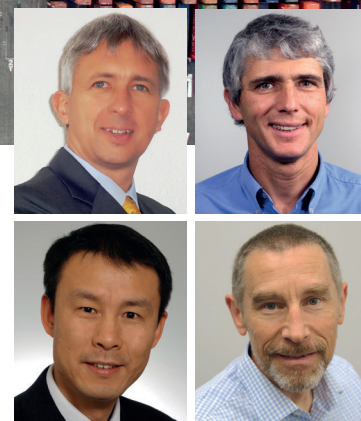




# HOW TO REDUCE OPEX COSTS FOR RTG TERMINALS

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Three major cost factors have arisen over the long term for both ship owners and operators of large cargo handling systems in ports: idle time, downtime and energy costs.

More than 50% of the total energy consumption of a port is from diesel-powered RTGs, which are used in many larger container terminals. Conventional RTGs consume 2 to 2.5 liter diesel per container move. Consequently a container terminal with a throughput of 1 million TEU consumes 2 million to 2.5 million liters of diesel per year. This drives many operators to look for suitable power supply alternatives for this type of crane, in order to reduce diesel consumption and thus emissions.

Conductix-Wampfler has been converting RTGs into electrified RTGs (E-RTGs) since 2006. The converting process involves shutting down the diesel genset and powering the RTG with electric power directly from the power grid. E-RTGs typically use 2.5 to 3.5 kWh electrical power per container move. Compared to 2 to 2.5 liter diesel and a given price

difference between electrical power and diesel, cost savings could be evident. The two main e-RTG solutions offered include one based on motor driven cable reels and the another based on conductor rails.

## DRIVE-IN I, INSTEAD OF PLUGGING-IN

The first conductor rail E-RTG solutions were plug-in versions, where a power cable with a plug and socket connector linked the collector trolley electrically to the RTG. Conductix-Wampfler revolutionized this approach in August, 2009 by launch a Drive-In solution.

With this system extension, the manual "plugging-in" of the RTG crane into the current collector trolley of the conductor rail system has been eliminated. Instead, the current collector trolley is automatically steered to the guide rails of the steel structure when the RTG crane enters the aisle, and the current collector is safely guided into the conductor rails. This Drive-In solution saves time and energy. It increases the efficiency of a terminal while reducing its environmental burden.

## AUTOMATING E-RTGS USING ADD-ONS

E-RTG solutions for conductor rails, like the Conductix-Wampfler Drive-in L system, has features that set the stage for the next big step in the evolution of RTGs: crane automation.

Besides environmental benefits, E-RTG solutions reduce one of the biggest operational costs, i.e. diesel costs. Logically, the next target should be reducing on manpower-related costs, which means not only simply reducing the number of operators, but also mitigating the costs related to human error, such as accidents or operational errors, training, and the need for continuous operation.

An automated steering system, for example, may assist the operator in steering the RTG straight when the gantry is travelling.

The system constantly measures the distance of the RTG to a straight reference structure and provides automatic steering inputs to the crane controls. This compensates for straight travel deviations and safely steers the RTG inside a container stack.

Full-E-RTG



A gantry positioning system allows the RTG to automatically find a pre-defined container position along the container stack. It also allows for an automatic identification of the container stack at the entry position. A camera system reads information from a Data Matrix Code band and the software determines the actual stack number. It then determines the absolute position of the RTG while travelling along the container stack. By comparing the actual position with the pre-defined container position information, the crane can automatically stop at the right container slot.

During RTG operation, the crane needs to exchange between its programmable logic controller (PLC) local control logic and the terminal operating system (TOS).

This data exchange requires a reliable and powerful data communication system. With its ProfiDAT data transmission system, Conductix-Wampfler has integrated the data communication fully into the conductor rail system for RTG electrification.

The Protective Earth (PE) rail serves two functions: it provides a safe earth connection and at the same time is a slotted microwave guide (SMG) channel. ProfiDAT guarantees a safe and reliable data transmission between the movable part, the E-RTG and the fixed part on the yard side, the conductor rails. This fully enclosed transmission channel provides maximum protection against any radio interference and allows a very high transmission data rate of up to 100 Mbit/s.

### MOTOR DRIVEN CABLE REELS FOR E-RTGS

Notwithstanding the widespread usage of conductor rail systems for energy and data transmission to E-RTGs, there are also operational niches where cable reel solutions offer notable advantages and could be the better choice:

- Very flexible relocation in case of yard layout modifications or expansions
- Center feeding reduces costs for flexible reeling cables in case of long container stacking blocks
- Long service life and simple maintenance limited to the cable reel itself, with easy access to motor and slip ring. It can be performed by mechanical engineers in the specific case of Conductix-Wampfler MAG Drive.
- In corrosive environments, the conductors are protected reliably within the rubber shields
- Due to high ampacity, or the ability to carry strong currents before deteriorating, it is often possible to operate in the low-voltage range LV without any transformers

However, changing blocks with E-RTGs equipped with cable reels has been a challenge. They require that crane operators interrupt the loading operations. Disconnecting and reconnecting requires additional staff in the yard, and usually these are electrical engineers due to regulations. Currently available automated plug-in systems are not mature enough to

offer reliable operation.

Like the Drive-In solution from Conductix-Wampfler mentioned before, Conductix-Wampfler's newly developed Cable Auto Plug (CAP) System has the potential to revolutionize the use of cable reels in E-RTG operations. CAP resolves some of the above-mentioned issues so that the known benefits of cable reels, like high reliability, high availability, and low total cost of ownership, can be complemented by efficient automation.

### SMALLER ECOLOGICAL FOOTPRINT

So far, E-RTG solutions, irrespective of using cable reels or conductor rail solutions, still have one weakness: their ecological footprints. For stack changing activities, they need at least a small diesel genset to power the RTG when it is in transit between two container stacks.

For those RTG terminals that are eco-conscious and want to avoid using diesel fuel, Conductix-Wampfler can add a battery pack on the RTG that converts the crane to a Full E-RTG, also known as a FE-RTG. A powerful Lithium-Ion battery pack provides enough energy to perform all stack changing activities safely, and is 100% emission-free. Up to 1,500 metres of autonomous gantry travel by battery power is possible.

### AUTOMATION OPTIMIZES OPEX

Looking into the future trends for the technical development of stacking cranes, solutions that facilitate optimizing CAPEX

and OPEX will influence decisions of terminal operators significantly.

With the above-mentioned E-RTG infrastructures and add-on features, a technically solid platform for automated E-RTG operation is ready:

- Its steel structure is a reliable reference for 2D scanners used to control an RTG's steering
- The add-on Data Matrix Code on steel structure offers an economic and reliable solution for gantry positioning
- The integrated, reliable, and safe data transmission via ProfiDAT guarantees an uninterrupted and timely data flow

Commercially, the costs of the add-on features are obviously lower than the needed technical modules, which are necessary for RTG automation.

In the context of immature automation technology, which may result in lower-than-expected productivity of automated operation, Conductix-Wampfler recommends a pragmatic approach: the Automation Aided Operation (AAO) deployment strategy offers step-by-step implementation towards full automation of existing E-RTG infrastructure.

For example, utilizing the above-mentioned add-on features allows implementing automatic gantry travel first: RTG travel to the designated position without human intervention, according to the instructions from TOS. In a second add-on, hoist and trolley operation can be automated and crane operators could be relocated to a remote control center.

Overall, saving energy costs is the primary goal of E-RTG solutions. However, utilizing the invested E-RTG facilities in a smarter and more connected way could be a further boost for OPEX savings.



Full-E-RTG Battery-Packs

#### ABOUT THE AUTHORS

Claus Burger, Global Market Manager Container Handling, joined Conductix-Wampfler in 1997 and held a number of various roles through his carrier. He has a sound knowledge of festoon systems, energy guiding chains, cable reels and E-RTGs. He is responsible for the Container Handling Market globally and works with clients such as crane manufacturers and port operators.

Willis Liu, Director Business Unit E-RTG, joined Conductix-Wampfler China in 2005. He was in charge of the container handling market, including OEMs and end users. In 2007, he initiated the idea of using conductor rails to electrify RTGs and finally developed this solution with the Conductix-Wampfler team for the international market. Since 2013 he has been based in Germany as Director BU E-RTG, a dedicated business unit

for RTG electrification solutions, in charge of business development, sales and project management.

Olivier Ruelle, Global Product Manager Reeling Systems, joined Conductix-Wampfler in 2014 as global product manager reeling systems. After a career in electronics, telecom and electrical engineered solutions, he now drives the further development of the cable reeling systems range, based on the Conductix-Wampfler technologies MAG Drive and SMART Drive, to meet requirements of future container handling applications.

Gunther Schäffer, Senior Manager Global E-RTG Projects, is a project manager for E-RTG projects worldwide, eight years of work experience on RTG electrification projects with OEMs and with end users. Strong focus on new technologies and on

new applications for RTG electrification, including data communication and energy storage.

#### ABOUT THE ORGANIZATION

Conductix-Wampfler is one of the world's leading suppliers of energy supply and data transmission systems for moving machinery and offers all available technologies and products to meet flexible and mobile energy and data transmission requirements, all from one source. Energy and data transmission systems play a very crucial role in these operations and they receive special attention by the operators, as well as by the equipment manufacturers and consulting engineers.

#### ENQUIRIES

Website: [www.conductix.com](http://www.conductix.com)