

and Bao says replacement intervals range between one and two years. SIPG bases its analysis of electrically-powered RTGs on "coal equivalent energy." (This is examined under "cold ironing" on p44 of this edition).

Deputy engineering manager Michael Yau said that NBCT also considers the overhead cable system to be the best option. It considered a cable reel system but the cost was around Yuan10,000 per metre of installation and the overhead system was much cheaper. The steel towers can be fabricated locally and very little in the way of ground works is required.

NBCT has four lines installed, each 1.2km long, and is installing a fifth this year. NBCT had an issue with some carbon brushes needing replacement every three months, but Yau says they are working to improve this to 9-12 months.

E-Rover from Igus

Igus has previously installed cable chains for providing mains power to quay cranes as well as for quay crane and RTG trolleys. The latest Igus solution for RTGs is an "energy guiding system" called "E-



The SIPG installation resembles a trolley bus application



Rover," developed for long travel applications that require a large tolerance between the energy chain and the mobile equipment.

The E-Rover uses the Igus P4 "maintenance free energy chain" and users can choose between Chainflex single core and Multicore cables (both shielded and unshielded). Medium/high voltage 6/10kV cables are also available as an option. To hold the chain system in place, clamping

plates are fixed to the ground with a system similar to that used for holding crane rails, and the trough is then bolted to the ground clamping plates.

The first E-Rover system has been put into operation at an undisclosed terminal in Asia where the total long travel is 220m and the travel speed is 160 m/min. The lateral deviation of the E-Rover system to the RTG is ± 400 mm, although Igus says this is not the maximum and any other distance can be catered for.

Higher speeds

Compared to cable reel systems, the E-Rover can support higher speeds (up to 300 m/min, which would be needed only for a high speed RMG), but the maximum travel length is 800m, which may not be long enough for some terminals. The first installation is at a port that experiences some snow, but Igus's product manager for energy chain systems, Theo Diehl, says that snow and freezing temperatures are infrequent and do not interfere with the system's smooth running.

In very cold areas and/or locations that have to contend with

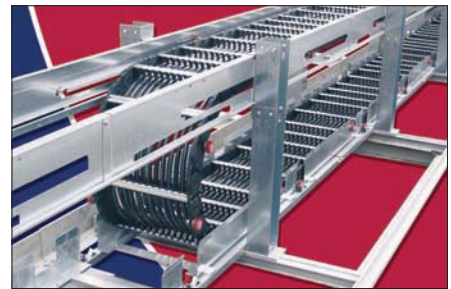
snow, Igus covers the chain system and this has been done successfully on crane trolley systems in Finland and in Saint Petersburg.

As far as the cost is concerned, Diehl says the capital cost is similar to alternative systems, but operating costs are lower because there are no parts to replace at scheduled intervals.

Operators can add cables at any stage, including fibre optic cable for faster and more reliable data transmission than a wireless network. At this point Igus does not have a drive-in option, although this is on the drawing board.

Refits at the quay

The first ship-to-shore gantry cranes to feature KabelSchlepp's Rail Cable Carrier (RCC) system have now been commissioned in Dakar. The two Reggiane cranes were relocated from Port Rashid by DP World when it took over the concession in Dakar, Senegal, but commissioning had to be delayed while the landside rail was replaced. The two second-hand cranes have a self-propelled trolley with a top speed of 150 m/min and an outreach of 44.5m, and total trolley travel is 78.5m.



The KabelSchlepp RCC cable carrier. Experience on the cranes at Dakar has been delayed because of quay repairs. The cranes have only just gone into service

The RCC is designed as a roller chain system where the chain "rolls" inside a dual level support structure on ball-bearing rollers fitted to the chain sides. The rollers fit in recessed U-shaped retainers on the frame, which hold the cable carrier securely.

This chain is supported over the entire travel length, which KabelSchlepp says reduces push and pull forces by around 90% compared to gliding arrangements, reduces wear and prolongs the service life of the cable and chain system compared to a conventional drag chain.

The RCC can be used with standard cable carriers from the KabelSchlepp range at high speeds with cable weights up to 50 kg/m. Compared to a festoon system the cable length can be reduced by two thirds - length at Dakar is 52m for a 78.5m trolley travel.

The Dakar cranes feature a "hybrid" chain from KabelSchlepp's MC1250 series with bolted aluminium stays in a solid

design. This construction provides "fitting accuracy to the millimetre, great stability and exceptionally smooth properties," said KabelSchlepp.

On the rails

Vahle has recorded another success with its combined conductor rail and slotted microwave guide (SMG) system for the trolley power application on a quay crane. Vahle has previously fitted this combination to a new crane at Teesport and retrofitted it to one crane at HIT, Hong Kong (which was subsequently relocated to Hui Zhou) and one at Shanghai Pudong International Container Terminal at Waigaoqiao Phase I.

All these cranes were self-driven trolley designs, but Vahle has now installed a much bigger system on a full machinery trolley crane at Algeciras, for APM Terminals.

At Algeciras the Vahle conductor rail and SMG replaced a worn out festoon on a 13 year-old crane. Although it has the references

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igus-crane.com

plastics for longer life®

igus® GmbH
Spicher Str. 1a

D-51147 Cologne
cranes@igus.com

phone +49-2203-9649-0
fax +49-2203-9649-222

Austria +43-7675-40 05-0
Belgium +32-16-314431
Brazil +55-11-35314487
Canada +1-905-7608448
China +86-21-51303100
Denmark +45-86-603373

France +33-1-49840404
Great Britain +44-1604-677240
India +91-80-39127800
Italy +39-039-5906-1
Japan +81-3-58192030
Malaysia +603-7880 5475

Mexico +52-722-2714273
Netherlands +31-346-353932
Poland +48-22-9635770
Portugal +351-22-6109000
Singapore +65-64871411
South Africa +27-31-5696633

South Korea +82-32-8212911
Spain +34-93-6473950
Sweden +46-42-329270
Switzerland +41-62-3899797
Taiwan +886-4-23581000
USA +1-401-4392200

ESL launches MV option

California-based electrical systems specialist ESL Power Systems, Inc has developed a safety-interlocked fused disconnect cabinet that enables terminals to run 4160v power supply directly to their RTGs without requiring a 4160v breaker for each crane.

The system was developed in consultation with SSA Marine, which is looking to electrify RTGs at up to five terminals. Like many other terminal operators, SSA does not want to use a conductor rail system because the fixed infrastructure makes future yard changes difficult and raises safety concerns where terminals use top picks around RTG rows.

For most RTGs powered off a cable reel, the power supply is stepped down to 480v before being fed to the RTG. With this approach the cable reel carries 4160v power, which is then stepped down on the RTG.

ESL's president Michael Hellmers says that this is a much more efficient option as it allows a smaller diameter cable and ground trough to be used.

The cable reel can manage up to 600m of cable. SSA has successfully implemented the system with 350m of cable for an effective

travel range of 600m from a central feed point.

When the system was initially designed with SSA each RTG block had a 4160v breaker, but these are expensive and very large and they came up with a better solution. ESL's new safety-interlocked fused disconnect cabinet is used to connect each RTG to the 4160v power supply.

Between four and six RTGs "daisy chain" off a single 4160v breaker and each RTG can be disconnected and reconnected without tripping the upstream circuit breaker and shutting off power to other RTG blocks.

ESL has a patent pending on its safety interlocked design that features a 7.2kv push/pull receptacle, a safety interlocked medium voltage switch and a mechanically interlocked ground switch. This prevents the operator from accidentally making or breaking the connection under load or removing the plug prior to releasing any residual voltage.

The system has been tested for nearly a year at SSA's MIT terminal in Panama. SSA is planning further installations at several terminals. ESL has now launched the system on the wider market. □

Front (left hand of picture) and side views of the new ESL cabinet

