GE Consumer & Industrial Lighting

NEW HORIZONS

Richard Forster I.Eng, MCIBSE, MILE, MSLL

The development of compact fluorescent lamps (CFLs) has gone through a number of stages driven by a combination of technological progress and market expectations.

Originally large increases in electricity costs instigated the demand for a more efficient light source than the tungsten filament lamp. Conventional linear fluorescent lighting was becoming established for the main functional spaces in commerce and industry but all the ancillary areas continued to be lit by filament lamps. Store rooms, toilets, corridors and like, only needed modest illumination and used basic luminaires.

The first step was therefore to produce a single ended fluorescent lamp. Compared with the tungsten lamp these were larger and required heavy wire wound control gear. Usually this prevented retro-fitting into luminaires originally designed for tungsten lamps. However the economic argument was strong and new luminaires were designed. The initial cost was higher but the savings in operating costs meant pay-back within a short time period. Because of the relatively low power rating of the first CFLs, typically less than 15W, the electricity supply companies did not demand power factor correction as was the case for the higher wattage linear fluorescent luminaires. The amount of low wattage fluorescent lighting was an insignificant proportion of the total lighting load and thus not important to the power supply distribution system.

Most end users had a metered supply which measured watts, rather than volt-amps, so low power factor (PF) CFLs gave the same energy cost saving as those with PF correction capacitors. However as the popularity and application of CFLs increased the problem of low power factor was recognised by the electrical supply industry. Also the international problem had moved from consumer energy costs to global atmospheric pollution. Emissions from power stations burning hydrocarbon fuels were, and still are, a major contributor.

With the availability of electronic control gear, high power factor circuits became standard and thus meant CFLs are now both cost efficient and truly energy efficient. Electronic control gear offers other significant additional benefits.

- Compact size
- Light weight
- Quiet operation
- Flicker-free

With electronic gear there was renewed effort to make smaller integrated lamps that could physically substitute standard incandescent lightbulb (GLS) and even candle lamps for the domestic market. Clearly the ability to reduce energy consumption of existing domestic sockets could contribute to the UK commitment to the Kyoto Agreement. However this approach does not meet the requirements of Part L1 of the Building Regulations, which calls for luminaires using energy efficient lamps to have dedicat-

ed lamp sockets, incapable of accepting conventional tungsten filament lamps.

These Regulations have created a new market demand for dedicated domestic luminaires using CFLs, which in turn, have caused the redesign of electronic ballasts in formats suitable for different luminaire configurations. The electronic ballast can be reconfigured whereas for a wire wound ballast, a regular cube is the most efficient shape.

With this background of continuing change, GE Lighting decided to expand its Biax ™ range of CFLs with the introduction of high wattage versions called Biax™ Q/E for commercial and industrial lighting applications and capable of replacing both existing CFLs and HID light sources. To ensure correct lamp operation GE Lighting has also introduced an electronic ballast to give optimum performance and no divided liability. Gear and lamp need to be considered as a package when considering optimum energy efficiency.

In two ratings of 57W and 70W Biax™ Q/E lamps are available with five colour temperatures from 2700K to 5000K. CFLs are based upon triphosphor technology and give good colour rendering of better than Ra80. This is important as the European lighting standard BS EN 12464-1 calls for lamps with a minimum of Ra80 for all working interiors, with only a few exceptions. No longer just replacement for tungsten lamps, these are mainstream lamps suitable for a wide range of interior and exterior lighting. Compared with HID sources they offer rapid run-up to full light output, and instant restrike when hot.

Because of the low system losses associated with electronic ballasts, the circuit efficacy is 70 lumens/Watt, a value that is well above the minimum of 50 lumens/Watt called for in Part L2 of the Building Regulations for England and Wales. It is also above the higher minimum requirement of 65 lumens/Watt called for in Part J of the Building Standards for Scotland.

A single ballast is suitable for both ratings, thus simplifying stocking for OEMs and maintenance. Constant lamp operation over a wide supply voltage range ensures stable light output and colour. Recent blackouts in several countries have demonstrated that electricity distribution is more prone to failure and the margin between demand and generating capacity has been reduced. Although the risk of total failure may still be slight, supply voltage variations are much more likely. An important benefit of electronic ballasts is the ability to compensate for these variations and to supply optimum lamp operation, and lighting performance. Electronic ballasts also operate from DC supplies which means they can be used for emergency lighting from central battery supplies. Additionally, with the known compatibility of lamp and ballast from one supplier, GE Lighting offer a 3 year guarantee for the ballast, and rated lamp life of 12,000 hours.

Because of their history there may be a perception that CFLs are only small light sources delivering modest lumen packages. GE's Biax ™Q/E means this is no longer true and their new lamps are worthy alternatives to linear fluorescent and HID sources.