

LED Retro Fit...the next generation in energy efficiency

Converting existing 12v systems to LED

Benefits and Features of Retro Fitting with LED-

Between 1960 and 1990, landscape lighting was still in the “infancy” stages and a majority of landscape projects didn’t include much lighting. Most of the designs were basic “Malibu” type or common auto lamp fixtures. Not much thought was given to fixture and lighting design.

The most dramatic change was in the early 1990’s with the introduction of multi tap transformers, more variety of lamp choices and better fixture materials and design. This allowed the landscape lighting industry to be one of the fastest growing segments in home improvement.

With larger projects came obstacles - voltage loss, complicated wire runs and over voltage with the options of higher voltage transformers. Installing less than 11v would cause inconsistent and dim lighting and installing more than 12 volts will cause premature lamp failure.

Landscape lighting required a specialized knowledge of electricity and the need for exact testing with voltage meters. Also, transformers and cable became a very expensive part of the lighting project.

Today, with the advent of new LED technology, the industry now has more options with less complication. Not only does LED allow for easier and quicker design layouts, energy costs, (which have risen dramatically), are also greatly reduced.

Why designing and retro-fitting with Led makes sense-

- Easier Installation - LEDs have a voltage range of 9v to 15v, which allow for a greater “sweet spot” on each branch circuit. Rather than utilizing 11.4 to 11.7 with incandescent/halogen, LEDs allow for a much more forgiving voltage range.
- Less Wattage - Lower watts allow for less cable and smaller size transformers. This greatly offsets the cost of using LED’s.
- Back to basics - With lower wattage, wiring methods can be simplified. Going back to the “daisy” chain is now common on many of LED installations. This will save on the cost of cable as well as the cost of installation.
- Longer Life – LED’s last approx. 30,000 hours compared to 3,000 hours of incandescent lamps.
- Less Worry Regarding Premature Lamp Failure - In the past, lamp burn out would cause the rest of the circuit branch to be affected with higher voltage. This is referred to as “the popcorn effect” when one light went out, the rest of the lights would soon follow as voltage increased on the branch circuit.
- Greater Color Options – LED’s offer several versions of white (deep warm, warm, neutral and cool) as well as brilliant colors and RGB color changing options.

What are LEDs?

Simply stated, LED’s are solid state PC circuit boards. Unlike conventional lamps (bulbs), LED’s do not have a filament. LED’s utilizing semi conductor “chips or diodes” that light up with energized electrons. LED’s require drivers that convert 110v current to 12v AC and DC current. Today, most of these components are integrated into the LED fixture or the LED retro fit lamp.

12v LED's have similar properties to their halogen counterparts. Basically, watts are watts and 12v products require 12v transformers. So, calculating voltage drop is the same formula only with fewer watts.

LED Transformers - Part of the confusion of LED power supplies is semantics. AC power supplies are referred to as transformers whereas DC power supplies are referred to as drivers. Both types have dimmable options. Please consult with the manufacturer for compatible power supplies and dimming systems.

What is the difference between AC and DC current?

AC (alternating current) is a conventional and standard form of electricity in the United States. Most lighting products used in residential and commercial applications are AC.

AC voltage typically ranges from 12v and 110v- 277v.

DC (direct current) is common in Europe, cars, RV and the Marine industry. DC is also used in battery technology. 12v DC lamps require a 12v DC power supply or driver. This gets a bit complicated as there are several types of DC drivers - electronic, magnetic, constant current and constant voltage. When using DC products you will need to find out what power supplies are compatible with the system you choose. DC voltage typically ranges from 6v, 12v and 24v (not including battery types).

Benefits of LEDs

Led is the most efficient light source available - On average, LEDs are rated at 50,000 hours. Standards allow for a 30% drop in efficiency over time, so most LED manufacturers state 30,000 hours.

Led lamps operate with virtually no heat or affect to room temperature - No heat means less corrosion and socket defects.

Led lamps offer tremendous energy savings – LED's are 7-10 times more efficient and can pay for themselves over the life of the lamp.

Led lamps are shock and vibration resistant - Many incandescent and fluorescent lamps are susceptible to shock and ground movement. LED's do not have a filament to break from the circuit.

Led lamps offer vibrant color options - LED technology can offer a brilliant pallet of colors as the diodes and circuitry have more options than incandescent technology.

Led lamps are the basis for new solar technology - Ultimately; solar power is the end game as this will have the greatest impact on energy consumption. The first step to efficiency is to reduce the power requirement which will mean fewer panels on the property.

LED Today-

LED's are now available in most lamp bases and conventional sizes. Also, most 12v LED's are now compatible with standard transformers, which mean they can be integrated and designed with conventional incandescent and halogen products.

Learning the Lingo-

Understanding lighting fundamentals is critical to successful lighting design.

Here are the key lighting terms and concepts:

- **Efficacy** - Energy shown in lumens per watt (lpw)
- **Lumen** - Intl Measurement for visible, spherical light - more accurate than watts.
- **LPW** - Lumens per watt- Lumens output divided by consumed watts
- **Foot Candles** - Measures light on a surface
- **Foot Candle** - One foot candle equals one lumen per sq. foot
- **Candle Power** - Measure light in a specific direction
- **Lux** - European - Shown as 10x Foot Candle
- **Kelvin Temperatures** - Colors of the spectrum
- **Watts** - Measures heat; not light output
- **Lumen Maintenance/ Dep.** - the degree in which LPW is maintained
- **CRI** - Color Rendering Index (1-100). Intl for light quality
- **Lamp Delineation** - MR, R, PAR, A, E12, E27, T, G and GU
- **Watts to Lumens** - Approx. 10-14 x factor (avg.)
- **LED Measurements** - In the past LED's were point source and not spherical in design. Today we can measure LPW (L/W), Lumens and Foot candles (light falling on a surface).

More about Lumens-

Lumens are the most important measurement when measuring actual light. Every one of us was taught to look at "watts" to measure light output. Watts actually measure heat and will vary by manufacturer. Lumens are the new watts, as they are defined and measureable. It is important to note that tighter beam angles and higher Kelvin temperatures have higher Kelvin temperatures or brighter light.

More about color or Kelvin-

Selecting the right color lamp is critical to a perfectly designed lighting system. The most common Kelvin is 3000k or closest to halogen. The most common Kelvin colors are:

- 2700k-3000k = Very Warm Incandescent
- 3000k = Warm White or Halogen
- 4100k = Neutral / Cool White
- 5000-6000k = Daylight

Note:

Typical Residential: 2700k - 3000k

Typical Commercial: 4100- 5000k

Lamp Comparison	Incandescent	CFL	LED
Lumens Per Watt	10-15 LPW	40-60 LPW	80-100-LPW
Lamp Life Rating in Hours	3000 avg.	10,000 avg.	30,000 avg.
Compare to Incandescent		3 x	7 x
Hazardous Material	Limited	Mercury	Limited

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LED's are available in two ways - retro fit and integrated fixtures-

LED Retro Fit - With new technology, LED retro fit lamps are the most cost effective method of using LED's. The main consideration is that the fixture and the retro fit lamps are compatible. The fixture should be rain tight and have "breathing room" so that air can circulate inside the fixture chamber. LED's perform best in dry and open areas. The other benefit is that retro fit lamps can be updated as LED's continue to improve.

Integrated LED Fixtures - The main benefit to integrated fixtures is that the housing is designed for a specific LED chip. Technically, the fixture and LED components are designed as a system. The drawbacks are that these types of fixtures are generally a lot more expensive. As LED's are constantly improving, it can render the integrated fixture obsolete in a short period of time. Also, replacing and updating components are not as practical as a retro fit lamp system.

In summary – LED's are the future. Just like cell phones and communication devices, the technology is quickly and dramatically improving, while the costs continue to go down. New products are sleeker, more efficient and offer a greater range of features.

We recommend working with high quality and knowledgeable LED suppliers (beware of the internet and discount re-sellers as this is where the obsolete LED product usually ends up). Start with LED retro fit products and continue to evaluate the technology and see which products work best for you.

Calculating Energy Costs - The basic formula is as follows:

Total watts consumed x hours used per day x .12 (average KWH utility rate).

Divide by 1000 and multiply by 365 (days in a year).

This will show the annual cost of electricity for the fixtures used.

About the author- Bruce Dennis is a third generation lighting designer. Bruce has been in the lighting business since his early teens and has seen the advancements in energy efficient lighting first hand. Bruce was one of the first lighting designers to introduce LED back in the mid 1990's, long before most others in the lighting industry. You can reach Bruce at Lightcraft Outdoor, Chatsworth, and CA. at brucedennis@sbcglobal.net.

LED 12v Retro Fit Lamps



LED MR16
3W, 5W and 7W
12V, AC/DC



LED T3 BI PIN
2W, 4W
12V, AC/DC



LED SC BAYONET
2W, 4W
12V, AC/DC



LED T5 WEDGE
2W
12V, AC/DC



LED MR11
2W
12V, AC/DC



LED A MEDIUM
2W, CLEAR
12V AC/DC



LED CANDLE
2W, CLEAR
12V AC/DC



LED PAR 36
6W, 9W
12V, AC/DC