

LED lighting is available in custom configurations and lengths, allowing lines of light to be integrated into the built environment.



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The latest in LED luminaires

Five big trends in indoor luminaires that reflect innovation and are driving growth. **by Craig DiLouie**

Strategies Unlimited has forecasted that by 2022, LED luminaires will achieve a 60% share of global luminaire shipments. In the United States, three major manufacturers of indoor LED luminaires say LED already constitutes a majority of their indoor luminaire sales. “The rate of change in the lighting market is unprecedented,” said Jerry Mix, CEO of Finelite (finelite.com). “Five years ago, LED was suspect, incandescent was standard for residential applications, and fluorescent dominated commercial lighting. Today, incandescent is out, and fluorescent is being overtaken by LED.”

“We see legacy sources being almost completely eliminated from our business within the next few years, speaking strongly to the level of market share and adoption,” said Imran Ahmad, general manager, architectural lighting, Eaton’s Lighting Division (eaton.com).

Martin Werr, director of product innovation for Hubbell Lighting (hubbellighting.com), believes a majority of LED retrofits now involve new luminaires. “A significant percentage of customers, however, accept half-measures through the use of LED replacement lamps in an effort to mitigate first costs,” he said. “Typically, these result in less-than-ideal performance compromises” (an exception, he pointed out, being luminaire retrofit kits).

FIVE KEY TRENDS

1. LED luminaires are getting sleeker.

LED sources are highly compact and reduce the distance required between the source and optics. As these sources become more efficacious—producing more lumens per watt—fewer sources are needed, which reduces the size of the heat sinking and housing. As a result, the early clunky LED luminaires are giving way to the current generation of sleek products. While sleeker, luminaires are not necessarily smaller, as they are often designed to replace existing luminaires. However, the smaller light source enables the new form factors that are now being explored.

Mix calls this “tailored lighting”—luminaires that follow architectural forms, available in quick-shipped custom configurations. “Demand for the design freedom of tailored lengths and configurations is growing exponentially,” he said. “Tailored lighting—lines of light defined by architecture—has seized the imagination of architects and lighting designers and changed the expectations of owners and tenants.” Mix sees lighting as becoming defined by architecture and a more permanent part of the built environment, similar to windows, doors, and walls.

While most luminaires are highly integrated appliances, a growing num-

ber of manufacturers are offering serviceable luminaires, although these features may impose a cost premium in exchange for the added value. "For most applications—including recessed troffers and high-bays—specifiers and end-users should insist on light engines, drivers, and optics that can be replaced or upgraded from below," said Werr. "Despite the implication from some lower-tier manufacturers, LEDs do not last forever, and even if they did, they are continuously improving. Responsible manufacturers provide the ability to upgrade luminaires as more energy-efficient light engines become available."

2. LED sources and optics have become integrated. As highly compact, directional point sources that produce very little radiated heat, LEDs offer the ability to attach optics directly to the source. This promotes very high optical efficiency (90% to 95%) while enabling light to be placed in precise patterns,

which improves application efficiency.

"Given that LEDs deliver flux within a narrower zone than traditional sources, LED optical systems are much more efficient since much less light is wasted," said Ahmad. "Over time, we have seen optical systems evolve by getting smaller, more efficient, and more precise."

New optical approaches include total internal reflection lenses, prismatic films, and light guides. For tunable-white lighting, a diffusion film of frosted internal optical elements may be used. For architectural visual comfort applications, edge-lit panels are trending.

3. Lighting is increasingly customizable. Traditional lighting is typically specified in standardized lumen packages and form factors, designed in more or less standardized layouts, and not very controlled. In contrast, LED lighting can be specified with drivers programmed across a wide range of lumen and wattage packages, which

allows light levels and power to be tuned to individual project needs.

4. Good controllability is broadening application of lighting controls.

LED lighting features instant-on (with negligible depreciation in source life), inherent compatibility with intelligent controls, and dimming as standard or a standard option for the large majority of luminaires. Coupled with the miniaturization of sensors and advances in radio-frequency wireless communication, many luminaires are now being packaged with onboard sensors and wireless networked lighting control. This facilitates greater energy savings, flexibility, and potential collection of data.

"The single biggest trend is the inclusion of dimming capability—once a luxury upcharge for fluorescent and impossible for HID," said Werr. "Those in the market would be wise to choose a manufacturer that offers products with dimming capability at no additional cost. An

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