

## LEDs & Lighting Controls

Lighting controls and dimming strategies are integral to advanced lighting design. Dimming can be a key strategy to improve energy efficiency, but often at a cost of reduced efficacy if using conventional light sources. Light emitting diodes (LEDs) are the exception, where efficacy actually improves as this light source is dimmed. LEDs demonstrate improved performance, such as higher efficacy and greater life expectancy as controls are introduced. This ALG Connections piece highlights an excellent [article from the \*Electrical Construction & Maintenance Magazine\*](#) discussing the potential of LEDs and lighting controls.

The nature of LED lighting is very friendly to automatic lighting control. LED luminaires are instant-ON devices, making them usable with automatic switching controls, and frequent switching does not affect lamp life as it does with discharge sources. Dimming from 100-1% (or 100-20%, depending on desired capabilities and cost) is compatible with line- or low-voltage methods, and is achieved through use of a dimmable driver, which dims the diode

using either pulse-width modulation (PWM) or pulse-amplitude modulation (PAM) methods. Dimming may extend service life because it reduces internal temperatures. Efficacy is stable across the dimming range until the low end, when efficacy actually increases due to dimming reducing internal temperatures, producing higher light output.

LEDs can interface directly to onboard luminaire control logic. The result is an “intelligent” luminaire that has the ability to monitor and respond to its environment and perform pre-programmed tasks to further conserve input power and reduce luminaire maintenance. The LED luminaire is digitally addressable, allowing it to easily network and communicate with other luminaires and similar control devices in the same room or throughout a building.

The figure below illustrates a sample efficacy relationship of a dimmed LED luminaire. Keep in mind that every product will have a different characteristic depending on thermal design and LED packages employed.

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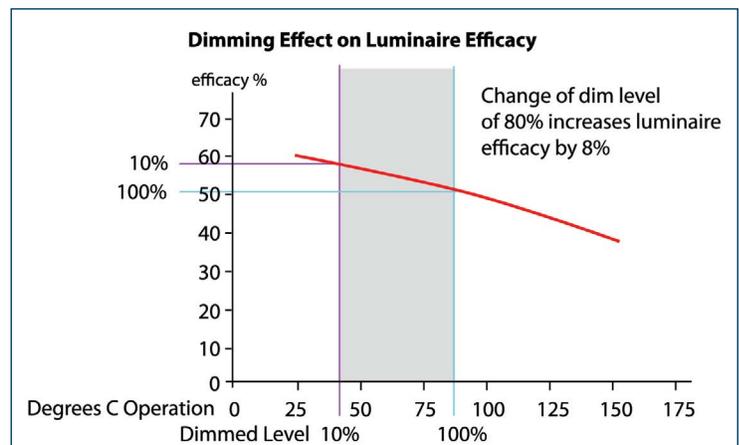
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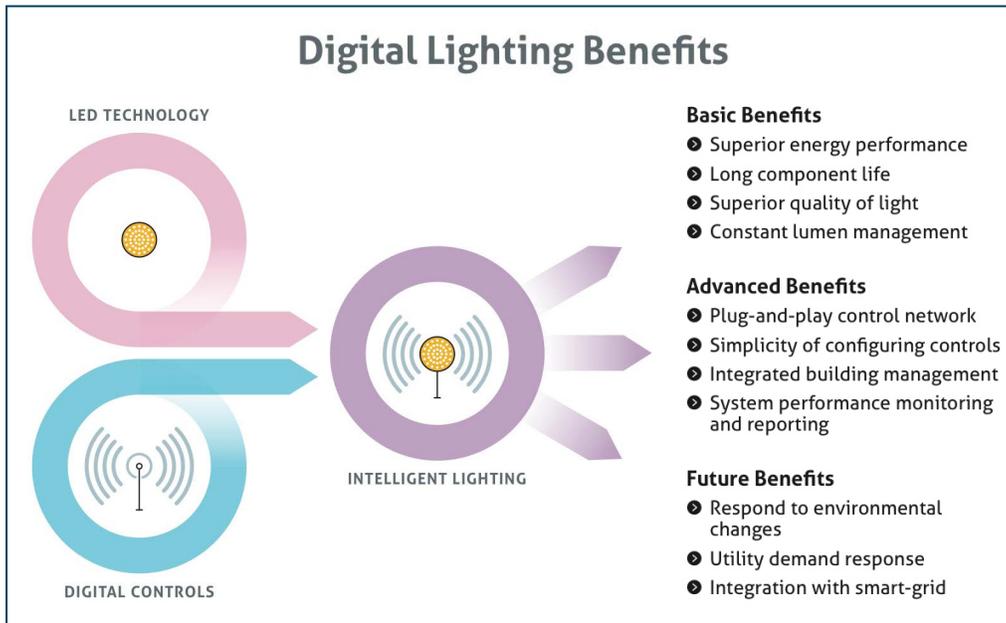


Image courtesy of Dave Ranieri, Lithonia Lighting.

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Network connections can easily be made using standard Cat. 5 cabling for true plug-and-play convenience. The ability to use simple Cat. 5 cabling to connect LED fixtures to other fixtures and controls delivers two critical benefits:

1. Cat. 5 cabling allows digital information to freely and easily flow from fixture to fixture and from fixtures to various room controls or building controls. This, in turn, allows controls to be embedded right into the fixture and — as soon as the cable is connected — enables the fixture to become its own “IP address.” This means it’s automatically recognized (addressable) and can deliver its own data about how it is performing. Likewise, it can receive directions on what to do.
2. Cat. 5 cabling is very flexible and easy to install. As a result, the initial setup cost — both in terms of time and materials (compared to standard 2-wire systems) — is significantly less. Because space typically has to be reconfigured over time, it is simple to move and readdress fixtures. They no longer have to be zoned or grouped — each fixture can be recognized and placed anywhere in the plan.

Combining LED lighting in buildings with intelligent, automatic controls has the potential to produce high efficiencies.

However, controlling white LED products in architectural lighting applications can be a challenge. Some products have a driver and power supply that enable dimming, others do not. Many are proprietary and incompatible with products from other manufacturers. Some do not work with basic electronic thyristor- or triac-based dimmers, sensors and relays. Some do not work well when connected to standard dimmers or existing 12V electronic transformers. For this reason, designers of lighting and control systems featuring LED products should verify that all components on the job are compatible and supported by their manufacturers.

For more on the potential of LEDs and lighting controls, read the full article written by Dave Ranieri, published November 22, 2011 by *Electrical Construction & Maintenance Magazine*, <http://ecmweb.com/lighting-amp-control/talk-leds>

ALG Online dedicates an entire section to [Lighting Control Devices, Systems and Equipment](#) covering personal controls, low-voltage control systems, occupancy sensors, daylight harvesting controls and systems, and architectural dimming controls and systems. For each major type of equipment, a description of technologies as well as application and commissioning guidance is provided.