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Still on track **C&A** crawler cranes

As reported a few months ago in the **Cranes & Access Heavy Lift** feature, the past year has been relatively quiet in the larger crawler crane market, but there are developments at the smaller end and with telescopic crawlers.

The two major launches - the **Terex Superlift 3800** which was first seen in 2012 and the **Manitowoc MLC650** which was unveiled in March last year - have been dealt with in some detail on page 40. Whilst there are up to 30 Superlift 3800s already out working, Manitowoc is still completing the test programme for its MLC range but already has a substantial list of advance orders.

At the top end of the crawler range Liebherr's 3,000 tonne LR 130000 is operational with Mammoet - and has already complete its first contract using the heavy duty 'P' PowerBoom. The new boom concept has also been fitted to the first 1,000 tonne Liebherr LR 11000 and is currently working in Germany lifting a 220 tonne turbine (see story page 38). The increasing weights and size of wind turbines are also requiring larger capacity cranes or booms with increased high reach capacity.

German crane rental company **Krandienst Schulz** has just purchased its first crawler crane, one of the first 600 tonne Liebherr LR 1600/2 with the new SL13 boom system designed for the erection of wind turbines with hub heights of

more than 150 metres. The crane was added because the company's large telescopic ATs are not able to handle the lifts on these larger turbines. Its first job involved lifting wind components weighing up to 63 tonnes to a height of 138 metres.

Smaller capacity cranes

Sales of smaller capacity crawler cranes also appear to be picking up, with increasing infrastructure contracts being let around Europe. In the UK Kobelco cranes has had a particularly busy period over the past few months, with more units due to be delivered next month. Over the past three months a total of 14 G Series cranes - ranging from the 80 tonne CKE 800G to the 135 tonne CKE 1350G - have been delivered to UK customers including BPH, Weldex, Johnsons, Murphy's and Q Plant.

Telescopic crawlers continue to develop with manufacturers expanding ranges to satisfy end users who appreciate quick set-up times and ease of use. At the end of November Sennebogen launched its largest crawler telescopic to date, the 120 tonne 6113E. This exceeded its previous largest capacity crawler telescopic - the 80 tonne 683 - by 50 percent. Sennebogen has been

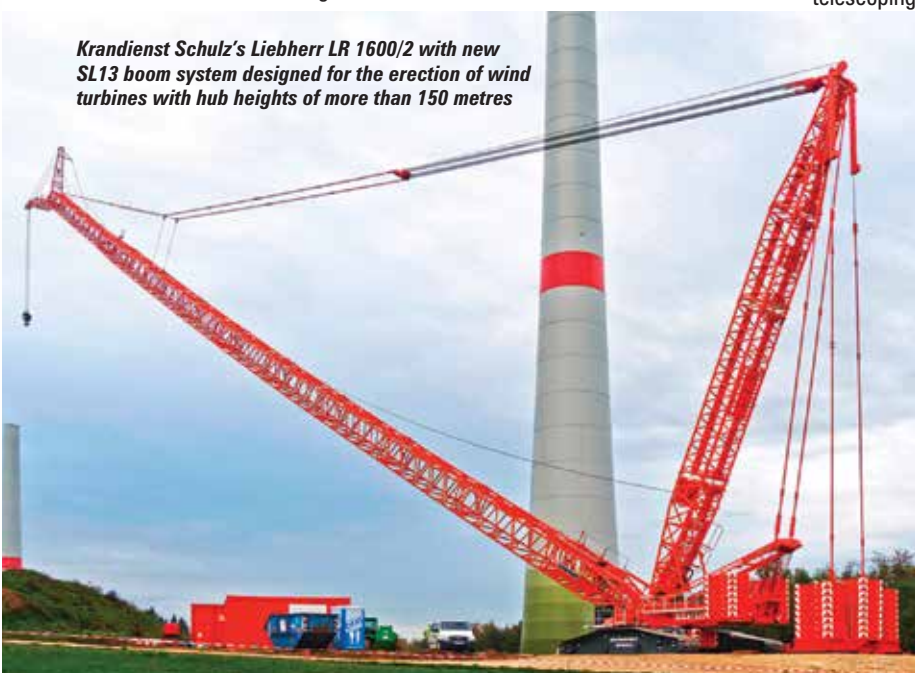


Liebherr LR 1600/2 using a 220 tonne LTR 1220 as a counterweight



A Kobelco G series crawler crane on a Thames barge in London, UK

Krandienst Schulz's Liebherr LR 1600/2 with new SL13 boom system designed for the erection of wind turbines with hub heights of more than 150 metres



manufacturing this type of crane since 1982 and now has a six model range from eight to 120 tonnes.

The 6113E has a four section, 40 metre, full power boom with a three stage telescopic cylinder, that according to the company results in a maintenance-free, continuously telescoping boom that can work at any desired boom length in the optimum configuration. With a choice of an eight or 15 metre jib and 12 metre lattice boom extensions, its maximum system height is 70 metres.

The 6113E can also pick & carry 100 percent of its load chart, and can work - with reduced capacity - on slopes of up to four degrees. The hydraulically extendible undercarriage uses eight metre long tracks with maximum 900mm wide pads

and overall width ranges from 3.95 to 6.3 metres. The crane can be transported fully assembled or with counterweight and/or tracks removed, reducing its 112 tonne total operating weight to 78.6 tonne without counterweight or 46.5 tonnes with both counterweight and tracks removed.

Sennebogen claims that the 6113E uses 30 percent less space when compared with a similar capacity

The 120 tonne Sennebogen 6113E has a 40 metre full power boom and 70 metre maximum system height



Rough Terrain or All Terrain cranes, giving an advantage in restricted space construction sites. A work platform will also be available with a capacity of 1,000kg although this has not yet been fully approved.

Liebherr LTR 1220 counterweight

With many telescopic crawler cranes used as auxiliary cranes during the erection of larger capacity cranes, Liebherr has dusted off an old idea for use when erecting long booms on its LR1600/2 crawler crane. It uses the mass of the 220 tonne LTR1220 telescopic

crawler crane as counterweight, significantly reducing the amount of ballast required on site. Long wind boom erection normally requires the full counterweight plus 350 tonnes of derrick ballast, which is reduced to 70 tonnes for lifting the standard wind turbine components, once the boom is up. The full 350 tonnes would then be required again to lower the boom. By using a special adapter the LTR1220 is used as part of the suspended counterweight to raise the boom eliminating the time-consuming handling and transport of 280 tonnes of extra ballast.



Using the LTR 1220 as counterweight significantly reduces the amount of ballast required on site

Boom Booster adds 60%

Terex's new Boom Booster has been put to work by Belgium-based heavy lift company Sarens on its CC 8800-1. The system comprises five, 10 metre long by 10 metres wide and 3.2 metres high, bolt-together boom sections, plus two bolt-together tapered adapter sections - both of which are 11 metres long - providing a new extra wide base boom of 72 metres. On top of this standard boom sections are pinned to increase the capacity of the CC 8800-1 at short radii and long boom lengths by reducing lateral deflection. Capacities are 60 percent higher than on the standard boom.

Sarens currently owns two Boom Boosters which can be fitted to all six of its CC 8800-1 cranes. One is working at Noordoostpolder, the Netherlands, where 38 wind turbines for Enercon are being erected. These turbines have a tower height of 135 metres and a capacity of 7.5 MW each. A second CC 8800-1 fitted with the system is working at the Sadara Project in Jubail, Saudi Arabia, where it has lifted an 85 metre high column, weighing 800 tonnes. A second column was due to be lifted at the end last year.

The CC 8800-1 fitted with the Boom Booster at the Sadara Project in Jubail, Saudi Arabia lifting an 85 metre high column weighing 800 tonnes



Versatility is the key

Trier, Luxembourg-based Steil Kranarbeiten used its Superlift 3800 crane to build a bridge in Luxemburg less than two days after the same machine was used to erect a wind turbine in the Hunsrück mountain range in Germany.

The 440 metre long bridge involved lifting a total of 14 steel girders measuring 96 metres long by seven metres high with a total weight of 295 tonnes each onto concrete piers. The Superlift 3800 needed just 31 trucks to transport the crane from the wind turbine site to Luxembourg, and was set up and ready to work in one and a half days. To lift the girders, the Superlift 3800 was rigged in SSL1 configuration with a 72 metre main boom, 250 tonnes of counterweight on the superstructure, 50 tonnes

of central ballast and 200 tonnes of counterweight on the superlift tray. To provide stability Steil's rigging team configured the vario hook block with dual hooks and a spreader.

The girders were first lifted to a height of 22 metres then rotated allowing the crane to carry them around 50 metres. To ensure ground stability, steel plates were used along the path. Once in position the crane swiveled again to set the girder down on its respective pier working at a radius of 23.5 metres.



The 440 metre long bridge involved lifting a total of 14 steel girders measuring 96 metres long by seven metres high with a total weight of 295 tonnes each onto concrete piers

Mountain climbing crawler

Swiss rental company Clausen Kran has driven its new 60 tonne Liebherr LTR 1060 telescopic crawler crane to the top of an Alpine mountain to work on the one of the highest railway tunnels in the Alps. The crane had to travel almost a kilometre on gravel tracks, negotiating tight bends and gradients of up to 40 percent to reach the 2,020 metre high site - a tunnel on the Gornergrat railway in Zermatt which is being extended to allow a downhill ski run to pass over the tunnel so that in the future it can stage FIS skiing events.

Clausen is used to working with cranes in high Alpine terrain, however the overall centre of gravity of the LTR 1060 was calculated to ensure that it would not overturn, and would remain manoeuvrable when travelling around the bends and up the gradients.

The crane was taken by low loader to an altitude of 1,840 metres. At this point company owner Geri Clausen got into the crane cab and began the two-hour journey up the rest of the mountain. The narrow track also forced the crane to travel with retracted tracks, creating a



The last few metres were driven in reverse

poor ratio between the crawler length and track width, making it less manoeuvrable. To allow the vehicle to get around the tighter bends, one metre timber squares were placed under the inner track to provide a pivot point. The final few metres had to be driven in reverse to enable the crane to access the site more easily.



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First PowerBoom on an LR 11000

The first 1,000 tonne Liebherr LR 11000 to be fitted with a PowerBoom attachment was recently used to place a large turbine house weighing almost 220 tonnes onto a tower near Cuxhaven in North Germany. The 6.2 MW pilot system was erected by Senvion (previously REpower) in the new test field for offshore wind turbines. Crane company Nolte decided to use a Liebherr LR 11000 crawler crane owned by Austrian-based Felbermayr while supplying the assist cranes from its own fleet.

The LR 11000 - rigged with a hook height of 147 metres - was ready to start lifting seven days after its arrival. Sections from the crane's luffing jib were used within the double lattice section of the main power boom, while the standard main boom sections created a heavy luffing jib which provided a 50 percent increase in jib capacity.



Up goes the 152 metre diameter rotor

Klaus Ruhland, Felbermayr project planner said: "Normally a 1,350 tonne Liebherr LR 11350 or a Terex CC 8800 would have been required for this lift. The 220 tonne load had to be lifted to a height of 130 metres at a radius of 30 metres. Just as a comparison, without the PowerBoom it would only have been able to manage around 160 tonnes at this height and radius."

The massive turbine is driven by a three blade 152 metre diameter rotor which was fully pre-assembled on the ground before being lifted into place. The crane was rigged with 78 metres of Power Boom, a 66 metre luffing jib and a 42 metre derrick boom. A total of 590 tonnes of ballast was used including a 50 tonne central counterweight, 220 tonnes of superstructure counterweight and a 320 tonne suspended counterweight.

The massive turbine housing weighed 220 tonnes with hook and beam.



Three crawler cranes were used to place more than 2,600 pre-cast concrete components

Crane Rental Corporation adds parking at FIU

Florida-based Crane Rental Corporation and Solar Erectors recently supplied three crawler cranes to place more than 2,600 pre-cast concrete components to complete a six storey car park on the Florida International University campus.

The components were placed by two 272 tonne Manitowoc 2250s with 30.5 metres of main boom and 30 metres of luffing jib, and one 181 tonne Link-Belt HC-248H5 crawler crane with 61 metres of main boom. The heaviest component was a 33.6 tonne shear wall. The 2,400 space car park is the sixth on FIU's main campus, serving 54,000 enrolled students.



Up goes the boom and jib on a pre-laid track

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Clash of the 650 tonners

Two of the biggest crawler crane launches in recent years included the Terex Superlift 3800 and the Manitowoc MLC650. With totally different design concepts we compare the two cranes as well looking at Liebherr's 600 tonne LR1600/2 with its upgraded boom kit.

Launched at the end of 2012, the Superlift 3800 is the successor to Terex's most popular large capacity crawler crane - the Terex 2800-1 - which has notched up around 400 sales in its various formats. Although the CC 2800-1 is still available to customers wanting a simpler, lower cost model, there will be no future upgrades - in particular to the engine - so the CC 2800-1 has a finite shelf life, forcing customers in most countries to eventually adopt the new 650 tonne capacity Superlift 3800. The launch of the radically designed Manitowoc ML650 at Conexpo earlier this year was however totally unexpected, and in the words of several large buyers is a 'game-changing' crane.

Bearing in mind these similar

capacity crawler cranes were introduced about a year apart, their designs could not be more dissimilar. Although a brand new crane, the Terex Superlift 3800 essentially continues and improves on the design of the CC2800-1 which first saw the light of day as the CC 2800 in 1998, although its DNA dates back to the original Demag CC 2000 of the 1980s. The improved CC 2800-1 was launched in 2003 and quickly become the benchmark in this sector of the crane market. A narrow track version - capable of travelling on five metre wide access roads - appeared in 2006, specifically aimed at the wind turbine sector and there are now more than 30 in operation around the world. All the major players in the heavy lift market own or have owned a CC 2800-1 -



Liebherr introduced the Wind variation of the LR 1600/2 in 2013



Manitowoc MLC650



Terex Superlift 3800

Sarens for example has more than 30 in its fleet.

Liebherr's 600 tonne LR 1600/2 was launched in 2007, but has kept up to date with upgrades such as the introduction of a Wind variation in 2013 and early in 2014 the SL10 and SL13 boom upgrade kits, offering improved performance.

Crawler cranes of this class have become increasingly popular for wind turbine erection, however increasing turbine hub heights and larger turbines means that cranes must lift heavier loads to higher levels. The taller the tower the more electricity can be produced. For example a nacelle at 120 metres can produce 10 percent more output than one at 100 metres. The latest, largest turbines are now weighing nearly 70 tonnes and are being installed to hub heights approaching 150 metres - a challenge for cranes in this sector, which may spur further developments.

Superlift 3800

The Superlift 3800 is an entirely new crane - not an upgraded 2800-1 - with improved performance, more safety features, easier transportation and faster, more efficient erection. Capacities have been improved by around 20 percent throughout the load chart

with wind turbine erection having a significant influence on the design, while incorporating changes to meet emissions and new European regulations.

Terex has so far delivered between 20 and 30 Superlift 3800's since its launch, with Franz Bracht and Sarens both adding four units to their fleets. One of the key reasons for its popularity in Europe, and



Terex has recently delivered up to 30 Superlift 3800s

How the three cranes compare.

	Terex Superlift 3800	Manitowoc MLC650	Liebherr LR1600/2
Max capacity	650t @ 12m	650t @ 5.8m 700t @ 8.53m w/ VPC-MAX option	600t @ 12m
Max load moment	8,484 tm	9,052 tm	8,228 tm
Max load moment w/o VPC-MAX	N/A	3,887 tm	N/A
Max boom	144m	140m	144m
Max system height	192m	204.5m	188m
Hoist 1 & 2 speed	130m/min	171m/min	133m/min
Hoist 1 & 2 line pull	18.5 tonnes	22.1tonnes	18.5 tonnes
Total weight	390t inc. 165t counterweight, 24m boom and hook block	564t with 32m boom, 600t hook block 300t counterweight	395t inc. basic machine with 190t superstructure 65t central counterweight

particularly in Germany, is its LSL Superlift with 153 metre main boom plus 12 metre jib to erect Enercon's largest wind turbine, the E-101. With nacelles weighing 67 tonnes these are being erected on towers with hub heights of up to 149 metres.

Terex says it has designed the erection and transportation of the Superlift 3800 with a view to reducing costs, to provide a higher return on investment. In spite of the improved capacities Terex has managed to reduce the weight of the basic machine by 17 tonnes, with the measurements and the weight of each component tailored for ease of transport, including additional lifting points and hydraulic motors positioned within the track frame, not only reducing track transport width, but also providing added damage protection during transportation.

The 3800 has a maximum capacity of 650 tonnes - 50 tonnes more than the CC 2800-1 - and an increased load moment of 8,426 tonne metres compared to 7,710 tonnes. It can self-erect with 114 metres of main boom and a 12 metre jib. With superlift mast, long main boom and jib it has a hook height of 153 metres at which it can lift 72 tonnes.

The new modular hook block allows customers to choose the required configuration, from 190 to 380 or 650 tonnes. Line pull has also been increased to 18 tonnes reducing reeving times and increasing lift speeds. The superlift back mast is available in Standard and Vario configuration with a counterweight wagon and has a variable radius from 11 to 19 metres, saving the amount of counterweight to be

transported to site.

For customers erecting wind turbines, the LF light fixed jib can be installed on the heavy SH main boom or on an LH stepped main boom. The optional special adapter head increases the capacities on the LF to 178 tonnes. The runner is standard on the LF and allows it to lift light loads quickly.

Terex says the Superlift 3800 offers the most economic use of counterweight. For example in wind turbine erection with 138 metre main boom and 12 metre light fixed jib the 3800 requires 70 tonnes less counterweight than the CC 2800-1, saving up to four truck loads each way - a €10,000 economy. The only component that is shared with the CC 2800-1 are the counterweight blocks, both cranes use the standard counterweight components now fitted on all models from the CC 2000-1 up to the CC 8800-1 Twin and the AC 1000. The Superlift 3800 is also the first crawler crane to feature Terex's new cab design and the company's Fall Protection System with a full guardrail system installed around the superstructure.

Manitowoc MLC650

The most striking feature of the MLC650 is its Variable Position Counterweight (VPC) system. The moveable ballast - which is automatically positioned using a track with rack and pinion drive mechanism - moves from mid superstructure to a position at the very rear, and does this when the boom angle or load changes. Manitowoc says this balancing movement improves stability, eliminating the need for carbody counterweights, allowing those weights to be



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The MLC650 during testing

added to the superstructure, thus increasing capacity while retaining mobility. The moving counterweight maintains and distributes the weight along the crane's entire track length ensuring lower ground bearing pressures, both during set-up and lifting operations.

One of the main options on the MLC650 is dubbed VPC-MAX where the counterweight tray is connected to the end of the VPC MAX beam allowing it to be extended well beyond the back of the superstructure, substantially improving capacities. One of the main selling points of this configuration is that the counterweight never touches the ground, which in combination with the balancing effect of the VPC cuts the amount of ground preparation

required. Manitowoc claims that for the MLC650 this equates to about 106 square metres of prepared ground, compared to 1,000 square metres for some other cranes of this size, saving time and costs. Although the counterweight never needs to touch down, the operator does have up to 20.21 metres of tail swing to consider.

Manitowoc illustrates the benefit of the counterweight by quoting applications such as working on a barge where wheeled or hanging ballast arrangements that need to touch down are not allowed. With the VPC-MAX option fitted the maximum capacity increases to 700 tonnes and maximum boom length to 140 metres.

Other significant features on the MLC650 include the Crane Control System which has two graphic displays in the cab for better visibility and Manitowoc's Fast Aligning Connection Technology (FACT) which automatically aligns crane components for faster, easier assembly.

Liebherr LR 1600/2

Of the cranes being promoted for wind turbine installation, only the Liebherr offers a specific wind variation - the LR 1600/2-W - with narrow crawler travel configuration. This gives it a slightly reduced load moment of 8,118tm with a smaller counterweight of 500 tonnes (rather than 565 tonnes).

The LR 1600/2 has been around for more than seven years, following its introduction in 2007. Based on the larger LR 1750, the crane was targeted at wind turbine installation being able to set up without an assist crane to place 3MW turbines on top of 100 metre towers. The wind variation was launched at Bauma 2013 and allows the LR 1600/2-W to travel with up to 108 metres of main boom and a 12 metre fixed jib. This has been achieved by using an extension to the superstructure frame, allowing the main counterweight to be reduced from 190 to 150 tonnes. A separate carbody ballast of up to 65 tonnes can also be added.

Earlier this year - possibly in response to the introduction of the Superlift 3800 and MLC650 - Liebherr introduced a boom upgrade kit for the LR 1600/2, increasing capacities by up to 20 percent and extending its heavy duty lift height. The new SL-10 boom system adds



Liebherr LR 1600/2

15 metres to the main boom and when combined with a 12 metre fixed jib takes the maximum hook height to over 160 metres, at which it can still lift 71 tonnes.

A more direct comparison with the standard boom system shows an increase in capacity from 77 to 92 tonnes at a hook height of 147 metres. The boom kit allows the crane to erect the latest generation of wind turbines with tower heights of up to 150 metres. The derrick system has also been improved to allow the longer main boom and jib combinations to be erected.

As usual with Liebherr, this new system can be retrofitted to existing machines, with the owner only requiring a few additional lattice sections which can be combined with the existing standard lattice sections to form the new SL-10 system. The additional sections can be supplied as a kit, making them ideal for those with more than one LR 1600/2 in their fleet.

The new system does not affect the basic machine and also does not increase its transport dimensions. Liebherr says that the new wind power system is the basis of an all-round upgrade of the LR 1600/2 involving the standard boom system being extended with lattice sections from the new SL10 system. The new boom 'system' carries the suffix H for Heavy.

Comparing capacities at various radii

Radius	MLC650*	Terex 3800**	Liebherr LR 1300/2***
10m	641t	650t	600t
20m	450t	418t	433t
30m	294t	282t	284t
40m	206t	189t @ 42m	199t
100-102m	44.6t @ 102m radius 122m boom	57t @ 102m radius 120m boom	49.1t @ 100m radius 120m boom

- * MLC650 with no 680 boom, VPC-MAX, 400t counterweight 44m main boom
- ** Terex Superlift 3800 54m main boom, 225t on-board ballast, 325t suspended
- *** Liebherr LR1600/2 48m boom, 150t on-board ballast, 250-350t suspended

Can they lift the latest wind turbines - 67 tonnes at 150m hub height?

Superlift 3800

Using a 150 or 153 metre main boom, with 12 metre luffing jib, 125 tonnes of on-board ballast and 325 of suspended ballast, the Superlift 3800 can lift a maximum of 72 tonnes to the required height at 19 metres radius or 70 tonnes at 28 metres radius with 285 tonnes suspended ballast.

Liebherr LR 1600/2

In SL10DFB/B2 configuration - 153 metres of SL10 main boom, 12 metre jib and suspended ballast - the LR 1600/2 can lift more than 71 tonnes at between 20 and 26 metres radius. Using the 153 metre SL13 main boom with 12 metre jib offers more than 75 tonnes, and even the 156 metre SL13 main boom and 12 metre jib provides 71.6 tonnes capacity at between 22 and 24 metres radius.

Manitowoc MLC650

On its maximum 140 metre main boom the MLC650 has more than enough capacity, at over 95 tonnes but does not have the reach, a fixed jib that can be extended to 42 metres ought to have enough grunt for the job, but we were unable to confirm this before going to press as the test programme has not yet been completed.



Based on the larger LR 1600, the crane was targeted at wind turbine installation

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