Understanding the ROI of LED Lighting

Quality lighting generates revenue and supports the bottom line for organizational success

There have been major advances in LED lighting technology over the past few years; but while these light bulbs (or lamps) tend to offer many benefits, the initial investment sometimes doesn’t seem attractive and people are hesitant to make the switch from incandescent and halogen to LED. Therefore, it’s important to look at the long-term investment and other factors that go into lighting a facility. This white paper is designed to help you calculate the return on investment (ROI) for a LED lighting project by accounting for all the factors that go into quality lighting.

LED LIGHTING CREATES INTENSITY AND UNIFORMITY

Visual quality is about combining visual comfort with efficiency, which is a person’s ability to perform tasks involving vision. Visual comfort is related to the ease of seeing the task. This part of lighting quality is subjective because it’s based on perceptions. However, one of the main reasons why LEDs are good for lighting quality is because of the intensity of illumination on the areas of interest and the uniformity of illumination.

Unlike incandescent lamps, LEDs are directional in nature and when combined with a unique optic, LEDs can create a specified beam spread; so you can create illumination in specific areas of interest. The phosphor of LEDs also helps with maintaining color consistency between options. Color is responsible for the experience people get from vision. An incandescent lamp is a simple design with a tungsten filament, and it produces the same type of light with the same characteristics. You can get many types of colors and create many different experiences with LED lighting.

Look at the Color Rendering Index (CRI), which is a system derived from visual experiments. To achieve a good CRI, you must use a high quality phosphor. To see if you are comparing apples to apples with LED lighting,
you need to look at the CRI. Reputable manufacturers want a CRI that is greater than 80.

To achieve a quality environment of color rendition and quality light, the R9 value (or saturated red) is an important value to look at because it’s where LEDs are the weakest. For instance, a negative R9 value is seen in cheaper manufactured LED lamps. It is also important to note that CRI is different than CCT.

To understand Correlated Color Temperature (CCT) for a lamp, you need to understand that there can be a number of color combinations used to create white light. Color is defined by degrees measured in Kelvin (K). Traditional ranges of CCT within LED lighting go from 2400K to 5000K. Traditional incandescent and halogen lamps can only produce at 3000K CCT.

Furthermore, a good LED driver (or the power supply of the lamp) gives long lamp life. LEDs need to be driven with constant direct current (DC) power supply for to achieve their long life. You’ll also want to invest in an LED lamp that utilizes top tier LED chips, which come with a higher cost. However, while the array of chips affects the cost of a LED, it provides stability against electric current variations.

Illumination intensity is typically measured in lux or footcandles, which measures the luminous flux per unit area. One lux is equal to one lumen per square meter. While high illumination levels may increase efficiency, it can also cause discomfort to the user.

There are many factors that go into appropriate illumination levels, so it’s important to get quality LED lamps to help you meet those levels and create contentment. Otherwise, it could affect a facility’s worker performance and guest satisfaction, thus decreasing your ability to achieve good ROI. For instance, say a hotel doesn’t have good light quality, it could affect guest loyalty. The same can be true for a restaurant, because there is actually a correlation with quality lighting and how it relates to expected food costs.

## CALCULATIONS FOR ROI WITH LIGHTING

As you can see, there are many things to consider for gaining ROI with LED lighting, such as guest satisfaction and worker productivity. If you want to calculate the ROI for installing LED lamps in your lighting project, we can start by breaking it down into categories—guest satisfaction, workforce engagement, maintenance savings and finally energy savings.

### #1 – Guest Satisfaction

The National Business Research Institute indicates that when a company retains five percent of its customers, profits can increase by 25 to 125 percent.\(^1\) Let’s look at the amount of ROI when there’s guest loyalty in a hotel.

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The revenue per year for a guest is $10,764 when booking a $299 hotel room three times a year. If that guest was a customer for 10 years, he or she would generate $107,640 in lifetime revenue. Now imagine if there are referrals, that guest could generate $10,764 per referral.

#2 – Workforce Engagement

Employee engagement has an economic impact on a facility. Research conducted by Gallup stated poor management and disengagement are costing companies money. Employee engagement is clearly tied to the bottom line of organizational success. According to the research, employee engagement affects the following:

- Productivity
- Customer satisfaction
- Attendance
- Turnover
- Safety incidents

Imagine how you can achieve the bottom line by providing an environment with visual comfort and efficiency. Research shows that companies with higher than average employee engagement receive 21 percent more in productivity. Let’s look at the ROI for employee engagement for a company with 500 employees. When focusing on workforce engagement, this company saved $5,017,982.³

#3 – Maintenance and Energy Savings

LED lamps are relatively small, solid and very efficient. LEDs are known to bring more value because they last longer; they last up to 10 times longer than compact fluorescents. They are durable because they don’t have filament and can’t be broken like an incandescent lamp.

Most importantly though, LEDs are cost effective because of energy savings and maintenance cost. Because they last longer, maintenance and labor shouldn’t be an issue. This should be a big concern for those warehouse lighting projects because replacing a lamp is no small feat. It can take many workers with cherry pickers and U-Haul trucks.

LEDs use 87 percent less energy than halogen lamps and have a 25,000 to 50,000 hour lifespan. Say your facility leaves its lamps on for 24 hours per day, lamps won’t have to be replaced for almost six years. The following are items to consider when measuring ROI:

- Amount of hours lights are on each day
- Number of days per week lights are in use
- Number of existing and new fixtures and lamps
- Wattage amount of existing and new lamps
- Current KWh rate
- Estimated cost of yearly maintenance
- Installation cost for lighting

Let’s say you have a hotel with 300 rooms, and you’re considering taking out the MR16 halogen 50 watt lamp and replacing it with the 7 watt LED lamp. If the cost per kWh is $.12 and the labor cost is $.39 per lamp installation, then the total kWh saved would

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be 180,806; and that’s if you needed 480 lamps, had a 43 watt reduction and used those 24 hours a day throughout the year. As a result, you would get an annual savings of $22,696 in energy for the hotel. See example at top left.

Another example is when TCP donated $17,000 worth of LED lamps to Lied Lodge & Conference Center’s renovation project for supporting conservation mission, which is to inspire people to plant, nurture and celebrate trees. After looking at its previous lighting system, the lodge and conference center is expected to save an estimated $25,000 annually in energy consumption.

The donation gave the lodge and conference center a longer-lasting, energy efficient light source, because it has reduced wattages after switching from incandescent lamps to TCP’s LED A-lamps and LED decorative lamps. Keep in mind that efficiency is measured by comparing the number of lumens per watt. The switch will not only help the lodge and conference center to save energy, but it will also save on overall maintenance costs due to the long life of the lamps.

If you want to compare the different types of lamp wattage to lumen, see the chart below for finding energy efficient lamps.

As you can see, there are many factors to consider when installing LED lamps. Therefore, it should be easy to demonstrate the ROI just by looking at the type of environment LEDs create for customers and workers, the type of savings on an energy bill and the amount of savings for maintenance and labor. Each year, as LEDs are dropping in cost and technology develops, making that switch from incandescent to LED lamps will become the obvious choice.

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