MEGAMAN

NEW LIGHT ON OLD PROBLEM

LEDs may have moved from being just an attractive feature to being a usable and functional light source, says lighting designer **Paul Nulty**, but there are still problems to overcome

I remember undertaking work placement while at university. It was 1997 and I found myself standing in the office of Bruce Kirk, the then head of Lighting Technology Projects.

Sat on Bruce's desk was a small black box, which he duly opened. On the inside of the lid was a picture of an aquarium with multicoloured fish swimming about. In the other half of the box was a light fitting that looked like a black tin can with a rather rubbish-looking plastic frosted lens and a very low output.

'What's that?' I asked. 'That my boy' said Bruce, 'is the future!' He wasn't wrong. What he was showing me was one of the first Colour Kinetics LED luminaires. Pretty crude in hindsight but ground-breaking none the less.

Now quite what the fish had to do with it I can only postulate... to demonstrate the wonder of RGB colour change perhaps?

A bar set-up at the showroom of lighting manufacturer Megaman in Hong Kong shows the effects that can be achieved by LEDs

LED-based lighting has obviously come a very long way since then. We now have pretty good white LEDs with CRIs creeping up, thermal management is in the main understood, and better luminous efficacies have allowed LEDs to move from the realm of nice-to-look-at feature lighting to usable, functional light sources.

There are some fundamental problems however that still haunt us, and as a diligent designer these concern me. What I'm talking about really is maintenance and longevity.

In the retail sector where projects have three to five-year life cycles these are not really major issues: install the fitting, walk away and don't come back until the shop is refurbished (well, theoretically anyway). However, design a project for a 10-15-year life cycle and you start to see problems that need to be addressed.

Manufacturers have rightly stopped claiming 100,000-hour lamp life – 50,000 hours seem to be the norm these days, but I question whether this is really true. When performing illuminance calculations most designers use a maintenance factor somewhere between 0.8 and 0.7. This means we're designing to lumen depreciation of 20 per cent to 30 per cent.

Look at the lumen-depreciation curves from the best manufacturers and you'll see for a white LED the actual life of the light source is more like 25,000 -30,000 hours (eight to 10 years based on typical switching cycles), similar to fluorescent sources and, in my view, still a perfectly acceptable life. It does mean having to seriously consider maintaining the light sources at some point though.

How does the client feel about having to take all their LED downlights out of the ceiling to ship them back to the factory to be 'relamped'? Not good, I suspect, and perhaps fed up of bumping into the wall they couldn't see due to the absence of said light. Would a better solution be to throw away the old fittings and replace them with new ones? This is both expensive and environmentally unsound of course, given it would involve throwing away both the diode circuit board and the luminaire components.

The LED circuit boards could be replaced on site by a contractor but most manufacturers won't guarantee the components because they can't guarantee integrity of the thermal management (and LEDs do produce a lot of heat).

Consider also technological advancement. By the time fittings require maintenance LED technology will have advanced to the point you may find yourself with twice as much light (or more) as you had originally. This problem is exacerbated with premature failure, replacing the fitting only to find it's brighter than the rest (a real issue if you happen to be relamping a section of cove, for instance).

So we have a problem: LEDs offer an energy-efficient means of light but a difficult means of maintenance. What is the answer?

I'd argue that we should seriously consider using retro-fit lamps more often, but it seems many designers are reluctant and are snobbish about retro-fit solutions. Perhaps this because they are not a 'techy' solution or maybe it is in part down to manufacturers telling us we can't treat LEDs as a typical light source and that we shouldn't consider them as 'lamps'.

Well, why not? I speak with enough facilities teams to know that they want easy-to-maintain sources of light, and the occasional swap-out of a low-energy, long-life source is just that. As a lighting designer I want to treat LED sources as a 'lamp' rather than some sort of computer-techy wizardry.

This allows the client to relamp at relatively low cost, without throwing the entire luminaire away. I appreciate that until recently good quality retro-fit solutions have been hard to come by but there are some very good products now available, including those by Megaman and Philips.

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PHILIPS

Until recently a good-quality retro-fit solution was difficult to come by, but lamps from Philips (left) and Megaman (above) are now among good products that are available

I've just completed a project that, when designing it two years ago, the client expressed concern over with regards maintenance. At the time we agreed to specify and install MR16 incandescent sources, the plan being that they would be eventually be replaced with retro-fit lamps once technology had moved on sufficiently.

Conveniently this gamble has clearly paid off. The project has just completed, the client is now moving into the building and the lamps are being replaced with good-quality retro-fit MR16 LED lamps.

The point I'm really making is that by utilising easy-to-maintain retro-fit sources it is easier to move with technological advancement. These light sources adhere (more or less) to set outputs (usually mimicking the incandescent source they are designed to replace). So as they become more efficient, rather than the output increasing as the wattage stays the same, it's the energy required that decreases while the lumen output stays the same. The standardised base such as an E27 or GU5.3 allows for swapping of manufacturers, which also keeps things competitive.

Consider a residential or hospitality project, and easy-to-purchase retro-fit solutions become even more interesting.

The downside is that retro-fit solutions aren't quite as efficient, nor quite as long-life as non-retro products. So perhaps we need OEM and luminaire manufacturers to tackle the problem in another way.

Taking a lead from the retro-fit camp and treating the sources as 'lamps' will provide light engines that are easily maintainable and not proprietary to the luminaire, that is some form of standardised 'base' and standardised lumen outputs (don't even get me started on colour temperature and thermal measurement...).

I think we are all in agreement that Bruce Kirk was right in his assumption back in 1997: LEDs really are the future, but right now we stand at a crossroads where we can either end up with a fragmented market and a legacy of poorly maintained, expensive installations or we can provide lighting solutions with longevity.

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The hope is that Zhaga (zhagastandard.org), a consortium of LED manufacturers united in a desire for standardisation, will help the industry address these concerns and provide designers and end-users the longevity we so require. Until then, I'll certainly be paying a lot of attention to developments in the retro-fit market.

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