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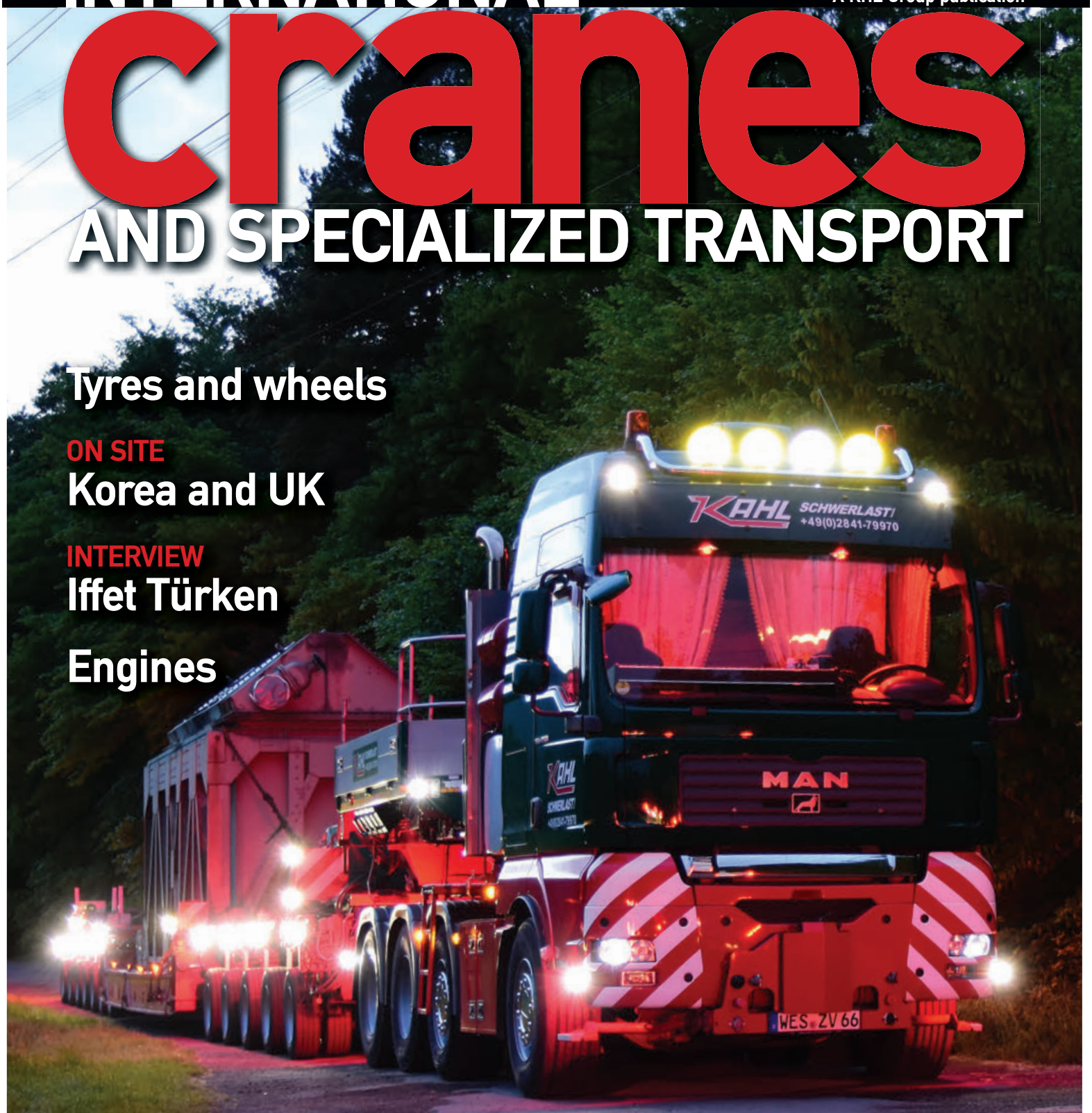


## Transport special issue

ICT50 TRANSPORT

SC&RA
OFFICIAL MAGAZINE
THE MAGAZINE FOR EQUIPMENT USERS AND BUYERS

# Size matters… part 2

**When talking about the Panama Canal expansion project it is only right to mention some of the heavy lift and transport-related activities that went into building it and the lock construction and other upgrades in general. MARCO VAN DAAL reports**

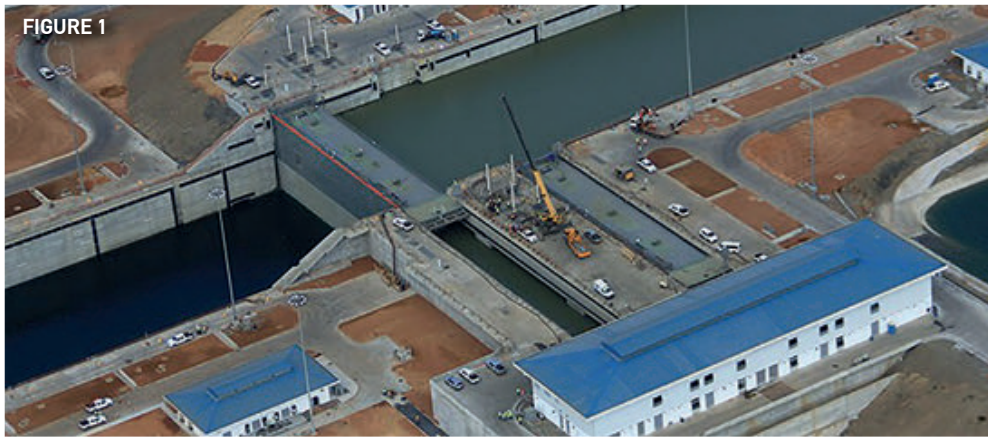
FIGURE 1

For the Third Set of Locks Project on the Panama Canal in Panama, central America, Sarens from Belgium was one of the main contractors responsible for the mobilisation of the lock doors, a task that sounds easier than it is.

The scope comprised the loading, shipping, transport and delivery of eight sets of lock doors (16 doors in total) varying in weight from 2,331 tonnes to 3,943 tonnes and varying in height from 23.5 metres to 34.7 m. All lock doors had the same width of just over 58.5 m as the new Panama Canal width is 55 m and they were roughly 10 m in thickness.

Four sets were destined for the Pacific side and four sets for the Atlantic side. The new doors operate differently from regular lock doors that turn to open and close on a set of hinges, either in a one door or two door configuration. These are so-called mitre gates. The new lock doors do not turn and there are no hinges. These doors open and close by rolling sideways from a constructed cavity in the lock chamber wall into a slot on the other side of the chamber wall. See Figure 1.

The lock doors were manufactured by Cimolai in Italy, with their final destination being across the Atlantic. Their size and weight meant that the lock doors were constructed in a standing position, the same way they were installed. The relatively narrow width of 10 m compared to their height, which was a maximum of 34.7 m, combined with a centre of gravity when loaded that was almost 20 m above grade, made these doors unsuitable for transport without special provision. Each door was fitted with five transport beams 15 m long and 1.3 m in height. This would raise the CoG by 1.3 m but the added 220 tonnes in deadweight did reduce this.

Sarens used four sets of 30 axle lines – 120 axle lines in total – of its Kamag K24ST self propelled modular transporter (SPMT) with 48 tonnes of axle line capacity. Even for the heaviest doors (3,943 tonnes and a CoG that was offset, the maximum axle line load did not exceed 40.5 tonnes. See Figure 2.


FIGURE 2


FIGURE 3

## Moving doors

From the fabrication yard each door was driven onto Sarens' own barge, *Paula*, for a river and ocean voyage from the private berth at the manufacturer to the port of Trieste (also in Italy) where a more critical ro-ro (roll on, roll off) operation was performed from the *Paula* directly onto a heavy lift vessel. See Figure 3. This transshipment involved an accurate ballasting operation of both the *Paula* and the heavy lift vessel. The load on the >

## ABOUT THE AUTHOR

Marco van Daal has been in the heavy lift and transport industry since 1993. He started at Mammoet Transport from the Netherlands and later with Fagioli PSC from Italy, both leading companies in the industry. His 20-year-plus experience extends to five continents and more than 55 countries. It resulted in a book *The Art of Heavy Transport*, available at: www.khl-infostore.com/books Van Daal has a real passion for sharing knowledge and experience and holds training seminars around the world.

FIGURE 4

*Paula* decreased and therefore rose out of the water (decreasing draft) while the load on the heavy lift vessel increased and submersed deeper into the water (increasing draft).

The heavy lift vessel carried four doors on each of its four transatlantic trips.

In Panama Sarens offloaded all 16 doors by the same 4x30 axle line configuration and stored them in a temporary staging area. As four door sets were destined for the Pacific side of the Canal, these eight doors had to cross the Panama Canal one by one to reach their destination. This crossing was carried out by barge, the first of which is shown in Figure 4.

Even though each of the doors had already undergone four separate ro-ro operations (load-out at the private berth, transshipment in Trieste, load-in at the Atlantic side and load-out at the Atlantic side), the load-in on the Pacific side posed a challenge as tidal variation can be as much as 6 m. This demanded a speedy, well thought out and well prepared ballast plan as well as an uninterrupted load-in execution, all of which was within the capabilities of Sarens.

At the final destination on both the Pacific and Atlantic side, each door was driven into its respective cavity in the lock chamber wall and offloaded.


FIGURE 5

## Alternative installation

Not all lock doors are installed this way. Most are lifted into position in wet conditions. This does not make the operation necessarily easier, it is a different approach to achieve the same goal. In 2004 Barnhart Crane & Rigging removed and replaced a set of lock doors on the Black Warrior River just outside Tuscaloosa in Alabama, USA. The lock doors were 25.9 m tall, 19.8 m wide and 2.1 m thick. Each one weighed 327 tonnes. Unlike the Panama Canal doors, the doors for the Black Warrior River locks were transported in a laid down position because they would be lifted (with a tailing arrangement) into position.

The plan for the gate replacement was based on a schedule that would keep disruption of the surrounding industrial facilities to a minimum. Keeping a tight schedule required the gates to be removed while the lock was full of water but, for the installation of the new gates, the requirement was for the lock to be completely dewatered. This would provide the Army Corps with a means to inspect the pump system and to install the pintle and hinge without needing to use divers.

Barnhart proposed to use a modified version of its Modular Lift Tower (MLT) system to span the 34 m opening of the lock. The modification involved finite element analyses as well as a newly designed moment connection allowing the required span. The MLT girders were equipped with a 500 tonne traversing winch that would ensure a 30 day turnaround for the removal of the old door and installation of the new door.

The entire MLT was erected using a Demag CC 2000 crawler crane from a barge that also held all lifting equipment and girders. See Figure 5. As a system load test was required by the Corps of Engineers prior to lifting the lock doors, the CC 2200 was also used as test weight.

A 21 m wide river barge was brought in position while the first door was lifted out of its hinges. The 500 tonne winch was fitted with a swivel as the lock doors have to be rotated out while being lifted. Each 21 m wide door was then lain down onto the waiting barge onto a bed of cribbing. The tugboat manoeuvred the barge in such a way that it became the tailing device. See Figure 6.

## Out with the old

With the old doors removed, another barge carrying the new doors was brought into position. The reverse operation was performed, again with the barge being

used as the tailing device. See Figure 7. The lock doors where lifted in between the MLT girders until cleared from the barge and lowered (until they clear the girders), rotated and installed over their hinges. This was a critical part of the operation as there was not much clearance between the doors and the girders. See Figure 8.

With the new doors installed the barge was taken out of the lock and the Corps of Engineers installed so-called "stop logs". These create a barrier that allowed the Corps of Engineers to dewater the lock completely and to inspect those parts that had been submersed for decades. During this part of the operation Barnhart performed the jacking operation as the new doors had to be lifted slightly to allow the engineers to visually inspect all the major components.

This project was rewarded with an SC&RA Rigging Job of the Year prize.

Interesting fact: When the MLT had just been erected and rigged it had to be partially derigged because of *Hurricane Ivan*. All equipment was placed back on the barge and both lock doors were closed to protect the equipment during the passing of the storm. When the storm had passed the MLT was erected once again and Barnhart still completed the project ahead of schedule. ■


■ *With thanks to Carl and Hendrik Sarens, Kleopatra Kyrimi at Sarens and to Jeff Latture and Shaun Sipe at Barnhart Crane & Rigging for help in producing this article.*