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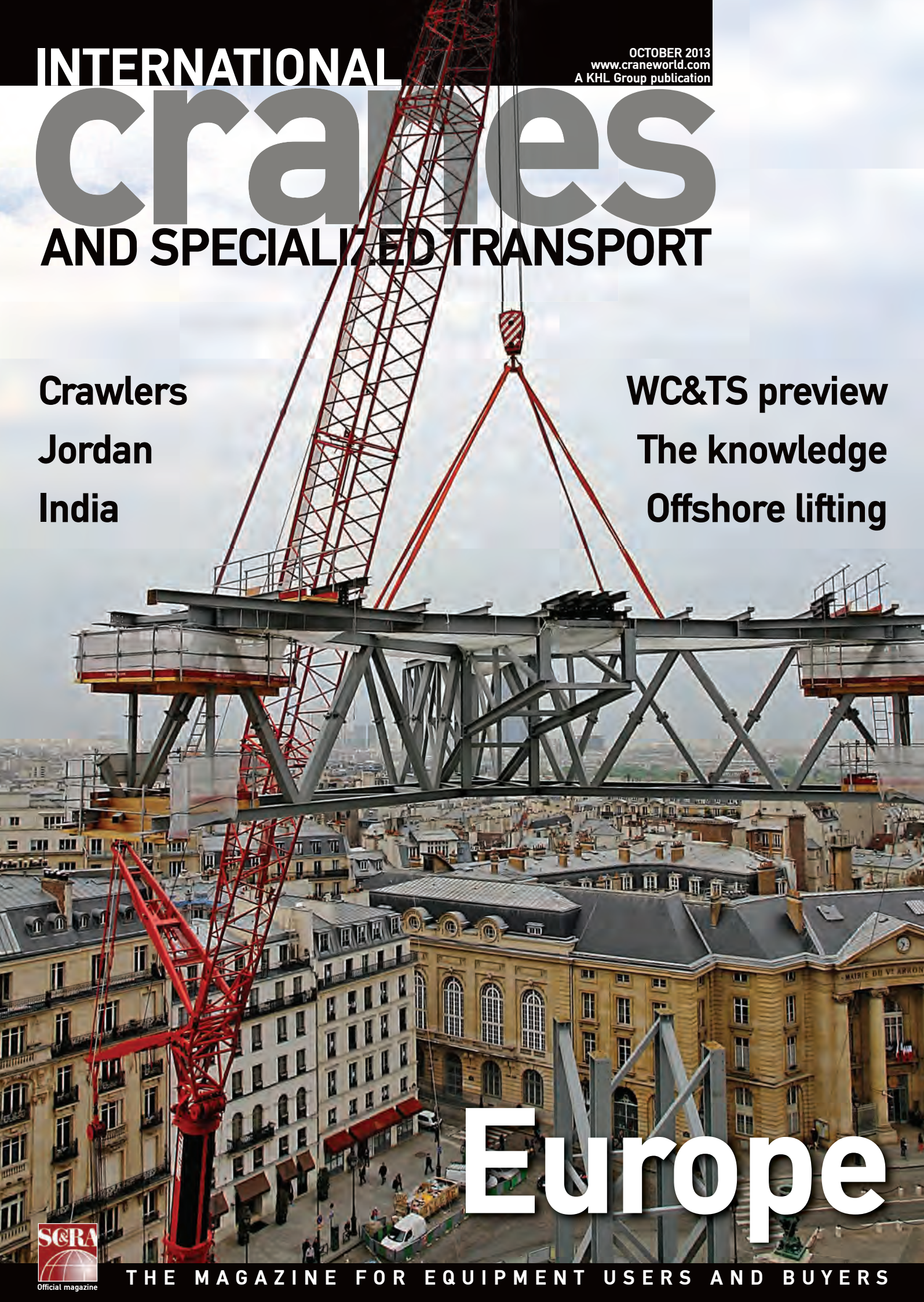

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THE MAGAZINE FOR EQUIPMENT USERS AND BUYERS

Launching a ship using pneumatic rubber rollers

As a logical sequel to the last two articles on transport and crane basics this month's feature, the fourth in the series, covers alternative moving and lifting techniques. MARCO VAN DAAL explains some options

Alternative ways

Cranes and modular transporters are considered conventional tools for the job but, where they cannot meet all challenges, an alternative is needed. In cases where there is a limited footprint, height restriction or other physical site constraints, the question, "What if a crane or transporter cannot be used?" may arise. The pyramids in Egypt, for example, would not exist without the development of alternative lifting and moving techniques.

This is a good starting point. The average pyramid consists of 2.5 million limestone and granite blocks, each weighing 2.5 tonnes each. More than 6 million tonnes of material has to be mobilised to build a large pyramid, sometimes from as far as 800 km away. Even with today's equipment and technology, these are mind boggling numbers.

There are a few different theories on how the pyramids were constructed but they all involve the rolling of each block via an inclined slope to the final elevation and destination. The rolling is believed to have been carried out on logs with many people pulling on the ropes. The logs coming out at the rear end have to be picked up and carried to the front end where they are lined up for the block to continue rolling on.

One of the challenges was, and even still in today's rolling applications, is the starting, stopping and steering of the load. It requires a certain force to start rolling, and once the load rolls it is important to keep it rolling. For the steering, one would have to stop the rolling motion, change the angle of the logs and start rolling again, all on an inclined surface. To turn the corner, it is believed that sand was spread out over a level area then the block was skidded over it with brute force.

Fast forward

Two moving techniques that are frequently applied in our industry today find their roots in the pyramid building >

Tank rollers to reduce friction in heavy shift applications

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 esteemed companies and leading authorities 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.com/books/the-art-of-heavy-transport/

Van Daal has a real passion for sharing knowledge and experience – the primary reason for the seminars that he frequently holds around the world. He lives in Aruba, in the Dutch Caribbean, with his wife and daughters.

era. The rolling of heavy loads is applied on many projects. Picking up the logs, however, and carrying them to the front of the load is extremely labour intensive and counter productive. A method where the logs are tied together and the ones that are ejected from the rear are automatically transferred to and injected in the front would eliminate much labour and increase the reliability of such a system. Tank rollers do just that and they are used in many applications.

Turning a load, like turning the pyramid block, becomes easier when the friction between the load and the surface it is sitting on is at its lowest. This can be achieved with the introduction of a friction reducing material, such as the sand in the previous example.

In reality, any friction reducing material will do, provided it is used on the right base. Oil on steel, Teflon on stainless steel, grease on hardwood, even regular liquid dish washing detergent has been used to move a 250 tonne generator into an engine hall. All modern skidding systems and turntables are based on this principle.

There is a specific application where a log-like method is still used, pretty much the way it was done in ancient times. Launching boats, barges and ships from a slope into the water can be achieved with airbags. This method of launching vessels is more commonly applied in the Far East and is a fast way of launching vessels, if done the right way. It requires some detailed knowledge of the procedure and the airbags in particular. Airbags have a break-lose friction of 3 to 4 % of the weight they carry. Thereafter (once the vessel is moving) the dynamic friction can be as low as 1 % or less if on a hard subsurface. This means that the tie back arrangement, to avoid a run-away vessel, requires serious looking into. Airbags are available from 1 to 2.5 metres in diameter and up to 25 m long. Depending on the airbag pressure they can easily weigh 400 or more tonnes each.

Calculating airbag capacity

Let's assume that we have an airbag with a diameter (D) of 1.2 m and a length (L) of 15 m. The airbag pressure (P) is 4 bar (400,000 N/m^2) and, after placing a load on it, the height (H) cannot be less than 0.5 m.

The capacity, F, of this airbag is then, (1.2 – 0.5) * 400,000 * 15 = 4,200,000 Newton, which equals roughly 420 tonnes.

The advantage of using airbags over a load out with SPMT onto a submersible barge is that airbags are cheaper and easier to use, there is less mobilisation cost and less investment. If it is already known during the construction of a vessel that airbags will be used for the launch, the docking blocks (on which the vessel sits while on shore) can be spaced in such a way that the airbags can be inserted and inflated, therewith lifting the vessel from its docking blocks, ready to launch. The airbags float and can be easily retrieved.

Air pallet with the inlet hose for compressed air and the rubber cushion

Disadvantages are the inability to make corrections during the launch and the necessity of building the vessel in front of or on a launch ramp. If the ship building company is building multiple vessels at the same time, they will need multiple launch ramps. The picture above shows an airbag launch where the airbags can still be seen on the bow of the vessel. The tie back arrangement can also be seen.

Airbag issues

A problem with airbag launches is that the launch ramp has to be designed and built in such a way so the vessel can simply float off the ramp while it enters the water. Results of an incorrect ramp (too short, incorrect or no angle) can be disastrous for the airbags, the ramp and the vessel being launched.

One often overlooked aspect of an airbag launch is the tidal condition. Launching at too low tide can result in the vessel hinging on the end of the launch ramp. The full weight (minus the buoyancy) is applied to that hinging area and buckling of the vessel becomes a reality.

While on the subject of air assisted moves, the air pallet has to be addressed. An air pallet is a rigid place with an airbag

Air pallet system being used to move a large engine in an industrial environment

Using air bag rollers to launch ships requires careful attention in tying them back

mounted to the underside. This airbag looks like an inner tube cut in half, the bottom is open. The air pallet is connected to an air compressor that fills up the airbag and lifts the air pallet (with load) off the ground. Since the bottom of the airbag is open, air escapes from here. This is exactly what it is intended to do. While the air escapes it creates a tiny gap between the airbag and the floor surface, forming a continuous film of air. Effectively the airbag, with its load, is now floating and friction is at approximately 2 %. It is the same principle as a hovercraft.

As with all other moving methods there are a number of pros and cons. The biggest advantage is that air pallets can freely move in any direction. They are not bound by path or track and final positioning of the load becomes an easy task.

Disadvantages, however, are that wherever the air pallet is moved to, the compressor with all the hoses needs to follow. No air pressure, means no movement. Also, the air pallet only works well on a perfectly smooth floor without cavities or cracks. Unevenness in the floor causes the air to escape from the airbag at the lowest point in the floor and disturbs the film of air, which means no more movement. Air pallets are also unsuitable for work on inclined floors, since the

A group of tank rollers on a steel guide track

airbags are not creating the air film at the exact same moment. This means the load could move (under the influence of the incline) while one of the airbags is still in contact with the floor. There is a realistic risk of airbag damage in such cases.

Next month's article will continue with this theme and address more alternative methods of moving and lifting. ■

NOTE: Every effort is made to ensure the accuracy of the contents of these articles. If you find any mistakes, a brief notification and explanation would be appreciated.