Trends in Compact Fluorescent Lamp Technology

A Pacific Energy Center Factsheet

Pacific Gas and Electric Company
Pacific Energy Center

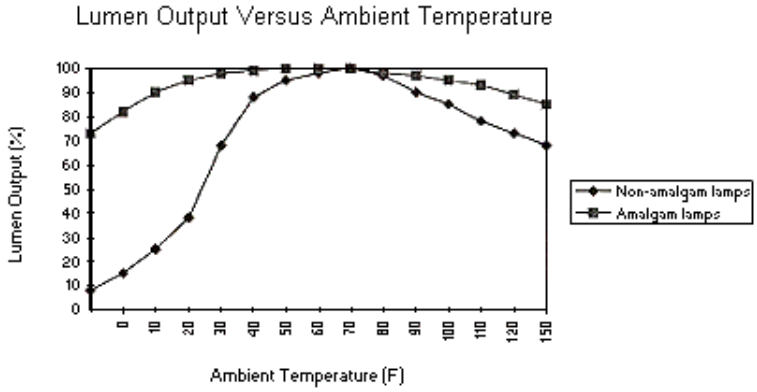
Introduction

Compact fluorescent lamps have been available in the United States since the early 1980's. Since that time, there have been many advancements in technology. The latest developments include better understanding of the thermal characteristics of the lamps, better cathode designs, new lamp shapes, and improved luminaire optics.

Thermal Characteristics

Light output in compact fluorescent lamps varies with both ambient temperature and the position of the lamp. Light output for a compact fluorescent lamp generally peaks at an ambient temperature of 80° F in the "base up" position. Variations from these optimal conditions reduce the light output and, therefore, the overall system efficiency. Newer luminaire designs are significantly more efficient as a result of improving the thermal conditions for maximum light output from the compact fluorescent lamp.

Another approach to regulating the light output of a compact lamp due to varying thermal conditions is to address the design of the lamp itself. The use of an amalgam (a mercury alloy) within the glass tube of the lamp results in light output less sensitive to varying ambient thermal conditions. With amalgam lamps, light output varies less than 10% over a temperature range of 20° F to 120° F compared to more than an 80% variation in light output with non-amalgam lamps over the same temperature range.



Verify with individual lamp manufacturers for specific lamp type to determine whether or not the lamp is amalgam-based. This is particularly important for temperature sensitive applications.

Better Cathode Designs

Lamps have been developed with sturdier cathode designs and are better able to withstand the high starting voltages associated with instant start ballasts. These cathode designs preserve lamp life when used with instant start ballasts, as is common with electronic ballasts.

New Lamp Shapes

Lamp shapes have evolved from twin tube to quad tube 2D and flat tube to triple tube configurations. The driving force in the design of these lamps has been to increase light output in the shortest overall length to replace incandescent lamps in approximately the same physical size. Manufacturers currently claim replacements for up to 150-Watt A-lamps.

The latest evolution is a generation of helical and other shapes which expose more surface area of the glass tube, thereby increasing the efficacy of the lamp. These new designs will create more efficacious 150-Watt A-lamp replacements.

Improved Luminaire Optics

The first luminaires designed for compact fluorescent lamps were merely repackaged incandescent luminaire designs. Since an incandescent lamp is optically very different from a compact fluorescent lamp, this first generation of compact luminaires was inefficient, optically inferior, or both. Luminaire designs dedicated to compact fluorescent lamps provide efficient, high quality light. Look for carefully engineered reflectors, high quality material, vented designs, and good glare control.

Note that incandescent luminaires with medium-base sockets do not necessarily provide equivalent light output or good glare control when using medium-base compact fluorescent retrofit lamps.

For More Information

Contact your PG&E representative or call 1-800-468-4743 for more information about PG&E's energy efficiency programs and other services.