

DEBUNKING THE LPW MYTH

Why Lumens Per Watt (LPW) is only part of the story when it comes to industrial lighting & how to assess the REAL markers of industrial LED fixture quality

As adoption of industrial LED lighting technology grows, so too does the competition among manufacturers to differentiate their products. In an increasingly crowded marketplace, laying claim to the highest performance metrics can certainly grab buyers' attention, especially as the technology continues to evolve quickly.

Unfortunately, some manufacturers are hanging their hats on performance claims that don't tell the whole story.

Lumens per watt (LPW) has become the new battleground differentiator in industrial LED sales and specifications. Manufacturers claiming to offer the highest LPW ratings are working hard to convince buyers that LPW should be a primary factor in the purchase decision. However, the truth is, manufacturers often make major sacrifices in other areas of fixture design and performance in order to achieve the highest possible LPW. That means buyers can easily be misled into purchasing fixtures based on a false pretense, only to be left with fixtures that fail to meet their expectations.

Here, we'll dive into why LPW isn't the only thing that matters and what other key performance factors industrial LED lighting buyers should consider when making purchase decisions.

What is LPW?

LED lighting has long been considered the most efficient lighting source on the market. Its ability to produce high lumen output while consuming very little energy compared to conventional HID sources has made LED lighting a popular choice for both new construction and retrofit applications.

This output-to-input ratio is measured in lumens per watt—the amount of visible light produced per watt consumed. As such, this has become the marker of LED luminous efficiency, with some products surpassing the 200 LPW barrier (by comparison, a 60-watt incandescent bulb produces just over 14 LPW).

Since one of the clear advantages of LED lighting is its ability to lower energy consumption, it is therefore easy to see how high LPW could become a product differentiator. Sellers suggest, and buyers assume, that high LPW translates to a more efficient, and therefore more economical, fixture.

But, that's not all there is to it.



Some LED fixtures can surpass the 200 LPW barrier



A 60-watt incandescent bulb produces just over 14 LPW

The High LPW Trade-off



What many manufacturers don't mention is that, in order to drive LPW performance higher, they often make sacrifices in other key fixture performance metrics.

1

Optical Control & Comfort

In an effort to amplify LPW and eliminate any obstacles that can “steal” from lumen output, some manufacturers omit secondary optics and/or windows, commonly referred to as lenses. This creates two problems: it exposes the LEDs to the risk of damage from environmental hazards, and it sacrifices optical control.

When unprotected, Volatile Organic Compounds (VOCs) and other airborne contaminants such as sulfur can attack LEDs and other electronic components and cause premature failure. In addition, poor thermal design and overheated LEDs can cause phosphor bleed and other issues such as lumen depreciation and color shifting.

With no optics in place to direct the light where it is needed, the light is sprayed at every angle, including onto areas that don't require illumination. Wasted light means wasted energy and wasted money, negating the purported efficiency benefits of high LPW fixtures.

By pushing the LPW higher, often by eliminating secondary optics, high LPW fixtures often become “glare bombs” that are unpleasant to the eye and difficult to work under. In fact, according to a study of high-output LED fixtures conducted by the U.S. Department of Energy¹, researchers concluded, “it's not surprising that glare was the greatest complaint from the observers....Only two of the luminaires received acceptable ratings for visual comfort and overall quality.”

This glare can cause workers to struggle performing tasks, hindering productivity. While the fixture may be more efficient, its glare impact can diminish overall facility efficiency.

2

Color Uniformity & Color Rendering

Light emission color and color rendering are not only perceptual markers, but also measurable indicators. The color of light emitted from a fixture is measured in degrees Kelvin as correlated color temperature (CCT)—for example, a warm white bulb, like you might find in a table lamp at home, has a CCT of about 2700K, while a cool white LED measures about 5000K. Similarly, how the light makes colors appear to the human eye is measured in CRI or color rendering index. Natural daylight has a CRI of 100, while a typical fluorescent light has a CRI of around 50.

In order to boost LPW efficiency, some manufacturers will amplify CCT and lower CRI. However, this often results in glare, eyestrain and discomfort, and poor color rendering, which could cause workers to misperceive color-coded warning signs, wiring colors and other indicators that rely on color for communication. Again, the higher LPW of these fixtures comes at the cost of visual comfort and safety.

3

Fixture Size & Cost

In their bid to maximize LPW, many manufacturers instead will underdrive the diodes, perhaps cutting amperage in half. The problem here is they're then forced to add more LEDs to the fixture to achieve the same lumen output.

That means what is saved in energy consumption is gained in overall fixture size, weight and cost. The luminaire might run more efficiently, but it's too large to fit in the allotted space, too heavy for electricians to handle and costs too much to make it a worthwhile investment.

All of these sacrifices can result in a fixture predisposed to underperform in every other metric besides LPW. Rather than offer significant cost savings, an ultra-high LPW fixture is instead likely to cost more to operate, require more frequent replacement, increase the total cost of ownership, and cause lower overall customer satisfaction.

The result is diminishing returns: squeezing an extra 5 LPW out of a fixture simply isn't worth it for only \$0.20 energy savings, especially when it comes with a host of other setbacks, sacrifices and headaches.



The Metrics that Matter

Long-Term Survivability of the Entire Luminaire

Rather than being lured into the LPW hype, industrial LED lighting buyers must consider a multitude of factors when evaluating the quality and performance of these high-efficiency fixtures. Just like many other purchase decisions, industrial luminaires are a complete system and must be evaluated based on the entire fixture's performance, rather than a single metric. You wouldn't buy a new car based solely on its fuel economy; you'd also consider its safety rating, visual appeal, capacity, maintenance needs and cost.

An LED fixture is no different. And, when choosing an LED lighting partner, it's important to consider not only the overall performance of the product, but also the supplier's engineering, construction and testing standards prior to making a decision. The more rigorous, the better.

That's where the Dialight Difference really shines. Our products are designed and engineered to deliver long-lasting performance and customer satisfaction, even in the toughest environments, and most carry our Industry-leading 10 year warranty. This guarantees a high quality, durable fixture that you can count on.

The Dialight Industrial LED Trifecta

At Dialight, our engineers design superior products that deliver on these three hallmarks, all of which make a far bigger impact on total cost of ownership and satisfaction than LPW alone.

1. Long Fixture Lifespan

One of the primary advantages of a high-performance industrial LED fixture is that they can essentially mean the end of lighting maintenance. By eliminating bulb changes completely, high-quality LED fixtures also eliminate the hassle, cost and safety risks, as well as the need to purchase and store replacement bulbs, ballasts or complete fixtures.

But not all LED fixtures are built for the same long-life performance. Many suppliers use cheap LEDs and off-the-shelf power supplies that aren't designed for industrial-grade lighting applications, which means they're often a weak link causing premature fixture failure. Thermal management is also an issue: in order to increase light output, some manufacturers overdrive the LEDs and fail to optimize thermal management with appropriate heatsinking technology. The excessive heat can dramatically shorten fixture life.

Dialight makes long-life performance a top priority. Each of our LED fixtures includes our custom-designed power supplies that are optimized for industrial lighting applications to ensure reliability even in harsh operating conditions. Our thermal optimization process is also a key differentiator. We use state-of-the-art technology to ensure our fixtures run cooler and longer. Finally, the entire Dialight fixture assembly is designed specifically for longevity and survivability in industrial environments. This further adds value by reducing or eliminating the need for costly and burdensome maintenance over the fixture lifespan. Plus, with our 10-year warranty, you get peace of mind that your investment is protected over the long haul.



Buyers Guide

In addition to energy savings, also consider the potential savings afforded by reducing or eliminating lighting maintenance over the lifetime of the fixture. Invest in fixtures that deliver the reliable, long-life performance (10 years or 100,000 hours) rather than cheap or poorly designed fixtures that will require frequent, ongoing maintenance. The majority of Dialight's industrial fixtures offer our industry-leading 10-year warranty and were designed specifically to reduce or eliminate the burden and expense of ongoing maintenance or fixture replacement.

The Metrics that Matter

2. Optical Control and Light Quality

One of the inherent benefits of LED lighting is that it is the most efficient white light on the market, offering uniform, near-daylight illumination with less energy consumption and lower cost compared to conventional fixtures. But, many companies make tradeoffs in light efficacy (the amount of usable light at the work surface), comfort and quality in order to drive up LPW.

Manufacturers that eliminate the secondary optics lens in order to drive LPW higher are sacrificing light efficacy, visual comfort and overall efficiency in the process. If much of the light is unusable or wasted (e.g. sprayed all over the walls) because the optics are eliminated, that detracts from fixture efficiency. Others sacrifice color quality and comfort, increasing glare, eyestrain and discomfort.

Per Architecture + Construction, “While an LED has a greater efficacy than most light sources, poor management of the light by the fixture or the use of low-quality components will quickly erode the efficiency of even an LED fixture.”

A Department of Energy study proved this notion: the product with the highest observer rating also had the lowest tested efficacy (136 LPW), which underscores the importance of visual comfort in the purchase decision. While the highest efficacy product (approximately 200 LPW) had a luminance of over 400,000 cd/m², it was rated 6 out of 7 by observers. Meanwhile, the lowest efficacy product with a diffuser and just 40,000 cd/m² ranked 1 out of 7.



Guidance from Architecture + Construction Continuing Education Center² confirms this, advising that “fixture efficiency, and fixture efficacy, although important, cannot be the only consideration when selecting the best product,” and that bare fixtures, while transmitting 100% of their light into the space, “are unable to meet other important performance goals, such as appropriate light distribution and glare control.”

Every Dialight fixture includes carefully curated, high-quality LEDs and leverages advanced optics to direct light where it is needed without sacrificing visual comfort. By using precision optics, in many cases we can actually reduce the total amount of fixtures needed to light a space, which can translate to significant installation and operational cost savings.



Buyers Guide

LED fixtures are already extremely energy efficient. Don't sacrifice light efficacy, comfort or color in the name of high LPW. Choose a fixture that delivers the value proposition of LED technology with more comfortable, usable light. This will not only help support worker comfort and productivity, but it may also substantially reduce your cost for the project by lowering the number of fixtures needed.



The Metrics that Matter

3. Optimized Efficiency and Enhanced Savings

Of course, cost should always be a consideration in any buying decision. But many buyers may not realize that a high LPW has an impact on fixture cost. When manufacturers underdrive the LEDs to maximize LPW, and therefore must add more LEDs to the fixture to compensate, the additional size and weight of the luminaire drive up purchase price.

Some will attempt to offset the added cost by choosing cheaper LEDs, which trades off reliability and lumen maintenance. To keep the size and weight small while accommodating more LEDs, some will forego the secondary optics, which results in wasted light and energy. The bid for high LPW creates a perpetual Catch-22.

The goal should be to maintain high LPW (in DLC-qualifying range) while increasing light quality through advanced optics, and to achieve high reliability with minimum environmental impact by choosing durable luminaire materials over cheap, throwaway components.

According to guidance from Architecture + Construction, “As a general rule, companies with a demonstrated dedication to quality and customer support and a concern for the longevity of their product solutions will not create subpar, short-term products that provide substandard performance, fail prematurely, and leave clients in a lurch, without components available to replace or upgrade the installed fixture.”³

Dialight designs our fixtures to operate with this in mind. Our goal is to ensure the highest customer satisfaction with the highest fixture efficiency while balancing performance, longevity, reliability and ROI.



Buyers Guide

Choose a product with a DLC standard or DLC premium LPW rating that qualifies for enhanced energy rebates, but also offers the optics, comfort and lumen maintenance that ensures light efficacy and customer satisfaction over the long haul. For even greater savings, consider advanced lighting controls that can help reduce energy consumption by dimming, grouping or scheduling lighting based around the needs of a facility.

There's More to a Luminaire than LPW

While efficiency is certainly a factor worthy of consideration in the industrial LED buying decision, it should not be the only or even primary deciding factor.

An LED luminaire is an entire system of interdependent components, and must be evaluated as such. Manufacturers who sacrifice other areas of fixture performance are selling customers short and may be distracting buyers from their products' subpar performance in other key areas that contribute to ROI and customer satisfaction.

Rather than base a decision around high LPW, choose a fixture that delivers the best quality and most comfortable light where it's needed for the longest possible time at a reasonable cost.

At Dialight, the experts in harsh and hazardous industrial LED lighting, we optimize every detail to address challenging industrial environments, providing you with superior performance and the best possible total cost of ownership over the lifespan of the fixture.