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Chicken or egg?

The new Manitowoc 31000 undergoing final testing

In a typical 'chicken and egg' situation there will always be a discussion as to which came first - the larger capacity crane or the longer, heavier component that needs lifting? In last month's feature on big crawler cranes we asked whether the new breed of 3,000 tonne plus capacity cranes from the major manufacturers had a useful role to play or whether the mega lifts were better suited to the growing number of 'big lift' alternatives and indeed whether this was the way forward? We take a look at some of the latest big lift machines and assess their pros and cons compared to crawler crane as well as looking at some interesting European heavy lifts.

With Manitowoc's new 2,300 tonne 31000 in final stages of testing and Liebherr's LR13000 in the process of having its main boom mounted, it wont be many months before all three of the major crane manufacturers (Terex, Liebherr and Manitowoc) have a 'conventional', large capacity (2,300 tonnes to 3,200 tonnes) crawler crane available for delivery.

Out of date crawlers

But in the time it has taken to develop these latest mega crawlers, have they been eclipsed by the 'heavy lift' alternatives offering capacities up to 5,000 tonnes?

One fact that is certainly true is that buyers are not exactly hammering at the doors of the majors to get their hands on these big beasts. Quite the opposite in fact with orders for the big crawlers (although never going to be high) lower than expected. This weak demand is more surprising given that most manufacturers developing and building limited edition large cranes tend to develop the machine in conjunction with 'guaranteed' end-user partners i.e. a lead customer that is willing to take at least the first machine. Al Jaber was the design partner and owner of the first Terex Demag CC8800-1 Twin, Bulldog Erectors for the Manitowoc 31000. Liebherr on the other hand appears to have chosen a different course and does not yet have a firm order.

Liebherr's 600 tonne capacity LR1600

But should Liebherr be worried?

Well there has been a global downturn in crane demand, although the sector for large crawler cranes has performed better than most. But is there also a shift away from the main line crane manufacturers to the 'heavy lift' alternatives from companies such as ALE, Sarens, Mammoet and Lampson, mostly building for their own rental/contract operations.

One reason might be that most mega lift cranes tend to carry out lifts from a single prepared position. In such cases this makes the crawler undercarriage an expensive and un-necessary addition.

ALE purchased this Terex CC8800-1 earlier this year

On the other hand we can see from the Hartinger contract in Germany (page20) space limitation means that the 'smaller' 1,200 tonne crawler may have to be fully rigged prior to the lift and then track into position. Or occasionally track with the load on the hook for a short distance as in ALE's Greater Gabbard offshore wind farm project which required the Terex CC8800-1 to track 35 metres across the fabrication yard with the 823 tonne jacket. However both these cranes had capacities considerably less than the range topping models.

Travelling or tracking large crawler cranes (more than 2,000 tonnes) can be precarious - as witnessed by Lampson's accident with its 1,100 tonne Transilift at the Black Thunder mine in Wyoming in 2008 - even if the ground has been carefully checked and prepared beforehand. Perhaps the crawler crane has found its true upper limit at around 1,800 tonnes, above which the latest generation modular lifters/cranes have the advantage?

Cost and delivery always play an important role in the choice of large lifting equipment. ALE initially decided to design and build its own heavy lifter after a total lack of interest from the major manufacturers to come up with a solution to lift a 100 metre long, 3,000 tonne column which was required on a petro chemical contract in Saudi Arabia.

By doing its own design and build, it claims to have reduced its costs significantly, the design was specific for the required contract and the company had total control (as well as responsibility) of the build-time and delivery date. It also ended up with a unique crane that would give the company an edge

when pricing for heavy lift jobs. ALE also designed the crane in such a way that with minor modifications – widening the base for instance – a much larger 5,000 tonne capacity crane could easily be produced.

In-house advantages

For these larger, global lifting and transportation companies keeping it 'in-house' has its advantages. ALE's moves appear to have spurred its competitors into action and now most of the major players in this market – ALE, Mammoet, Sarens and Lampson – have designed a new range of cranes. Because of this it is difficult to see why they might be tempted to buy smaller capacity and possibly more expensive 2,300, 3,000 or 3,200 tonne crawler crane from the major manufacturers.

At this point we should clarify that while all four of the above heavy lift companies have produced plans and designs for land based cranes above 3,000 tonnes, only ALE has in fact built one - the 4,300 tonne capacity AL.SK190 – and it is in the process of adding a second to its fleet during the second half of next year. The ALE SK is a more radical design than the Mammoet and Sarens 'ringer' designs, with the latest Lampson bridging the design gap between the conventional crawler and modular lifter by using two tracked undercarriages.

Basically the ALE SK uses its counterweight as its centre of rotation which the company claims provides a much better working envelope, as well as helping reduce the need to track to a different position. Because of the crane's different configuration the model numbering has been changed to reflect the way the industry measures performance – so the SK190 and SK350 now mean 190,000 tonne/metre and 354,000 tonne/metre load moments measured from the centreline of rotation. Measured this way, even the smaller SK190 has a load moment about 19 percent and the SK350 more than 120 percent more than its nearest rival - the 160,000 tonne/metre Mammoet PTC-160DS.

The Mammoet PTC Maxima

Sarens 1,200 tonne Gottwald AK680

ALE's 190,000 tonne/metre AL.SK190 at its launch

"Big cranes from major manufacturers such as the Terex 8800 Twin are very wide machines and very difficult to move unless operating on a very open site," says ALE's executive director Michael Birch. "As well as having almost four times the load moment of the 8800, the AL.SK190 is much easier to erect, operate and transport and can be relocated on site by skidding or by self propelled modular transporters (SPMTs) when fully assembled and rigged."

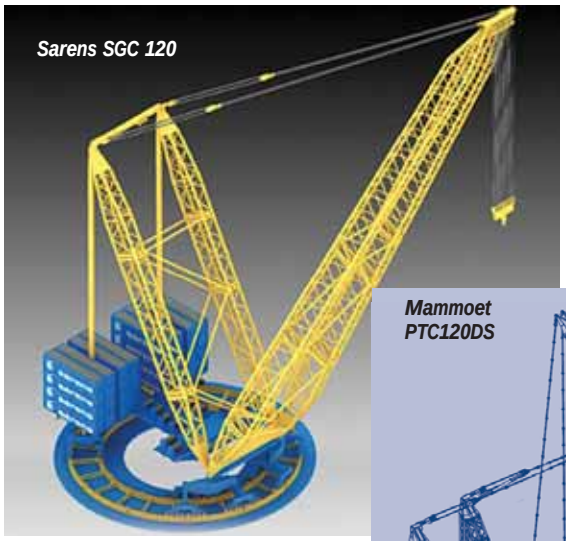
Both SK cranes are equipped with a standard quick winch system (150 metres/hour) for loads up to 600 tonnes and a strand jack lifting system (10 metres/hour) for loads up to 5,000 tonnes.

Traditional ringers

Mammoet announced the plans of the larger PTC-160DS (Platform ringer Twin boom Containerised crane) even before it had built its smaller brother - the 100,000 tonne/metre PTC120DS. Both cranes use a traditional ringer with rollers for slewing and use the same boom and jib configurations as well as the same counterweight and winches. The difference is the footprint with the PTC160DS having a 54.5 metre diameter ring about 10 metre larger than the PCT120DS.

Sarens new 3,250 tonne, 120,000 tonne/metre heavy lift crane – the SGC120 – is also a classic ringer slewing on a double ring track which sits on a load bearing mat system. The concept has apparently been in development with Rigging International for some but time development has been spurred on following Sarens acquisition of the

Liebherr's 3,000 tonne LR13000 shortly before having its main boom mounted

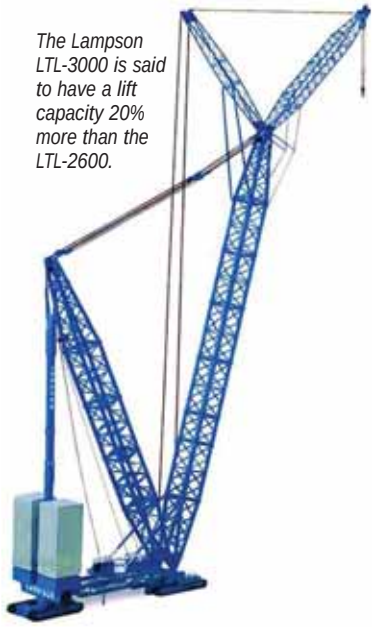


Sarens SGC 120

Mammoet PTC120DS

company last June. Work is scheduled to start early next year and performance examples include the ability to handle 600 tonnes at 100 metre radius.

The SGC120 uses up to six high power winches rather than strand jacks, with 61 tonnes of line pull and line speeds of up to 20 metres/minute making it more akin to a regular heavy lift crane.



The Lampson LTL-3000 is said to have a lift capacity 20% more than the LTL-2600.

And for applications requiring frequent movement, it can be mounted on a dual track rail system laid out to suit the job site.

The SGC120's load moment puts it firmly between Mammoets pair of PTC lifters but one major feature is its 90 metre luffing jib compared to the 43 metres available on the PTC machines.

The ALE, Sarens and Mammoet cranes can all be broken down to transport in standard 40ft containers and when set up on site, use similar sized reinforced containers filled with locally sourced materials for the 3,600 tonnes of counterweight.

The growth of these European heavy lifters and the collapse of two of the largest 'bespoke' cranes in North America in 2008 – the VersaCrane TC36000 owned by Deep South Crane and Rigging of Baton Rouge, Louisiana and the Lampson Transilift working at the Black Thunder Mine in Wyoming – means the initiative in the large capacity alternative crane sector is firmly on this side of the Atlantic.

New Lampson

However earlier this year Kennewick, Washington-based manufacturer Lampson signed a contract with Hitachi Transport for a newly designed crane the LTL-3000 – which has a lifting capacity about 20 percent more than the 2,600 US ton LTL-2600. The unit is being designed and built over the next 22 months specifically for the construction of a new advanced boiling water reactor at Higashidori NN-1 nuclear power plant for Tokyo Electric Power Company.

Although Lampson claims that the LTL-3000 will be the largest mobile crawler crane in the world its projected lift capacity of a little more than 2,800 tonnes is a long way short of the 3,200 tonne Terex 8800-1Twin.

The Lampson LTL is unlike any of the European heavy lift cranes in that in true Lampson style it aims to combine the heavy lift capacity of a big ringer crane with the mobility of a crawler by using two, individually powered twin track crawler transporters - one at the front supporting the main boom and back mast, and the one at the rear supporting the counterweight.

The front crawler transporter unit increases to a 15 metre square with three metre wide track pads and Rolli-Flex rollers. The stinger, strut and counterweight frame will be similar to the LTL-2600, but will incorporate the ability to telescope between 24, 30 and 36 metre positions to significantly reduce the time to perform 'mode' changes.

The crane will be equipped new winches and stronger cable to provide a 50 percent increase in line speed. The LTL-3000 121 metre boom will have 6.1 x 4.8 metre cross section, but will maintain the Lampson pin together design concept. The crane will also have a 36 metre jib.

At least Lampson has a partner and first sale for its LTL-3000. Whether or not other planned heavy lifters see the light of day remains to be seen, particularly bearing in mind there will be three more conventional crawlers on the market in the coming months.

Has the crawler crane found its upper limit of about 1,800 tonnes?

ALE invests at the top end

Global heavy transport and lifting company ALE has been making further investments in its large capacity crane fleet. The most recent addition being its second 4,300 tonne AL.SK190 that it claims is the world's largest land-based crane with a load moment of 190,000 tonne/metres. Earlier in the year, the company also added a 1,600 tonne Terex CC8800-1 crawler crane at a cost of € 11 million which successfully completed a record breaking inaugural lift at the Galp refinery near Sines, Portugal.

68 lines of SPMTs were used to transport the 1,457 tonne, 42m long reactor

The record breaking lift was at or close to the CC8800-1s maximum capacity for the configuration.

Record breaking lift

The Sines job involved the transport, lifting and installation of a 1,457 tonne, 42 metre long 5.5 metre diameter reactor. The move from Sines docks to the refinery – a distance of nine kilometres, was completed with 68 lines of SPMTs (Self Propelled Modular Transporter) and is said to be the heaviest load ever moved on Portuguese roads. Overhead restrictions forced the load to take a deviation through a mine area with inclines of up to 10 percent.

Once the vessel was on site the new CC8800-1 worked at a radius of 13.1 metres with a 60 metre main boom. The counterweight included its full 295 tonnes of superstructure counterweight, 60 tonnes carbody counterweight and 640 tonnes of superlift ballast - suspended at a 30 metre radius. A specially designed rail mounted ALE gantry was used for tailing-in purposes. The lift was close to the cranes 1,500 tonne maximum capacity for the configuration and is said to be the heaviest lift ever carried out by a single Terex Demag crane.

And on to the next job

The Terex CC8800-1s second outing involved up-ending and loading-out 35 jackets as part of the Greater Gabbard offshore wind farm project. The wind farm - located 23km off the Suffolk coast in the UK - is set to be the largest in the world when completed.

The jackets – each weighing between 450 tonnes to 823 tonnes - had to be loaded onto barges before being transported and erected at the wind farm site. The 1,600 tonne capacity Terex CC8800-1 was brought in to up end the heaviest jacket, whilst it was tailed using Terex Demag TC2800-1 and CC2500-1 cranes.

Once vertical, the CC8800-1 - with full Superlift - transported the 823 tonne jacket 35 metres across the fabrication yard before placing the load onto a barge for onward transport.

Finding the right equipment for the job is often the key to success. When Karl Hartinger, the crane and heavy transport company from Warburg, Germany, was asked to lift 30 metre long cylinders onto a 108 metre high chimney in Kessel, Germany it selected a Liebherr LTR 11200 equipped with 84 metres of luffing jib. Because of the lack of space, the luffing jib had to be erected outside the site and the crane the tracked into position fully rigged. The narrow-track crawler proved to be the ideal crane to negotiate the narrow access passage and tight working area and carry out the lift.

The Terex CC8800-1 had to load-out 35 jackets weighing between 450 to 823 tonnes

Historic SS Robin lift

Ainscough Crane Hire has used two of its new heavy lift lattice boom truck cranes – an 800 tonne capacity Liebherr LGD1550 and 600 tonne Terex Demag TC 2800-1 - to lift the historic ship SS Robin from Lowestoft's dry dock for the SS Robin Trust, ready for its journey to the River Thames in London, where it is set to become a floating museum.

Built in 1890, the London-built SS Robin is the world's last remaining steam coaster and needed to be lifted on to a pontoon for its return trip to London following a £1.9 million restoration. The SS Robin is a unique piece of maritime history, listed on the National Historic Fleet register and regarded as one of the most important British-built ships.

The LGD1550 was rigged at 33 metre radius while the TC 2800-1 worked at 34 metres. The two cranes carefully raised the 300 tonne, 44 metre long, seven metre wide ship from the dock's slipway and placed it onto a floating dock/pontoon.

Gary Bowler, Ainscough Heavy Cranes contracts manager said: "This was a complex lift, which needed to be planned to precision to protect this unique piece of maritime history. We needed to lift the vessel from a four degree incline on the slipway and used a specially designed rigging system to level the load before positioning it on the pontoon – ensuring no unnecessary stresses were put on the structure. The SS Robin is an important part of our national heritage and it was an honour to be involved in the project."

Project management consultants Kampfner bought the historic vessel for £1 from the owners of the Cutty Sark 10 years ago and founded the SS Robin Trust leading a technical team of East Anglian and London-based marine consultants, engineers, naval architects and shipwrights in a unique historic ship conservation project.

David Kampfner, project director, said: "This irreplaceable Grade 1 listed vessel is the only one left of her type and will now be saved for the nation. We are delighted that this technically challenging lift was a huge success and an important milestone in the conservation of this listed historic ship."

Double bridge replacement

Sarens UK - working for design and construct management contractor BAM Nuttall - recently completed the replacement of two, three span, six deck Network Rail bridges between Arundel and Amberley stations in West Sussex, England.

One of the two bridge replacement sites

The sites located on two adjacent farms, were on the same line and less than a mile apart in low-lying flood plain farmland bordering two Sites of Special Scientific Interest and within a Site of Nature Conservation Importance.

Sarens used two truck mounted lattice boom cranes - a 1200 tonne capacity Gottwald AK 680-3 fitted with 101 metres boom, and 250 tonnes of Superlift ballast and an 800 tonne capacity Demag TC 3200H fitted with 78 metres of main boom and 250 tonne Superlift ballast.

The six month preparation included constructing two temporary roads, ditch crossings, crane foundations and building the new bridge components, cable slewing and scaffolding. All were completed in readiness for the double bridge reconstruction which had to be carried out during a 74 hour, bank holiday weekend railway possession slot. Work that had to be completed included the removal of the old track, the two existing bridge decks, the cutting of the existing abutments and piers followed by the installation of four new cill beams, eight ballast walls, new bearings and 12 new decks, slewing existing cables into new trough routes and the laying of new ballasted track over both bridges…. No time for napping then!

The project was successfully completed without any incidents or accidents ahead of programme offering Network Rail a large cost saving. The value of the work within the weekend possession alone was more than £3 million.

Difficult access

Access to site was particularly challenging because of the narrow, rural roads and travelling across the flood plain ground. Two, 800 metre long temporary roads were constructed to cope with more than 2,000 vehicle movements, including the large cranes and steel deck transporters. More than 13,000 tonnes of locally sourced recycled aggregates were used to construct the raised roads across the flood plain (which included streams and ditches) so that no oils or fuels could contaminate the surrounding area. At the end of the project, the temporary road was removed and the aggregate sold back to the supplier for re-screening and re-use.

The poor ground also necessitated the design and construction of temporary foundations for the cranes to work from, which included steel grillage systems to minimise the amount of excavation. All the concrete casting of the decks, cill beams and ballast walls was completed on site due to the restricted road access.

Automatic guided concrete cutting wire techniques reduced the level of the existing piers to receive the new bearings allowing for precise and efficient cutting to a depth that traditional saws could not reach. Furthermore noise and dust emissions were considerably reduced.

The new bridges are easier to maintain with the new ballasted track giving greater flexibility than the original which was fixed to the decks, while the new bearings can be replaced separately.

This crane was well set up in terms of mats, but the engineered aggregate platform- located near a stream was compromised by heavy overnight rains and collapsed when the weight went over the outriggers closest to the edge.

Sustainability and environmental

The new construction provides two new bridge decks with a lifespan of 120 years. Extensive ecology reports and surveys costing £50,000 were undertaken before and during construction works. Construction methodologies were altered and pro-active ecology measures such as bat boxes were installed along the access roads, greatly benefiting the local bat population.

Substantial river protection measures were also used across the site, such as spill equipment, safety boats and containment booms. Scaffold was erected under the existing decks within the river's tidal zone and the demolition was programmed to be carried out at low tide with the scaffold temporarily encapsulated to contain all debris. The site also adopted a dual generator system, which switched to a smaller generator when less capacity was required, considerably reducing the diesel required.

Health and Safety

The tight schedule and with more than 300 personnel (including 36 from Sarens) from 32 different contractors on site and over 10,000 man hours worked, meant that the risk of accidents was high, however none were recorded.

£500,000 savings

The scheme was completed ahead of schedule within the critical, high risk 74 hour main possession with no delays to passenger services.

Value engineering throughout the contract ensured client cost savings of £500,000, thanks to the road material recycling, generators, steel procurement, pre-casting concrete on site and using multi-skilled resources to undertake the work directly rather than using subcontractors.

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