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# Taxi drivers

The 100 to 180 tonne class of All Terrain Cranes covers both taxi cranes capable of taking on multiple daily jobs, through to larger more project oriented cranes. It also marks the point where four axle carriers give way to five axle cranes. In the first of two articles, Will North looks at the choice available in the 100 to 120 tonne class and talks to the leading manufacturers about the considerations driving their latest developments.

The market for All Terrain cranes has been a hotbed of development in recent years, spurred on in part by the seemingly constant engine changes required to meet the latest emission regulations.

The need to make engine changes prompted manufacturers to upgrade other aspects of their cranes at the same time. In the past year or so the market sector for All Terrain cranes with capacities of between 100 and 180 tonnes has become one of the most competitive, particularly towards the lower end of the sector, where a wider variety of different models are offered than in any other. This is partly due to basic arithmetic: proportionately the difference between a 100 and a 140 tonner is far greater than, say, between a 300 and 350 tonne crane. But it is also an indication of the degree of optimisation buyers and end users are looking for in this class of crane, in the quest for as much lifting capacity as possible, while meeting local road requirements and regulations as well as suiting local job sites in terms of space and access. The variations between models include boom length, overall dimensions, travel weight, number of axles, outrigger set up systems and counterweight configurations.

## A wide choice – too wide?

Buyers in Europe currently have 20 different crane models to choose from which include six Liebherrs, six Tadanos - although three of these do not have the latest engines - four Groves and four Demags. Customers in North America have all of these along with two Link-Belt North American All Terrains to choose from, including the 150 tonne 175 AT, the first model in a new family of Link-Belt All Terrains.

As touched on above, the lower end of this market has seen the most new product launches and now includes seven 100 tonners alone with the Grove GMK4100L-1, the Tadano ATF100-4.1 and ATF-100G-4, the Demag AC 100-4 and AC 100-4L and two Liebherrs—the four axle LTM 1100-4.2 and five axle LTM 1100-5.2.

Liebherr also offers the 110 tonne five axle LTM 1110-5.1 and four axle 120 tonne LTM 1120-4.1, while Tadano has the ATF-120-5.1 or the older ATF-120G-5 and Demag jumps to the 130 tonne AC 130-5.

Kato has also been looking at this market and showed the four axle 100 tonne KA1000Rx prototype at Bauma last year, initially designed for the Asian market there was interest from European buyers.



While the prototype looked good, the 51.3 metre boom is now too short for most European buyers, while the prototype's Stage IV power unit is a nonstarter, so a major redesign would be required if it decides to get serious. Feedback from the show confirmed both issues and Kato says it has taken these on board for consideration.

## The long and short of it

It is notable that two cranes in the 100 tonne class carry an 'L' designation indicating them to be long boom versions of earlier models. Longer - 60 metre - booms

have become a key selling point on 100 tonne cranes, with only the Demag AC 100-4 and Liebherr LTM 1100-5.2 and the two older Tadano G models having anything shorter - 50 metres on the Demag and 52 metres on the Liebherr and Tadanos.

The only Grove entrant in this class demonstrates how long booms have increasingly become a standard requirement, at least in Europe. Product manager Florian Peters explains: "In 2007 we launched the GMK4100, but it was followed swiftly by the GMK4100L. The GMK4100 had a 52 metre boom while the GMK4100L was actually the first four axle, 100 tonne crane



The 100 tonne Kato KA1000Rx prototype displayed at Bauma, was short on boom length, but could do well in Japan



The long boom Demag AC100-4L

**A Grove GMK4100L-1 employs all of its 60 metre boom to lift a nine tonne nacelle on a wind farm in Wales**



with a 60 metre boom. Since then competitors have also introduced 60 metre booms, and from our perspective, demand for 100 tonne short boom cranes is now low compared to the long boom version. So when we upgraded and introduced the GMK4100L-1 at Bauma 2016, we decided to discontinue the 'short' version."

Moving on to roading issues, Peters adds: "You can drive the GMK4100L-1 with up to 6.7 tonnes of counterweight on board within 12 tonne axle loadings. While a single truckload of counterweight provides substantially increased capacities. Or where 16.5 tonne axle loads are permitted you can travel with 19.9 tonnes of counterweight on the crane."

**Demag retains short option**

Demag, which is becoming increasingly integrated into the Tadano group, still offers a shorter 50 metre boom on a 100 tonner with the AC 100-4. Product marketing manager Michael Kiein says: "It makes sense now to think of the 'long' model as standard, as the 60

metre boom 'L' version is what most customers take. The short 50 metre boom is more or less a version we now build for Japan. The shorter boom means less weight, making it possible to get this crane on the road in Japan. We have sold some units in other parts of the world, but only where customers have a well defined job case and where they prefer a little more lifting capacity."

**Horses for courses**

Liebherr has kicked off what looks like becoming a new trend, offering both four and five axle versions of its cranes in this size range. The 100 tonne LTM 1100-4.2 and 120 tonne LTM 1120-4.1 are both on four axles with long booms - 60 metres on the 100 tonner and 66 metres on the 120. The five axle 100 tonne LTM 1100-5.2 only offers a 52 metre boom, and the LTM 1110-5.1 is only a 110 tonner, both of which seem counter intuitive.

Liebherr's Wolfgang Beringer explains the rationale: "The LTM 1120-4.1 and the LTM 1110-5.1 have different concepts. The LTM 1120-4.1 is the strongest four axle crane on the market and is



*Central Contractors, part of the All group, used a Demag AC100-4L to install equipment at the Revolution Brewery in Kedzie, Illinois. Located in a busy neighbourhood, the site was a challenge to access. Reaching into the installation area from an open lot would have required a 600 tonne crane and cutting power to the brewery for two days. The company decided to drive the crane through the brewery. A 70 tonner would have fitted but would not have had the reach or capacity. Tucking in the AC100-4L's side mirrors and lowering its suspension provided just enough clearance to drive through the building and carry out the job.*

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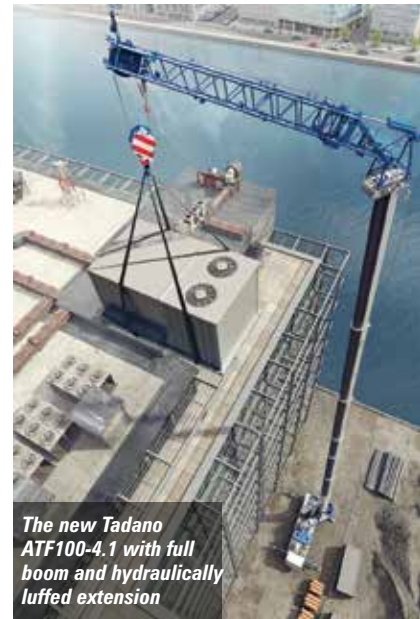


*The 110 tonne Liebherr 1110-5.1 Liebherr's 'light' five axle crane can travel with 10t axle loads*

is our 'light' five axle crane, which can carry up to 13.4 tonnes of ballast within 12 tonne axle loads. So the crane can carry out a wide range of lifts without additional ballast transport, so in many ways it is a true taxi crane. If less counterweight -- up to 1.1 tonnes -- is carried onboard, the LTM 1110-5.1 can even travel within 10 tonne axle loads."

Beringer also cites the UK's STGO (Special Types General Order) road rules, which allows cranes, or other over weight vehicles to travel with much higher axle loads at reduced speeds, pointing out that

the perfect crane if you need high lifting capacities on constricted construction sites, where a four axle crane has advantages over a five axle. But this concept needs all of the permissible weight for the structural load bearing components, so it can only carry 2.1 tonnes of ballast within the 12 tonne axle load limits. The LTM 1110-5.1 however,



*The new Tadano ATF100-4.1 with full boom and hydraulically luffed extension*

UK users can carry 20 tonnes of counterweight on the four axle LTM 1120-4.1 within the permitted 16.5 tonne axle loads.

Tadano has offered a similar but slightly different approach for some time with its four axle 100 tonne ATF100G-4. With a 51.3 metre boom it can manage six tonnes of counterweight within 12 tonne axle



*Gruas Roxu in Spain ordered two new Liebherr LTM 1100-5.1 at its launch in 2019. The first crane arrived in May and went straight to work at the San Juan el Real Basilica in Oviedo.*



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loads or 22.5 tonnes in the UK. The five axle ATF120G-5, which has a 52 metre boom, can travel with 15 tonnes in the UK or meet 10 tonne axle loads without counterweight on board. Both cranes are still available, but with Stage IV engines and short booms, they are being replaced -- at least in Europe -- by the 100 tonne ATF100-4.1 and ATF120-5.1 which were unveiled at Bauma last year and feature longer booms and Stage V diesel power. The first deliveries began this summer.

### The new Tadanos – one crane two chassis

The new four axle ATF100-4.1 has a 60 metre seven section main boom and is available with a hydraulically luffed and stowed nine to 16.8 metre bi-fold swingaway extension that can offset up to 45 degrees and be extended to 30.8 metres with inserts. A three section telescopic luffing jib option is also offered. The crane can meet 12 tonne axle loads with 3.1 tonnes of counterweight on board or manage 13.2 tonnes under UK rules. To achieve the crane's full capacity potential requires the 30.4 tonnes maximum counterweight, but that also requires a support vehicle. Unlike most of the competitors the ATF100-4 and ATF120-5 adopt Tadano's two engine concept.

The five axle ATF120-5.1 uses the same superstructure but mounted on a five axle carrier, which allows it to meet 10 axle loads without counterweight or carry up to 11.5 tonnes within 12 tonnes axle limits -- as long as you leave the boom extension behind -- otherwise it is 9.2 tonnes. In addition to the higher rating, the bigger chassis also provides improved capacities especially at longer reach where it can work at a greater radius. In terms of size the overall stowed

length is not that much greater than the four axle at 13.5 metres, however the carrier is 1.78 metres longer, which can be critically important when squeezing into tight spaces.

One feature that is unique to the Tadano cranes and rarely mentioned, is the Lift Adjuster which automatically adjusts for boom deflection when picking up or placing a heavy load. It was a factor mentioned by Marta and Cristina Rodríguez of Grúas Cigales, which took one of the first ATF100-4.1 to be delivered, they said: "The Lift Adjuster also played a crucial role in our purchase decision, as the system keeps the radius constant during lifts by automatically luffing the boom to a steeper position whenever load deformation occurs."

### On the road again

The UK and Singapore are among the few exceptions where cranes are permitted to travel with axle loads of up to 16.5 tonnes, but road regulations around the world vary substantially between national and even internal jurisdictions, requiring manufacturers to design cranes with enough flexibility to cope with these variations, especially for those markets, such as the USA, where rules in neighbouring states or even counties can differ. When it comes to larger cranes with capacities from 130 to 180 tonnes the challenges are even more intense. Even within the UK high axle loads are not always possible: restrictions such as bridge limitations can be an issue, while customers working in London are increasingly required to reduce axle loads to 12 tonnes or less.

With these cranes designed for one person operation, moving and installing counterweight becomes an important part of preparing to work: it's all well and good being



The new Tadano ATF120-5.1



One of the first Tadano ATF100-4.1 to be delivered went to Grúas Cigales in Spain

able to drive to the site alone, but setting up can be time consuming and therefore costly as well as being an irritant to the operator.

A change was made to the design of the Grove GMK4100-L1 to help in this area, product manager Peters says: "We initially tried to have a single global solution for the onboard counterweight stowage, but will not always be the best solution for everybody. We had some demand from the UK to fit 10 tonnes of counterweight on the rear of the carrier and 10 tonnes on the front. That meant that before working you had to lift one on to the other, and then install the combined counterweight on the superstructure. For an operator working alone this is possible, but it is one more job to do."

"So we designed a counterweight

version which is now different. You can have 10 tonnes already attached to the superstructure and the other on the front of the carrier deck. You just slew the superstructure, pick up the extra counterweight and start working. This makes it more convenient and



UK based KAS Crane Hire used a Grove GMK4100L-1, alongside a GMK3055 for a tandem boat lift in Devon. The 100 tonner uses the manufacturer's new counterweight system, for faster easier set up times on site



The new Tadano ATF100-4

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# LIEBHERR



*Infinitely variable outriggers, like those on this new Liebherr LTM 1150-5.3, offer additional versatility when setting up on site*

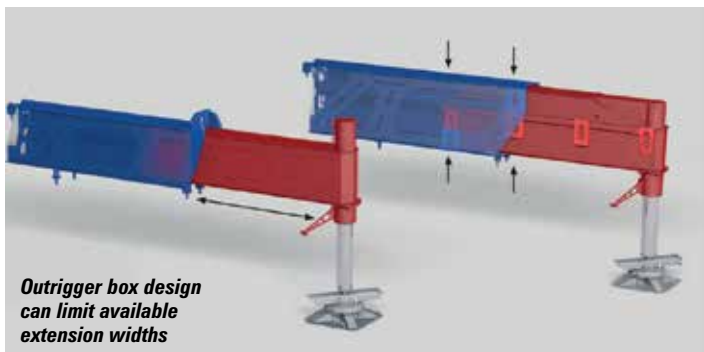
setting up the crane faster.”

**Every nook and cranny**

Getting to the job site and setting up is only one aspect. For cranes in this class -- effectively the highest end of the taxi crane sector for most markets -- it is equally important that capacities are as good as possible throughout the load chart. This is especially true when working on sites with limited space or obstacles that prevent the full extension of the outriggers. Factors affecting this include the overall

dimensions of the crane, including chassis length, which can affect their ability to get into tight areas, followed by counterweight, and outrigger spread. The availability of variable outrigger set up has been a boon in this area, allowing cranes to get the absolute maximum out of the available space, maximising their performance.

Of the seven cranes we mentioned the Grove, Liebherr's and Tadano ATFs are all 2.75 metres wide, while the two Demag's have an overall



*Outrigger box design can limit available extension widths*



*Grove's Megatrack suspension*

width of just 2.55 metres, which on some jobs can be the difference between getting in or not, or moving closer to the job. Comparing the two Demag cranes with the Tadano ATF models suggests that the narrower width does carry a modest trade off in terms of capacities, especially on the fully telescoped main boom.

Overall height of the stowed crane can also be an issue, although straying above four metres is a real 'no-no' due to road restrictions, so most manufacturers use up every drop of the four metres, with all the models in our survey being close enough to make no odds.

However Peters believes that the Grove cranes have an advantage thanks to their Megatrak independent suspension system. All of the cranes mentioned have hydro-pneumatic suspension which allows the height to be varied and all -- apart from the Grove -- have traditional fixed axles which limits the lowest height the suspension can drop to. The Megatrak system however uses the independent De Dion type suspension concept found on most cars. This allows the chassis to be lowered a little further. "Megatrak allows us to design a carrier frame with less height and a flat deck, which is both convenient and operator friendly," says Peters. Whether this is enough to make a difference is debatable.

**Variable footprints and set up – not everyone agrees**

All manufacturers now offer variable outrigger positioning systems with automatic sensing, but there are significant differences in their approaches. Liebherr's VarioBase allows operators to set each outrigger beam at infinitely variable 'arbitrary' positions, with the crane calculating an individual load chart for the actual footprint set by the operator, as well as the actual superstructure position. The Grove MaxBase system and Link-Belt's Pulse 2.0 use stepped outrigger extensions, each of which

has its own load chart: where you are able to set up between steps the capacities will be limited to the narrower set up position. Many, if not all models however limit the outrigger beam extensions to predetermined widths, as the outrigger boxes are only structural reinforced for the predetermined extension points, which saves some weight, but limits set up flexibility.

Demag's IC1 Plus, which is likely to be available soon on Tadano models, originally used a similar stepped approach, but the company started rolling out its new FlexBase system earlier this year, initially on the Demag AC 45 City then on the three axle AC 55-3 and AC 60-3. The system provides an infinitely variable set up function along the lines of Liebherr's VarioBase system. It dovetails nicely with the company's IC-1 Lift Plan software which allows the fully variable outrigger positions to be integrated into the job planning process. Quite when it will be available on larger machines remains to be seen.

Tadano's two new ATF cranes also offer a totally flexible automatic asymmetrical outrigger set up system, which is tied into the AML crane control system. Once the outriggers are set the system calculates a specific load chart, dependant on the length of each individual outrigger beam and superstructure slew position. If the crane slews into a weaker load chart sector, with a load close to its capacity limit, the AML crane control automatically warns the operator, and switches the load chart bringing the crane to a smooth stop if the operator ignores it.

Link-Belt's Andrew Soper, talking about the Pulse 2.0 system used on its 175 AT and other cranes, explains the company's rationale behind the stepped approach: "Each outrigger has three positions, retracted, intermediate and extended. One of the benefits of that is you can always reference

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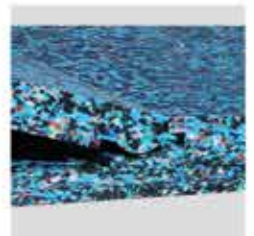
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Link-Belt's new 150 tonne 175 AT American All Terrain



our crane rating manual, as paper charts, and that is one of the regulations in North America, you have to have a book with the chart. Paper charts are also great for lift review and pre-planning leading up to a job."

The system used on the Grove uses more 'discrete' steps with five outrigger widths rather than three.

Defending the approach Peters says: "We still stick to those locked positions. You have five different positions per outrigger you can use. Our system works quite a bit differently to what others have. So, while we do not gain the super high charts over an individual outrigger, we do however have core sectors, including over the front left or right

and you have a very big window of the slewing range: plus or minus 35 degrees over the rear, for example where we have pre-calculated charts, which makes it very easy to do job site planning and to position the crane on the job site. I believe job site planning is simply much easier if you have a set of load charts in hand and can literally check on paper if

your job works or not." Liebherr's Beringer naturally disagrees, saying: "Surely being able to extend outriggers to any length is much better, as you can extend the outriggers to the maximum length that the construction site allows. This gives you more lifting capacity. The argument that you can print load charts using discrete steps is negligible, as even then there are still thousands of combinations. You will anyway need load planning software like our LICCON work planner which can be used on a PC in the office and is also integrated in the crane controls, so the driver can simulate the lift at the site."

**In conclusion**

With such a wide choice - and we did not even look at Chinese built machines - in this important part of the market, you really need to understand what sort of work the crane will be used for, or your customer's needs to get the most out of your investment. The positive aspect is that the sector includes some fantastic and exciting products.



*German crane rental company Scholpp used a Liebherr LTM 1100-4.2 to erect telephone masts in cramped conditions in the Alps. The two front outrigger beams could only be extended to 50 percent. CEO Martin Scholpp said: "The VarioBase not only enhances safety but also makes the cranes much more flexible to use. When you inspect a construction site one day and the crane arrives the next day, things often look completely different. The variable supporting base enables us to react flexibly to changed conditions and work with optimised load capacities where space is at a premium."*

**How do the 'current' 100 tonne All Terrains stack up?**

Manufacturer	Model	Max capacity	Boom length	No. of axles	Overall Dimensions				On board counterweight	
					Carrier length	Travel length	Width	Height	12t axle loads	16.5t axle loads
Demag	AC 100-4	100t	50m	4	10.64m	13.27m	2.55m	3.99m	6.1t	19.3t
Liebherr	LTM 1100-5.2	100t	52m	5	11.6m	13.63m	2.75m	4.0m	11.5t	26t
Demag	AC 100-4L	100t	59.4m	4	10.64m	13.37m	2.55m	3.99m	4.3t	19.3t
Liebherr	LTM 1100-4.2	100t	60m	4	10.73m	13.51m	2.75m	4.0m	2.5t	17.2t
Grove	GMK4100L-1	100t	60m	4	11.09m	13.21m	2.75m	3.99m	5.7t	19.9t
Tadano	ATF-100-4.1	100t	60m	4	11.02m	13.12m	2.75m	3.97m	3.1t	13.2t
Liebherr	LTM 1110-5.1	110t	60m	5	12.26m	13.84m	2.75m	4.0m	13.4t	29t
Tadano	ATF-120-5.1	120t	60m	5	12.68m	13.51m	2.75m	4.0m	11.5t	13.2t
Liebherr	LTM 1120-4.1	120t	60m	4	11.68m	14.87m	2.75m	4.0m	2.1t	20t

Note: All dimensions on 16.00 tyres

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