

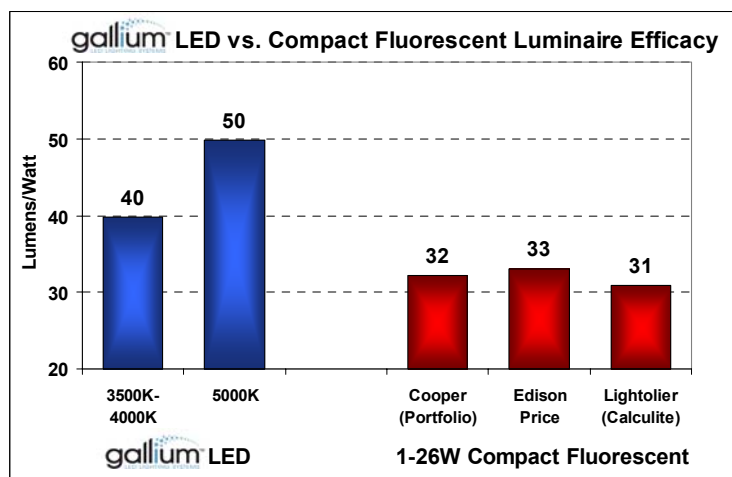
## LED Luminaire Efficacy Surpasses Compact Fluorescent

The benefits of white LEDs for general illumination are well known, including long life, eco-friendliness, use with occupancy sensors, durability, shock resistance, and so on. However, until now, only LEDs at the coolest color temperatures (i.e., 5000K+) have provided luminaire efficacy (as measured by lumens/watt) higher than specification-grade compact fluorescent luminaires. However, substantial recent advances in the efficacy of power LEDs (i.e., LEDs that operate at one watt and higher) have enabled Gallium Lighting to offer LED luminaires with higher energy efficiency than typical specification-grade compact fluorescent luminaires **in all color temperatures from 3500K to 5000K.**

This Technical Bulletin provides an overview to LED luminaire efficacy, and demonstrates the energy efficiency benefits provided by LED versus compact fluorescent luminaires.

### Compact Fluorescent Efficacy

Although 26 watt, triple-tube compact fluorescent lamps (CFLs) initially provide over 60 lumens/watt (excluding ballast and fixture inefficiencies), the actual efficiency produced by compact fluorescent luminaires is typically much lower. For example, most CFL electronic ballasts, which are around 90% efficient, consume over two watts when used with a 26 watt lamp.



### Luminaires Used in This Comparison

This *Technical Bulletin* compares the Gallium GS6 luminaire to specification-grade compact fluorescent luminaires featuring 45° shielding and 6" apertures. The catalog numbers for the compact fluorescent luminaires used in this comparison are as follows:

- Cooper (Portfolio): C6042 6000
- Edison Price: Triples V-26/6 DS
- Lightolier (Calculite): S6132BU

### For More Information

#### Compact Fluorescent Efficacy:

Technical data for compact fluorescent lamps can be found on the web sites of major lamp manufacturers:

- General Electric: <http://www.gelighting.com/na/>
- Philips: <http://www.lighting.philips.com/>

Technical data for compact fluorescent luminaires can be found on the web sites of major luminaire manufacturers.

#### Benefits of Using White LEDs to Illuminate General Architectural Spaces:

See Gallium Lighting's *Technical Bulletin* Volume 1, Issue 2, May 1, 2007: "White LED Lighting: Coming to an Office Near You." <http://www.galliumlighting.com/products/>

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Further, most specification grade compact fluorescent luminaires (i.e., those providing at least 45° shielding to reduce distracting glare), are only 40%-50% efficient in directing the light produced by CFLs onto the work surface. As a result, most specification-grade compact fluorescent luminaires with 6" apertures deliver about 32 lumens/watt (see the chart above).

## LED Efficacy

Substantial advances in LED efficacy have recently been introduced by leading LED suppliers. As a result, the lumen output of these LEDs has substantially increased while input power has remained relatively fixed at a little over one watt per LED (when driven at 350mA).

At the coolest color temperatures (i.e., 5000K and above), LED efficacies have surpassed 90 lumens/watt when operated at low LED junction temperatures (i.e., 25°C). Further, although some LED suppliers have recently issued press releases announcing efficacy of well over 100 lumens/watt, these results typically reflect very low levels of LED drive current, such as 25mA. Although very high efficiencies can be realized at these low levels of current, very little usable light is produced.

As LED junction temperatures rise to typical operating levels, the light delivered by LEDs declines. Also, like compact fluorescent luminaires, there are also LED driver (the equivalent of a ballast in an LED lighting system) and optical inefficiencies. However, **even at the relatively warm color temperature of 3500K-4000K, Gallium LED luminaires now provide up to 40 lumens/watt, and up to 50 lumens/watt at 5000K.** These performance results have been verified by Independent Testing Labs (see ITL report 59190 on model GS6-LR-350 at <http://www.galliumlighting.com/products/>), so specifiers can confidently design their lighting projects with Gallium Lighting luminaires.

## Conclusion

Due to substantial advances in LED efficacy, Gallium Lighting now provides specification grade LED luminaires with efficacy substantially better than comparable compact fluorescent luminaires, even at the relatively warm color temperature of 3500K-4000K. These long-awaited advances have led to the development of Gallium LED luminaires that outperform compact fluorescents on all major operating parameters (e.g., long life, energy efficiency, etc.).

## About Gallium

Gallium is dedicated to leading the way into the new era in lighting technology. Gallium's state-of-the-art, specification-grade LED lighting systems produce a brilliant white light. Featuring optical systems designed especially for illuminating general architectural spaces, Gallium LED lighting systems make a distinctive statement while providing unprecedented energy efficiency.

## The Gallium Advantage

- Long Life
- Energy Efficient
- Directional Light Distribution
- Environmentally Friendly
- Safe, Reliable & Durable
- Long-Term Cost-Effective Operation
- Cool Operation

## Author's Biography

Dr. Keith Bahde is the President of Gallium Lighting. He has 20 years of lighting industry experience with three of the four largest lighting fixture manufacturers in North America. Keith founded Gallium Lighting to accelerate the adoption of LED technology in mainstream architectural applications. His academic credentials include an MBA and a Ph.D.

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