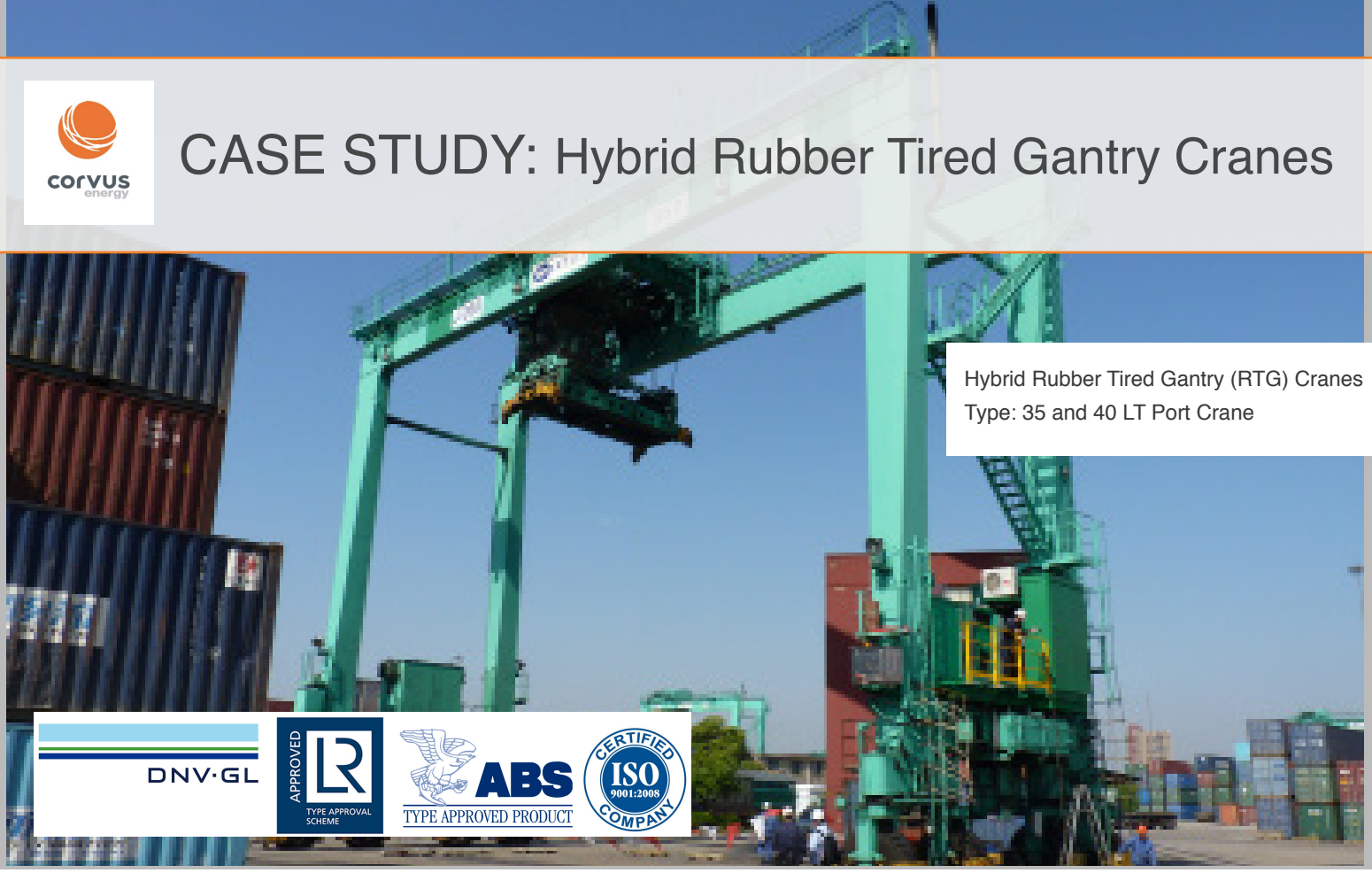
CASE STUDY: Hybrid Rubber Tired Gantry Cranes



Hybrid Rubber Tired Gantry (RTG) Cranes
Type: 35 and 40 LT Port Crane

Hybrid Power Cleaning up Port Operations

Corvus Energy and integrators CCCC Shanghai Equipment Engineering have completed several retrofits of diesel Rubber Tired Gantry (RTG) cranes into diesel and LNG-battery hybrid RTGs. RTGs are used at container terminals and container storage yards to straddle multiple lanes of rail/road and container storage. RTGs typically rely on a constant speed diesel generator for power generation.

By hybridizing an RTG, fuel consumption can be reduced by 65%. This technology not only reduces operating costs but also lowers exhaust and noise emissions in the terminal.

A Greener Solution

RTG cranes contribute a disproportionally high amount of air pollutants and emissions. Approximately 11% of oxides of nitrogen (NOx) emissions and 9% of diesel particulate matter (DPM) emissions from cargo handling equipment at ports is emitted by RTG cranes[1]. **With a 65% reduction in harmful emissions and particulate the Corvus solution dramatically improves local air quality.**

Specifications

Pack: 14 x 6.5 kWh
Capacity: 91 kWh
Bus Voltage: 700VDC
Partners: Energy Storage System: Corvus Energy.
System Integrator: CCCC Shanghai Equipment Engineering.
RTG Manufacturer: ZPMC.
Customer: Multiple Terminals, Shanghai International Port Group

Located in Shanghai, China

[1]2010 Air Emissions Inventories: Port of Long Beach and Port of Los Angeles. Starcrest LLC. 2011.

The Solution: Energy Storage System (ESS)

A rugged industrial quality Corvus ESS is installed on the cranes to allow the units to run at optimal efficiency. Designed for commercial marine applications such as hybrid drive systems, the Corvus ESS is proven safe and reliable for heavy industrial applications.

Potential Port Savings - Port of Shanghai Example

- 204 RTGs in three terminals*
- Average annual diesel fuel consumption per RTG: 150,000 **l/yr**

THE MATH

Diesel RTG: 150,000 x 204 RTGs = **30,600,000 l/yr**

Hybrid RTG: 52,500 x 204 RTGs = **10,710,000 l/yr**

19,890,000 l/yr FUEL SAVED

PUTTING IT IN PERSPECTIVE

The equivalent of running 132 of the 204 cranes **for free, every year!**

*Based on Waigaoqiao phase 1 terminal Shanghai Pudong International Container Terminals Ltd, Waigaoqiao Phase-4 Terminals, and Yangshan Terminal. According to www.portshanghai.com

Benefits of the Hybrid RTG

Regenerative Braking

Regenerative braking energy is captured and stored as electricity when a container is lowered. This recaptured energy is directed to the Corvus ESS, reducing the amount of power required from the generator.

No More Idling

In the conventional RTG configuration, the diesel generator undergoes periods of inefficient sustained idling, resulting in unnecessary fuel usage. With the Corvus ESS in place the diesel generator is shut down during traditional idling times, allowing the RTG to operate on “full electric” battery power.

Maintenance Savings

A smaller generator, running fewer total hours, greatly reduces maintenance costs for the hybrid RTG.

Smaller Generator

The generator can now be sized for the average load with the battery handling the peak power output requirements. Reducing a 500 kW generator to a 50kW version significantly lowers fuel consumption and exhaust emissions.

Maximizing the Life of the Batteries

The Battery Management System (BMS) regulates electricity flow to and from the modules, performing cell balancing, state of health calculations and safety. The BMS also allows for remote monitoring, firmware updates and facilitates a seamless integration with the ZPMC control system.

About Corvus

Corvus Energy manufactures the world’s most durable Energy Storage Systems (ESS). Designed for heavy industrial applications, a Corvus ESS will reduce fuel consumption, maintenance, emissions & increase reliability. Contact us today to learn how energy storage can improve your bottom line:

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