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SPARES

OTHER HEAVY MACHINERY

Another way of doing it

Despite the increasing capacity of All Terrain, crawler and mega lift cranes, they cannot even begin to look at some of the massive loads that need to be lifted and transported. Even Mammoet and Stoeff Engineering's latest mega lifter called 'Focus' which has a theoretical capacity of 24,000 tonnes may well be insufficient or not a practical option. This month we take a look at some of the alternative lifting and moving solutions from around the world.

Two years ago in a similar feature C&A profiled Enerpac - one of the world's leading manufacturers of high pressure hydraulic systems for lifting and shifting heavy loads - looking at its strand jacks, hydraulic gantries, skidding systems and SPMTs. The company has recently launched a new 56 tonne SCJ-50 Cube Jack - a compact and portable alternative to wooden cribbing for various applications including equipment maintenance, vehicle unloading or jacking a transformer.

The jack uses a base lifting frame and self-aligning, lightweight steel cribbing blocks giving a safer, controlled and more efficient alternative to climbing jacks with wooden cribbing.

Using a similar operating principal to Enerpac's larger Jack-Up Systems, the SCJ-60 has a much smaller footprint and without the need for

electrical controls. Up to eleven, 16kg steel cribbing blocks can be safely and easily stacked onto the compact Cube Jack base frame giving a maximum lift height of two metres. The base frame footprint measures 502mm x 430mm making it easy to move around particularly in a restricted operating space. A low 494mm minimum initial jacking height increases flexibility and reduces start up time. The SCJ-50 Cube Jack operates with standard 700 bar hydraulic pressure and is compatible with standard Enerpac pumps such as the Split-Flow Pump that offers the ability to synchronously operate multiple Cube Jacks.

Overload testing for the SCJ-60 has now been completed using four Cube Jacks connected together to provide simultaneous lifting and lowering, lifting a 226.5 tonne test load up to a height of two metres. The Cube Jacks were also subjected



French heavy lift company Scales SAS has used an Enerpac JS-250 Jack-up gantry system to lift and lower Koumba - a 8.9m diameter, 11.4m long tunnel boring machine weighing 880 tonnes - in the latest phase of the Paris Metro extension project.

to a 1.5 percent side load at its maximum height to demonstrate its stability even with an oversize load.

"The incremental system mechanically locks the load as each cribbing block is manually added or removed, instead of being held by hydraulic pressure," said Peter Crisci, product line director, Enerpac heavy lifting technology. "Once the mechanical lock engages, the lift cylinder retracts and another cribbing block can be added or removed. This safer, simplified operation sequence can be accomplished with 50 percent fewer cycles than climbing jacks, yielding a substantial increase in productivity."

Electric modular side shifts

Enerpac has also expanded its hydraulic gantry lifting options

for industrial movers. In addition to fixed lifting lugs, it now offers modular electric powered header beam side shift units for its entire telescopic gantry range from the SL100 through to the SBL1100. The modular side shift units allow gantry users to customise the 'below the hook' distance to suit header beam dimensions and project requirements. It also requires less space above the header beam compared to hydraulic powered side shift units.

Controls for the electric side shift are integrated within the gantry base units and wireless control system. The side shifts are available with extension bars and sling guides providing more lifting options and all side shift systems ship in dedicated storage frames for ease of handling.



An Enerpac gantry with electric powered header beam side shift

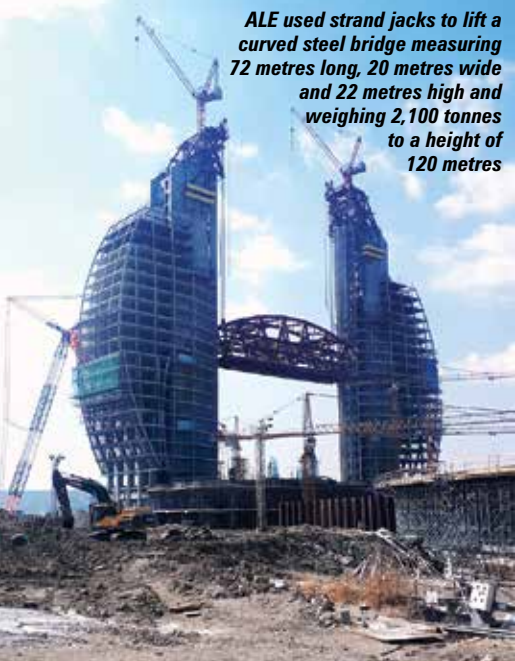
Record-breaking lift in Azerbaijan

Heavy lift and transport company ALE has used strand jacks to lift a curved steel bridge - measuring 72 metres long, 20 metres wide and 22 metres high - weighing 2,100 tonnes to a height of 120 metres during the construction of the seven-star luxury La Luna hotel in Baku, Azerbaijan. The bridge forms a link between two of the hotel towers and claims to be a record-breaking lift using this method. When completed in 2010 the 28 storey hotel will be crescent-shaped.

The bespoke lift was initially suggested using several large cranes to lift the bridge. However these would have been costly and impractical for the project's congested site. The region's frequent high wind speeds would also have risked significant delays to the project.

Strand jacks were prepared on specially-designed jacking beams mounted on each of the towers 138 metres above the ground. The entire beam assembly consisted of jacks, beams, clevises and strand jacks. And by using this method it allowed the linkspan bridge to be constructed entirely at ground level which minimised work at height as well as being a much easier and quicker way of construction.

ALE used strand jacks to lift a curved steel bridge measuring 72 metres long, 20 metres wide and 22 metres high and weighing 2,100 tonnes to a height of 120 metres



Dan Kempin, business development manager, ALE Offshore Services said: "Civil engineering projects often pose unique challenges so we used our offshore strand jacking expertise allowing us to work in confined spaces with restricted lifting options and using a micro-step by micro-step methodology."

"This area can experience wind speeds of up to 80kph but our bespoke design ensured we could continue to operate in greater wind speeds as we could monitor the real time wind effect, maximising the client's operational time."

Alternative shipyard solution in Spain

Marine engineering operations for unexpected shipyard recoveries often need to be performed quickly to minimise costs and reduce disruption to other work. ALE used a variety of its heavy lifting equipment to right the 'Lumian' - a 400 tonne fishing boat which tipped over while undergoing repairs in a shipyard in A Coruña, Spain. Several other companies had attempted the operation unsuccessfully.

The 33 metre long vessel first had to be lifted and rotated until it was upright and then moved to rest on its keel. The limited space at the dock meant using a large crane was not an option and the solution also had to take into account the boathouse's steep slope. ALE worked with the shipyard owners to find the most efficient solution and had just 15 days preparation.

For the gantry lifting and heavy lift skidding operation, two A-frame gantries, four SLS2000 strand jack lifting units, eight skid beams and eight 150 tonne capacity strand jacks were used.

The two heavy lift gantries were installed over the ship, each supported on two skid beams that were connected to strand jacks. Two lifting units were also connected to each gantry. As each of the lifting units could be controlled separately, they provided a high degree of control and accuracy for the complex manoeuvres. This allowed ALE to carefully lift the ship into position. Once righted, the ship was skidded onto the beached bed to rest on its keel allowing further repairs to be completed.

A variety of heavy lifting equipment was used to right the 400 tonne fishing boat 'Lumian'



100 for Mega Jack 300 in Kuwait

ALE's 300 tonne Mega Jack 300 system - launched last year - has recently performed its 100th jack up on the Al-Zour oil refinery project in Kuwait. When completed the oil and gas complex is expected to become one of the largest refineries in the world. The Mega Jack system started work on the project in 2018 and previous lifts have included the longest and highest modules ever jacked-up and installed in Kuwait.

As the loads all vary in weight and dimensions, the system's flexibility has been vital. One of its benefits is the low starting height enabling it to pick up loads directly from SPMTs while the accuracy of the control systems has ensured modules can be manoeuvred safely.

ALE is providing the full onshore heavy lifting solution for the Fluor Daweoo and Hyundai JV's module strategy, performing the jack-up, transportation and installation of 188 modules. The Al-Zour complex is divided into three projects and includes a refinery, liquefied natural gas (LNG) processing facilities, and a petrochemicals complex. The Al-Zour Oil Refinery's completion is planned for 2020 and is expected to deliver 615,000 barrels per day.

ALE's 300 tonne Mega Jack 300 system has performed its 100th jack up on the Al-Zour oil refinery project in Kuwait.





Merry
Christmas
And

Happy New Year

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We would like to thank all of our readers, sponsors and contributors, for the fantastic support that you have given us this year, all of which helps to make this and our other publications and events what they are.

Wishing you all a very happy Holiday season and a happy, healthy and prosperous year in 2020.



New method to exchange acid converter

Mammoet recently exchanged a 20 year old, 750 tonne acid converter vessel with a tailor-made solution never before attempted at a Gulf Coast spent acid regeneration facility. The vessel exchange - a critical part of an upgrade to the plant - had to be carried out in restricted space and with as little disturbance to nearby components that had already been upgraded in a previous shutdown.

The exchange was further complicated due to ground bearing pressure restrictions making it difficult to use heavy equipment however, Mammoet's cradling method meant the vessel could be moved with precision and control. Historically, exchanging a converter is a time consuming and space intensive process. In recent years, advances in technology have resulted in vessel designs that can be moved in one piece. However the converter still has to be fully supported around its foundations to prevent damage to the sensitive internal linings.

Mammoet designed a jack and slide system that could cradle both the old and new vessels at the foundations to elevate and slide

them into place. To lift the vessels, custom beams narrow enough to slide between the foundation supports yet still have the capacity to cradle the entire 750 tonne tank were installed. The beams were then attached to jacking components set up on each side of the vessel and resting on a pair of 500 tonne climbing jacks positioned at each end.

To remove the old vessel the whole arrangement was jacked up, lifting the converter. It was then skidded out directly onto three waiting SPMTs - placed under a total of 332 metres of skid track - before being transported out of the facility.

Mammoet installed the new vessel using the removal operation in reverse to ensure the correct



Mammoet designed a jack and slide system that could cradle both the old and new vessels at the foundations to elevate and slide them into place.

alignment of the piping etc. The installation included aligning the skid track on the SPMTs at precisely the correct angle to ensure that the vessel would clear the steel of the existing unit by the required 65mm.

Once cleared, the team positioned the trailers to ensure the skid tracks lined up with markers inside the unit and the converter's rotation was correct before skidding it into its final position.

Delivering two 335 tonne transformers

Collett & Sons used its Scheuerle girder bridge trailer to deliver two 335 tonne transformers made by Daher Projects in Germany to Sellindge Substation located between Ashford and Folkestone in Kent, UK.

Both units arrived at the Port of Dover on the same vessel and Collett lifted the first from the hold onto a waiting 14 axle SPMT for storage portside. The second was lifted directly onto its 79.5 metre long girder bridge which then made the 30 mile trip from the Port of Dover to the substation, arriving six and a half hours later.

The route from Dover circled the outskirts of Folkestone, before following the M20 towards the site. With planning and enabling works beginning in January, Collett had meticulously surveyed the route, undertaking topographical surveys and swept path analysis to identify any required modifications and street furniture removals ahead of the project's commencement. Once at the site, the girder bridge trailer was too long and heavy to navigate the site roads so the cargo was transferred from the girder bridge to a four file 10 axle SPMT equipped with power pack module.

With mats, supports and beams positioned under the transformer Collett used the girder bridge's hydraulics to lower the cargo to the supports and allowing the side decks to be autonomously driven clear. Then utilising climbing jacks it raised the transformer to a sufficient height allowing the SPMT to be driven underneath.

Once jacked down to rest on the SPMT, the team manoeuvred the 335 tonne transformer to a temporary plinth before jacking and skidding it to its final position within the substation at a later date. With the first of the transformers safely on site, Collett returned to the Port of Dover and repeated the process for the second.



Arriving at the Port of Dover



On site the transformer was transferred onto a 10 axle SPMT

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Hill Crane & Rigging skids stacked heat exchanger

Hill Crane & Rigging (HCR) used a 454 tonne capacity Hydra-Slide heavy-track HT500 hydraulic skidding system to change-out a stacked heat exchanger at a Carson refinery in its home state of California, USA.

HCR first had the emergency removal of a 118 tonne stacked heat exchanger before installing a 127 tonne replacement unit having to overcome major obstructions onsite, a tight schedule and project delays inherited from other contractors. For the task HCR used the HT500, 91 tonne capacity engineered modular

support stands and Hydra-Pac synchronous hydraulic power unit, as well as additional equipment from HCR's fleet. The HT500 has a total height of just 200mm, saving jacking time and making it ideal for use in confined spaces. It can push 454 tonnes and pull 227 tonnes with a standard double track layout.



Both heat exchangers weighed in excess of 118 tonnes, shown here loaded on the HT500 system and engineered 91 tonne modular support stands



Obstructions and restricted access presented challenges onsite

The full scope of the work included transportation of the old exchanger back to the manufacturer, and the transportation and installation of the new 8.4 metre by 2.3 metre by 4.6 metre exchanger in the refinery. HCR also employed a 454 tonne capacity Enerpac gantry to load and offload the exchangers onto a dual lane, eight line trailer. The project took five days to complete and was delivered on schedule.

Michael Barry, general rigging superintendent at HCR, said: "The existing stacked exchanger was sitting on 1.22 metre high concrete pedestals; we used crib stacks and pipe stands to support the slide track at the same height then slid the exchangers a total of 9.1 metres. Without removing the overhead structure beams, a jack and slide solution was the only viable option."

Intricate ship engine removal

A Type 23 frigate recently underwent routine maintenance in the dry dock at Her Majesty's Naval Base Devonport in Plymouth, UK including the removal of two of its 40 tonne propulsion motors for refurbishment - the first time this procedure has ever been undertaken.

The contract length and adhering to the work schedule were crucial factors in the project with each additional week in the dry dock costing more than £70,000. Other significant challenges included space restrictions, very tight tolerances on the alignment of the motors and the vast amount of additional maintenance works in the near vicinity.

Heavy lift and transport company ALE was chosen to remove both engines, the first time this has been needed since the original Type 23 frigate - HMS Norfolk - was commissioned in 1989. Named after British Dukes, the ships are commonly known as the 'Duke class'. The Royal Navy's current Type 23 frigates will be replaced by the Type 26 Global Combat Ship beginning in 2023.

The intricate project began with the cutting of a large opening in the side of the ship before ALE's heavy lifting team arrived. This was needed because the motors were installed and the ship built around them, leaving no easy access point for removal.

Once the opening was complete, ALE constructed a platform on the dock base alongside the ship and jacked it up the required height of five metres to form a continuation of the ship's motor room floor. A bespoke skidding system was then installed within the engine compartment after the motors had been jacked up. Due to the ship's design the weight of the motors could only be supported on very specific and limited positions within the engine compartment and on the platform.

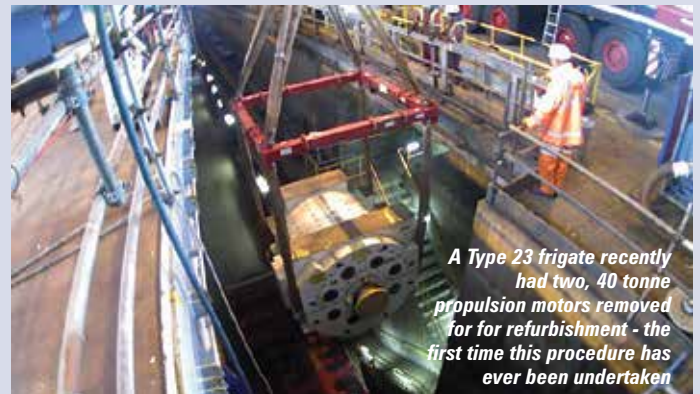
Starting with the starboard motor, it was jacked up just enough to allow the installation of the bespoke skidding system designed to take into account the

geometric alignment of the motors and gearboxes and allowing the motor to be skidded on an angle without affecting the gearboxes.

Each motor in turn was skidded onto the platform and lowered onto a waiting six axle SPMT which then moved each motor a short distance to the rear of the dock base where they were lifted by crane onto a Neck 4 trailer and then taken off site.

Other equipment used included hijack frames, conventional and climbing jacks, Teflon skid tracks and shoes plus specially fabricated beams. All the equipment had to enter and leave the dock base through a narrow three metre wide entrance.

The project was completed two days ahead of schedule providing a substantial cost saving to the client. The repair itself forms part of an initiative to extend the life of the Duke class fleet, which is a versatile ship for warfighting, peacekeeping and maritime security operations worldwide.



A Type 23 frigate recently had two, 40 tonne propulsion motors removed for refurbishment - the first time this procedure has ever been undertaken

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100 tonne Nootboom low-loader

Nootboom has further expanded its Euro-PX low-loader programme. The latest addition is the four axle IC Interdolly Compact which combined with six steered pendle axle lines at the rear, is now the largest low-loader combination in the range. The first sale is to C. Zwagerman Transport from Nederhorst den Berg in the Netherlands. The combination has been optimised for the German regulations with axle load of 12 tonnes at 80kph allowing loads of up to 100 tonnes to be transported.

Cor Zwagerman, director and owner said: "The cranes and machinery we transport are getting heavier all the time. This new low-loader is the largest that Nootboom has ever put on the road. With a German exemption the load capacity is just over 100 tonnes and this enables us to enter a new segment of the market. The Nootboom 4+6 low-loader has several advantages for us. In order to adapt the low-loader to comply with the German regulations for exemptions, the axle distance has been increased to 1.51 metres instead of the usual 1.36 metres. In practice this means it minimises the load on bridges and viaducts and the exemptions in the various federal states of Germany are easier to obtain. Another advantage is the close coupling system which makes it easy for us to convert the trailer into a 10-axle semi low-loader. In

this configuration the load capacity increases to around 110 tonnes and the steering of the Interdolly can easily be adjusted to this shorter configuration."



The latest EURO-147-46(ICP) low-loader combination has been optimised for the German regulations

When purchasing the latest 4+6 Zwagerman opted for a flat, thin, 2750mm wide extendable floor as well as a narrow spine floor for the transport of large tracked vehicles. The spine floor also comes with bolsters to extend the load floor's width, in a high or low position.

The Interdolly with four axle lines is optionally equipped with a hydraulic landing leg which makes it even easier to couple/uncouple the load floor and the Interdolly. The gooseneck of the low-loader can be used on a four axle or five axle tractor.

Nootboom has introduced the largest low-loader combination with a load capacity of more than 100 tonnes at 80kph

Trailer Power Assist completes first outing

Mammoet's Trailer Power Assist (TPA) - designed to improve transport efficiency - has been used for the first time on a Deugro Danmark and Siemens Gamesa contract to transport 23 generators and 23 hubs along a challenging twisty section of road to a wind farm site near the northern Norwegian town of Narvik.

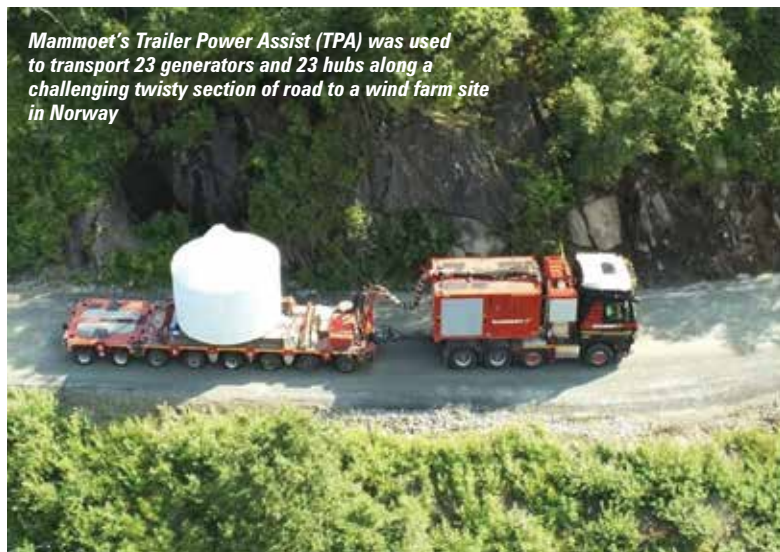
TPA is a powered trailer system designed to improve transport efficiency and significantly lower the carbon footprint of long haul heavy transport projects. An alternative to SPMTs and conventional prime movers it consists of six axle lines, the middle four of which are driven by a 1,000hp hydraulic Power Pack Unit. This system delivers twice the pulling force of a conventional prime mover and offers significant improvements to the safety and efficiency of projects.

Anders Bräuner, sales manager Mammoet Denmark said: "The four kilometre section of the route to the

Narvik site involved climbing an 18 percent gradient and navigating 14 hairpin bends. With each generator weighing 74 tonnes and each hub weighing 47 tonnes, we needed to use the TPA system to maintain safety."

"Traditionally, an operation of this magnitude would have involved several vehicles working together. With multiple drivers having to work as one, this would have made negotiating numerous hairpin bends especially difficult and time consuming. Combined with the TPAs' decreased turning radius and the improvements this gives

Mammoet's Trailer Power Assist (TPA) was used to transport 23 generators and 23 hubs along a challenging twisty section of road to a wind farm site in Norway



for navigating tight bends, this solution mitigated the risks involved with multi-truck configurations and improved the safety and speed of each individual journey."

By reducing the number of vehicles needed to complete the transport, the TPA offers significant

sustainability improvements. Reducing the carbon footprint of heavy lifting and transport equipment is also becoming increasingly important and smart engineering solutions like the TPA are just one example of achieving this aim.



The 4,000 tonne Huisman crane for the Bokalift 2 crane vessel

Huisman to deliver giant ship crane

Specialist crane manufacturer Huisman has supplied Dutch dredging and heavylift company Boskalis with a 4,000 tonne Offshore Mast Crane (OMC) to be installed on its Bokalift 2 crane vessel. This follows the delivery of a 3,000 tonne OMC for Bokalift 1 in 2017.

With a lifting capacity of 4,000 tonnes at 100 metres above deck, the crane is capable of lifting jackets for wind turbines off the deck of the vessel. A fly jib allows lifting of smaller components up to a height of 125 metres above deck level. The crane has a number of auxiliary systems, aimed specifically at installing tall structures while the vessel is subject to wave induced motions. For its first project Boskalis will install jackets for the Taiwanese Changfang and Xidao offshore wind farm project.

The main advantages of the Huisman OMC include a small footprint and zero tailswing which leaves maximum space on the deck of the vessel for payload. Its ability to lift structures of more than 100 metres high means the Bokalift 2 will be well positioned for the installation of current and future generation offshore wind turbine foundations as well as work in the offshore oil and gas, decommissioning and salvage industries.

Qatar reduces World Cup travel times

Ahead of hosting the 2022 FIFA World Cup and an estimated 1.5 million additional visitors, Qatar is carrying out a significant civil infrastructure project linking Hamad International Airport to Umm Lekhba Interchange in central Doha reducing travel times by more than half. The project includes constructing a new 8.7km long, four lane expressway, several bridges including a 1,200 metres cable-stayed bridge - the first of its type in Qatar - plus upgrades to nine sections of existing roads.

As part of this project, ALE is to transport 854 heavy items weighing between 128 and 202 tonnes two kilometres from a precast yard to the build site using one 16 axle lines of SPMT alongside three conventional 12 axle trailers.

The items mainly include sections of precast concrete measuring up to 19 metres long, 3.9 metres wide and three metres high. Transportation of items from the precast yard to the steel storage frames on site takes place during the night, while during the day they are moved directly for lifting into position by the onsite crane.

ALE is to transport 854 heavy items weighing between 128 and 202 tonnes



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