

BiNY: next generation smart LED high-mast lighting



Jimmy Zhang, R&D Manager; Barry Cai, Senior Thermal Engineer; and, Jacy Zhou, Senior Optical Engineer; BiNY, Shanghai, China

What difference will smart LED light sources plus a real-time control solution make to high-mast lighting at harbor sectors? As an overall solution provider of VLS (VeryLargeSpace®) lighting, BiNY has initiated the smart high-wattage floodlights, offering much greater control for harbour operators.

Besides the main features such as high efficiency lumen output, IP65 protection, environment-friendly components and shock absorption as is the case with most other BiNY products, BiNY's LED luminaire will go further to meet several special requirements regarding the light application on high-masts in harbour sectors.

An integrated structure

We have designed the new model in such a way that the sink itself will also work as the fixture. This structure reduces the weight of the fitting to 15 kilograms, which is actually one half of the conventional HID luminaires of 30 kilograms and above. The electronic drives to be mounted onto the back as little attachments will be easily retrofitted.

Thermal management can guarantee the reliability of high-wattage luminaires, equaling 50,000 hours at 25°C. The excellent heat dissipation is decisive for the working of high-wattage LED luminaires.

Optical design

In light of the real situation at port and terminal sites, high-wattage LED luminaires for high-masts should have several beam angles like 5°C, 10°C, 15°C, 25°C, 30°C, 45°C and 60°C. A perfect lighting array on the head-frame of high-masts should be the adoption of most wide-beam-angle fittings plus some

narrow-beam-angles to satisfy illumination uniformity.

Infrared thermal radiation coating

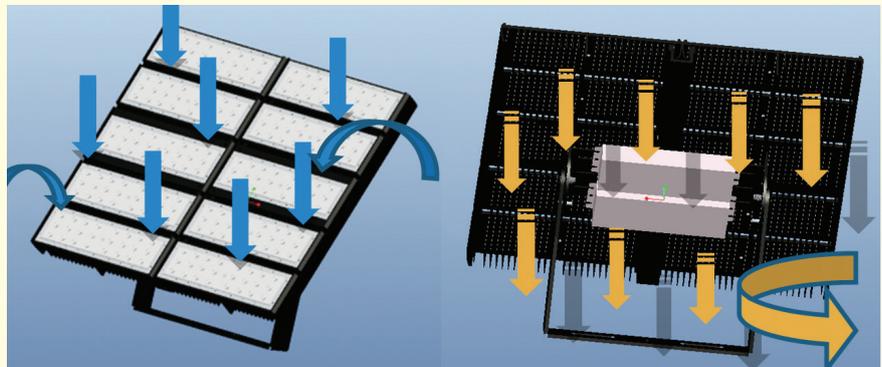
The slim appearance requires the coating layer to serve as a perfect heat conductor as a whole. The specially designed coating will enhance the heat dissipation of the sink.

Smart-lit technology

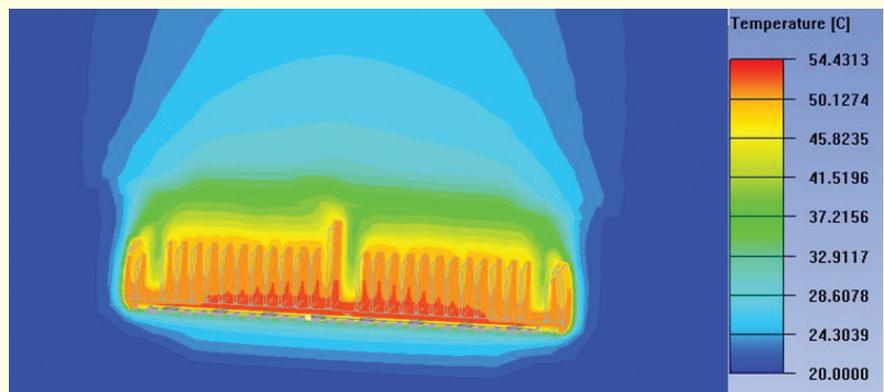
This technology has allowed the real-time communication between each luminaire on a high-mast and operational



BiNY's 500W Smart LED Floodlight



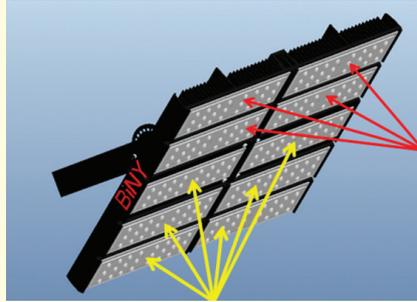
Integrated structure with light weight, strong wind resistance and simple ways of installation



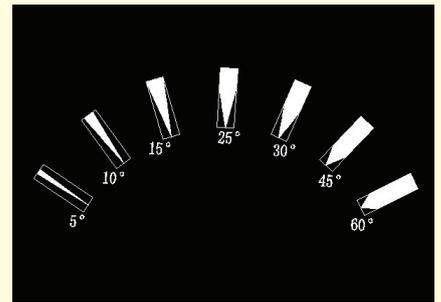
Reliable and excellent heat dissipation performance



Smart-lit technology



Optical design



administrators. Each light on the high mast alone is not only a light source, but a receiver and information collector. The smart light will connect one by one and ensure the total high mast lighting at ports and terminals becomes a VLS system.

Technical specifications

The solution will efficiently integrate every high-mast and its smart LED luminaires into the control programme so that every administrator can operate the VLS lighting freely at a distance.

Pilot project

We have been testing one unit of the 30 metre high-mast with 6,500 watts smart LED flood lights over the past three years at a car racing park in Shanghai. Our aim is to get an illumination result in lux value as well as uniformity ratio as follows:

*The distance above is the actual length from the measured point to the centre point of the high mast base

Energy conservation

We would like to take the example of Yangshan Deep Water Container Terminal Phase IV at Shanghai Port, the world's largest automated container terminal under construction, at which LED luminaires have been recommended to be used at the top of 40-metre-high lighting towers. BiNY has proposed to replace 600 more pieces of 1 kilowatt sodium vapour floodlights with 600 pieces of smart high-wattage LED floodlights.

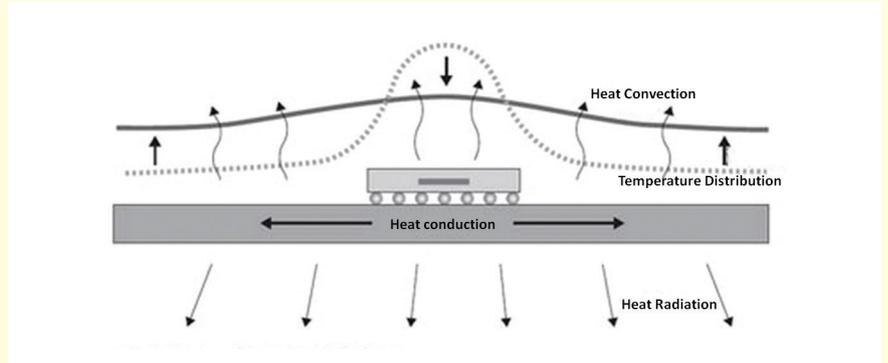
Table 2: Theoretically total input and investment recovery period for an operation period of 5 years

*Only procurement expenditure is included while labor costing and others are not covered

*The return of energy conserved by dimming during the operation of high mast lighting has not taken into consideration

Table 3: Theoretically annual energy conserved or carbon emissions reduced

*The calculation is subject to 13 hours per day and 365 days of a year. SCE denotes Standard Coal Equivalent



Infrared Thermal Radiation Coating

Category	Annualised
Light Efficiency (lm/W)	110
Color Temperature (K)	2700~6400
CRI	> 70
Lighting control (Dimmable)	0~100%
Dimensions (mm)	600 × 510 × 140
Weight (kg)	< 15
LM (50000 HOURS @ 25°C)	70

Technical Specifications

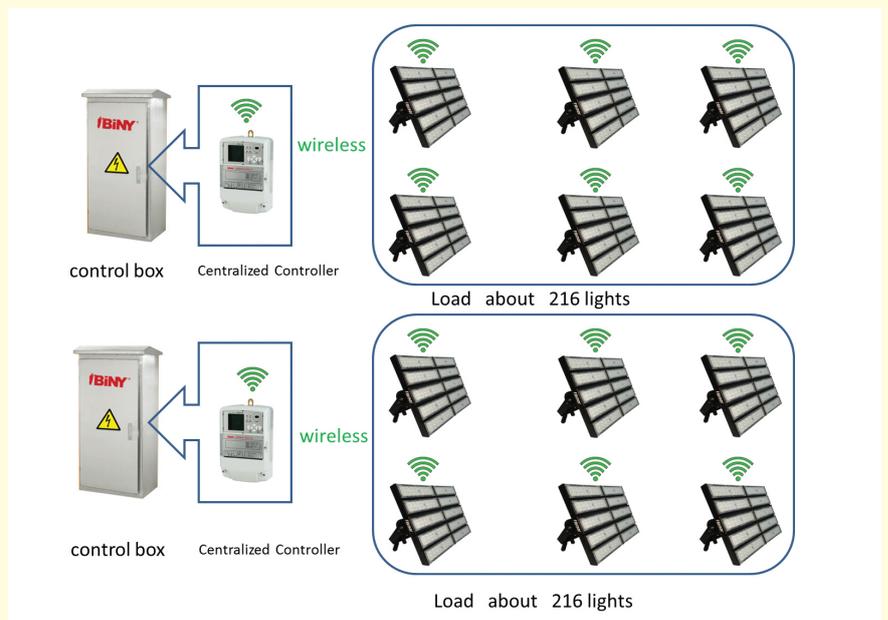


Diagram 1. BiNY's Lighting Control Part 1

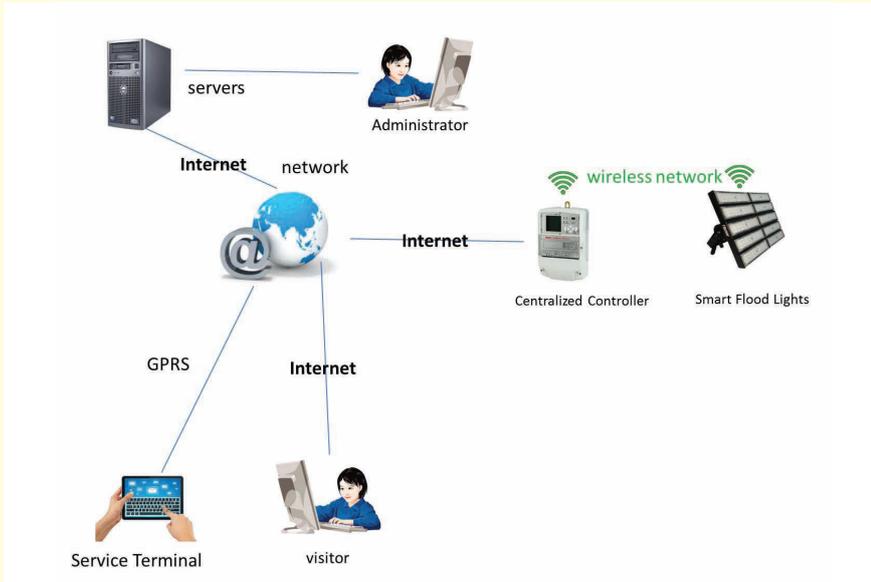
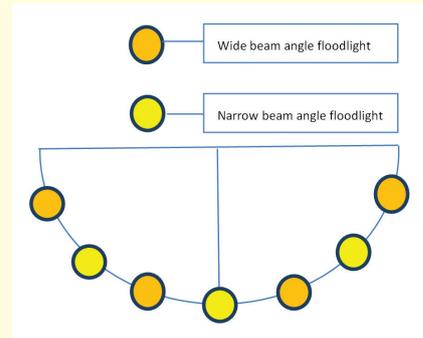


Diagram 2. BINY's Lighting Control Part 2



Lighting array of smart LED flood light atop the mast

*International standard 1 kWh saved equals the conservation of 0.3619 kgce or the reduction of 109,590kg carbon emission

The comparison outlines the great advantages of smart high-wattage LED luminaires with regards to both economy and environmental benefits.

Summary

The conditions are ripe for the utilisation of smart high-wattage LED floodlights for high masts at ports and terminals. As the leading VSL Lighting solution provider, we hope to continue our worldwide aim of providing port operators with BiNY's smart LED high-wattage floodlights and further lighting control technology.



A High Mast at a car racing park



Illumination at night

Distance	1M	2M	3m	4M	5M	6M	7M	8M	9M
Lux	14.10	15.20	16.50	18.20	20.40	22.10	26.00	32.70	40.60
Distance	10M	20M	30m	40M	50M	60M	70M	80M	90M
Lux	46.20	47.40	39.50	24.00	16.80	12.60	10.70	8.60	7.50
Distance	100M	110M	120m	130M	140M	150M	160M	170M	180M
Lux	6.40	6.00	5.70	5.00	4.87	3.95	3.66	3.00	2.90
	Maximum	47.40	Minimum	2.90	Average	17.06		Uniformity	0.17

Table 1. Measured average lux value over three years

*The distance above is the actual length from the measured point to the center point of the high mast base.

S/N	Lighting	Initial Investment	Rehabilitation Costing within 5 years (USD)	Total Input for an Operation Period of 5 Years (USD)	Capital Saved (USD/year)	Investment Recovery Period (years)	Recovery Period of Extra Procurement on LED (years)
1	Sodium Vapor Floodlight	\$1,021,248.00	\$520,836.48	\$1,542,084.48	/	/	/
2	Smart LED Floodlight	\$1,379,000.00	\$0.00	\$1,379,000.00	\$295,531.52	4.7	1.2

Table 2. Theoretically Total Input and Investment Recovery Period for an Operation Period of 5 Years

*Electricity tariff per unit is 0.1577 USD/kWh.

*Only procurement expenditure is included while labor costing and others are not covered.

*The return of energy conserved by dimming during the operation of high mast lighting has not taken into consideration.



Yangshan Deep Water Terminal Phase IV, Shanghai Port (October 2015).

S/N	Lighting	Electricity Consumed (kWh)	SCE* Consumed (ton)	CO2 Emissions (ton)	SCE Saved (ton)	CO2 Emissions Reduced (ton)
1	Sodium Vapor Floodlight	3,535,974.00	1,279,669.00	3,390,999.00	/	/
2	Smart LED Floodlight	1,660,750.00	601,025.43	1,592,659.25	678,643.57	1,798,339.82

Table 3. Theoretically Annual Energy Conserved or Carbon Emissions Reduced

*The calculation is subject to 13 hours per day and 365 days of a year. SCE denotes Standard Coal Equivalent.

*International standard 1 kWh saved equals the conservation of 0.3619 kgce or the reduction of 109590 kg carbon emission.

About the authors

Jimmy Zhang is a Senior Lighting Technician and has been serving in the field of LED's for 10 years. He has a sharp insight and distinctive grasp of leading-edge technology in electronic, optical, thermal and mechanical sectors.

Barry Cai is a Senior Thermal Technician majoring in Thermal Engineering. He has perfectly combined thermal management with electronics regarding the research and development of smart high-wattage

LED luminaires.

Jacy Zhou is a Senior Optical Technician and takes charge of the optical design team for the next generation smart LED high-wattage luminaire with decisive contributions and unparalleled innovation.

About the organisation

BiNY is one of the leading overall solutions providers of VLS lighting and is based in Shanghai, China. It makes high-masts, next generation raising and lowering systems for high masts, smart

high-wattage LED luminaires as well as specialised lighting control developed for operators of port, airport, and other VLS projects.

Enquiries

No. 2240 South Pudong Road, Shanghai, China 200127
Email: biny@mail@binygrp.com
Tel: 0086-21-51325016/17/18
<http://www.binygrp.com>