

LED Technology



An LED (Light Emitting Diode) is a solid state electronic device that consists of several layers of semiconductor material, in contrast to a lamp that consists of a glass envelope and electrodes assembled into a base. The mechanically robust nature and low voltage operation inherent in LED technology makes it attractive to use in many lighting applications.

LED benefits

LED Technology has enormous benefits for the mining industry, the most obvious being the reduction in maintenance requirements of our "fit and forget" design principle that reduces vehicle servicing down times, as there are no globes to burn out or holders to corrode.

Hella LED lamps are pre-wired for easy installation and manufactured to offer maximum impact resistance and high tolerance to chemicals, salt spray and cleaning fluids. Most of the LED products offered can survive shock impulses of 200G, and operate over a much wider range of ambient temperatures than normal products.

LED technology

Unlike conventional lamps that produce a broad spectrum of colours (white light), an LED emits light only in a particular single colour. The specific colour is dependent on the semiconductor material system used (AlInGaP and InGaN) and ranges from red through amber, green and blue. Creating a coloured light signal from a conventional globe requires the use of a filter (generally a coloured lens) that absorbs most of the light and passes through only the desired colour spectrum. The filter losses normally range from 30% to 80% depending on the colour and intensity requirements. LED technology eliminates this inefficient process. Hella LED signal and warning lamps operate with up to 60% less current draw than comparable globe lamps.

White light from an LED is produced by one of two methods. The most common is a process of luminescence conversion where a blue LED light excites a phosphor to emit yellow light, the mixture resulting in white light. The other process of RGB colour mixing uses individual red, green and blue LEDs and by altering the relative mix of the three primary colours, any other colour including white can be created. The efficiency of white LEDs has

risen considerably over the past few years; values of 50 lm/W and more are now being achieved. It is now possible to produce white LED lights that are more efficient than Halogen and incandescent lamps, but still significantly less efficient than gas discharge lamps. The relatively high cost of high-efficiency white LEDs still limits their use to applications where a small amount of light with minimal heat is required, areas where mechanical damage due to shock and vibration destroys other lights, or where the safety of low voltage operation is paramount.

LED temperature behaviour

The amount of light emitted by an LED reduces as the temperature rises: yellow LEDs are more affected by high temperatures than green and blue LEDs. Loss of output as a result of high temperature reverses when the LED cools down and should not be confused with degradation which happens over a long time or in lamps in which LEDs are operated beyond their design current.

LED product design

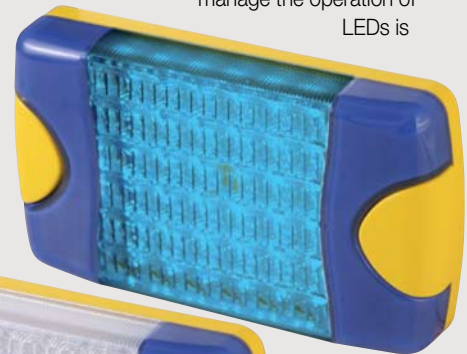
The high efficiency, low power demand that Hella LED lamps are known for is not an automatic result of using LED technology. Many competitor products are no more efficient or durable than conventional lights. Hella invests considerable time and diligence into the four most significant aspects of LED product design, thereby producing award winning, class-leading, innovative products that set new standards and receive worldwide recognition.

The most important issue relates to the selection and optimum application of LED devices suited to each task. Like all electronic components, LEDs are mass-produced, with each production batch yielding LEDs that vary enormously in efficiency and colour. As one of the largest global users of high intensity LEDs, Hella has developed sophisticated techniques that enable us to select only the most efficient LEDs that fall within very tight colour specification parameters.

The second aspect depends on maximising optical system efficiency. Individual LED devices typically produce a hundred times less light than a conventional light globe. To use the light effectively requires highly meticulous

optical system design.

The third aspect relates to effective power supply and control circuit designs. LEDs are much more sensitive to heat and electrical issues than conventional lamps. The development of robust, efficient circuits that manage the operation of LEDs is



just as important as the optical aspects. Years of experience gained through the production and worldwide use of millions of LED lights,

enables Hella to keep delivering innovative and effective solutions to the challenges faced by LED systems.

The final aspect is the physical product design. All the mechanical, thermal management and operational environment and production requirements are integrated into a robust product that is expected to remain fully operational under severe cold, heat and humidity, while also being subjected to high levels of vibration. Hella backs up our innovative physical design and assembly processes with a large investment in extensive in-house test and development facilities to prove all of our products meet the demands placed on them in the field.

Multivolt™

One of the leading advantages of Hella LED technology is the unique Multivolt circuitry fitted to most LED products. The system ensures a uniform level of light intensity and full light output at any voltage in the range stated (typically from less than 10V to more than 28V). Multivolt lamps can be connected to 12V or 24V automotive electrical systems, without modification. The light output will not be adversely affected by the voltage drop

commonly encountered in such systems on large machines and trailers. In all but the most compact lights, the Hella Multivolt system also incorporates sophisticated over voltage, transient impulse and reverse voltage protection and thermal management circuitry to ensure that the LED lamp functions problem free.



MultiFLASH



Mines across the world have many different site regulations, and traffic regulations differ between countries. To eliminate the need to change equipment when a plant is moved from one mine site to another, Hella developed MultiFlash technology that incorporate a range of user selectable flash patterns into many of our optical warning beacons.

LED beacons like DuraRAY and DuraLED can

be programmed in one of 10 flash patterns, synchronised and controlled singly or in groups with a simple three-position switch. UltraRAY, OptiRAY and MiniRAY beacons offer simple installation and user programming via a switch array inside the light fitting. PulseRAY Xenon strobe beacons offer dual or quad flash options by simply switching the polarity of their connecting cables. All of these lights function on either 12V or 24V electrical systems.

