DALI: The Next Generation of Lighting Controls

Lighting Controls—Historical Perspective

Lighting is often the largest electrical load in the typical office, school or store, but the cost of lighting energy pales when compared to the cost of the personnel using the space. Accordingly, the goal of lighting controls has historically been to reduce lighting waste without negatively impacting the occupants.

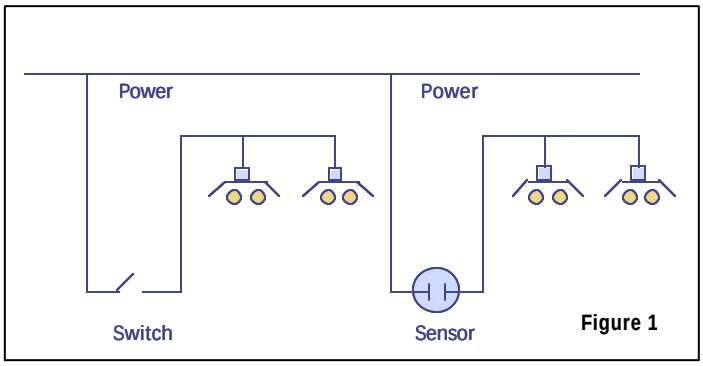

Figure 1

The most common form of control is the standard wall switch. Today, it is being replaced by occupancy sensors, which turn the lights off when the area is unoccupied, or by time-based controls (Figure 1). Both are more effective than the standard switches at saving energy, but each has the potential of turning the lights off by mistake. Neither, however, provides a direct benefit to the occupant.

Next Generation

The potential energy savings and occupant satisfaction increase dramatically if users can control the lighting level, not simply turn it ON/OFF. Combining digital ballast technology with reliable low-cost communications and simple automation promise reliable and cost competitive fluorescent dimming that can improve energy savings, occupant satisfaction, and building operation. Using the non-proprietary Digital Addressable Lighting Interface (DALI) protocol, lighting networks can be constructed with the components from various manufacturers that are interoperable.

Typically, the fluorescent ballast controls the current and voltage applied to the lamps in a fixture. Adding microprocessor (digital) control to the ballast opens the door to numerous performance improvements. For example:

- The starting characteristics of the lamp can be closely controlled to increase lamp life by a factor of two in applications with frequent switching while also allowing the lamps to be turned on at any level without flickering or blinking.
- Dimming response becomes consistent and predictable with no flat spots.
- The ballast can respond to multiple control messages such as ramp up, ramp down, go to a specific level, pulse, shed a set percent of lighting load, or go to a preset scene (Figure 2).


Figure 2

Additionally, bi-directional communication—both to and from the ballasts—provides benefits to the occupant and the owner while also simplifying design, including:

- Occupants can control the lighting within their area using a local switch or personal computer (Figure 3).

Figure 3

- In conference rooms and classrooms, lighting scenes can be created by selecting and memorizing the light level for each fixture.

- Occupancy sensors, daylighting sensors, dimmers, and scene controllers can be combined to match energy controls and occupant overrides to the needs of small offices, open offices, classrooms, meeting rooms, and convention centers (Figure 4).

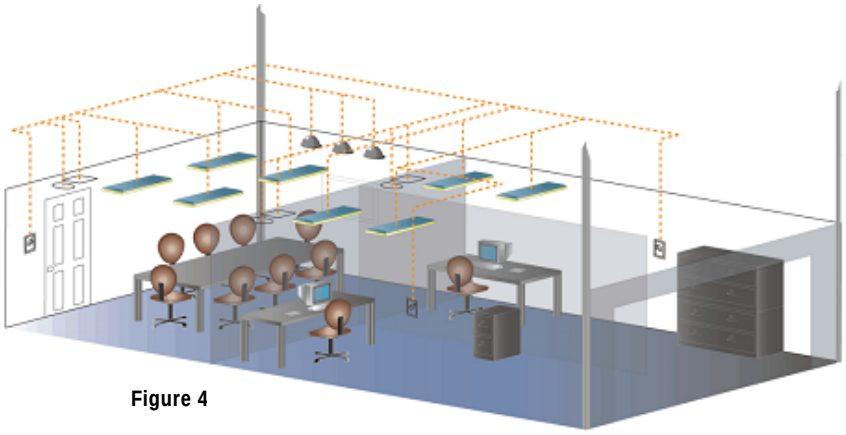

Figure 4

- Utilities and building owners can work together to shed lighting loads during peak usage times.

- To improve facility management, energy use by area can be monitored and failed lamps or ballasts annunciated.

In summary, DALI protocol provides a powerful new method for managing the lighting in commercial buildings by providing a more occupant sensitive and productive environment while increasing energy savings. The building becomes smarter, adding to its value, and the built-in flexibility will continue to pay dividends as the building adapts to new uses.

In cooperation with the National Electrical Manufacturers Association (NEMA) and The Watt Stopper (TWS), the California Energy Commission Public Interest Energy Research (PIER) Program is funding DALI research under the Lighting Research Program. The goals are to help bring together a NEMA-facilitated working group of major manufacturers to develop an open standard for controls, conduct roundtables to gain input from designer and end-user groups, and provide a demonstration of the protocol. Detailed information is publicly available at www.archenergy.com/lrp or contact:

David Peterson
The Watt Stopper
www.wattstopper.com
david_peterson@wattstopper.com

Donald Aumann
California Energy Commission
www.energy.ca.gov/pier
daumann@energy.state.ca.us

Judie Porter
Architectural Energy Corporation
www.archenergy.com
jporter@archenergy.com