Lighting up the future of ports with LED

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OVERVIEW

Ports and terminals compete fiercely for container traffic. Those with the most efficient operations stand to win the most business and generate the highest profits. Driving down costs is crucial to remaining competitive. Upgrading to the latest light emitting diode (LED) lighting technology contributes to terminal cost control.

Light fixtures installed on port container cranes endure constant vibration, moisture and corrosion – elements always present in marine environments. These extreme conditions result in premature lighting fixture failure, demanding constant maintenance and increasing material and labour costs. Installing properly designed LED fixtures on port container cranes can immediately reduce energy usage, reduce crane maintenance costs and increase operator safety, while moving terminal operators closer to the universal goals of safety, sustainability and profitability (Hertel 2009: 70).

INTRODUCTION

LED technology has existed in its basic form since 1962. It has long been used in outdoor promotional lighting, and more recently in television screens and street lights. While most of these are stationary applications, solid-state LED technology is ideal for installation on industrial equipment subjected to high vibration environments. Heavy industrial equipment and above-ground mining equipment now often operate with LED lighting. Properly designed and manufactured LED fixtures for installation on port container cranes will last, maintenance free, for 50 000 hours, all the while reducing crane electricity draw and maintenance expenses. In the last two years, high-brightness LED chips have increased the potential light output from a single fixture. This enhancement quickly broadened LED applications beyond television screens and flashlights. LED technology can now illuminate an area as large as a football field, as well as container cranes and terminal yards – all at a fraction of the previous power consumption.

While traditional HID, incandescent and fluorescent fixtures spill light in every direction before reflecting it towards a target, LEDs emit light in a single forward direction. Properly designed LED modules can produce high lumen output at lower wattage. They are also 'instant-on' and illuminate immediately upon powering. As terminals begin to electrify RTG cranes, LED technology offers a considerable performance advantage over traditional high pressure sodium (HPS) or metal halide (MH) fixtures that require 15 minutes plus of warm-up time (Hertel 2009: 70).

WHY LED?

The advantage of LED technology is its inherent durability. LEDs are solid-state light sources that contain no moving parts, filaments or fragile glass, thereby dramatically reducing the risk of damage during transportation, installation and operation, even in the toughest environments. LED technology also offers a great deal of versatility. If a port operator prefers a warmer light source, lenses can be inserted over the luminaire to decrease the colour temperature. Furthermore, a modular design of LED fixtures allows for customisation specifically for crane heights. The directional nature of LED light allows for improved light penetration at the bottom of the vessel hold, and improves operator viewing conditions.

Companies on the forefront of this technology are considering the variety of lighting requirements of ports while designing their optic packages. An LED fixture can incorporate an array of point sources that direct light precisely where it is needed, with very little scattering or loss of light to the environment surrounding the port. Distribution is controlled by the placement of LEDs, as well as by efficient use of optics that take advantage of the focal point presented by each individual LED. Effective fixture design can translate to lower optical losses, higher luminaire efficacy, and an even distribution of light across the target area. Crane floodlighting garners the most attention, but some companies offer LED fixtures to replace all lighting installations on a crane and for walkways, the machinery house and the electrical room. LED lighting can virtually eliminate costly maintenance in all of these areas (Stephany 2012: 52).

LED REDUCES MAINTENANCE COSTS

While LED lighting is touted for reducing power consumption, ports and terminal operators will realise the greatest savings from reductions in maintenance expenses. A properly designed and produced LED fixture should operate maintenance free for 50 000 hours. With average usage of 12 hours per day, an LED fixture should last over ten years. Compare this to the numerous lamps, ballasts, capacitors and resistors that would typically be changed over the course of this time to maintain traditional lighting. LED chips alone can last for more than 100 000 hours under controlled conditions, but these are perhaps overly optimistic projections about expected fixture lifespan (Hertel 2009: 70).

ADVANTAGES OF LED

- **Energy:** less electricity consumed
- **Maintenance:** lower labour costs
- **Safety:** reduced need for maintenance work at extreme heights
- **Parts:** fewer purchases of spare components
- **Disposal:** less environmentally-sensitive material to discard.

IMPROVED SAFETY

Poor lighting, particularly at night, and shadows can make it difficult for drivers to see and avoid pedestrians, hazardous driving surfaces, and other obstacles.

Hertel (2009: 70) states that installing energy-efficient LED floodlights onto container cranes dramatically reduces their energy consumption from lighting, virtually eliminates lighting-related maintenance requirements, and moves terminal operators closer to universal goals of safety, sustainability and profitability. The use of LED floodlights can eliminate constant maintenance in this difficult area, while improving light quality. Just as crane manufacturers have engineered revolutionary advances, so too have LED fixture manufacturers, making these lights ideally suited for the harsh, corrosive environment in which container cranes operate. LED fixtures are also beneficial for ship-to-shore (STS) cranes where a power outage necessitates a waiting time of up to 20 minutes until the traditional light source operates at full intensity. LED technology minimises downtime, increases safety and improves operational efficiency.

Access to the light fixtures on cranes can be difficult and dangerous. With LED technology, no re-lamping is required during the usable lifetime. Properly designed LED fixtures will not fail catastrophically, but will rather dim gradually. The light source is assumed to have run its lifespan when light output reaches less than 70% of the original strength. In fact, well-designed fixtures can last over 50 000 hours, eliminating equipment downtime due to lamp failure. For a port operating with lighting 24 hours a day, a fixture could last five to seven years!

CONCLUSIONS AND RECOMMENDATIONS

Increasing environmental regulations, along with the need to lessen costs and increase productivity, are placing tremendous pressure on port and terminal operators. Finding solutions is challenging, but advances in technology are addressing these issues. Incorporating high-performance LED luminaires into port container cranes provides the necessary illumination that allows crews and automated machines to work with maximum efficiency and safety. After years of few or no advancements, lighting technology is in the midst of a major transition. LED technology offers multiple benefits to those ready to embrace and invest in the newest technology. Transitioning to LED lighting offers savings on multiple fronts for ports and terminals, boosting their competitive position (Stephany 2012: 53).

REFERENCES

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Stephany, M 2012. *LED Technology – Putting unattainable goals within reach* (online). Available at: http://www.phoenixlighting.com/sites/default/files/2012_june_-_world_port_development.pdf (Accessed 10 October 2015). □