

LEDs – the light fantastic



WE are in the throes of a lighting revolution that has many more years yet to run. The humble LED has, in the last few years, achieved brightness levels that have started to compete with other forms of lighting. The LED has still to achieve the low manufacturing costs of the longer established present technologies; however, this is only a matter of time!

Where LEDs presently have greatest advantage is in low power lighting – ideal for boats! As a guide, replacing halogen or incandescent lamps with LEDs will reduce power to something between one fifth and one twentieth – depending upon whether you try to match the amount of light or accept a lower level of light! In any case, you can mix LED and halogen lamps as you please.

LED replacement bulbs are available for 12 volt



(some 24 volt) and 230 volt AC circuits.

Unlike all other forms of lighting, LEDs produce light in a very narrow band of the colour spectrum. This is seen in the intense blues, greens and red colours of LED lamps that you may have seen used in car-modding, torches and illuminated ornaments. To achieve the white LEDs, manufacturers have 'doped' the blue end of the spectrum with phosphorescent materials to achieve a range of acceptable white hues. The common white 'colours' are Cool White and Warm White with Daylight White becoming available in

some of the latest versions. Probably of little benefit to boaters is the fact that LED visible-light bulbs produce no infra red light or ultraviolet light, which can fade paintings and materials.

LEDs produce almost no heat (this is where halogen and incandescent lamps waste most of their power) and therefore have a far lower fire risk. Halogen lamps run at extremely hot temperatures – certainly hot enough to burn you (if you've ever felt the surrounding bezel or glass)! The reduced load of LEDs means that you could reduce the fuse rating of your lighting circuit and hence protect the wiring at a lower and thereby safer, power level.

With no fragile filament to worry about, the LED withstands vibration in automotive and marine applications far better than any other form of lighting. Similarly, LEDs have no fragile glass case and are instead embedded in clear resin.

LED replacement bulbs are certainly more expensive than their halogen counterparts, however, the typical rated life of a halogen is up to 2000 hours (about one year high usage) while the LED equivalent boasts at least 50,000 hours (about 17 years high usage) and even then the LED has only diminished to 70 per cent of its original brightness! In financial terms therefore, the replacement of your halogen bulbs once a year at a cost of (say) £2 each would, over the life of the LED example cost you $17 \times £2 = £34$ – not to mention the effort, or perhaps cost, of effecting replacement! Compare this with the cost of LED versions, which are typically priced between £9 and £15.

It is true to say that the available LED replacement bulbs suitable for light fittings on boats may not reach the light levels of halogen lamps above 20 watts. However, you CAN have at least five LED lights switched on for the same 'load' as a single halogen – with more light, distributed over a wider area!

Typical conservative usage suggests that in the evenings we turn on maybe five halogen lamps, especially while cooking. For the same power consumption this would allow 25 LED lamps on – probably every light within a typical narrowboat!

Another example is the common 'surface-

mounted' halogen capsule (G4 type) light fitting which are typically fitted with 10 or 12 watt halogen bulbs. The equivalent 21 LED G4 lamp is rated at 1.2 watts and is a good match in light output terms – ie the same amount of light for one tenth the power – and power costs money!

Assuming your engine provides the source of electrical power for your boat, then the amount of power consumed by your lights has to be replaced by running the engine (or generator). If you reduce the amount of power drawn from the batteries to one fifth, then (in a perfect world) you would only need to run the engine for one fifth the usual time to replace that power. In turn, you will use less fuel, reduce wear and tear on the engine, reduce the number of 'running hours' and hence prolong the time between major services, oil changes, filter changes etc!

Apart from the replacement bulb method of lighting, LEDs are now readily available in 'strip' form in lengths from 3cm to 2m. These can be set end to end thereby achieving almost any length. This means that boaters can now consider illuminating their boats 'longitudinally' by installing runs of these strips down the length of their boats.

LED strips are also available in many colours; red, yellow, green, blue, cyan, amber, cool white, warm white and even ultra violet! Multi-coloured strips (often called RGB strips) are also available with colour controllers to manually or automatically select an illumination 'mood' for the evening.

These are probably not the ideal choice for normal lighting (unless you install a lot of them) however, they do compliment normal down-lighters while potentially providing another dimension to the ambience and mood of a boat.

Short lengths of LED strips are ideal for lighting those dark cupboards and storage lockers – especially when connected to a door switch!

LED lights are becoming available in many hardware and DIY stores. These however, are designed for running on a regulated 12-volt transformer connected to a domestic power supply. These are NOT rated at the higher voltages encountered from batteries/chargers, even automotive-rated bulbs cannot cope with the higher voltages generated by boat three-stage chargers which can raise the supply to 14.8 volts!

The ideal LED bulbs to fit are those with internal



Are LEDs the future of lighting technology for narrowboats? Richard Hall charts the rise and rise of the ubiquitous LED

voltage regulation and current limiting rated at 15 volts or higher.

The same applies to 24-volt bulbs – look for LED bulbs rated at 28 to 30 volts to ensure a long and trouble-free life!

Care should be taken with replacement LED bulbs, marginal differences exist between the size of LED bulbs and their halogen counterparts. If in doubt, ask to purchase just one LED bulb on sale-or-return to try out before committing to larger quantities.

For the technically minded who want to know how much battery power is being used and saved by LEDs, here are some simple formulae to calculate the expected minimum power saving:



Example A: Evening use of 10 x 12 watt halogen bulbs for five hours.

1 Add up the total wattage:
 $10 \times 12w = 120 \text{ Watts}$

2 Calculate the current drawn by dividing the total wattage by the nominal battery voltage:
 $120 \text{ watts} \div 12v = 10 \text{ Amps}$

3 Calculate the Ampere Hours by multiplying the Amps used by the hours on:
 $10 \text{ Amps} \times 5 \text{ Hours} = 50 \text{ A/Hr}$

This shows that during the five hours a standard fully charged 110 A/Hr battery would have been almost half emptied for lighting alone. At that rate, the battery would be almost flat after two nights!

Example B: Using 1.2w LED bulbs (which give similar brightness to the 12w halogen bulb)

4 Total wattage of $10 \times 1.2w = 12 \text{ Watts}$

5 Total current drawn is $12w \div 12 = 1 \text{ Amp}$

6 Ampere hours is $1 \text{ Amp} \times 5 \text{ Hours} = 5 \text{ A/Hr}$

In this hypothetical example the LED lamps are using one tenth the power of the halogen bulbs. The halogen bulbs would almost flatten a single battery in two evenings, whereas the LED versions would last for over a month! Another way to look at it is that you can probably switch on every LED light inside the boat, all evening, and still use less power than a few halogen or filament bulbs!

The same conclusion can be gained from just comparing the total Wattage of the halogen example against the LED example:

Halogen total Wattage = 120 Watts, LED total Wattage = 12 Watts.

Ratio is $120:12 = 1/10\text{th}$ the power.

● Richard Hall, an avid narrowboater, is Head of Design of 'Bedazzled', a company that specialises in all forms of LED Lighting but in particular marine. For more information on available LED lights, bulbs and strips, visit the website at www.bedazzled.uk.com email info@bedazzled.uk.com or call 01327 844735.

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