LED failures of public lighting: factors influencing the growing global trend of faults

You may have recently seen articles or heard the horror stories of great failures as 20,000 luminaires light emitting diodes (LED) in Detroit are failing or100,000 lights in Mexico blinking like Christmas trees after being installed for just a few years. WHATS the problem? Is the quality of LED luminaire's an electrical, infrastructure or power quality problem? The simplest answer is a combination of all three factors.

Over the past decade, LED lights have become a commodity. Municipalities and utilities issue RFP tenders for public lighting programs based on quality specifications. But, by and large, they ultimately are making decisions based on price. In the rush to compete in these applications, LED manufacturers are pushed to find cheaper and cheaper components to earn the projects. However, it is still expected that the manufacturer meets the specification requirements and also provide guarantees for 10+ years. Most reputable manufacturers submit their products to rigorous testing and reports obtained by external laboratories to verify quality of its products. With the best intentions, they put their products on the market with the confidence that their LED lights perform without problems for 15 to 20 years.

Most reputable manufacturers design their products with the highest standards of quality and use. Unfortunately, poor maintenance of electrical grids and problems of power quality can cause catastrophic damage to the luminaire.

Distribution lines that provide power to the luminaires were installed to manage lights from a different era. In general, they were designed to feed high pressure sodium (HPS) luminaires, not the current LED configurations. LED luminaires are essentially mini-computers with sensitive electronic components that are susceptible to power fluctuations deviating from the rated voltage.

Upgrading the distribution network can be challenging from a design perspective, cost and duration.

The common practice has been to require LED manufacturers to provide surge protectors inside their luminaries to protect against high voltage events, such as lightning. Overvoltage events are analogous to a heart attack. They can kill quickly. When the voltage rises above the nominal clamping voltage level, the surge protector suppresses excessive tension to avoid causing damage. Specifically, internal components called metal oxide varistors (MOVs) absorb excess voltage and divert to the ground wire, preventing it from reaching the connected equipment. When connected in series, surge protectors continue to absorb energy in an overload and divert the extra voltage to earth until they finally reach their classification end of life, at which point it will fail the overload protector and open circuit. This will prevent the flow of all power to the LED driver luminaire. The surge protector is a consumable device, such as your car brakes. It is much more economical to change the surge protector than to replace the entire LED luminaire.

However, surge protectors do NOT protect against under voltage (sag) or over voltage (swell) events. Sag and Swell events are analogous to cancer, they kill slowly over many years. Under voltage (SAG) events occur when the average voltage of a three-phase power system drops below intended levels and is sometimes referred to as a brown-out. Electro-mechanical devices are designed to be operated at very specific voltage levels. If these devices are allowed to operate at reduced voltage levels they will draw higher currents. The increase in

current causes increased heat which can damage sensitive components in LED drivers causing them to fail prematurely. Often times when this happens, component failure occurs causing LED lights to blink, cause "day burners" due to a damaged photocell or the lights may stop working completely. Over voltage (swell) events are the opposite of sags and describe surges in voltage of 10% or more above normal or recommended usage. Swells can occur when a large load is turned OFF and voltage on the power line increases for a short period of time. The principal causes of swells are switching events such as the connection or disconnection of a current and short-circuiting to the ground. Surge protectors are unable to protect against SWELL events due to their clamp ratings being higher than the swell event. For example, a surge protector may have a clamp rating of 600v. An electronic component may have an operating range of 300v. There is a gray area of 300-599 volts that the surge protector allows voltage to pass through prior to clamping taking place, which can cause serious damage to electronic components.

Sag, swell and surge events can happen when tree limbs hit distribution lines, when ice or snow sits on distribution lines and even when car wrecks knock over street light poles. These are all instances that can't be controlled, yet the LED light is expected to work in these dirty power environments for over 15-20 years without issues.

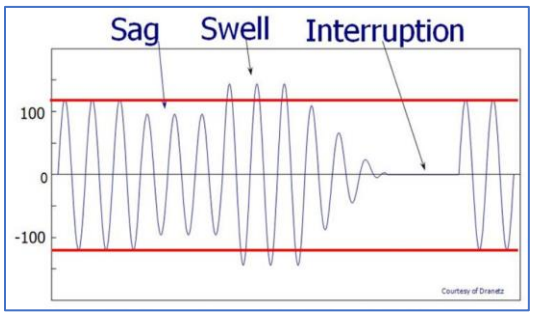
Why is the industry not talking about these low voltage problems and why are they not issuing RFP's that address these concerns is a very big question? The likely answer is that most specifiers at the time of tender issue may not have anticipated how the varying degrees of dirty power may affect performance and longevity of the LED lights. Only now, after years of experience with LED installations damaged by such events, can municipalities and researchers understand the massive impact and begin the search for viable long term solutions.

We believe the time has come to address these problems and GreenStar has the measure of protection for assets that has not been previously available for these types of installations. The Greenstar patented Autonomous Voltage Interrupter device (AVI) is ideally suited for high volume, long term installations and has

proven to protect assets well beyond surge protectors, particularly in the case of low voltage or swell events.

See Autonomous Voltage Interrupter (AVI) Below:

Luminaires typically have no protection against Swell or Sag power quality occurrences or “Dirty Power” that is influenced by external variables. Surge protectors are not a solution.



Autonomous Voltage Interrupter (AVI)

For details on how we may assist you, please contact www.GreenStarled.com.