Towering advantage

In many countries tower cranes mounted on a mobile crane carrier are seen as a specialist tool for niche jobs, such as lifting HVAC units onto rooftops. But perhaps they should really be seen as an emerging class of more general purpose cranes, Will North reports. If we look back over the history of the modern crane rental industry, there are several examples of new crane concepts that started out as niche products, but which went on to become mainstream, or even leading market sectors.

The roots of the European crane rental sector, and of many of its largest businesses, can be traced back to post war entrepreneurs who mounted homemade cranes on decommissioned military trucks. They were replaced in the 1950s by purpose built lattice truck cranes, and then in the 60s by telescopic truck cranes. In the USA and the Middle East, Rough Terrain cranes also became a popular lattice mobile alternative. Then as we headed into the 1980s, All Terrains began to emerge, eventually replacing truck cranes. Rental rates for all of these cranes has tended to be based on their nominal capacity, rather than their overall load chart capability.

The idea of mounting an up and out folding tower crane on a roadgoing mobile carrier is not new. Indeed, Liebherr traces the concept to efforts to make its original cranes - developed in 1949 by its founder Hans Liebherr - more mobile. This included the KA Series in 1961, followed by the very unusual AUK models of the 1960s and early 1970s, mounted on Kaeble 6x4 chassis with trailing tower.

Some major rental companies took them on due to the overwhelming appeal of the concept – but it was no runaway success.

Liebherr's KA series was introduced in 1961

A 1977 Munsters crane

The AUK 120 was different beast altogether

At the same time Dutch manufacturer Munsters introduced its first mobile tower crane with 500kg capacity and later mounted self-erecting tower cranes onto truck type chassis. And then in the USA we had the Grove/GCI tower with lattice or telescopic jib mounted built into a semi-trailer type chassis.

They were all trying to combine the benefits of a tower crane's up & over reach, with the rapid travel and set up time of a truck crane, in order to bring this type of crane to the short term rental market.

The concept gained some traction, particularly in the Netherlands. It was there that Leo Spierings 'picked up the baton' in the late 1980s and went on to do more than anyone to develop and promote the concept and take it more mainstream. His idea was to design a high capacity purpose built self-erecting tower crane mounted on a modern crane


A young Leo Spierings in 1990 with his first crane An SK 345-AT3

carrier. Liebherr followed soon after when it launched its MK series of 'mobile construction cranes. What made these new models stand out is that they were designed as a highly optimised, roadable unit, able to arrive on site, set up quickly, entirely on their own, and get to work immediately. They needed no special permits for travel and no additional components or ballast to be installed, so one man operation was entirely practical.

While these cranes may indeed have been seen as a niche product, as with other crane types before them, they are becoming more mainstream, and in an increasing number of countries an important element of many crane fleets, able to take on a growing variety of routine work with improved efficiency. The challenge now is not finding jobs they can do but selling and explaining their benefits to end users and establishing pricing that is based on the job, or capacities at height and reach, rather than the nominal capacity rating used by their telescopic rivals. This move away from a focus on nominal capacity also applies to aluminium boomed truck cranes where capacities at height and reach can match substantially larger, heavier cranes, or spider cranes which can often get much closer to the lift, and therefore do not need to be so big.

Two principle players

As discussed in the box story, I think it best to think of these cranes as 'Tower-type All Terrains'. Whatever you call them, there are only two major manufacturers building these cranes for developed crane markets: Netherlands based Spierings, and Germany's Liebherr. I spoke to both companies for this piece, talking with Spierings chief executive Koos Spierings (Leo's nephew) and his sales engineer Maarten van Brink, and Liebherr's product director for the mobile construction crane business, Wolfgang Schlaucher.

While Munsters was a pioneer of the concept, it has not played a major role in the market for some time and has passed through a number of hands and name changes since 1976 when it became De Jong-Munsters. Belgium's Arcomet acquired the business in the early 2000s and developed the AF38, a self-erector mounted on a three axle Faun carrier. The business was then sold to Max Holding in 2017 and rebranded as MTC mobile tower cranes. The company still makes the AF 38, with the latest model, the MTC AF38 2.0, featuring a Euro 6 diesel now on the drawing board. Perhaps, when Cranes & Access next surveys this market, we will be talking of three competitors? Or maybe one of the other major mobile crane manufacturers will have joined the fray?

Spierings Vs Liebherr

Both of the main 'players' in this market focus on ease of set up and use of their cranes, in comparison to telescopics with similar long reach capacities. Spierings says: "We have always had the concept that one operator should be able to do the job and no additional ballast should be required. On our six axle crane, you can lift 1.7 tonnes at a radius of 60 metres. With any other mobile crane, you would need two or three trucks for ballast to achieve this sort of capacity."


The Spierings cab in top position

Just as Liebherr's MK range compares with that of Spierings for lifting capacity, so both ranges are designed for rapid set up, with the crane ready to go in under 30 minutes: 10 to 15 minutes to set up the crane on outriggers, and then a similar length of time to fully erect the tower and jib. Set up is not only fast, but fully automated - no assist cranes or helpers.

Schlaucher says: "One operator can bring the crane to the job site, erect it and operate it afterwards." This ease of use, and the lower operating costs, comes at a price though. Schlaucher adds: "The initial price is a little bit higher as there is more technology inside for the automatic setup, where you need sensors and so on."

There are a few key differences between the two manufacturer's ranges. One, which we'll look at in more detail elsewhere in this issue, is their approach to electrification. Both of Liebherr's cranes, and Spierings' two latest models - the four axle SK597-AT4 eLift and six-axle SK1265-AT6 eLift - can operate using plug in mains electric power. Spierings, however, also offers a compact three axle crane, the SK487-AT3 eDrive or 'City Boy', which can travel up to 20 miles on battery power alone, allowing it to access city centres with restrictive emission or noise regulations.


Liebherr MK140

It's all in a name

One way to help promote a new concept is to have a clear widely used name. All Terrains for example combined a Rough Terrain and truck crane, suitable to both unprepared sites and fast smooth road travel. Today they have very little in common with RTs.

Spierings calls its cranes 'mobile tower cranes'. Liebherr prefers 'mobile construction crane' a direct translation of the German term Mobilebaukrane - Baukrane, directly translates as 'construction crane', but in English that covers any crane used on construction work. Cranes & Access and Vertikal.net has always called them 'self-erecting mobile tower cranes'.

I would suggest however that none of these names quite captures the difference between these cranes and other mobiles, while being confused with regular self-erecting tower cranes designed for longer term building jobs. These cranes are not merely mobile, in the way that some self-erectors can be towed to site or moved around site on rails or tracked chassis, they are both fully roadable and optimised for maximum capacity at long reach and height. They are in every sense an All Terrain, albeit with a different lifting mechanism to the telescopic All Terrain cranes.

Associating them with regular self-erecting towers avoids the key benefit, in that once they arrive on site they can be ready to make their first lift in as little as 10 minutes without a great deal of physical effort required by the operator. They can get straight to work and then be ready to leave again just as quickly. They are very much versatile taxi cranes, capable of working on two or three jobs in a city on the same day.

So, I propose calling and thinking of them, as 'Tower-type All Terrains'. This both captures the nature of the carrier, and that of the crane. It differentiates them clearly from telescopic All Terrains, or lattice truck cranes, without risking confusion with normal tower cranes.

Will North

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Liebherr electric controls

Hydraulic or electric controls

The two manufacturers approach also differs mechanically. The Spierings cranes are mostly hydraulic, while majority of functions on the Liebherr models are electric, the exception being a couple of hydraulic actuations required during set up. As with other cranes and aerial lifts, the choice here largely comes down to operator familiarity and preference, and is probably not a factor most buyers consider, although Koos Spierings says that many operators of his company's cranes value the way the hydraulic controls 'listen' to them. But equally, other operators are quite happy working with electric controls and value the range of functionality they offer.

Another big difference between the two ranges is the cab, which on all of these cranes can travel up the tower mast to provide a better view of the load, especially important when lifting a chilling unit into the centre of the roof of a multi storey building from a narrow street. On the Spierings models, the elevated cab height has to be selected from a choice of fixed positions. Changing cab height requires reconfiguring the crane which takes time. On the Liebherrs the cab can be located at any height, with the operator even changing it while working.

While most mobile self-erectors can only work at fixed luffing positions of up to 45 degrees, Liebherr's MK 140 can also be set up for stepless luffing up to an angle of 70 degrees. To achieve this, the crane must be re-configured from trolley hoisting, standard for cranes of this type, to jib tip hoisting, as used on luffing jib tower cranes. Doing this will take some steps and checks but will take an operator only 10 minutes. The ability to make this change in so short a time is even more impressive, when compared to the time and cost it would take otherwise to bring in a telescopic crane able to lift the same load to the same radius and lift heights.

Owners will, of course, need to assess whether this will significantly add to their ability to take on jobs in their area, or whether they are better served by having a fleet mix of telescopic cranes with luffing jib options, and straightforward up and out Spierings models, or Liebherr's other MK. Price, finance, and relationships will of course also play a significant role in the selection.

Reach and vision

The birthplace of the modern 'Tower-type All Terrain' was the Netherlands. Even before Leo Spierings' innovations, similar cranes with a tower on a roadable carrier were well established, often used for short term concrete pours etc... which remains a core market for the product.

Bob Bruijsten is director of Kuiphuis Kraanverhuur, a company that can trace its history back more than 100 years. It bought its first Spierings crane in 1994. He says: "We first bought a three axle crane, then a four axle, and another three axle, and then we took the first five axle unit in Eastern Holland. We have owned the whole range. Of all the newly bought cranes from Spierings, we have only ever sold five of them. All the others are still being used."

Spierings has fixed cab heights

The Liebherr cabs can stop at any height

Liebherr can luff its jibs to 70 degrees reeved over jib tip

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Cranes are used intermittently at key stages in housebuildings...

and commercial construction

Bruijsten, and Koos Spierings, both estimate that mobile tower cranes make up around a third of the country's roadgoing mobile crane rental fleet - around 500 units out of a total of approximately 1,500 cranes in all.

Bruijsten explains that much of the country's construction sector is now built around the use of these cranes. "We have the landscape for mobile towers. In Amsterdam or Rotterdam, there may be more telescopic mobile cranes because of the very high buildings. Outside of big cities, or big industrial sites, you still see mobile towers everywhere. In general construction, everything in Holland is prefab concrete, and rarely over three or four tonnes. We have some customers - small construction companies - that build just a few houses a year. We'll come in, place the flooring panels, and be gone in a few hours, and then go back again later when they are ready to do the next phase of the building. While on steel construction, the crane can be employed for several weeks at a time."

Bruijsten says that lifting into the centre of large roofs is no longer a core job for its mobile towers, as the range of applications they are used for has widened. But

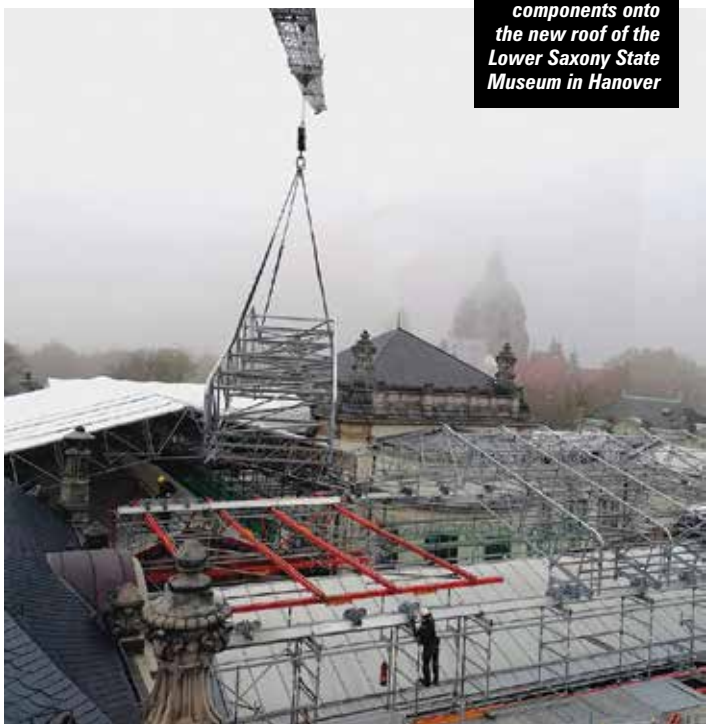
Kuiphuis finds good work for its Spierings cranes in restricted spaces

he cites a contrasting type of job that is becoming popular: lifting down below ground level, on jobs such as the widening of the A9/A10 motorways, or working on waterway locks, customers appreciate that the crane's raised cabs allow operators to see down to the load.

On the lock jobs, Kuiphuis recently used two of its crawler mounted Spierings. These feature the same tower type superstructure but on a compact tracked chassis or carrier. They have the added benefit of being able to travel with the tower erected. The Spierings were not used for the 70 tonne lock gate itself – obviously – but for placing iron around the site. "On these projects," says Bruijsten, "It was more important to have a hook available across the site, than to be able to lift a great deal of weight."

The fact that the raised cab gives operators a clear view of the load is a definite advantage. Koos Spierings points out that his company's cranes have LED lights running along the jib, which provide a daylight view below for night time operations. The basic geometry of the cranes, compared to their telescopic rivals, makes this possible: a line of lights at a fixed height on a horizontal jib has obvious utility, a line of lights on a luffing telescopic jib, less so. In fact, one of his cranes provided the lighting for the Vertikal Days 10th anniversary evening networking party.

LED lights along the bottom of the jib light up the workspace - or party - below



A Liebherr MK88 owned by BKL lifts components onto the new roof of the Lower Saxony State Museum in Hanover

Reaching out

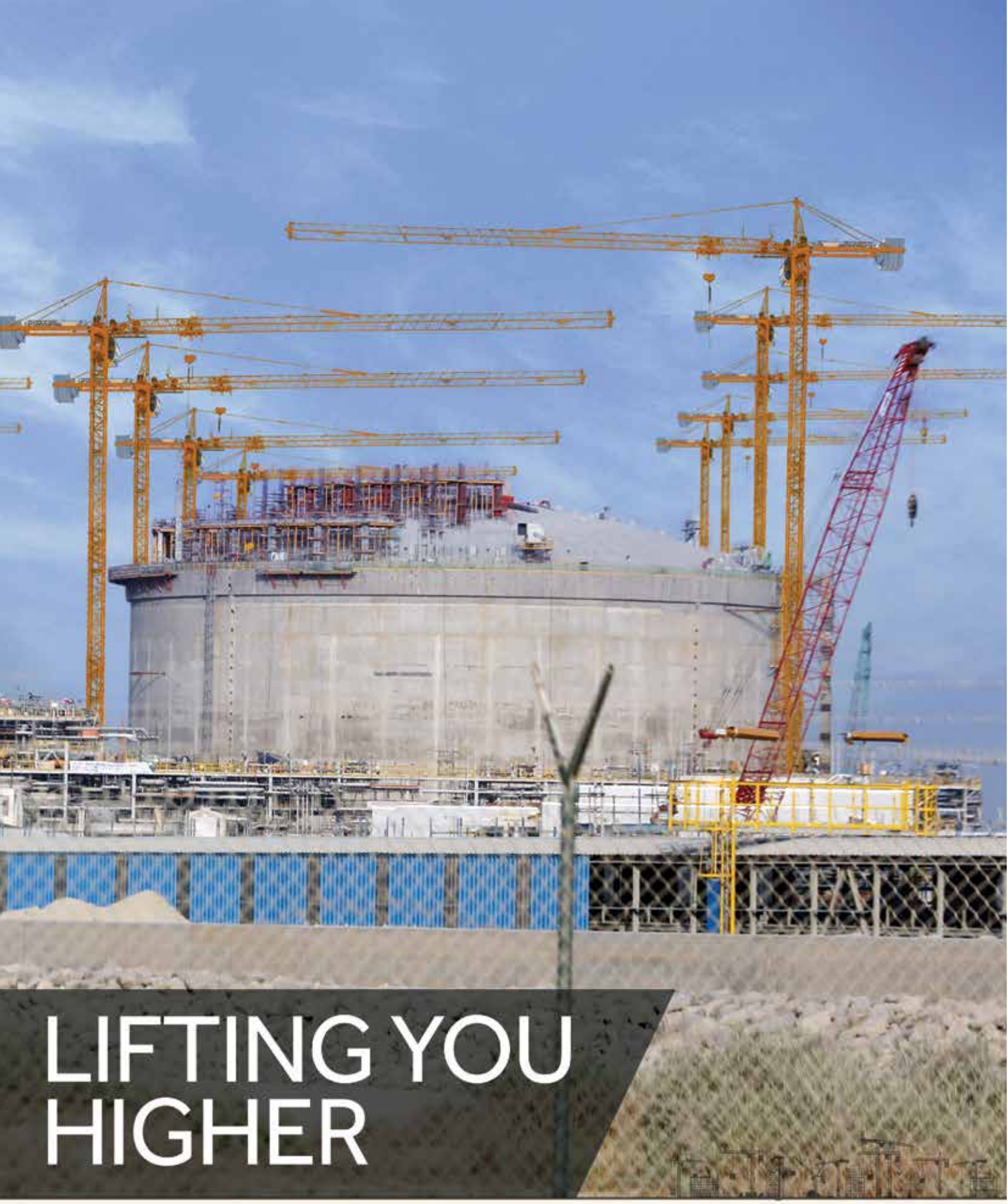
While lifting single loads onto rooftops may have been eclipsed by a host of new applications, their ability to handle relatively modest loads over extended distances, without interference from the building's edge, makes them a compelling alternative to telescopics of much higher nominal capacity on many city centre jobs. For example, placing a 3.5 tonne HVAC unit onto the roof of a 35 metre building say 30 metres in, from the street below is a breeze for a six axle Spierings. And if the unit is ready when the crane arrives, the entire job can be completed in a couple of hours, with the AC unit placed exactly where it is required, and the operator having a perfect view of the load placement without leaving his crane.

The alternative is to bring in a big All Terrain, close the road, truck in counterweight and jib, set up, do the short lift and then strip it all out. The whole process can take an entire weekend and involve huge amounts of transport and labour, not to mention require a good deal of space at street level – so no contest, and yet this method is still relatively common. It is almost akin to transport companies using a horse and cart to transport freight in the 1930s.

Wolfgang Schlaucher at Liebherr says: "We are seeing big demand in Scandinavia at the moment, driven by the high cost of labour and the possibility to run the crane on electrics. As soon as labour becomes expensive, the quick setup time and ability for one man to set up and operate the crane on his own the more the concept appeals."

"We also see demand in France, and Spain is now coming along too. In Austria and Switzerland, there has always been a market. Of course, they are not the biggest countries. But for the size of the country, there is now a good population of these cranes."

Beyond Europe, Schlaucher says Liebherr is seeing increasing demand from further flung international markets, for example South Korea. "At first some contractors imported mobile



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Commercial construction is a big application for NMT

construction cranes more or less to use them for their own work, but then they saw the possibilities for this crane type in a taxi crane concept, coming from one job site to another."

"we have to convince the customer of our customer"

Before becoming chief executive of the family company, Koos Spierings was responsible for sales in the UK, and witnessed the concept really take off, almost from a standing start, especially erecting large commercial buildings placing large sheets of metal cladding. "If you look at the huge warehouses that have been built in the UK over recent years, you can see there has been a big move to mobile tower cranes. All the roofing and sheeting is done with our cranes, because once a customer has seen how quickly it goes, he realises that it's a huge benefit compared to telescopic mobile cranes. It took 30 years in Holland to show the concept to all the end users. It's a process where we have to convince not only our own customer, but also the customer of our customer."

In the UK and the Netherlands, these large commercial buildings are an important part of selling the concept. In the UK, Tim Ambridge is one of three brothers, along with Nick and Mark, whose initials are referenced in the name of family business, NMT Crane Hire. The company started out in vehicle recovery in the 1970s, but after a couple of scary, and life threatening, incidents on the motorway, the brothers decided to move into crane hire.

As a well established business, they moved into tower type mobile cranes in the early 2000s, initially with a six axle Spierings in late 2005, then a seven axle and two more six axles. The company's focus has been on the larger models, with longer reach. That brings in a lot of city centre crane jobs, but also longer hires on those warehouse projects.

Ambridge says: "We are doing a lot more contract lifts now. We've got a particular customer we work with, who builds big, million square foot, buildings all over the country. Generally, on those projects, the crane does 120 lifts a day. They are really fast pieces of equipment."

"It's not just that the cranes are fast to set up, and to perform each lift. It's that you can cover the entire structure from a single point," adds Ambridge. "You have 50 to 60 metres of reach on the six axle cranes. So, on a 100 metre building, you only have to re position the crane once or twice."

On these jobs, reach is far more important than capacity, says Ambridge: "We are using a big roof sheeting beam now with which we can handle 15 to 20 metre long panels. So, the beam is heavier than the load a lot of the time. The total load is no more than one to two tonnes."

Germany is another market where mobile tower cranes are beginning to carve out a significant market share. Jörg Hegestweiler is chief executive officer of BKL, or BauKran Logistik. The company's roots were in regular tower crane rental, but it added mobile cranes initially for tower crane erection and dismantle, and then as part of its rental fleet. Today, the company runs around 100 wheeled mobile cranes, including Liebherr MK mobile self-erectors. Hegestweiler notes that this is a high proportion for the country, estimating that overall these cranes only make up around three or four percent of the national fleet.

As in the UK, the reach, especially at height, is key to winning new jobs and convincing end users that this is a better solution. While in the Netherlands, he notes, jobs will be planned around the use of mobile tower type cranes, in Germany, their use has to be pitched to customers further along in the process, but it is an argument that is increasingly succeeding.

BKL supplied an MK88 to lift components for a new roof on the Lower Saxony State Museum in Hanover. The crane needed to be positioned in an area with limited space, and to reach over an interfering edge. Working close to the building highlighted another advantage over telescopics: the crane could plug in to site power, working without emissions and limiting noise.

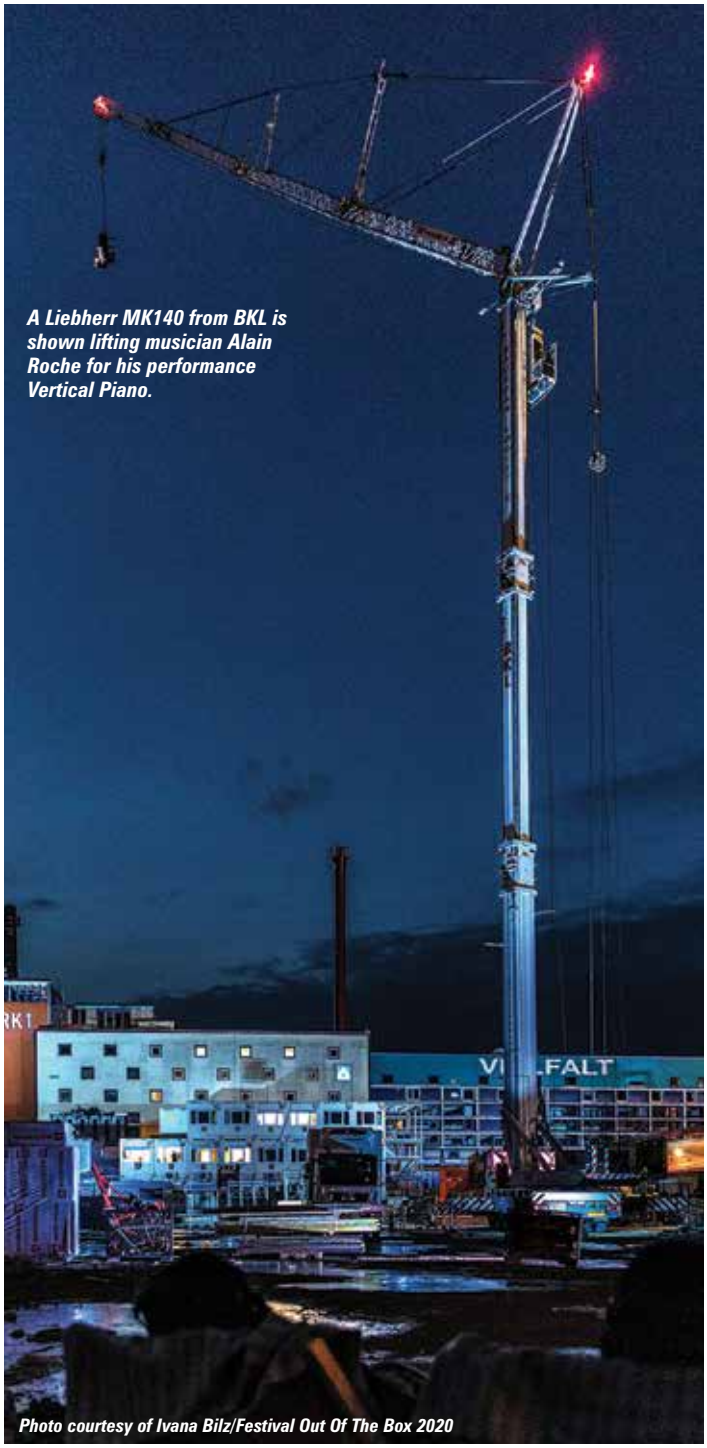
On some jobs, Hegestweiler sees advantages to the high height under hook made possible by the MK cranes' luffing jibs. But more routinely, it is reach that matters. "On 30 or 35 metre high buildings, we can go very far into the job site, they are used for everything, even scaffolding. As well as staircases, in complete pieces or sections. You still have the maximum lift of eight tonnes, which is not so small, but also not so heavy in comparison to telescopic mobiles."

Routinely in Germany, as in other markets, these cranes are being used to reach into the centre or far edge of large warehouses or factories, such as the Tesla 'Gigafactory' currently being built near Berlin, or across smaller scale housing projects. But Hegestweiler has seen another application taking off in the country, carrying out lifts in the petrochemical sector.

He points out that such sites will occasionally have no alternative but to shut down in order to perform maintenance work, lifting in pipe racks and similar modules. On these shut down projects, where every second of lost production carries a substantial cost, being able to quickly deploy a crane and lift a load into place over obstacles and crowded space where other works is going on is vital.

"These jobs are pushing demand, not just in Germany, but around the world, you have a very limited time, maybe a couple of days for the shutdown, where you need to go in, do the lifts and get out. And the loads are usually extremely small, often relatively small parts, but you have to take them far into the site," says Hegestweiler.

Congested petrochemical plants need to work fast during short shutdowns - a Liebherr MK 140 from ADW at the Stade Dow chemical plant during a recent shutdown



A Liebherr MK140 from BKL is shown lifting musician Alain Roche for his performance Vertical Piano.

Photo courtesy of Ivana Bilz/Festival Out Of The Box 2020

Best supporting actors

One new role for these cranes is in the entertainment sector, and one in which both BKL in Germany and NMT in the UK have already had a starring role.

In Munich, BKL supplied a Liebherr MK140 for musician Alain Roche's performance 'Vertical Piano', which saw him and his piano carried over two 33 metre and 54 metre buildings, before being swung in front of the audience. For this job, the crane was configured with nine tonnes of additional ballast; with the crane's luffing jib positioned at 45 degrees and working at a hook height of 75.5 metres to a radius of 40 metres.

On any job like this, safety is key. The job needs to be carefully planned, eliminating risks. In Germany, and most other well regulated markets, the crane itself must be set up to a much higher safety factor than for normal lifts. And multiple layers of redundancy must also be in place.

For Hegestweiler, this was another compelling reason to use the MK140. The crane, he explains, is especially equipped with a completely redundant additional control system, alongside the standard cab and remote controls. This optional extra control for the transportation of passengers duplicates all elements, including PLC and frequency converters, meaning that if anything goes wrong with the in cab or remote controls, the operator is still able to operate the crane. Adding this extra layer of redundancy, ensuring the safe recovery of lifted personnel in the event of a failure elsewhere, can speed up the approval process for personnel lifts in Germany; it would likely be looked on favourably in other regulatory regimes as well.

NMT's stage career is much more well established. While there is no Oscar for stage rigging, if there were, the company would likely be a regular nominee. As many baristas and delivery drivers in Hollywood or London will tell you, getting that first role can be an insurmountable challenge. For Tim Ambridge, one introduction, and a reputation built up over time, has led to a regular flow of work for his fleet.

NMT Film and TV Crane Hire has deployed a wide range of equipment, on films such as Gravity, the Fast and Furious franchise, World War Z, and Mission Impossible. Beyond the film industry, they have been used in live performances, such as those in London's Hyde Park, and for personnel lifts, such as the singer Pink, who has used the cranes to support her during an acrobatic entrance to her shows. It says a lot about the company's attention to detail that the famously meticulous Tom Cruise has worked hanging from one of the company's cranes, as have others such as Brad Pitt and Angelina Jolie.

When rigging an outside stage, whether for a film set or a live performance, speed is vital. Ambridge says that with its reach and pace of lifting, a tower type crane can rig a stage in under a week, often in two or three days, compared to two weeks for a telescopic mobile.

The up and out geometry of a tower type crane has another advantage over telescopics on these roles, it is much easier to set up without casting a shadow.

Pitching the job

One potential drawback of these cranes is that they do not fit within the mindset of much of the crane rental industry, which regards them as niche or specialist machines, and most customers will not know to ask for them. So the response to a manufacturer's salesman is that old chestnut - "we never get asked for them". For some crane owners, and more importantly, most customers, crane hire is all about selecting the cheapest crane of the right nominal capacity for the best possible price.

On the nominal capacity front an eight tonne mobile tower crane can appear impossible to compete. How can you compare a crane that lifts no more than 10 tonnes, with one that supposedly lifts 200 tonnes?

The answer, as we have pointed out, is that this type of crane lifts its full capacity to a much greater height and radius than a larger

NMT Spierings cranes rigging a stage set

telescopic. A 200 tonne load, for example, is a totally impractical and impossible lift for a 200 tonner at any radius. While the mobile tower's time and cost savings of setting up without the need for additional support vehicles, or the space to lay down and set up jibs etc... is massive.

In countries or market sectors where these cranes are still an emerging alternative, it takes a great deal of explaining to the customer that the job will be completed faster and cheaper, than with a telescopic crane of the nominal capacity they are used to asking for. But Ambridge is clear that making this pitch is worth it.

"They're a good earner. If it were possible, I would get rid of all of our telescopic mobiles, and just run a fleet of mobile towers as they are a one man operation."

Breaking news

As we go to print, we hear news that Liebherr will unveil a new three axle MK 73-3.1 mobile model incorporating all of its latest technology and more. Check Vertikal.net and the next Cranes & Access for the full details.