

All-electric RTGs hit the USA

The Georgia Ports Authority (GPA) has become the first port operator in North America to implement ERTGs powered off a conductor rail, beating APM Terminals' Pier 400 Terminal in Los Angeles to the starting post.

In December, the GPA unveiled its first four Konecranes ERTGs at its Garden City Terminal in Savannah and reiterated its earlier announced plan to convert its entire fleet of RTGs to electrical power by 2022. GPA currently has 110 RTGs – a number expected to grow to 169 at build out.

The GPA selected the drive-in conductor bar system from Conductix-Wampfler, the RTG conversions were carried out by Konecranes, and the power system was supplied by the local utility, Georgia Power. GPA is the first to use Conductix-Wampfler's new "Drive-in-L" system that uses linear motors instead of hydraulics or pneumatics to engage the connecting arm from the RTG into the conductor rail automatically.

Best option

Richard Cox, GPA's general manager of equipment and facility engineering, explains that the project team considered cable reels and an overhead pantograph as well as conductor bars. Cable reels had the advantage of fibre optic cores for data, but the length of GPA's stacks were an issue. The RTG blocks at Berths 4, 5 and 6 are 2400 ft (732m) long and are intersected by several vehicle crossing points. The GPA looked at terminals using cable belt covers at crossing areas, but Cox said he had concerns about debris building up in the channel.

The big advantage of a conductor bar was the availability of an automated drive-in option, which is not yet offered with cable reel systems. Garden City Terminal occupies 1200 acres and has experienced a sustained period of +10% traffic growth per year, at the same time as transitioning from a top lift to a full RTG terminal. Managing that process requires a great deal of flexibility – RTGs are moved as far as 1.5 miles between different areas of the terminal. Disconnecting and reconnecting a cable would be possible, but would be a significant burden on maintenance personnel.

The ability to use the conductor rail as a fixed point of reference for autosteering and container positioning was not a factor for GPA. It will continue to use the Sattel (now Identec) GPS system for container position information, and Konecranes DGPS system for autosteering.

Safety

With regard to the risk of a vehicle collision with a conductor rail, the GPA believes it is not a significant issue. Unlike some west coast terminals, it does not operate top lifts in RTG blocks and the conductor rail mounting poles are encased in 4ft-dia concrete blocks to protect them from terminal tractors and road trucks.

Ultimately, however, keeping vehicles away from the conductor rail is about traffic flow and the GPA is confident it can manage this. "We were concerned about collisions, but we haven't had any close calls yet," said Cox. Conductix-Wampfler's global market manager, ports, Dr Lawrence Henesey, added that configuring the RTG blocks so their profile does not extend past the conductor rail is another important point in this regard.

Another risk that other terminals have identified is an empty container being blown off a stack

The United States now has four terminals running or installing electrically-powered RTGs and more look set to follow



Set-up of the first installation in Savannah, using Conductix-Wampfler's Drive-in L system. Oversized concrete mountings were laid to protect the rail from vehicles

and hitting the conductor rail. This would most likely happen when the terminal was shut down due to bad weather, and as such is more of a maintenance than a safety issue. One of the attractions of a conductor rail is that it is "fairly easy to replace a section and we still have the diesel to operate within the stack," added Cox.

One area where GPA did change the layout recommended by Conductix-Wampfler is in the gap between the connector arm and the conductor bar. The connection side of the RTG is the opposite side of the gantry portal to the driver access stairs and the road truck lane, but personnel access is needed for the electrical room.

GPA engineering wanted enough distance between the conductor rail and the RTG to allow for a person wearing a backpack to climb the stairs without getting caught in the rail and to permit maintenance truck access, so extended the gap to 4ft 8 ins.

So far, so good

The conductor rail and the Drive-in-L system were installed by Conductix-Wampfler while Konecranes did the integration with the RTG electrical and control system. Cox explains that Konecranes had a considerable work load as the GPA did not want the ERTG system to be stand-alone from the main crane controls. Konecranes integrated the ERTG functionality into the



crane PLC and the CMS (crane monitoring system) and adapted the drive system to support regenerative energy from the RTG lowering cycle.

After two months of operations the GPA is pleased with how the conductor rail system has performed. As with any new system there have been teething issues, including getting the alignment between the connector arm and the rail right on both sides of the rail, reducing nuisance trips and some software issues. Cox stressed that these are really "fine tuning" points and there have been no major hardware problems.

As far as the drivers are concerned, acceptance has not been an issue. They were keen to volunteer for training and like the smoother, quieter operation. Until recently the GPA ran diesel-powered quay cranes and drivers were glad when these were electrified as it removed diesel fumes around the cab. The ERTGs are viewed with the same enthusiasm.

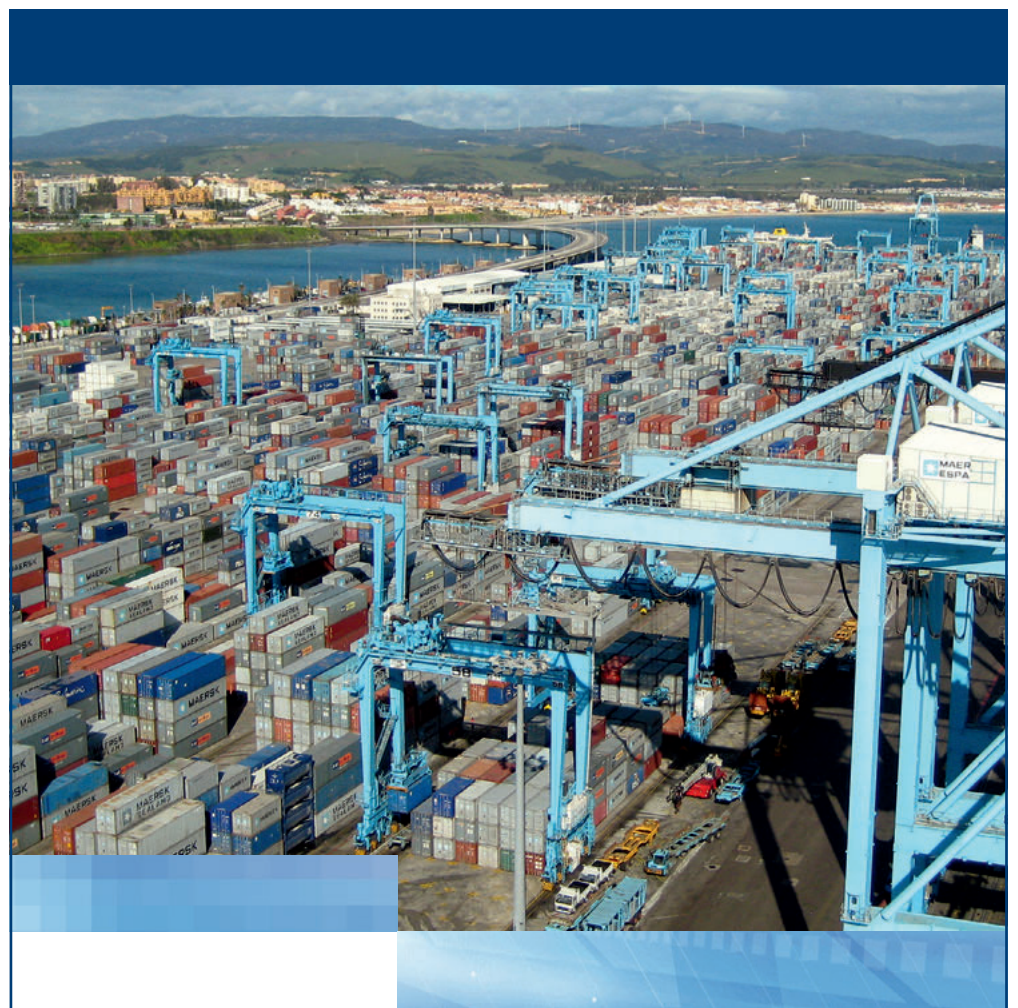
Savings

GPA calculates that converting a machine to ERTG reduces fuel consumption "by an estimated 95%." The current fleet of 110 machines use around 1.57M USG of diesel (almost 44M litres) a year and electrification would cut that to 78,000 USG. At its maximum capacity of 6M TEU, the GPA would have around 169 RTGs consuming around 5.97M USG of diesel a year. Electrifying a fleet that size would save GPA nearly US\$10M a year in power costs.

GPA is also expecting a significant saving in downtime through reduced genset maintenance. When it converted its STS cranes from diesel to electricity, downtime dropped from 1.2% of operating hours to 0.5%. Cox said he expects a very similar performance from the ERTGs. The pay-back period for electrification depends on fuel and energy costs, but is expected to be within the 4-5.5 year range.

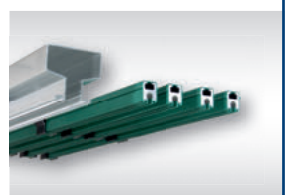
Staying with RTGs

Committing to electrifying up to 169 RTGs indicates that the GPA does not intend to transition to RMGs in the short to medium



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term. Cox said GPA has considered RMGs, but their lack of flexibility is a drawback. RMGs are stuck on a single block and GPA would need 50-60 more machines to cover its massive facility.

A key part of the GPA's electrification plan is a more detailed study on how the RTGs use power, so it can better design a system for the whole terminal and get a clearer picture of budgetary implications. The Electric Power Research Institute (EPRI) has installed equipment on two conven-

tional RTGs and two ERTGs to provide detailed data on the energy usage characteristics of individual machines. EPRI and other researchers will use the data to determine the amount of regenerative energy produced by an ERTG cycle. The GPA did similar research when it converted STS cranes from diesel and found that an STS crane generates electricity for 18 minutes every hour.

The study could affect the sizing of conductor rails. The first four ERTGs are running on a



West Basin Container Terminal in the Port of Los Angeles is now running RTGs with the cable reel carrier system from Paceco Corp

Staying on the rails

PaulVahle GmbH reports continued strong interest in conductor rails for ERTGs, although it cannot confirm project details at this point. Vahle has also had to tackle the safety issue with potential US customers and one method it has identified that could help address the concern is putting the conductor rail inboard the RTG legs, between the leg and the container. This would also allow safer access to tyres and long travel gear.

Other markets have different

concerns; dust and sand accumulation are a big issue in the Middle East, for example. Vahle's product manager Jürgen Henkel said that mounting the rail so the slots open to the bottom makes it difficult for sand to stick, but they can be safely cleaned periodically with compressed air. Vahle is also working on two projects using conductor rails for STS crane trolley power applications, one with APM Terminals and another with crane maker ZPMC. □

480v rail sized to operate four RTGs at a time at any stage of the duty cycle - so four RTGs could all hoist their rated load at the same time. The study will also look at whether this is needed across the whole terminal.

More to follow

While major greenfield and redevelopment projects are tending to favour RMGs and ASCs, there are many RTG terminals in the US that are under pressure to electrify their machines. There are around 250 RTGs in California alone and other big RTG termi-

nals include Charleston (43) and Bayport Houston (36).

Three other terminals in the US are known to be installing ERTG systems, including AMPT Pier 400 terminal, which is also using a conductor rail from Conductix-Wampfler. The system is now expected to be operational in February or March this year. Dr. Henesey said it had been hit with some delays due to "extraordinary events" like the ILWU labour disruption, but is now progressing.

WBCT's cable trolley

In another development, West

Basin Container Terminal (WBCT) in Los Angeles has installed the Paceco Corp cable reel carrier (CRC) ERTG system on the first two of six RTGs. The CRC uses a cable reel. However, the reel is not mounted on the RTG, but runs next to it on a trolley (the CRC). Paceco began the WBCT project some time ago but, as previously reported, there was a problem with certification; the cable was not acceptable to the City of Los Angeles because it was made to a European CE standard. This issue has now been resolved and WBCT will not be required to change the cable.

The CRC has four solid rubber tyres and is attached to the RTG by two towing arms that can be raised out of their mounting slots when the RTG needs to move block. The trailing cable runs along the ground in a guide trough made out of 10 gauge steel, which also acts as the guide to keep the CRC straight. The CRC is the reference point for an optional autosteering system that uses two laser range finders to monitor the distance between the trolley and the RTG and correct any deviation automatically.

Paceco's chief engineer Sun Huang said a laser range finder autosteering system is more reliable than GPS. GPS is often used for container position information as well, but Paceco has installed encoders on the hoist and trolley drive and tags in the ground for this requirement at WBCT.

With small diameter cable, the CRC system can support up to 750ft of RTG travel in a single direction at the RTG's conventional (130 m/min in this case) speed. If the cable feed is from the centre of the block, long travel from a single cable reel could be as much as 1500ft. The cable does have to unplugged and reconnected manually if the RTG needs to change block, but Huang said the system is 460v and does not require a certified HV specialist.

While APMT and GPA have opted for conductor rails, Huang said the CRC is a good solution for terminals that are concerned about safety in a mixed top pick/RTG operation. It also has the advantage of requiring minimal fixed infrastructure - the cable channel is the only thing that needs to be fixed down, and it is mounted using small dynabolts.

Next to install the CRC will be Seaside Transportation Services (Evergreen) at berths 226-336 in LA. Last month the South Coast Air Quality Management District Board (AQMD) approved a grant of US\$1.87M to Seaside to cover the cost of three CRC systems and 50% of the transformer cost.

High voltage option

Operating voltage and (un) plugging the cable are key issues with

Elettrotec growing

Italy-based Elettrotec Kabel may be a relative newcomer to the market (the company was founded by experienced professionals in Bagnolo in Piano in 2001), but its extensive range of cables includes designs for all kinds of harbour cranes and it has also achieved considerable success in the Italian automation and robotics markets.

The company has been growing on a global level and has subsidiaries in Europe, North America and Asia, winning business in the crane cables, drag chains, festoon systems and marine and offshore segments. It says its strengths are ready product availability from stock, high quality and optimal customer service. Wherever possible, the company promotes halogen-free and low smoke materials even when these are not necessary.

In the ports sector, Elettrotec works with OEMs, power systems contractors and end users, and says that the drive towards ERTGs and ASCs is providing it with very strong business opportunities. □

a cable reel system. Where a terminal has in-house resources to supply enough 480v power, it may prefer to step down voltage before the RTG connection. The disadvantage of this approach is a very large and heavy cable is required to meet the electrical current demands of an RTG at 480v.

Using 4160v supply and then stepping down the voltage on the RTG itself allows a much smaller, lighter medium voltage cable to be used. As previously reported, California-based ESL Power Systems, Inc has developed a safety-interlocked fused disconnect system that enables terminals to run 4160v power supply directly to RTGs without requiring a 4160v breaker at the substation for each RTG. Between four and six RTGs can be fed off a single 4160V breaker, and cable lengths up to 300m (984 ft) can be achieved, allowing a single cable reel to support a 600m (1968 ft) block with a centre feed arrangement.

ESL's safety interlock system prevents a MV cable from being removed or connected under load or while there is any residual current in the cable or connector. A single RTG cable can be safely disconnected without tripping the upstream breaker and disrupting power supply to other RTGs. This system was first implemented and tested by SSA Marine in Panama and ESL now has over 100 units in operation worldwide. □

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ATT Lift from Gaussin

France-based Gaussin Manu-gistique is launching a new variant on its ATT (automotive terminal trailer) product, ATT Lift. While ATT is Gaussin's alternative to conventional terminal tractor/trailer sets, ATT Lift is an alternative to straddle carriers, as it is self-buffering at the stacking crane interface. The ATT Lift chassis has movable container guides and a lifting/lowering stroke, and it matches with a docking station at the stack interface.

The docking station allows the ATT to decouple when is delivering/retrieving a container to/from the CY, so it no longer has to wait to be serviced by the stacking crane. This saves time compared to conventional RTG ter-

minals, but it also means, says Gaussin, that ATT Lift can be used as an alternative to straddle carrier systems. Gaussin describes straddle carriers as the most expensive and most costly to operate and maintain type of ground handling equipment.

A straddle carrier, of course, grounds the container at the quay and is itself the grounding/stacking machine, and this double decoupling ability has traditionally been highly rated for its efficiency and cycle speed. However, there is a body of opinion that, in terms of the cycle between ship and stack, the stack interface is where most delays occur in RTG terminals.

In a sense, ATT Lift can be seen as the Gaussin equivalent of the