

LED Lighting Technology

Advancements in technology offer energy savings, limit light pollution and reduce maintenance costs

By Gail Greet Hannah for Landscape Forms

LED lighting technology continues to make rapid advances in energy efficiency, color and color rendering. As they continue to be developed and refined, it is clear that LED's are poised to make significant contributions to energy savings, carbon footprint reductions and environmental initiatives targeted at limiting light pollution and enhancing human health.

Landscape Forms is collaborating with award-winning lighting consultants, Clanton & Associates, to pursue innovative solutions for new lighting products that use LED's as the light source. Our commitment to LED technology is consistent with our goal to address the needs of our customers while becoming a more environmentally sustainable company.

WHY LED?

The U.S. Department of Energy sums it up in its announcement of major investments in Solid-State lighting research and development:

"...Solid-state lighting (which includes LED) has the potential to more than double the efficiency of lighting systems, significantly reduce our carbon footprint and transform the built environment...(It is part of) a comprehensive strategy to meet our future energy needs in a way that encourages economic growth, enhances energy security and addresses the serious challenge of global climate change."

WHAT'S AN LED?

An LED (Light Emitting Diode) is a diode consisting of semi-conducting material through which current flows from one side (p-anode) to the other (n-cathode), releasing energy in the form of a photon. LED's are very small and can be readily printed onto circuit boards. The efficacy (light output per unit of power input) of LED's has increased exponentially since the first practical application of visible-spectrum LED's in the early 1960's. And the range of available color has dramatically increased.

LED's can get their power from conventional wiring or from solar power. Landscape Forms provides LED lighting of both types.

LANDSCAPE FORMS WIRED AND SOLAR-POWERED LED SOLUTIONS

Wired-in LED lighting is offered in marker/wayfinding products such as bollards as well as in pedestrian, pathway and area lighting where measurable illumination is required. These light fixtures draw their power from the grid like other conventional lights but, unlike other lights, offer the exceptional efficiency, longevity and other advantages of LED's listed below. They require access to electrical

infrastructure – a condition typically present in a majority of the outdoor environments for which lighting products are specified. [Paladin](#), [Sentinel](#), [Annapolis](#) and [Stop](#) bollards offer options featuring wired-in LED lighting.

Solar-powered LED lighting is offered in [Annapolis](#) bollards, [Connect](#) and [Kaleidoscope](#) transit shelters. The LED luminaires in these products draw their power from photovoltaic cells and batteries that absorb and store energy from the sun. We call these “Smart Bollards” and “Smart Shelters” to describe their use of solar “Smart Technology.”

Solar-powered LED lighting is an excellent solution for remote areas (on the ocean, in the desert) where access to the grid is not available; in situations where installing wiring would require a major investment; and where emergency conditions and security concerns require uninterrupted service in the event of grid failure. In a blackout, solar-powered LED lighting continues to perform. Replaceable storage batteries are long lived and LED’s can last up to 15 years.

All LED’s, wired and solar-powered, have the following advantages:

Energy Efficiency

LED’s, are extremely energy efficient. Today’s high-performance LED’s produce 100+ lumens per watt (100+ lm/W) in comparison to @15 lm/W for conventional 60-100 watt incandescent bulbs.

Long Life

LED’s have a lifespan of 60,000 to 100,000 + hours. (The typical incandescent bulb lasts from 1,000 to 3,000 hours and the typical fluorescent from 10,000 to 15,000 hours.)

Light Pollution and Trespass

LED’s provide focused light with no waste or “spill.” Due to the directional nature of LED light, it is easier to put light where it is needed and avoid light pollution and trespass.

Longevity and Reduced Maintenance

LED’s dim over time, they do not abruptly burn out, allowing scheduled rather than emergency replacement. As LED’s do not have catastrophic failure, LED lifespan is defined as 70% of original output. These facts, combined with LED’s lifespan translates into reduced maintenance costs.

On-Off/Cycling

LED’s light up with no “re-strike” time; they do not burn out quickly when cycled frequently like fluorescents; and do not require a long time to re-start like HID lamps.

Damage and Vibration Resistance

LED’s are difficult to damage due to their solid-state construction, and contain no filament or glass.

Non-Toxic

As LED’s are solid state, they emit no gasses and unlike fluorescent lights, do not contain mercury.

LUMINAIRE MAINTENANCE

LED lighting contains multiple LED’s organized into arrays. The number and organization of LED’s in a package, the efficiency of the “driver” (transformer) that provides the energy, and the characteristics of the fixture determine the amount and quality of illumination. LED’s generate heat and successful “heat sinking” (dissipation of heat build-up) prolongs longevity. The design and engineering of the luminaire are critical to LED function and long life. These are areas where Landscape Forms excels.

Our engineering team has become very sophisticated in its understanding of LED technology and applications. It is continuously testing new products and designing elements that take advantage of new technology to optimize the lighting in our products. Landscape Forms LED lighting products feature light packages and fixtures that provide the appropriate amount of light for the application, offer excellent performance and longevity, embody the quality design our customers expect, and take an innovative approach to the color of LED lights used in outdoor environments.

COLOR AND COLOR RENDERING

The color of the light emitted by an LED is based on the materials used to make the diode and on the phosphor coating applied to it. Early LED's were in the red spectrum, the development of blue-spectrum LED's enabled the generation of bright blue-white illumination, and today improved phosphor coatings make it possible to achieve greater finesse in color.

Landscape Forms, with the expertise of lighting consultants who are specialists in environmentally sensitive lighting, is pioneering the use of white LED's for outdoor applications. While other manufacturers use cool blue-white LED's (6000° K+), we make a strong recommendation for warm white LED's (3700°K) that mimic nature and provide illumination similar to moonlight, supporting the natural melatonin/serotonin cycle that is essential for human health.

Color rendering, the ability of a light source to accurately portray color, is also crucial to general illumination products because not all LED's are created equal. We are focusing on solutions that merge color, color rendering, illumination levels and contrast to create the best possible vision experience.

LUMENS AND LIGHT POLLUTION

Landscape Forms LED lighting products are designed for either marker/wayfinding or general illumination. Marker/wayfinding products are not meant to light paths or fully illuminate outdoor structures. They supply light in a low lumen range, providing sufficient glow to accomplish their purpose, and do not produce light "trespass." General illumination products for pedestrian, pathway and area lighting take advantage of LED's directional nature to place light where it is needed and not waste energy where it is not needed, as is the case with unwanted light pollution.

Bright white light is typically specified for settings like stadiums and gas stations where high brightness is desired. But very bright lights have three major drawbacks. Even though adjacent areas may be well lit, they will seem dim by comparison. This often sets off a vicious cycle in which surrounding areas respond by over illuminating, causing more light pollution and more wasted energy. After exposure to an over-illuminated area, the eyes require a long time to adapt to normal light (you could be driving blind for two minutes after existing a brightly-lit gas station), and the uniformity of bright white light can be blinding (contrast is better for peripheral detection vision.)

In the past year the US Government has become involved in setting standards and testing protocols for chromaticity (color) and lumens in lighting products, areas in which truth in advertising has been questionable. These standards will level the playing field among manufacturers, provide greater customer confidence, and, hopefully, discourage a tendency to over-light outdoor environments.

We now have viable alternatives for addressing critical lighting issues. Taking advantage of them will require overcoming flawed assumptions and laying aside outdated practices. Landscape Forms LED lighting initiatives have taken us full circle, from the quest for energy efficiency to the search for solutions that support the well being of people and the planet. We have made progress. And this is just the beginning.