LED vs. INDUCTION LIGHTING

WHICH SOLUTION IS RIGHT FOR YOUR FACILITY?

Time for a lighting upgrade? You may be torn between LED and induction fixtures. Both offer low maintenance needs, are compatible with a variety of applications, and can secure energy savings. Familiarize yourself with the basics of these technologies to uncover which one will bring your project to light.

Understand the Essentials

Pioneered by Nikola Tesla, induction lighting has been around for over 100 years—plenty of time to earn its "set it and forget it" reputation, says Mark Havira, senior lighting consultant at Efficient Lighting Consultants. Induction lamps rely on ballasts and sealed gas-filled bulbs. Unlike the Edison-style incandescents, induction lamps don't require a fragile electrode burning inside the bulb to produce light, which allows life expectancy to reach 60,000 hours for retrofit kits or up to 100,000 for the latest manufacturer-provided systems.

"In terms of years, 24/7 use means about 8,700 hours a year," Havira notes. "In many cases it will be 20 years before you change a lamp on an induction fixture given the right opportunity and environment."

LED technology is a solid state lighting system, meaning that light is created from electrons moving around within the semiconductor, a piece of solid matter inside the LED. They tend to be more expensive than induction systems, though this is no longer true in all cases, Havira notes: "You have to look at the different wattages on a case-by-case basis and make a determination from there."

Declining component costs and continuing development are helping to drive down LED prices, Havira continues. The cost of induction systems is unlikely to budge much in either direction because the leaps in innovation have already occurred with induction—there's not much else to improve on, whereas LED fixtures are still making notable strides.

Most innovation in LED products now focuses on optimizing the entire system rather than individual diodes and other components, adds Gary Trott, vice president of product strategy for Cree. This change has contributed to the decline in cost.
“Sometimes building owners will say ‘Why should I buy a computer now if the technology is still improving?’” says Trott. “One reason is that the drops in cost aren’t going to be as large in the future, and the other is that this is the same argument as ‘Why should I buy a computer now if the technology is still improving?’ You buy it now if it makes sense financially for what you’re trying to accomplish.”

**Investigate Induction**

Ideal applications for induction systems include high bay areas, wall packs, and “anywhere there are metal halide, pulse start, mercury vapor, or high pressure sodium fixtures,” Havira notes.

That sort of flexibility appealed to the University of California, Santa Cruz, which included induction technology in a portion of its campus-wide lighting retrofit in 2012. The $1.1 million project included a solution for the East Field House Gym’s uneven, insufficient lighting, which stayed around 20 fc.

A design based on 3D lighting simulation led crews to replace 30 metal halide fixtures (all of which were either 175 or 250W) with a dozen 315W induction fixtures, reducing the fixture count by 60% while creating even light distribution and raising the light level to 35 fc.

The wood floor in the gym is easily damaged by heavy equipment like the scissors lifts needed to change out malfunctioning lighting fixtures, making the low-maintenance requirement paramount among the team’s concerns. The existing metal halide fixtures not only consumed a high amount of energy, but they also weren’t conducive to controllability, which in turn worsened the energy consumption problem.

The gym also requires careful attention paid to the fixtures’ safety, as wayward volleyballs can damage the motion and daylight sensors on the ceiling.

“Metal halides don’t turn on and off well at all, but LEDs and induction were fairly equal in that respect,” says Patrick Testoni, energy manager for the campus at UC.

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**LED VS. INDUCTION: PROS AND CONS**

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*MARK HAVIRA / EFFICIENT LIGHTING CONSULTANTS*
Santa Cruz. “The induction fix worked well in the gym – when we did modeling, it improved the light distribution in the area and also allowed us to install daylighting and occupancy controls.”

Examine LEDs

Aided by financial incentives, UC Santa Cruz’s 2012 retrofit also replaced MR16, T12, and T8 lamps in 70 elevators with LED versions, cutting the elevators’ energy consumption by over 50%. Light and fan controls were added to compensate for the heat produced during round-the-clock operation, and automatic controls ensure that the lights and fan turn on for eight minutes when the elevator doors open, then shut off.

Additionally, 230 150W HID streetlights were replaced with dimmable 85W LED versions and over 300 locations received bi-level LED wall-pack fixtures that can switch between 52 and 26W. The inclusion of both LED and induction provided an easy comparison for university staff.

“In some cases, what we were trying to do at the time was to determine the best way to move forward. Our electrical engineer was really favoring induction lighting and we in the energy department were strongly looking at LED,” explains Testoni. “We wanted to do a pilot to see which one would deliver more efficient lighting, decreased maintenance costs, and a longer lifetime.”

University of California, Davis faced a similar decision when they decided to roll out an exterior lighting retrofit covering 70% of the campus’s pedestrian paths, bike lanes, and roadways. About 1,200 street and area lights, 100 decorative post-top luminaires, and 100 wall-packs were replaced in 2011 and 2012, most of them with LED products. The post-top retrofits involved 45W light engines with zero to 10-volt dimming, while the HID wall-packs were replaced with LED versions that use 14W in low mode and 45W in high mode – less than a third of the HID luminaires’ consumption. Completed in 2012, the $950,000 project saves roughly 1,000 MWh and $100,000 a year.

UC Davis originally planned to use induction lighting to replace high pressure sodium pole mounts in their parking lots, but opted to try LED instead.

“The problem was that the induction lights were huge devices. A lot of the poles have four heads and they started to look like umbrellas – they were just huge,” explains Scott Arntzen, senior project manager for design and construction management at UC Davis. “We were looking for something with a smaller footprint. The product we ended up going with has a dimmable driver – we can dim it all the way down to 10 to 20%. The induction type usually only has a couple of settings below 100%, whereas the LED version has a range.”

Additionally, the new LED lights provided significantly better color rendering over their high pressure sodium predecessors, Arntzen adds. This feature also appealed to Presence Saint Francis Hospital, an Evanston, IL-based Level I trauma center with 24/7 traffic. Its parking garage featured yellow high-pressure sodium fixtures that just didn’t pass muster.

THE YELLOW HIGH-PRESSURE SODIUM FIXTURES in Presence Saint Francis Hospital’s parking facility did not provide adequate, safe lighting for visitors – an especially large concern given the hospital’s 24/7 visitation policy, notes Joe Stark, regional director of support services. The HPS lighting also needed frequent maintenance from hospital staff tasked with bulb and ballast replacements. The first retrofit, an LED lamp, was disappointing in both quality and aesthetic value.

FORTUNATELY, THE NEXT LED RETROFIT – pendant-mounted LED luminaires – cleared up both the appearance issue and the color quality, increasing the safety of the garage (left). The white light even improved security camera footage by making it easier to read license plate numbers and view details.

AT UC SANTA CRUZ (above), McHenry Library was part of a campus-wide retrofit that also replaced metal halide fixtures in the East Field House Gym with induction lighting and HID streetlights with LEDs.
"When you go into a parking garage, yellow light does not give a sense of safety and security to people," explains Joe Stark, regional director of support services for Presence Saint Francis and Saint Joseph Hospitals.

The hospital initially planned to retrofit the existing HPS fixtures with LED lamps, but ultimately ended up installing pendant-mount LED luminaires instead. This secured lower operating costs for the garage and provides even white light that also resulted in clearer security camera footage.

How to Make the Right Decision

There's no automatic answer to which lighting technology best fits your facility. To determine which product can meet your needs, consider these tips.

1) Run the numbers. Incentives and project bundling can help make projects more affordable. Some are specific to a particular lighting technology — for example, Efficiency Vermont currently offers 20% bonus rebates for some LED fixtures and controls in addition to its general incentives for energy-efficient commercial lighting equipment.

2) Think beyond the one-to-one swap. There's more to good lighting than just changing out your old lamps for newer, more efficient ones, says Alexis Troschinetz, behavior change and metrics coordinator for Clean Energy Resource Teams (CERTs), a statewide partnership in Minnesota that provides resources for community-based clean energy projects.

"Depending on your upgrade, it could be beneficial to take a look at the lighting design for the area," explains Troschinetz. "You might not have to do a one-to-one changeout. You could do less, but still get a good quality lighting output for the space."

Westcor Land Title Insurance Company in Maitland, FL, opted to bypass the one-to-one temptation entirely by bringing in a lighting designer during a planned renovation. The designer was tasked with addressing the inconsistent light quality and constant buzzing sound of the existing fluorescent fixtures. The end result called for more than 100 LED downlights and over 200 troffers across the 20,000-square-foot space. The 90-plus CRI rating helped highlight the textures and brightly colored accents in the office.

3) What warranties are offered? If you're switching to a new technology, determine whether the vendor's offered warranty is compatible with your comfort level, Troschinetz recommends.

4) Do your research. When Testoni needs LED lighting, he tries to stick to products that are DesignLights Consortium certified, as the designation signifies a dependable level of quality and efficiency in commercial LEDs.

"The only problem with DLC approval is that the list isn't maintained as fast as we would like, so there could be some high-quality fixtures on the market that just haven't completed the approval process yet," Testoni explains. "Typically, if the manufacturer already has many fixtures on the list and their new one isn't on it yet, I would still move forward with it."

5) Be proactive. Develop your own criteria to help narrow down the myriad lighting options on the market, Testoni recommends. "Most of the time, facilities people come in contact with LED through a representative of a certain product or company," he adds. "It's better to stay ahead and be the one looking at products — vendors will give you specific solutions based on the products they have. Not all lighting products are created equal, so find out how they aren't."

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