

Let there be light

The energy-saving and low maintenance qualities of LED lights are attracting more port and terminal operators to consider them as an alternative to conventional systems. Paul Page sheds more light on the subjects

While good illumination is a paramount safety requirement in ports, where the mix of machines and humans makes them potentially dangerous areas, lighting is still an area where operators can reduce costs.

Using light-emitting diode (LED) lights on quay and yard cranes is one way that ports can benefit through energy savings and reduced maintenance requirements, according to Ryan Hertel, Director of Business Development at US-based Phoenix Products Company, a specialist in marine-grade, vibration-resistant LED light fixtures for a range of port-related equipment.

A 300W LED light can replace a 1,000W high-intensity discharge (HID) fixture, achieving an energy saving of



Ryan Hertel of Phoenix Products Company

up to 70%, according to Hertel. On maintenance, he told *CM* that LEDs eliminate the need to replace and dispose of bulbs and electrical components. This in turn reduces inventory and labour costs involved in replacement, while also providing increased safety by reducing aerial maintenance.

In terms of savings, Phoenix estimates that an automatic stacking crane

(ASC) fitted with LED floodlights and area lights can reduce annual operating costs by as much as US\$5,000 per machine. However, the company believes that some of the greatest savings are achieved through the lack of maintenance required.

"A properly designed and produced LED system should operate maintenance-free for 50,000 hours. Maintenance of traditional lighting requires numerous replacements of lamps, ballasts, capacitors and resistors, or in some cases the entire fixture. This amounts to a significant, and often unnoticed, cost," said Hertel.

LED technology has existed in basic form since 1962 but has mainly been used for stationary applications, such as outdoor promotional lighting. However, the very make-up of its solid-state technology is

ideal when properly designed for port equipment, which is subject to high vibration levels.

Although some manufacturers promise fixture lifetimes of up to 100,000 hours, the lifetime of support components must also be considered to validate such claims. "If an LED chip survives 50,000 hours but the power supply fails at 10,000 hours, terminals will not be rewarded for their investment," suggested Hertel.

Hertel also told *CM* that the design of an LED floodlight is critically important for container-handling equipment installations. "When evaluating LED fixtures, terminal operators need to ensure that the unit is designed to withstand vibration, shock, corrosion and the marine environment for its entire life," he stressed. "A light designed originally for high-bay

installation will not exhibit the durability necessary to survive.”

Phoenix Products is so confident about its products that it took one of its ModCom® crane lighting units and dropped it, while illuminated, over 7 m (25 ft) from the roof of its premises onto a two-inch steel slab; other than some distortion to the frame at the point of impact, the unit remained intact and illuminated (you can see the test on YouTube).

Over the past two years high-brightness LED chips have increased the potential light output from a single fixture, with different optics offering a range of light spreads towards a target. LED floodlights mounted on a ship-to-shore (STS) crane trolley using a customised optical configuration can illuminate the bottom of a vessel's hold, which may be 70 m below the crane, while also providing even light distribution when the trolley moves over the quay.

While traditional metal halide, incandescent and fluorescent fixtures spill light in every direction before reflecting it towards a target, LEDs emit light in a single forward direction to produce high lumen output at lower wattage. Hertel suggested that a traditional HID lighting package for an ASC would require 200 lux at ground level using fourteen 400W units, totalling 5,600W of power.

In comparison, an equal or lesser number of 150W Phoenix ModCom LO™ units, with a combination of proprietary optics, can match this light output while

more than halving the power consumption, to 2,100W. Four 300W Phoenix ModCom HI™ floodlight units could also achieve a suitable operational light level using 1,200W.

An added benefit is that LEDs illuminate instantly. In comparison, traditional high-pressure sodium or metal halide floodlights require around 15 minutes to warm up. Terminals can programme cranes to automatically activate the lights when working over a truck transfer area, but extinguish them during normal stack operations.

In November 2012, the company launched a new

PCWL Linear LED Walkway Light, a 20W, 1,200 lumen fixture designed for port container and walkway applications. It uses 42% less energy than a conventional two-lamp 17W linear fluorescent set-up and is ETL/cETL-rated to UL1598A and IESNA Dark Sky Compliant. It has been designed to prevent moisture intrusion and also to protect components against shock and vibration.

Although LED is still in its relative infancy in port environments, Phoenix has replaced original 1,000W trolley lighting fixtures with its 300W ModCom HI units

on around 30 STS cranes in terminals on the US East and West Coasts and in Europe, Singapore, Australia and Asia.

In addition, the company is supplying LED fixtures for incoming STS and ASC cranes for the Long Beach Container Terminal expansion. Interest is also coming from manufacturers of mobile harbour cranes, who see the advantage of reducing the energy draw on generators, therefore enabling them to install smaller genset units.

Reluctance

UK-based GlowLED specialises in internal high-bay lighting systems for port storage facilities. Arzhang Tahmosybayat, LED lighting consultant at the company, told *CM* that the ports industry is still reluctant to change to LED lighting, even though in the long term there can be substantial cost savings.

Accepting that currently the initial cost is higher than for existing industrial lighting installations, he explained that the overall energy-efficient lifetime cost pay-back is shorter in 24/7 logistics environments.

Equally, such systems are not affected by dust, cold or damp and, unlike their traditional counterparts, provide instant light without the need to warm up before they reach their full intensity, while also generating less heat. In addition, they are easier to control, which creates new opportunities for managing them.

“There is a lot of momentum when moving



Prismalence is not convinced that LEDs are the way forward, other than for pinpoint illumination of an area at the foot of a crane

goods in or out of containers or moving the container itself, and a fluorescent tube or a standard bulb system will not stand up to much impact. In comparison, LEDs are solid-state and far more rugged and shock-resistant,” said Tahmosybayat.

In recent years the lighting industry has been moving towards ‘intelligent lighting’, incorporating sensors that automatically activate the light when required, rather than it remaining on all the time. According to Tahmosybayat, these systems have had mixed results, depending on the application. “For guaranteed performance, the way forward is fully integrated sensors in the light fixture, and to use LEDs as a light source – they are inherently controllable,” he said.

GlowLED supplies energy-efficient LED lighting products and has partnered with US-based Digital Lumens, which has developed an intelligent lighting system that uses centrally managed, wirelessly networked smart LED lights that have integrated sensors as standard. These intelligent systems provide an unprecedented level of control and flexibility over lighting usage and routinely reduce the costs associated with industrial lighting by up to 90%.

“With an integrated intelligence it is possible to reduce energy costs further, as the operator knows that the light will only come on when its individual sensor is triggered – or when it receives operational commands that



Illumination difference: on the left, an aisle lit by a 400W HPS lamp; on the right lit by a GlowLED 160W LED lamp

relate to the lighting profile that controls the system. In warehouses, where often banks of lights are used in separate bays, it is possible to light only the area in which people are working with a single light unit, rather than wasting energy by using the entire bank of lights in that aisle,” said Tahmosybayat.

“Managers can also see which areas of their logistics facility are consuming the highest lighting energy via the software platform that each light reports to, or make rapid system-wide changes to the lighting schedule if a shipment is delayed.”

He also explained that traditional bulb and lamp technologies have a finite number of ‘strikes’ (on/off) that make up their life, whereas LED lights can be switched on/off as many times as required – something



that actively prolongs their lifespan, which on average is over 50,000 hours.

Although individual LED lights can be used to replace single lamps in an existing traditional installation, Tahmosybayat questions why people think that a retrofitted replacement would save money.

Dumb LED

“Using a retrofit LED will indeed save energy, but that’s where the gains will start to dry up. Why retrofit a ‘dumb’ LED rather than have an intelligent system that allows lights to be controlled, dimmed or turned off automatically, significantly reducing lifetime energy and maintenance costs?” he asked.

Although it has launched its own LED fittings, Swedish manufacturer Prismalence is yet to be convinced that LEDs are the way forward for general

lighting in ports, other than for pinpoint illumination of an area at the foot of a crane.

Expressing doubts to CM, Fareed Ishani, who is responsible for sales in the UK, Ireland and Africa, said: “I don’t think LED lighting has reached a stage where it can compete with lights designed for large terminal areas. You would need a massive LED platform to achieve the light intensity required, which would generate too much heat.”

That said, the company claims that its new 38W Polaris LED range, which has the same optical lens as its other Polaris models, is suitable for both interior and exterior environments, especially where direct or controlled ignition is a requirement via motion detection.

Ishani explained that LEDs currently have a narrower spectral output than the full-spectrum (daylight-like) white light produced by a ceramic discharge metal halide (CDM) lamp. “Your eyes can see better at night with full-spectrum white light; equally, you need fewer units with white lights to achieve the same visibility as a narrow-band light such as high-pressure sodium,” he said.

Accepting that LED technology is moving forward, he predicted, however, that it would be another five years before it “comes of age” and meets the same output as more traditional lights. “There’s a lot of hype about LEDs. As they develop and new technology is introduced, it will be necessary to replace the entire fitting.

DPW Cochin makes history

DP World Cochin has become the first container terminal to select the new Solstice LED lighting solution from Global Tech LED to replace its existing lighting towers in the Indian port.

The insert lighting kits have been installed directly inside existing fixture housings, thereby converting 322 high-pressure sodium fixture housings to energy-efficient pure white light luminaires, without the need to purchase expensive new housings. Each replacement took around 15 minutes and has achieved a total weight reduction for each tower of 304 kg.

Before the conversion total power usage was 417 kW, which has dropped to 96 kW, with the new LED units providing a total power saving of 321 kW and an annual saving of 1,405,980 kilowatt hours (kWh). In cash terms, this equates to an annual saving of US\$168,717. In addition, there is a carbon reduction of 827 barrels of oil per year.

"The total conversion cost was US\$265,650. However, with an 18-month payback in energy cost savings, this represents a return on investment of 60%," claimed Jeff Newman, president of Global Tech LED.

"Global Tech LED proprietary software protects the modules from both over- and under-voltage and incorporates a thermal management technology using Active Cooling Fans that offers super-long life in hot climates where others would fail," he added.

Our LEDs have replaceable light engines," he claimed.

He also pointed out that the current rules laid down for the minimum lux rating – the intensity of light present and visible as perceived by the human eye – are based on old technology; this apparently has now been accepted, and new rules are to be prepared that take into account spectral output, i.e. colour rendering.

Daniel Björk, Primalence's international sales manager, told *CM* that the company's CDM patented system with special optics gives energy savings ranging from 35% to 75% depending on the circumstances, easily matching the savings claimed for LED lights.

"LED products are not cost-effective for large installations, costing four to six times as much as our CDM solutions and not saving any more energy. With a CDM lifespan of 30,000 hours, LEDs do not save much on maintenance either. However, we are following the development of LEDs closely and using them where we see an advantage – such as streetlights, which are also using our patented optics."

Describing the company's products as "perhaps over-engineered but lasting forever", Ishani said that it had supplied numerous small and medium projects in 35 countries, with strong sales in Europe and Scandinavia,

especially Holland, Belgium and Sweden, as well as in Asia and Africa. Generally the company installs between 200 and 1,500 fittings per port.

However, take-up in the UK has been slower, although units have been sold to Peel Ports and the ports of Tilbury and Dover. Ishani puts this down to the fact that the company's units are slightly more expensive than products from some larger manufacturers.

"I don't think there is another product in the market that is as robust or vibration-proof as ours, with the patented optics spreading the light exactly where needed. Many operators look at the cost of a product, not always the quality," he suggested. "The return on investment is around six months longer than other competitive products, but in the long run they work out cheaper because of their durability."

Recently the company reached a milestone agreement with DP World to supply lights for the entire Jebel Ali port and terminals. Installation has started with yard lighting for the Terminal 2 extension.

"We are also the choice for DP World's 19 new STS cranes and 50 RTGs, as well as its ARMG cranes. All in all we are talking about 5,000 fittings or more over a period of a couple of years," said Björk.

The company has already supplied lights for other DP World facilities, including Southampton Container Terminal in the UK; Grobbendonk, Belgium; Dakar, Senegal; Constanta, Romania; and Rio de la Plata, Argentina.

"Our long-term aim is to be a complete lighting supplier, as we have products for all areas in ports from STS and RTG cranes to yard lighting towers, warehouses, workshops and streetlights," concluded Björk. ■



Four Phoenix ModCom HI floodlights will achieve a 200 lux ground light level comparable to 14 traditional lighting packages