED | | | | | |
| Power | 18W | 10W | 7W | 4W | 6W |
| Light output | 1500 lumens | 810 lumens | 650 lumens | 300 lumens | 410 lumens |
| Lamp cost (typical) | £12.50 | £10.00 | £10.00 | £10.00 | £7.50 |
| Energy cost/1000hrs*1 | £2.70 | £1.50 | £1.05 | £0.60 | £0.90 |
| Lamp life | 25,000hrs | 25,000hrs | 25,000hrs | 25,000hrs | 25,000hrs |
| Life time saving*2 | £325.50 | £205.50 | £141.75 | £96.75 | £209.00 |

*1- based on electricity costing 15p/kWh (average)

*2- compared to using equivalent tungsten bulb

Shaded areas show alternative bulbs that give slightly lower light output than the tungsten version