

What's the Right LED Retrofit Strategy:

Lamps, Kits, or Luminaires?

For building owners and their operations staff, lighting retrofits come in waves. There were electronic ballasts and then T8 fluorescents, compact fluorescents, improved-color metal halides, and now LEDs. All of these product categories save energy and, in many cases, improve lighting quality in all types of installations.

Different levels of intervention were required over the years: sometimes retrofit lamps did the trick; sometimes a retrofit kit and a bit of rewiring were required. But often an entirely new fixture was needed to operate new technologies properly and to light the space effectively. Today's LED retrofits are unique in that retrofit lamps and retrofit kits and complete retrofit fixtures are all available for almost every type of luminaire you can think of.

In virtually every case, retrofitting to LED will save a building owner or tenant money over the long term. But (despite what a salesperson might tell you) there is no one-size-fits-all LED solution. LED replacement lamps, LED retrofit kits, and new LED luminaires all offer tradeoffs in terms of initial costs, long-term energy and maintenance savings, and lighting quality. Customers should consider multiple strategies, and question the pros and cons in each application.

Best-fit Retrofits

Lamp changeouts are certainly easiest, but heat and power quality issues in existing light fixtures could wreak havoc on the LED electronics inside, leading to disappointing performance over the life of the system. In addition, LED retrofit lamps may not fit properly with the luminaire's optical system or outward appearance; the result is poor, perhaps even uncomfortable or unsafe, lighting quality.

Of course, an entirely new fixture would operate the LED light source optimally, likely with a fresh look and feel. But installation costs are far higher in terms of fixture cost, labor, and disposal of discarded materials.

Discarded legacy lighting equipment can represent a waste of the owner's valuable assets. Decorative fixtures and iconic custom luminaires can be important design elements in public and work spaces. This can be less of a concern with commodity light fixtures.



LED retrofit kits save energy and match – or often improve – the quality of light from existing luminaires. LED arrays with onboard drivers, and newer LED arrays with direct AC connections, come in all shapes and sizes and are quick to install. When they are engineered well for proper thermal management, dimming, and light distribution, then lighting quality and performance are maintained over the course of a long lifetime. Finally, the owner's investment in legacy lighting fixtures is preserved with a quick wipe-down of the optical surfaces.

The basic equations for calculating the payback, or return on investment, of an LED lighting retrofit remain the same. You are balancing three criteria: initial installation costs (including rebates), energy savings, and long-term maintenance savings. But choosing the right solution among the myriad of LED retrofit strategies is challenging. In addition to running the numbers, building owners must consider warranty issues, product safety, ease of installation, light color qualities, illumination levels, thermal management, glare control, and overall appearance. These are all crucial factors in effective lighting. Lighting that has deleterious effects on occupant productivity or safety can turn any retrofit into a financial disaster.

Five Myths about LED Retrofits



LEDs are too expensive.

When you look at component costs, an LED retrofit may be more expensive than the cost of replacing traditional lamps a few times. And fluorescent, compact fluorescent, and metal halide light sources are already pretty darn energy-efficient.

But consider:

- LEDs are the most energy-efficient electric lighting technology available.
- The tiny size and highly directional nature of LEDs can often deliver light better: out of a recessed can; uniformly across a diffuser; or spread across an area, ceiling, or wall.
- Utility rebates (think ENERGY STAR® and DLC®) can help reduce the payback for an LED retrofit considerably: 12 to 18 months is common.
- Incandescents are still in wide use: wasting 90 percent of their energy as heat.
- In some installations, depending on burning cycles, LEDs could last 20 years or more.

When assessing the costs of an LED retrofit, be sure to include all the costs over the life of the system. You'll find the savings with the right LED retrofit are substantial, and always pay back the project costs.

What is ENERGY STAR®?



Created by the EPA and Department of Energy, the ENERGY STAR program sets international standards for energy efficiency. ENERGY STAR certified LEDs use at least 75% less energy than incandescent, last longer, and produce less heat.

What is DLC®?



The DLC is a group of regional energy programs that promotes energy-efficient lighting through common standards, incentives, and education. Products on the DLC Qualified Product List achieve high standards for efficiency.



The lowest-cost LEDs will be fine.

The market for LED lighting is maturing and becoming increasingly competitive. Manufacturers compete with less-expensive products and settle for smaller profit margins. As a result, some LED manufacturers will cut corners and deliver substandard products. It's true: you get what you pay for.

"Cheap" LED products can have insufficient insulation or exposed electrical elements, introducing electrical shock and fire hazards. Replacement lamps may just pop right in and operate on an existing ballast, but they're so inefficient they consume more energy than the fluorescents or CFLs they replaced. Less-expensive LED retrofit products often produce less light or have high light losses: you will need a higher-wattage product to get sufficient light out of the fixture.

Light quality is sometimes garish or filled with glare; poor color qualities may cast people and products in an unflattering light. Color can vary widely among replacement lamps from the same manufacturer; sometimes even lamps shipped in the same carton. These kinds of LED products increasingly fail to qualify for utility rebates. The light qualities of LED, and the feel of the lighted environment, should be equal or superior to the legacy technologies they replace.

If you get a shorter-term warranty, or one that does not cover light quality issues well, you may find yourself replacing those "money-saving" LEDs a lot sooner than expected. Don't make the mistake of focusing on up-front costs; the real payoff will come in maintenance and energy savings in the years ahead.

Instead, look for LED products that have labels from UL, for safety testing. An ENERGY STAR or DLC listing means the product could be eligible for utility rebates. These products must meet standards for efficiency, light quality, and warranties.



LEDs tend to discolor after only a few years of operation.

First-generation LEDs did tend to color-shift – that is, the light would acquire a greenish hue after just a few years. This caused tremendous frustration for building owners. Aside from energy efficiency, the primary benefit of LEDs is their amazing longevity. Reputable lighting manufacturers considered such drastic variations in light output and color quality to be premature failures.

Thanks to better materials, manufacturing, and circuit design, color shift has virtually disappeared from quality LED products in all categories. Always ask your lighting supplier where the LEDs are sourced. Be sure the LED chips and modules themselves are manufactured by a leading brand, not a low-cost knock-off.

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You must change out to new fixtures to accommodate LEDs.

LED retrofit lamps and retrofit kits come in a huge range of configurations and offer selections in light color (CCT) and light output (lumens). A retrofit lamp is usually the easiest solution, with retrofit kits involving some rewiring; both strategies preserve the existing light fixture. Quality products that provide a good thermal and optical fit offer reliable performance and longevity – part of the reason they can be so cost effective.

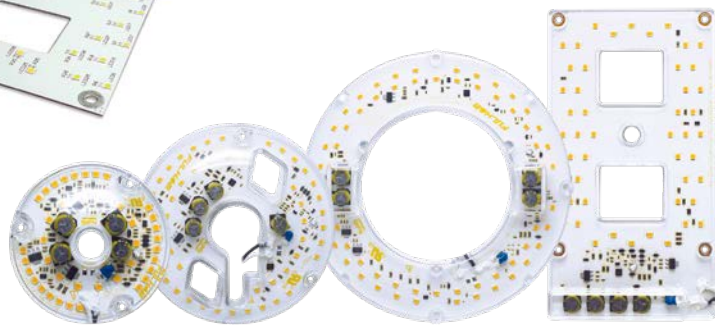
Changing out lighting fixtures will almost always have the higher costs in materials and likely twice the labor compared to lamps and kits. In addition, patching and repainting may be required if the new fixture’s footprint is a mismatch. Was there a significant or recent investment in the lighting fixtures? Will the additional downtime affect your business operations?

LED replacement lamps and retrofit kits can be integrated into your overall maintenance program; the luminaires’ appearance should be the same or even better (which is usually the case when kits using arrays are replacing CFL lamps). You’re already spending the money on the personnel and equipment to power down, access, and open the fixture. Why not “upgrade as you go”? This also lets occupants live with the new lighting strategy; evaluating the results before upgrading the entire system.

Common Retrofit Kit Configurations



DC Retrofit Kits
LED driver mounted on DC module.
High efficiency, flicker-free



Direct AC Retrofit Kits
LED module with integrated circuitry.
Low profile, easy to install



LED replacement lamps are the best solution.

The problem with LED replacement lamps is the power supply. LED replacement lamps carry their drivers inside. And when LED systems fail, the heat-sensitive electronics in the driver are often the to blame.

An LED lamp may fit inside the luminaire, but won't always work well with the existing ballast. Often ballasts must be removed or bypassed to accommodate replacement lamps. This drives up labor costs, and possibly materials and disposal costs. The LED replacement lamp is then running directly on mains power.

In most single-ended (screw-base and pin-base) replacement lamps, the driver is located behind the LED emitters near the socket and heat sink. In T8 replacement lamps and tubular retrofit kits, the power supply may have a better position, but is sealed inside the 1-inch tube. (Other T8 kits have remote drivers; again, higher installation costs.) Thermal management is particularly difficult in higher-output LED replacement lamps, as higher wattages mean more heat.

However, the potential energy savings remains attractive – 20 to 40 percent – in these higher-wattage applications. Think warehouses, big box retail, concourses, and arenas where T8, T5, compact fluorescent, and metal halide lighting are consuming a lot of energy. In highbay applications, the rental and operation of lifts or cherry pickers required to change light sources often justifies conversion to longer-lived LED. Here it is even more important to choose a quality product that will live up to expectations of both lighting quality and maintenance savings for a long, long time.

LED retrofit kits also come with a driver, but careful engineering of high bay products locates the electronics well away from the LED board's thermal management structures. In low- or medium-output retrofit kits (many replacing CFLs), the power supply can be located toward the front, allowing better thermal protection, but remain concealed behind a diffuser or other fixture element.

Asking the Right Questions

There's a saying: When all you have is hammer, all your problems look like nails. But every lighting retrofit project has its own set of requirements, so there is no one correct strategy for every retrofit.

Now that we've dispelled some common myths about LEDs, let's look at the smart questions to ask before committing to a particular strategy.

Questions to Ask When Choosing a Retrofit Strategy

- What exactly does the warranty cover in terms of performance?
- Are all the installation costs included: materials, disposal, patching and repainting, cleaning fixtures, etc.?
- Are the luminaires UL-listed? ENERGY STAR? DLC?
- Will the retrofit installation interfere with business operations?
- After installation, will illumination levels be suitable?
- Is the light quality as good or better? Will glare or color qualities hinder safety or productivity?
- Are the LEDs sourced from a reputable manufacturer?
- Are the products designed, installed, and operated to manage heat properly?
- Can rebates for certain products shorten the payback?
- Have all the pros and cons of multiple strategies been considered?

Inevitably, investing in the right upgrade to LED lighting will yield a reasonable payback and generate lasting returns. But commercial building owners must consider all the approaches to LED retrofits. Whether using replacement lamps, retrofit kits, or new luminaires, how you choose to tackle your lighting retrofit, the best strategy is the one that delivers long-term savings with quality lighting.

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