

Application Guidance Notes: Technical Information from Cummins Generator Technologies

AGN 209 - LED Lighting

OVERVIEW

Application Engineering has investigated the demands on an alternator when supplying power to LED lighting. The investigation included research into the associated trend for such lamps to replace street lighting, high bay lighting and building floodlighting.

There are different designs of LEDs, which enable the provided light to be a range of colours, through to a pure 'white' light, thereby providing opportunities to achieve a lighting scheme that best meets the need of the subject area being illuminated. The flood lighting of buildings can be a rich mixture of colour tones, in the same way that rooms can be illuminated with a colour to provide the desired ambience. For work areas, a pure 'white' light without a stroboscopic effect is provided.

For street lighting, the LED lamp assembly is claimed to provide an equivalent illumination to that of the existing sodium, mercury, or metal halide lamps with better control over light pollution.

GENERATING SET POWER SUPPLY

The power supply for clusters of LEDs is provided by specially designed "LED Driver" packs. The Generating Set supplies the LED Drivers. These LED Drivers operate with switched mode technology, to convert the applied ac 50Hz or 60Hz supply at 200 to 270V or 100V to 140V supply to the LED clusters with some 56Vdc at ratings from 350mA to 2000mA. Some of the LED Drivers offer a lamp-dimmer capability.

TECHNICAL SPECIFICATION

Typically, the current consuming characteristics of a switched mode power supply, is for the input current to have a very high switching frequency with a 5% Total Harmonic Distortion [THD], for a power supply where the applied voltage waveform has a 4% to 6% voltage THD. These 'Drivers' have built in power factor correction to enable the overall LED lamp package to run at very close to unity power factor.

With the LED Drivers being single phase (L-N) there must be a risk that the total electrical load will not be balanced across the three phases of a power supply.

The technical specifications for the LED lighting units make various claims for operational savings over existing conventional lighting schemes. In the case of street lighting, where the LED scheme is replacing existing sodium and mercury 500W lamps, a new technology LED lamp will offer the same luminance with a power consumption equivalent to 50% and an operational life of some 10 to 12 years.

This longer life, combined with reduced power consumption, is then presented as a 'through-life saving' for an LED lamp, which represents an operation cost of some 30% of conventional lighting.

For information, a street lighting unit typically has an operational duty of 4200 hours per year.

ALTERNATOR NOMINATION

The size and type of alternator required will be influenced by the THD on the voltage waveform. Application Engineering are available to assist in the sizing of a suitable alternator for a LED Lighting application. Contact applications@cummins.com.