

Energy-efficient lighting – is it all good?

Traditional light bulbs are filament lamps. The UK Government has announced that sales of filament lamps will be phased out over the next few years. That means that we will all become much more familiar with their replacements, compact fluorescent lamps (CFLs). But not everyone agrees that this is a good idea.



Andrew Lambert Photography/SPL

How they work

In the filament lamp (on the left), a current flows through a tungsten filament. Electrons collide with tungsten atoms, giving them energy so that the metal gets hot and glows.

In the fluorescent lamp (on the right), a current flows through low-pressure mercury vapour in a glass tube. Electrons collide with mercury atoms, giving them energy which they give out as ultraviolet radiation. This is absorbed by phosphor powder on the surface of the glass and re-emitted as visible light.

Estimate the concentration of mercury in the air if a CFL breaks in a room of volume 20 m^3 . Compare this with the safe level, about 0.05 mg/m^3 over 8 hours.

Last year, IKEA recycled 80 tonnes of CFLs via its stores worldwide.

Issue 1: Energy consumption

Lamps are for producing light, but they are not very good at it. Less than 10% of the energy supplied to them is transformed to light. The rest ends up as heat.

60 W filament lamp: 2.3% efficient

11 W fluorescent lamp: 7.5% efficient

So a CFL takes about one-quarter of the electricity to produce the same amount of light as a filament lamp. Much less energy is wasted as heat.

The problem is this: The waste heat from lighting helps to warm our houses. If there is less of it, we will have to turn up our heating systems. So, where is the gain?

Light-emitting diodes (LEDs) are more efficient than CFLs, but more expensive – see Catalyst Vol 13 issue 3 in our online archive (www.sep.org.uk/catalyst).

Issue 2: The mercury hazard

CFLs contain mercury, a poisonous substance. If a CFL is broken, mercury vapour enters the air. Isn't this a hazard? And what about CFLs at the end of their lives – won't they pollute our rubbish dumps? This ignores another source of mercury – coal. Much of our electricity comes from burning coal, which contains mercury as an impurity. As coal burns, mercury is released into the atmosphere. We need some numbers to make a fair comparison.

Mercury released by a filament lamp in its lifetime: 10.0 mg

Mercury released by a CFL in its lifetime: 2.4 mg

Mercury contained in CFL: 4.0 mg

(These are typical figures.)

In fact, CFLs can be recycled and the mercury recovered – you already pay 15 p as the cost of recycling in the initial price of a CFL.

