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The case for hydraulic luffers

Tower crane development over the past few years has been rapid, with most manufacturers adding new models with increased performance to cope with the demands of current construction techniques. However, one type of tower crane - the hydraulic luffer - which was once a bit of an oddity is now appearing in the product ranges of an increasing number of manufacturers. We take a look at the benefits of this type of tower crane and compare what is currently on the market.

There are several reasons for the increased popularity of the luffing jib tower crane. On congested, inner city sites the crane's ability to raise its jib, thus avoiding oversailing adjacent property or safety hazards such as rail lines or power cables is particularly appealing, especially in markets where this is an issue such as the UK, Hong Kong and Australia. Luffers are also particularly useful constructing tall tower blocks when working space for each crane is severely restricted, reducing the risk of collision with its neighbours.

With space restricted sites being the natural habitat of the luffer, there is often insufficient room available



for delivery, set-up and erection/ dismantling. While luffers are ideal for this habitat, the topless hydraulic luffer is even more suitable, especially on the smallest sites, being more compact and quicker and easier to erect. It is therefore no wonder that demand and usage is on the increase.

Luffing cranes have been particularly popular in the UK primarily because of the ancient legal principle that a landowner's rights stretch from the centre of the earth all the way to the stars. Although legislation has given aircraft rights to pass over without causing any trespass, the principal holds good when nearer the ground. So when a contractor slews a tower crane there is a real risk that oversailing neighbouring airspace will amount to trespass, not to mention to the dangers of lifting over an area not controlled by the contractor.

Users appreciate the benefits of using a luffing jib crane particularly on such sites which resulted in manufacturers producing more compact cranes with smaller out of service radii. However, despite the use of hydraulic powered luffing booms - such as the Liebherr HB series launched in the 1950s which had a very fast luff speed - hydraulic luffers went out of fashion in Europe causing the company to halt HB series production.

The reason for their demise? Possibly

leaky hydraulic systems and the potential for the jib to creep down overnight or when the crane was out of service?

A current alternative crane which offers similar benefits is the articulated crane which is also making a comeback - such as the four tonne capacity Artic Raptor 84 and its bigger brother the eight tonne Raptor 184 pioneered by City Lifting in the UK. 20 to 30 years ago similar cranes would have been the Tornborgs Magni S-40 and S-46 which had a maximum radius of 30 metres and a 2.2 tonnes capacity. The advantage of articulated cranes such as the Raptor 84 is the very small out of service radius of just four metres. Even the larger capacity Raptor 184 has an out of service radius of just 4.5 metres.

The pioneer of the modern hydraulic luffer was German company Jost and in late 2005 it introduced its third generation tower cranes - the JTL 108 and JTL 158 hydraulic topless luffer which offered the versatility of a luffing jib and a topless crane in a single unit. The JTL 158 had a capacity of 2.4 tonnes at a 50 metres radius, while its 75 degree maximum jib angle

gave an 8.3 metre overall length from counterweight to jib tip. The products got off to a very good start selling well, satisfying pent up demand for such a crane. In the years that followed Jost developed a comprehensive line of hydraulic luffing cranes from 80 to 300 tonne/ metres and has delivered more than 200 cranes since then.

tower cranes

Hydraulic advantages

Advantages of the topless design is that it is easier to erect with an All Terrain crane, reducing the overall



height of the lift, and the jib section

can be changed to suit the capacity

of the assist crane. Unfortunately,

heavier which limits the hydraulic

class. Most hydraulic luffers can

also be erected in less than a day

- compared to a day and a half or

longer for a traditional rope luffer.

raised concerns following the

collapse of several cranes in the

UK during high winds. The Health

worried to issue a tower crane

& Safety Executive was sufficiently

alert to operators, reminding them

that any luffing jib tower crane left

unattended in the out of service

mode with the jib at a safe out of

service radius. Owners were asked

to double check safe out of service

radii, the function of the slew brake

of the slew drive motors, gearboxes

and slew ring so that the crane was

not prevented from slewing freely

to properly weathervane. The use

release mechanism, the condition

condition must be in free slew

In 2014, the hydraulic luffer design

luffer to around the 350 tonne/metre

the design means that the jib

sections have to be bigger and

of a sail device was also added to some models to help weather vaning when the jib is left in its smallest out of service position. Jost issued a reinforcing kit for its cranes to improve resistance to high winds.

New launches

Over the past year or so Potain has entered the sector with its first topless hydraulic luffer - the MCH 125 - and Raimondi is in the final stages of launching its first hydraulic

This means there is now - or will soon be - a choice of hydraulic luffing tower cranes from seven manufacturers - Wolffkran, Jost, Jaso, MTI Lux, Saez, Potain and Raimondi. Wolffkran is believed to have a new hydraulic luffer on the drawing board - the 133B which is a smaller version of its 166B - but is deciding whether this is the right size for the market. Perhaps surprisingly Liebherr, Terex and Comansa do not have any products in this sector - probably because of the limited geographic demand and relatively small global market at the present time, although this is changing.

Potain MCH 125

At the beginning of this year Potain launched its first topless hydraulic luffer - the MCH 125 - first seen as a prototype at Bauma China in November 2016. Since then pre-production units have been on test on Potain distributor job sites in Thailand, Australia and New Zealand. The crane has a maximum capacity of eight tonnes, five jib lengths from 30 to 50 metres and

A Jost JTL 68.4s being erected by a Jost JTL 108





a jib tip capacity of two tonnes. Maximum hoist line speed is 100 metres a minute when fitted with the 60 LVF 20 hoist. The crane has been designed for fast erection and dismantling. Potain claims a 40 metre free-standing height crane can be erected in less than six hours and the entire upper works of the crane including its full 50 metre jib can be transported on four trucks.

The MCH 125 can be mounted on existing 1.6 or two metre Potain towers with jib sections from the MCR luffing jib cranes and can raise its jib from horizontal to 87 degrees in around two minutes. We mentioned the speed of the old Liebherr HB series - the four tonne capacity HB 50 took just 50 seconds to fully raise its jib! And some modern rope luffers are almost as fast.

The Potain is unusual in that it features a short, fixed counter jib rather than the usual dynamic counter jib on this type of crane. The crane also features Potain's Vision 140 cab, claimed to be one of the largest on the market. Deliveries will begin shortly, with the crane initially being available initially in Asia, Africa, the Middle East, Russia and South America, but surprisingly not in Europe.

Raimondi LRH174

Over the next month or so Raimondi will launch its first hydraulic luffer - the 10 tonne/50 metre LRH174 - which has a maximum jib tip capacity of 2.4 tonnes at 50 metres. Raimondi says its 10 metre out of service radius is a major feature of this crane compared to a traditional luffer with a minimum double that radius.

The crane boasts easier installation - similar to a flattop crane - due to the lack of A-frame and tie rods. The jib is assembled at ground level for a single lift. Preparation of the jib, hoisting winch and rope reeving are all completed at ground level reducing work at height requirements. Raising the jib to 85 degrees takes only 108 seconds and the crane houses the new generation Raimondi safety control system.

Jost JTL 68.4s

Jost's latest topless hydraulic luffer - JTL 68.4s - has an out of service radius of just four metres - small enough to rival the articulated Artic Raptor 84 - with the first unit recently delivered to UK tower crane company Bennetts. The JTL 68.4s features a short, four metre counter jib, rather than the 6.9 metre jib on the standard 68.4. The crane and jib have significant structural reinforcement to cope with the high stresses imposed by the smaller sail area for weather vaning/free slew when out of service in strong winds. Maximum radius is 35 metres at which it can handle two tonnes.

The crane has been designed specifically for the smallest job sites and urban areas where contractors face serious issues of over sailing. The new crane's first contract was



How the new Jost compares with the Artic Raptor articulated tower crane

	Jost JTL 68.4s	Arctic Raptor 84	
Max jib length	35 metres	30m	
Max capacity @ m	4,000kg @ 17.7m *	4,000kg @ 21m	
Max radius and capacity	2,000kg @ 35 m	2,000kg @ 32m	
Min out of service radius	4 metres	4 metres	
Max free standing height	30 metres	32 metres	
Power supply	400v 50Hz	400-480v 50/60Hz	
Max hoist speed 4 tonnes	31m/min	45m/min	
Tower size	1.13 x 1.13 metres	1.26 x 1.26 metres	

*with 35 metre jib

a student accommodation block for Exeter University on a site in the centre of the city. The site is not only tight but abuts both a busy road and commercial and residential properties, leaving little room for manoeuvre. It was erected using an existing Jost JTL 108 luffing jib tower crane that had been positioned a few weeks previously. Bennetts managing director Edward Seager said: "The new Jost JTL 68.4s is an excellent solution for this site. With such a short counter jib and out of service radius there is no issue with it over-sailing properties, however it can still lift four tonnes. We see this crane being very popular in London, where sites can be small and very challenging."

The Jost is available with three different jib lengths - 25, 30 and 35 metres - providing five metres more than the Arctic Raptor. The 25 metre jib has a maximum capacity of four tonnes at a 20.6 metre radius which is similar to the Raptor 84's maximum at 21 metres. At 25 metres the Jost can lift 3.3 tonnes and with the 30 metre jib it can take four tonnes to 17.7 metres - 2.1

metres less than the Raptor. The Raptor also has an additional two metres free standing height but uses a larger 1.26 metre square tower. All in all, these two very different types of tower crane offer similar overall performance. Overall the Raptor just has the performance edge, but perhaps most importantly, both have the critical out of service radii of four metres.

Jaso

Over the past two years or so Spanish manufacturer Jaso has launched several new models including two hydraulic luffers - the 45 metre/six tonne J118HPA and more recently the larger J168HPA, which can handle six tonnes at 30 metres radius and 2,500kg at its 50 metre jib tip. The Jaso HPA series is unusual in that it has the single hydraulic lift cylinder at the rear of the tower rather than at the more usual front. Jaso claims the design provides a more reliable luffing mechanism, extending the service life of the cylinder, reducing power consumption and giving the crane a compact minimum out of service radius of seven metres. The hoist











is located on top of the jib which it says is safer in operation and allows the crane to be transported by six trucks.

Jaso has also launched its cloud based Smartlink system which allows full remote monitoring and reporting of the crane's performance, including an alarm system that warns of overloads and excessive wind speeds etc.

Wolff 166B

Wolffkran launched its first hydraulic luffer - the 166B - in 2012 and to date it remains its only hydraulic tower crane in the company's range. We understand that the company is looking to add a smaller model - possibly the 133B? - but is still researching potential market demand.

Hydraulic luffing cranes

Manufacturer	Model	Max jib length	Max Capacity
Jaso	J118HPA	45	6 tonnes
Jaso	J168HPA	50	6 tonnes
Jost	JTL 68.4	45m	4 tonnes
Jost	JTL 68.4s	35m	4 tonnes
Jost	JTL 78.4	40m	
	JTL 78.6	40m	4 tonnes
Jost		-	6 tonnes
Jost	JTL 98.4	45m	4 tonnes
Jost	JTL 98.6	45m	6 tonnes
Jost	JTL 108.6	45m	6 tonnes
Jost	JTL 118.6	45m	6 tonnes
Jost	JTL 118.8	45m	8 tonnes
Jost	JTL 158.6	50m	8 tonnes
Jost	JTL 168.8	50m	8 tonnes
Jost	JTL 168.10	50m	10 tonnes
Jost	JTL 208.12	55m	12 tonnes
Jost	JTL 218.10	50m	10 tonnes
Jost	JTL 218.12	50m	12 tonnes
Jost	JTL 268.12	55m	12 tonnes
Jost	JTL 268.16	55m	16 tonnes
Jost	JTL 318.12	55m	12 tonnes
Jost	JTL 318.16	55m	16 tonnes
MTI Lux	MTL100-6	45m	6 tonnes
MTI Lux	MTL120-6	45m	6 tonnes
MTI Lux	MTL170-8	50m	8 tonnes
MTI Lux	MTL220-10	55m	10 tonnes
Potain	MCH 125	50m	8 tonnes
Raimondi	LRH174	50m	10 tonnes
Saez	SLH 80	45m	5 tonnes
Saez	SLH 100-6	45m	6 tonnes
Saez	SLH 190-8	50m	8 tonnes
Wolff	166B	55m	12 tonnes







The 166 tonne metre Wolff 166B slots between the company's traditional 100B and the 224B rope luffers and utilises a single hydraulic luffing cylinder along the same lines as Jost. Maximum capacity is 12 tonnes when dual reeved - six tonnes on a single line, while jib lengths of up to 55 metres are possible in five metre increments with a maximum jib tip capacity of 1.8 tonnes increasing to 2.8 tonnes at 50 metres.

The standard 60kW jib mounted hoist can handle up to 500 metres of rope, which can be reeved on the ground before the crane is erected. Minimum radius on full jib is around three metres at which point the counterweight tail swing is reduced to about two metres giving a total clearance radius of five metres. If the main top section is separated the heaviest single component is 7.4 tonnes. If left assembled the tower top, jib connection frame and luffing cylinder weighs 13,120kg. The standard concrete counterweight can be replaced with the more compact steel

alternative as an option.

Summary

The hydraulic luffing jib tower crane was pioneered by the German company Jost which found an immediate market in the UK where congested city centre sites are plentiful and oversailing a major issue. Since then other manufacturers have entered the market including Potain and over the next few months Raimondi. With so much focus on this niche sector higher sales and geographic spread are surely likely, encouraging Liebherr, Terex and Comansa to join the party, which would give this market an even more significant boost which could spread the concept beyond the classic luffing jib markets.





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Wolff

166B





Cranab A



Slagkraft^a

Slagkraft



Doing it the right way'

Since 2015 Falcon Tower Crane Services has been the largest independent tower crane rental company in the UK. Rapid expansion particularly over the past five years has seen its tower crane fleet grow from less than 200 units to more than 400 today. Mark Darwin, visited its sprawling head office facilities at the old American airbase at Shipdham near Thetford in Norfolk and spoke with commercial director Andrew Brown and national sales director lan Gray.

Gray has been with Falcon for 20 years and has seen the changes which have taken place throughout that time. "The old company carried out its work well but has adapted considerably to keep up with innovations and changes in the industry. With the huge investment made in the depot facilities we are keen to encourage all our clients to visit to see the scope of the operations being carried out," he said.

Falcon has completely transformed itself over the past ten years, reinvesting profits into equipment, workshops, training and people. It went through a Management Buy Out in May 2006, involving six directors and managers. However, a year ago, the various companies

Falcon has invested heavily

in its own transport fleet

and divisions were consolidated into one trading company and one holding company. Falcon Tower Crane Services Limited - which deals with all the equipment rentals - includes Brown and Gray, as well as managing director, Barbara Brown, operations director, Philip Gale and sales director Steve Paxman. The holding company -**Tower Crane Asset Management** sales. Company revenues in 2017 were around £60 million and these are projected to increase to £70 to £75 million this year.

"We ordered our 400th crane at the beginning of this year with our expansion achieved by retaining existing customers and winning new ones - a combination not only

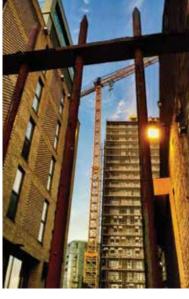
Holdings Limited - deals with crane











of price, but also the quality of the product and customer service," says Brown. By reinvesting in the fleet, the average crane age is down to six years and eight months which we think is good, considering the fleet size - now 410. The cycle now is to reinvest in cranes, people and facilities both here and our depots in Birch, Manchester and Lesmahagow in Scotland."

Falcon is also UK distributor for Spanish tower crane manufacturer Jaso and has developed a power division with more than 150 large generators. In addition to this the company has added state of the art shot blast and spray facilities in both depots and a training academy. Founded in the 1970s, Falcon began

life as a self-erecting tower crane rental company and evolved into a national tower crane supplier. It then progressed selling and renting tower cranes internationally. During the 1980's the focus moved towards conventional saddle and luffing jib cranes with the fleet steadily increasing to more than 200 tower cranes. For a short period the self-erectors were phased out owing to market conditions and also the company rented goods and passenger hoists.

25 years ago, the strategy was to update and standardise the fleet with Jaso cranes, by selling older units for export. During the financial crisis of 2008, UK rental activity plummeted and the company shifted its focus to international crane sales.



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In doing so, key members of staff were retained and the training of apprentices continued, positioning the company in a strong position when the economy recovered.

The company has continued to expand and currently employs 460 staff. This includes a new dedicated self-erecting tower crane division with 75 cranes. The company is probably close to its maximum fleet size, limited by the availability of staff to install and maintain them correctly and available workshop space in which to overhaul and repair them.

"Initially, an early concern was how to sell second-hand Jaso cranes which were unknown in the UK. However, with the growing popularity of the Jaso brand internationally, this problem has disappeared. Following the recession, Jaso sold the majority of its rental fleet, so if its agents or customers around the world look for used cranes, we try to sell our older units to Jaso and replace them with factory built, new units," said Gray "We have just sold three J360 cranes to Australia after they finished a contract in London and we have replaced them with new larger J560s which are now on a contract in Birmingham."

Falcon has also just recruited Mel Edwards who was with the CITB for more than 29 years involved with the CPCS card scheme, most recently as technical developer for plant. She starts her duties with the company next month to head and expand its training department.

"Mel was responsible for facilitating the changes to the CPCS standards for tower cranes so for her to join Falcon is fantastic for us," said

Brown. "The industry has a shortage makes it hard to recruit. To counter this we run erector courses in our dedicated training yard - taking on cranes in the yard's controlled environment, before being allowed people, on our own equipment, it helps to provide the company with staff. It is our intention to expand this activity to offer our services to said Brown.

"At Vertikal Days this year, we will show all the areas in which we are involved, including our generator division which, having begun with a single unit for a customer in London, has expanded rapidly. The division only runs Stage 3A compliant sets and is currently ordering forward to achieve Stage 5 compliance as and when it is needed. We have engineers strategically placed over the UK and can now look at hiring generators outside of the tower crane business."

All the lifting ancillary equipment, generators, lighting and anticollision systems are based at the Birch, Manchester depot, which has recently installed a large paint and shot blasting facility, matching the one at Shipdham.

"We decided to invest in the main facility at Shipdham for our crane inspections," says Brown. "It has to be one of the best in the country with two spray and one shot blasting booth, housed in one of the old World War II hangers on site. We have invested a lot of money

of experienced crane people, which eight trainees at a time who learn by constantly erecting and dismantling onto site. Yes, it is a struggle to get good people but by training our own a good source of trained competent external companies, in due course,"



"The paint operation is at full capacity at the moment and could expand the facilities further by taking on more outside work. We have painted tractors and telehandlers, but the hanger is big enough for a mobile crane. When we sell a used tower crane we always respray and service it first."

clients smart cranes in keeping with

their own image".

Current market

"Rental rates over the past few years have increased but we always maintain the price of the crane over the contract, even if it over runs. With long-term customers we felt we couldn't just increase the prices. We have increased them, but not to the extent of other companies," says Gray. "The market is strong at the moment, particularly for luffers, although this can fluctuate for no apparent reason. Last year we had big demand for the Jaso J160s - a mid-range saddle jib crane - and purchased 20 of them. However, now the J168 hydraulic luffer is very popular and we have 35 in the fleet. Surprisingly, Jaso has even had demand for its hydraulic luffers in North America."

"Years ago, we collaborated with Jaso in the production of a small luffer for the UK market, capable of fitting inside a lift shaft. They built two J80s which we purchased to start replacing older Liebherr models. They relied on us to make the model a success and we now have over 50 of them. From that model, the J138 was evolved and now that in turn has been replaced with the J168 hydraulic luffer.





Our most popular luffer is the 60 metre/18 tonne J208. We now standardise on the J118, J168 and J208."

"The advantage of the hydraulic luffer is its low power requirement and narrow parking radius," says Gray. "But we have worked with Jaso to develop a park radius device for the rope luffers that sits against the A frame, to reduce the out of service radius. With wind sails in the jib to weather vane, even the large J380s can be reduced to a 10 metre parked radius - as long as the tower is large enough to take the additional forces. We have also won contracts in London due to the greater free-standing heights of the Jaso cranes. We have a J138 erected in Wembley, with a 96 metre free standing height with 3.6 metre sections at the base."

But why have a young, modern fleet when rental rates are the



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same for both new and old? "The advantage of the new Jaso cranes is the telematics/black box system which will allow us to diagnose faults remotely. They are highly efficient - the black box reports the faults and soon there will be twoway communication passing on lift information/performance with the ability to repair remotely. The design and performance of the cranes are similar but new cranes have the advantages of the new technology."

The Falcon fleet is primarily Jaso but it also includes Potains and Liebherr 32TTs in the self erecting division. "In 2015 we won a competitive tender to take over the running of McCarthy & Stone's in-house fleet of 29 tower cranes," says Brown. "They had decided to follow a business model which did not include owning and running their own plant and we were delighted to be able to offer our services in supplying them with whatever craneage their sites might require. We now look after their requirements nationwide supplying them with around 80 cranes a year most of them higher capacity cranes than they had in their own fleet

as their site needs have evolved and changed. This in itself is a good-sized business, scattered all over the coastal towns of the UK, which has actually helped improve our back-up service ability. A few weeks ago we put two J160s on the Isle of Skye. We also have a few cranes in mainland Europe - two in the Netherlands with a third going in soon, a J300 going into Germany and a few in Belgium, all through Jaso agents."

Direct operators

"Since the inception of the company, all of our operators are directly employed. All have been trained on our cranes and we have all their training and medical records. Of the total of 460 staff, about 300 are operators. It is harder to get operators for the self-erectors, particularly during the winter - no one wants to stand outside with a remote control all day! Around half of the machines are rented with operators in other cases, our customers supply their own staff. We do occasionally rent out larger towers without an operator, but the client's drivers are carefully vetted and inducted so as

to ensure safe working."

Future

"We have a lot of investment plans, not only for cranes, but also the infrastructure of the company. We have built a new workshop with overhead cranes in Shipdham and are expanding the Manchester depot with another yard, making it more like the head office facility. It is out intention to concentrate on supplying our clients with the cranes they need to successfully and efficiently carry out their contracts. We also aim to continue with our training policy to try to encourage young people to enter our industry."





