

# LED lighting delivers cost savings to terminal operators

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## Introduction

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 labor costs. Installing properly designed LED fixtures on port container cranes can immediately reduce energy usage, reduce crane maintenance costs and increase operator safety.

## LED technology evolving to industrial applications

LED technology has existed in 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.

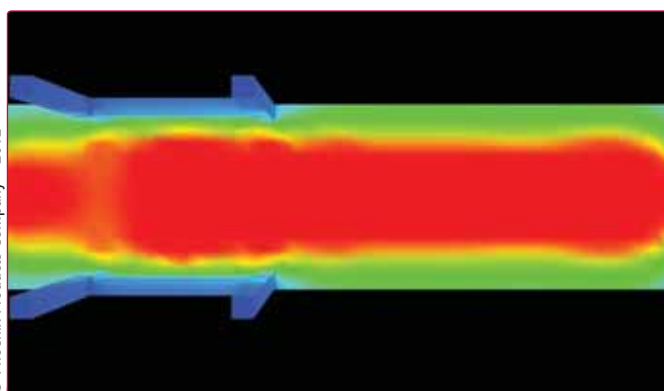
In the last two years, high brightness LED chips have increased the potential light output from a single fixture. This enhancement quickly broadened LED applications beyond televisions and flashlights. LED technology can now illuminate an area as large as a football field as well as container cranes 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.



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Mounted hundreds of feet above the working surface, this 300 watt Phoenix ModCom™ HI LED floodlight delivers energy savings and dramatic reductions in maintenance costs to the equipment operator.



Lighting layout. Ship-to-shore crane outfitted with Phoenix ModCom™HI LED floodlights. Pseudo-colors represent specific light levels achieved and light level consistency.

Varying optics can be used to control emitted light, offering a range of light spreads towards a target. LED floodlights mounted on an STS trolley use a narrow distribution to focus light on the container below. RTG cranes can use a mix of optics to simultaneously illuminate the stack below, yet provide enough perimeter light to maintain safe working conditions at ground level.

A traditional RTG lighting package includes at least 14 fixtures at 400 watts each, totaling 5600 watts of power consumption. An equal or lesser quantity of 150 watt Phoenix ModComLO™ fixtures, with a combination of proprietary optics in the same fixture, can match light levels, reduce fixture quantities, and reduce power consumption to 2100 watts – a considerable saving. In addition, an automated stacking carrier outfitted with four units of 300 watt Phoenix ModComHI™ floodlights achieves ground light levels of 200 lux. Traditional lighting packages required upwards of ten fixtures to achieve a comparable light level.

## LED also reduces maintenance costs

The positive reputation of LED lighting stems from the benefits of energy reduction, ensuring cost savings for terminal operators, particularly in countries with high energy costs and an elevated electricity rate for peak hours. Outfitting an RTG with LED floodlights and area lights reduces yearly operating costs by as much as \$5,000 per RTG. With a fleet of 50 RTGs or more, a port stands to save over a \$250,000 per year through the use of LED light fixtures.

While LED lighting is touted for reducing power consumption, ports and terminal operators will realize 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 there are perhaps overly optimistic projections about expected fixture lifespan. It is critical that

ports, terminal operators and crane engineers determine if all fixture components share this published lifespan. A terminal will not benefit from incorporating LED crane lighting if the fixture manufacturer cannot establish with certainty that all components of the fixture – including the driver – are rated equally and backs that fixture with an extended warranty.

Most fixture manufacturers indicate an expected life of 50,000 hours. To realize the full 50,000 hour lifespan of LED fixtures and all associated cost savings, the fixtures must be designed properly for the high vibration, moisture and corrosion inherent in a marine environment. Small LED chips may be rated for 50,000 hours, but if other electrical components fail prematurely due to vibration or succumb to moisture intrusion, a crane owner will lose money on the investment. A potted driver encapsulated in a gasketed housing is recommended for best resistance to the elements. In addition, LED modules should be coated in optically clear silicon to provide a complete moisture seal.

## Module design prevents fixture failure, makes repair easier

An important consideration for crane maintenance personnel is the ease with which LED fixtures can be repaired. Many LED fixtures on the market today are not built for repair, so if a failure occurs, the user will be forced to purchase an entire new fixture. Designing and manufacturing modular LED fixtures allows for individual modular replacement. As an added benefit of modular design, failure of one LED module will not result in complete fixture failure, so replacement can be made during prescheduled preventive maintenance.

Terminal operators can take advantage of LED technology for crane retrofits as well as new crane purchases. Two years ago, the largest above ground mining equipment manufacturers in the world approached Phoenix Products Company to convert all equipment lighting to LED. Applications included exterior floodlighting, electrical and mechanical rooms, and emergency lighting. These fixtures have been in use on mining equipment for up to 18 months without failure.

Terminal operators and ports around the world can now begin to use this same technology to install LED fixtures for future implementation on port container cranes and equipment. A total cost of ownership evaluation of LED crane lighting incorporates a wide range of cost savings:

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

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.

### ABOUT THE AUTHOR

**Ryan Hertel** joined Phoenix Products Company in 2008 and serves as Director of Business Development for the port crane market. He graduated from the University of Wisconsin in 2006 with a degree in Mechanical Engineering. He is currently pursuing his Masters in Business Administration from the University of Chicago-Booth School of Business.

### ABOUT THE COMPANY

**Phoenix Products** is a global provider of specialty, durable lighting products that are designed to perform in extreme environments and rough service conditions. Its products are known for meeting exacting specifications, improving equipment performance and reducing equipment maintenance costs in multiple markets. Founded in Wisconsin in 1892, the company maintains its headquarters in Milwaukee.

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