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• Superior lifting capacities, on-line load chart calculation
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THE 3 IN 1 SOLUTION
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Material Handling

06  **Cranes**: New Tools & Features for Operator Efficiency

29  **COMANSA** introduces New Generation Flat-top Tower Cranes

30  **Liebherr** delivers 10\textsuperscript{t} 1000 EC-H 40 High-Top tower crane at Grand Paris Express project

32  **AMCS Technologies** introduces IoT Lifting Web and Mobile Application Solutions

33  **GENIE** Z\textsuperscript{45} XC\textsuperscript{TM} Boom Lift goes 3,280 ft underground

34  **Haulotte** big booms ideal for maintenance of XXL works of art

Logistics

12  Performing a Ro-Ro Operation  

18  **Hofmann** Kran-Vermietung is using »BLADES« to handle the latest generation of wind turbine blades

20  Anipsotiki S.A. places trust in **Goldhofer**’s FTV Blade Lifter to transport wind turbine blades

22  **Faymonville** introduces new WingMAX for XXL Rotor Blades

24  **SPMTs from SCHEUERLE** help Riga Mainz carry out efficient bridge replacement

Warehousing

26  **BIAL** opens India’s first On-Airport Public Bonded Warehouse

28  **Strata** raises 140 crore for Warehouse investment opportunity amid lockdown

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Cranes: New Tools & Features for Operator Efficiency

With project design and construction becoming more complex, crane manufacturers are incorporating advanced tools and features in their cranes to derive higher operational efficiencies. P.P Basistha reports.
Any failure in cranes operating in an industrial or general infrastructure project due to a defect in the components or faulty operation, can be catastrophic and of an unprecedented magnitude. Construction of industrial projects like refineries, steel plants, etc., involve highly complex processes, especially with industries becoming more modern and high performing entities. In view of their enhanced construction requirements, crane manufacturers are incorporating more superior features in their new-gen cranes to ensure better operational efficiency and safety.

Subhajit Chandra, Divisional Head, Liebherr Cranes India, says, “A unique feature in our mobile all-terrain crane is Variobase, which is activated by our patented Liccon software. Variobase enables the crane to infinitely calculate the load configurations despite the outriggers placed arbitrarily, allowing launch of the bridge girder or precast sections on constricted sites. Our newly advanced Variobase+ can, even more accurately, calculate the load as per the placement of the rear outriggers in the crane in a trapezoidal manner, giving a more stable placement of the crane within the constricted area. Liebherr has pioneered another new feature is the single engine in our All terrain cranes, which will act as the main prime mover and also for boom functioning, leading to reduced cost of operation due to less fuel consumption, and reduced maintenance costs.”

Adds Ghananeel Molankar, (Divisional Head - Construction Machinery), Liebherr India, “For easier planning, higher accuracy and increased safety during lifting the new Crane Planner 2.0® from Liebherr is truly remarkable. Currently the normal lifting crawler cranes and duty cycle crawler cranes are incorporated in the Crane Planner 2.0®. Features include an interactive 3D model visualization, easy machine configuration, display of machine information (boom configuration, radius, load lifted, maximum load that can be lifted, utilization etc.) and ground pressure visualization make the Crane Planner 2.0® an exceptional planning tool. All relevant data is incorporated in the planning tool and most importantly you can witness real time calculations for any given lifting operation. This includes the ground pressure visualization also which means that the ground pressure is calculated for every configuration with given load. In fact, the Crane Planner 2.0® is an ideal tool for planning engineers; it helps them to create a virtual job site scenario and plan the lift with the exact boom configuration required for the lift. Thus, it enhances the safety and efficiency of the lift on job sites by providing real time calculations, including ground pressure. So, we are confident that it will greatly contribute towards operational efficiencies.”

He informs that keeping safety of personnel being lifted at heights in mind, the crawler cranes have a personnel lifting mode, based on which, the crane operator will be able to automatically, adjust the load charts. Another feature is the wind load charts which enables the operator
to adjust the load charts according to the wind speed by just a click on the monitor in the cab. The operator doesn’t have to anymore calculate manually to reduce the load charts based on the permissible wind speed limits as mentioned in the manual. This completely eradicates the human intervention, which was time consuming and also could be erroneous in some cases.

For enhanced safety during assembly and lifting, the boom up and down aid is another advancement in Liebherr’s crawler cranes manufactured in Austria. “This prevents the cranes from toppling, while lifting as it automatically calculates the tipping line and brings the boom back in safe zone.” informs Molankar.

Demag informs that the company is bringing more flexibility to its smaller all-terrain range with the Flex Base stepless outrigger system (which was first developed for the AC 45 City), on its AC 55-3 and AC 60-3 cranes. By using Flex Base with the company’s IC-1 Plus control system, crane owners will be able to take on jobs that would otherwise be unreachable. In order to make this stepless variable extension system possible, Demag has made modifications in the outriggers’ steel structure and in the IC-1 Plus control system software. A seamless integration has been made in the Flex Base function of the crane’s IC-1 Plus crane control system. Further, the online IC-1 Lift Plan planning tool for PCs and mobile devices supports users in preparing for lifts in advance. “This tool makes it possible to determine the exact position and configuration of the crane at the work site, under consideration of the load being lifted, so that every crane job can be as fast and cost-effective as possible,” he says.

Sanjay Saxena- Sr. VP & Head- HE at Sany Heavy Industry India, says, “We have made composite advancements in our cranes to bring in greater operational efficiencies. We have made design improvements based on customer feedback on changing applications and site requirements. Our aim is to ensure safety as per Indian and International safety standards, and to enable lower cost of operation. Our cranes feature standard load moment indicators with cut off features; and our new, advanced ‘E-Vision’ telematics, when connected through GPS, gives real time information on the crane’s operating functions such as number of lifts, fuel consumption, etc.”

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“To ensure safe operations of our truck cranes, crawlers, tower cranes & New-generation cranes during lifting etc, there is a safe load indicator device with features like hydraulic cut-off and a password enabled safety is provided in our machines,” informs Manoj Agarwal, Chief General Manager, Marketing and Product Support, Action Construction Equipment (ACE). “A rear-view camera gives the operator a view of the entire equipment from the cabin, especially during slewing, and there are safety guards on the wheels. We are in the process of incorporating Telematics / GPRS to monitor machine performance, get updates and record usage of the cranes, based on which we can upgrade our machines, undertake preventive maintenance etc, and reduce their downtime.”

He adds, “We have operator assistance devices like console displays which are integrated with the machines’ hydraulics, engine, boom etc, for providing information to the operators for safe and reliable operation. Our R&D department is working to ensure higher integration and optimization of the cranes and is taking inputs from vendors for design of the chassis and boom fabrication. Above all, we are creating a pool of skilled operators through our advanced training programs so that our cranes are used optimally to give high productivity.”

According to V.G. Shanthi Kumar, Managing Director, Schwing Stetter India, “The XCMG mobile all-terrain cranes feature crane booms, enabling them to lift heavier loads at longer radius. The cranes score high on both safety and ease of operation due to the cranes’ axle load inspection technology. The axle load and center of gravity position is calculated dynamically with the driving mode in real time and automatically matched to the maximum gear and axle, resulting in two-
way protection for safe travel. In heavy load site transfer, an alarm is given to monitor the travel condition in real time and to remind the driver of controlling the speed in case the crane tilts when the axle load reaches the maximum limit. This helps to maintain the safety of the cranes. Further, the multimode driving technology in the cranes helps to strengthen the adaptability of the machine in different working conditions. This includes, urban road travel, cross country travel, highway travel and heavy-load site transfer. The third and the fourth axles can be changed with strong power and oil consumption."

Additional operator assistance devices in the cranes include heavy loads pressure braking system, and general braking and managing platform technology. Backed by this, the braking distance is reduced, thus increasing equipment longevity. When traveling on roads, the emergency braking distance is reduced to effectively avoid accidents. Traveling on long and minus grade, the abrasion of the braking system is reduced, thereby increasing the life of the equipment. Some of these features are available in XCMG XCA 220 all-terrain cranes.

"Since the initial capital cost of the new generation cranes is higher, we must bring higher safety and other advanced features that enable lower lifecycle costs and higher availability for our customers. For instance, our Grove All-terrain cranes have a Twin-Lock full hydraulic system with electronic controls; and a single telescopic cylinder that uses two horizontally mounted pins to move a boom section into the required position. The use of two pins increases security and their position in the side of the boom means that they can operate in the neutral zone. A single telescope cylinder reduces weight used elsewhere to strengthen the crane and increase its lifting capacity. Grove’s 20° hydraulic tilting superstructure cab gives the operator an improved and more comfortable view of the lift. Increased comfort means that lifts are completed faster and more accurately."

Anil Bhatia, VP Sales & Marketing-TIL Limited informs that the company makes continuous improvements and value adds in the design of its mobile cranes to enhance their safety, ease of operation, and fuel consumption. The cranes are equipped with intelligent IoT-based systems that give information on fuel consumption and predictive/preventive maintenance for higher uptime and performance of the cranes.
Ro-ro is short for “roll-on, roll-off” which covers both operations from shore to barge as well as from barge to shore. There is a significant difference between the roll-on and the roll-off operation. So, to further clarify the type of ro-ro operation we talk about load-out (move from shore to barge) or load-in (move from barge to shore).

When preparing for a ro-ro operation it is important to know your environment (tides, depths, type of quay/jetty) as this has an impact on equipment selection (number of ballast pumps, size of the barge) and type of ro-ro operation (with ramp, with steel plate, grounded barge, floating barge).

We differentiate between 5 basic types of ro-ro operations;
1. roll-on (roll-off) to free floating barge (tidal)
2. roll-on (roll-off) to free floating barge (non tidal)
3. roll-on (roll-off) via steel plates (non tidal)
4. roll-on (roll-off) to barge fixed aground
5. beach landing, barge fixed aground

In nautical and marine operations, reference is often made to documents that have been drafted by classification societies. Complying with the contents of such documents, to a great extent, warrants a safe project performance or at least preparation, in order to satisfy insurances and/or insurance appointed surveyors. Reference is made to one such document here, the DNV document “Guidelines for Load-outs” with document number 0013/ND of which the latest revision was issued in December 2015. In section 5 (table 5-1) DNV recognizes 5 types of load-outs, see figure 1.

Note: On 12 September 2013, DNV (Det Norske Veritas) and GL (Germanischer Lloyd) merged into DNV GL, forming the largest classification society with headquarters in Oslo, Norway.

It is important to point out the difference between the two summations of these 5 ro-ro types as they may seem identical at first glance but there is a distinct difference which could cause confusion. The DNV classes of load-out (figure 1) are based on tidal limitations with reference to pumping capacity or pumping requirement whereas the basic 5 ro-ro operations have expanded that and includes the operational environment.

The two main differences being that DNV does not differentiate between using ro-ro ramps or using a steel plate as the transition between shore and barge, because from a pumping requirement it makes no difference. It makes however an operational difference in the allowable vertical barge movement, which is much less when using steel plates.

<table>
<thead>
<tr>
<th>Class</th>
<th>Tidal Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The tidal range is such that regardless of the pumping capacity provided, it is not possible to maintain the barge level with the quay throughout the full tidal cycle, and the load-out must be completed within a defined tidal window, generally on a rising tide.</td>
</tr>
<tr>
<td>2</td>
<td>The tidal range is such that whilst significant pumping capacity is required, it is possible to maintain the barge level with the quay during the full spring tidal cycle, and for at least 24 hours thereafter.</td>
</tr>
<tr>
<td>3</td>
<td>Tidal range is negligible or zero, and there are no tidal constraints on load-out. Pumping is required only to compensate for weight changes as the load-out proceeds.</td>
</tr>
<tr>
<td>4</td>
<td>Grounded load-out, with tidal range requiring pumping to maintain ground reaction and/or barge loading within acceptable limits.</td>
</tr>
<tr>
<td>5</td>
<td>Grounded load-out requiring no pumping to maintain ground reaction and/or barge loading within acceptable limits.</td>
</tr>
</tbody>
</table>

Figure 1:
Simplifying O.D.C. Transportation
Hydraulic Axle Modular Trailers, Special Purpose Trailers, Mechanical Trailers

At VMT, we simplify your heavy-duty transportation and logistics needs and offers numerous solutions for over dimension cargo. For over six decades, we are serving the industry with our mechanical and hydraulic axle modular trailers. Our trailers are known for reliability, economy, and safety.

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DNV also does not differentiate between a grounded barge at a jetty and a beach landing where a jetty is absent and has to be constructed.

Note: Even though the list in figure 1 is titled “load-out classes” and the DNV 0013/ND document is called “guidelines for load-outs”, leaving the impression that only load-outs are covered (excluding load-ins), section 1.2 states that load-ins are also covered by this document.

Load-out onto free floating barge with tidal conditions

For every load-out (and load-in for that matter) the barge is pre-ballasted so that the barge deck is horizontally lined up with the quay. Figure 4. Load-outs performed in an area with tidal conditions often make use of buoyancy. While the load or cargo is inching forward onto the barge an increasingly higher load is transferred from shore to barge. The consequence of this is that the draft (the submerged part of the barge) increases and the freeboard (the part of the barge above the waterline) decreases. How much the draft increases can be determined from the hydrostatic particulars as shown in figure 2. The first column shows the average draft (in decimal feet) and the second column shows at which displacement (barge weight plus all cargo, fuel, equipment, crew etc) this occurs.

Ideally, when performing a load-out and the draft of the barge increases, the upcoming or rising tide will bring the barge deck back to the desired level, in line with the quay. This delicate balance has to be monitored throughout the entire load-out. If the cargo is rolled onto the barge too fast and the tide cannot catch up, the barge deck will end up below the quay. Likewise, if the cargo is rolled onto the barge too slow, the barge deck will end up above the quay, as the rising tide will not stop and wait.

From these, we can draw the conclusion that a load-out is preferably performed on a rising tide. As we know that the time between two high tides (or two low tides) is 12 hours and 26 minutes (provided there is no disturbance by land masses and/or restricted water flows etc.) we can state that the load-out should be completed well within 6 hours starting from low tide as after 6 hours the rising tide will turn in a falling tide and will work against you. Figure 3.

Does this mean that the load-out can be performed without any ballasting if the rising tide provides sufficient buoyancy? The answer to this question is a resounding “No”. Let us assume that the load-out is performed on the bow of the barge. As the load is transferred from shore to barge, the bow of the barge submerges further into the water. At the same time the stern raises (draft at the stern reduces) and the barge will end up with a certain amount of trim. Trim being defined as a difference in draft between bow and stern. The length of the transporter determines the allowable trim, you cannot run out of stroke. DNV 0013/ND document section 14.2.5 recommends not to plan beyond 70% of the transporter stroke. Generally during a load-out the barge is maintained at near zero trim.

Knowing that the barge moves (pivots) about the Center of Flotation (COF), for the sake of convenience, we assume that the barge in question is perfectly symmetrical at the bow and the stern, and
that the COF is located exactly at the longitudinal centerline of the barge. This means that if the draft at the bow increases by 30 cm (1 ft), the draft at the stern decreases by 30 cm (1 ft).

Note: The actual Center of Flotation can be found in the hydrostatic particulars and differs with the draft as the barge in reality is not symmetrical. Column 5 in figure 2.

Every ton of weight transferred to the barge at the bow needs to be compensated with water pumped into the ballast tanks at the stern in order to keep the barge at near zero trim Figure 5. From the total weight of the barge (incl. ballast and cargo), the average draft can be read from the hydrostatic tables (column 1) in figure 2.

The trim of the barge can be calculated with the following formula;

\[
\text{trim} = \frac{\text{displacement} \times (\text{COG} - \text{COB})}{\text{MT1}}
\]

Equation 1

where;
- displacement is equal to the total weight of the barge, cargo, crew, equipment etc
- COG and COB are the Center of Gravity and Center of Buoyancy in longitudinal direction
- MT1 is the moment to change trim 1 inch, column 7 in figure 2

Notes: The trim is affected by the term (COG-COB), as the COG get closer to the COB the barge will show less trim. We cannot influence the COB but we can influence the COG (the combined COG) by means of ballasting. If we manage to ballast the barge in such a way that the COG gets close (or even lines up with) the COB, the barge will remain at near zero trim.

MT1 stands for Moment to Change trim by 1 unit (either 1 inch or 1 cm depending on other units in the hydrostatic tables). In figure 2 MT1 is Moment to Change Trim 1 inch.

It is important to check that the unit for the displacement (metric ton, long ton etc) is the same unit as for the MT1 (metric ton * meter / cm, long ton * ft / inch).

With the above information (average draft and trim) we can determine the draft at the bow and stern with the below two formulas;

\[
\text{draft bow} = \text{avg. draft} \times \left(1 - \frac{\text{trim} \times \text{COF}}{\text{L}}\right)
\]

Equation 2

\[
\text{draft stern} = \text{avg. draft} \times \left(1 + \frac{\text{trim} \times (L - \text{COF})}{\text{L}}\right)
\]

Equation 3

As the axles move beyond the COF something changes. These axles now place load on the barge beyond the pivoting, the COF, and contribute to the draft at the stern. As we have been pumping ballast water into the stern tanks, we now need to start pumping water out of the stern tanks as the axles beyond the COF take over this function.

At the same time, there is less and less weight placed on the bow of the barge. We have been relying on the tide to keep the barge in line with the quay but as there is now less weight on the bow, we need to replace this weight with ballast water. In short, when the cargo moves beyond the COF, the stern requires de-ballasting while the bow requires ballasting in order to keep the barge at near zero trim. The principle of moment about the COF applies Figure 6.

Once the cargo is in its final location (often required to be confirmed by a marine warranty surveyor) it is common that both bow and stern tanks contain a certain amount of water. The exact amount of water depends on the required or preferred draft Figure 7. When a barge is being prepared for its voyage it is often trimmed with the bow slightly higher than the stern (some 1 to 2 degrees) as it aids its hydrostatic behavior and reduces fuel consumption of the tugboats.

Load-out onto free floating barge without tidal conditions.

The above case covered the load-out onto a barge in an area where tidal conditions apply. Such a load-out is subject to two constraints;
- load-out is subject to (low) tide and is to be completed within 6 hours
- rising tide provides buoyancy and reduces ballasting requirements

So, what happens in an area where tides are absent, such as on a river or lake, how is a load-out performed under these conditions as there is no tide to provide the needed buoyancy.

Let’s review this step by step. If there is no tide, then the load-out is not subject to any tidal movement. This means that the load-out can therefore be performed at any time of the day (or night). Secondly, if there is no tide, then there is no reason to complete the load-out within 6 hours as there is no falling tide after 6 hours. Those are two positive aspects of performing a load-out in a non-tidal area.

How do we deal with the lack of increased buoyancy from a rising tide? As with a load-out in a tidal area, the first activity is to pre-ballast the barge, so it lines up horizontally with the quay. See
Figure 8. To keep the barge horizontally lined up with the quay we must maintain the draft at the same level as during pre-ballast condition. When the first axles roll onto the bow of the barge the draft at the bow increases. To ensure that the draft remains equal, and does not increase, weight has to be removed from the barge as the axles roll onto it. This can only be achieved by pumping out water from the bow that was pumped into the barge for pre-ballasting. For every ton of weight that rolls onto the barge, a ton of water has to be pumped out to keep the barge horizontally lined up with the quay. See Figure 9.

This is an interesting phenomenon as this means that the barge should hold quite a bit of water in pre-ballasted condition. Indeed, the barge should hold at least an amount of water that is equal to the weight of the cargo that is rolled onto it. Ideally this should be a bit more as ballast tanks cannot be emptied completely, a 5% residual volume is a fair assumption. If there is less water in the ballast tanks than the weight of the cargo that is rolled onto the barge, you will eventually run out of water in the ballast tanks and you will not be able to complete the load-out as the barge draft will increase and horizontal line up of the barge with the quay is disturbed. This can have serious negative effects on the load-out performance.

One note needs to be made here. When in a situation where the barge ballast tanks are empty and the cargo has not yet completely rolled onto the barge, there is a way to recover from this situation. As there is no tide, it is relatively easy to roll the cargo off the barge again while filling the ballast tanks again. There are no time restraints from a tidal point of view.

As far as the hydrostatic behavior of the barge goes, this is quite a bit easier than compared to a load-out with tidal conditions as we are now dealing with only one draft. Consequently, we are dealing with only one fixed Center of Floatation (COF) instead of a varying COF due to varying drafts.

During the execution of a load-out it is next to impossible to keep the draft at a fixed value. A load-out is a dynamic process that is performed in a dynamic environment (waves, other water traffic etc). These constant motions have an effect on the transporters; they reduce the effective usable stroke of each axle. That is why it is important to keep the barge and the quay horizontally lined up at near zero trim. The transition between the barge and the quay can consist of a ramp or a steel plate. Typical ramp height is 30 cm (1 ft) and this thickness result in a reduction of the effective transporter stroke. In case of a steel plate (typical thickness 1.0 to 1.5 inch) obviously has much less impact on the transporter stroke. The drawback of using steel plates is a much smaller degree of allowable barge movement in vertical direction.

It is imperative that a load-out is prepared and engineered to an extend that prevents and avoids unexpected situations, such as running out of ballast water, as mentioned above. In practice however, a load-out is not an exact science. When performing a load-out onto a reasonable size barge, it is not practical to aim for a draft within 1 cm or 0.5 inch. The dynamics of the surrounding environment simple prohibits this. Therefore, in case of using a steel ramp as the transition between the quay and the barge, the ramp is used as an indicator.

As mentioned before, the barge is pre-ballasted so that it is lined up horizontally with the quay. In reality the barge is often ballasted to a few inches above the quay. When the ramps are positioned, they show an air gap between the underside of the ramp and the quay. This air gap is used as an indication of how much the cargo can be rolled onto the barge as the air gap will decrease during this motion. When the air gap has been decreased to virtually nothing it is time to let the ballast operation increase this air gap again while the transport does not move forward. With sufficient experience, the rolling onto the barge and maintaining a certain air gap can be a simultaneous task.

Figure 10 shows that the cargo has passed the Center of Flotation (COF). In this figure, it is shown that the bow still holds sufficient water for de-ballasting if there would be a deviation from the expected situation. At the same time, we can see that the stern
has started with de-ballasting as the cargo has passed the COF, which causes the stern to increase in draft if de-ballasting would not commence.

When the cargo has reached its final location and assuming that the Center of Gravity (COG) is lined up with the longitudinal and transverse centerlines of the barge and assuming that the barge shape on the bow and stern is identical, the amount of ballast water in the stern and bow tanks would be identical as well.

At this point it could be stated that the load-out has been successfully completed. However, the operation has not yet been completed as the transporters still have to be removed from underneath the cargo back onto the quay. This may be seen as a minor detail, but this is not always the case. Let us assume that the cargo has been rolled onto the barge via a 30 cm (1 ft) steel ramp using SPMT’s with a minimum deck height of 1.2 mtr (4 ft) and a maximum deck height of 1.8 mtr (6 ft). The cargo has been set onto sea fastening stillages of 1.65 mtr (5.5 ft). There is 1.65 – 1.2 = 45 cm (1.5 ft) of space left between the transporter deck and the underside of the cargo, the transporter has therefore this 45 cm of vertical maneuvering space or stroke. There is also 30 cm (1 ft) of ramp height that the transporter needs to negotiate, this needs to be deducted from the available transporter stroke. So, there is only 45 cm – 30 cm = 15 cm (6 inch) of stroke available to maneuver the transporter from underneath the cargo back onto the quay. As you can see, even during this part of the operation it is important that the barge is vertically lined up with the quay in order to retrieve the transporter combination. It may even be required to ballast the barge to achieve this. See Figure 11.

About the author: Marco J. van Daal has been in the heavy lift & transport industry since 1993 starting with Mammoet Transport in the Netherlands and later with Fagioli PSC in Italy. His over 20 years of experience extends to over 55 countries and has resulted in a bestselling book “The Art of Heavy Transport” which is available at www.the-works-int.com.
Transporting Wind Turbine Blades

With its »BLADES« hauler and FTV Blade lifter, Goldhofer is solving the challenges of road transporters in transporting large, heavy, and extremely difficult-to-transport wind turbine blades.

Hofmann Kran-Vermietung is using »BLADES« to handle the latest generation of wind turbine blades.

For transporting extra-long wind turbine blades, Hofmann Kran-Vermietung GmbH & Co. KG of Paderborn is now using the new »BLADES« blade hauler in combination with Goldhofer’s self-tracking trailing dolly. The German company, whose portfolio includes work platforms, heavy transport vehicles, and industrial erection, in addition to crane rentals, is one of the first companies to invest in the trailing dolly solution, which was introduced last year. On their latest job, which included the transportation of three 75-meter-long wind turbine blades from Rostock to the Hopsten-Schale wind farm more than 400 km away, their new equipment was again the key to safe and punctual delivery.

In order to transport three wind turbine blades from the German coast of the Baltic Sea to their destination in Hopsten, Westphalia, the Paderborn heavy haulage experts relied entirely on special vehicles from the house of Goldhofer. The over 400-km journey from Rostock was mainly on motorways, and it was possible to make reliable calculations of the expected forces acting on the blades and vehicle components. The fact that the three vehicle combinations, each over 82-meters long, were able to complete the journey in a record time of three days, was mainly due to the use of the new »BLADES« in combination with a trailing dolly from Goldhofer.

The combination of a blade root carrier on the gooseneck and a five-axle trailing dolly with pneumatic suspension plus...
Making quick work of the unloading process (Photo: Goldhofer)

Model of the »BLADES« blade hauler with an SN-L trailing dolly with pneumatic suspension (Photo: Goldhofer)

turntable and blade support is a new industry benchmark. With this system, several roundabouts and tight turns were negotiated without any difficulties. As the turbine blade itself has a structural function within the configuration, the solution offers significantly higher ground clearance than extendable vehicles so that the blade simply passes over various obstacles.

The new vehicles were first presented as a concept for the economical transportation of turbine blades in 2019 and were the subject of discussions with Hofmann following approval by the blade manufacturers. “We were immediately convinced by the advantages. The blade is carried unsupported between the free-turning device behind the tractor and the trailing dolly. This permits higher travel speeds of up to 80 kph and greatly simplifies route planning,” says Sven Wolter, transport planner at the Hofmann company.

Wide range of applications
Goldhofer’s »BLADES« is available in different combinations. With the use of a 5-axle tractor and/or dollies, for example, the system offers scope for a variety of applications. Further combinations have already been sold throughout Europe, and demand is steadily growing. As a practical feature, the trailing axle can be coupled directly to the free-turning device when running empty. This turns »BLADES« into a standard tractor-trailer with variable-load lift axles to reduce tire wear. Thanks to the flexibility of the system, »BLADES« can also be used to transport other extra-long loads, such as precast concrete elements.
Anipsotiki S.A. places trust in Goldhofer’s FTV Blade Lifter to transport wind turbine blades.

When it comes to erecting sustainable wind power plants in the windy regions of Greece, Anipsotiki S.A. (Aspropirgos/GR) is often the company of choice for turbine manufacturers and wind farm operators. In order to transport the extra-long turbine blades quickly and safely to even the most remote locations, the road transport specialists employ various blade lifters in the Goldhofer FTV series. That is clearly a good choice: Anipsotiki has now transported a total of 366 wind turbine blades to their destinations.

Anipsotiki, the leading Greek specialist transportation company, has been operating for over 50 years in business areas including lifting and transporting heavy and oversized loads, alternative lifting systems, and the erection, servicing, and maintenance of turnkey wind power plants. The company’s extensive customer base includes not only the Greek government and state-owned companies but also prominent construction companies, refineries, shipyards, and wind turbine manufacturers.

To ensure that the heavy and bulky machinery and components reach their destinations, which are sometimes remote and difficult to reach, as safely and punctually as possible, Anipsotiki has relied on Goldhofer transporters and special equipment since 2009. In addition to numerous towed and self-propelled heavy-duty modules in the THP and »ADDRIVE« series, Goldhofer has primarily supplied various vehicles for transporting wind turbine components. With a fleet comprising several FTVs, pendular axle flatbeds and »BLADEX«, the wind power pro has erected 119 wind farms to date. The company has transported no fewer than 366 wind turbine blades using Goldhofer FTV 300 and FTV 550 blade lifters.

Flexible mastery of demanding routes

In contrast to other cargo, which is placed on the deck of the transport vehicle, the turbine blade is mounted horizontally to the FTV blade lifter – in exactly the same way as it is ultimately mounted on the rotor hub. With the hydraulic tilt mechanism and 360-degree pivot system, the secured turbine blade can be erected up to an angle of 60 degrees and rotated around its own axis as required. In addition to avoiding the need for tree-felling on winding forest roads, the combined tilt and pivot feature makes for easy and aerodynamically safe progress on even the tightest bends on steep sections of the route without the blades being adversely affected by changes in the wind forces or angle of attack. For negotiating streets in built-up areas, the tilt mechanism is used to raise the blade high enough to pass over roadside obstacles such as roof eaves and trees, while lowering the blade provides safe passage under power lines and other structures with height restrictions for vehicles.
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The new rotor blade generation is part of the continuous development in wind turbines. They must be increasingly powerful and use the available installation spaces more and more efficiently. “For wind turbine blades in XXL format with a length of up to more than 70 m, Faymonville has now developed a vehicle that is not only long, but also strong and very easy to maneuver,” says product manager Rainer Noe, describing the basic principle of the flatbed semi-trailer that is available as a 3 or 4-axle model.

The unique selling point of the new vehicle is the interaction of several technical advantages: enormous gooseneck stroke, longest available loading platform with 4-fold extension, gooseneck length compatible with 5-axle trucks and strong 19.5-inch pendle axles. “Thanks to this profitable combination, this semi-trailer overcomes all challenges,” says Noe, explaining the reason why this innovation is a genuine gain for the wind power industry. Proven pendle axle technology provides for a steering angle of up to 60° and a maximum stroke of 600 mm. “In combination with the hydraulically lifting and lowering gooseneck, the new WingMAX can overcome almost any obstacle that crosses its path, such as roundabouts. As a result, the route is manageable even in the case of demanding terrain conditions and road profiles,” says Noe, amplifying some crucial features when it comes to moving extremely long loads.

The hydraulically operated gooseneck raises itself by up to 1,700 mm, which enables considerable ground clearance. And the flatbed semi-trailer, which is designed for use with 4 and 5-axle trucks, has more clever solutions to offer. Sliding load supports for the blade tip frame enable the semi-trailer to be shortened even under load. They are a true aid to deal with any winding road sections more easily. Hydraulic support legs simplify the extension or retraction of the telescopic loading platform. The double-sided locking of the telescopic stages ensures increased driving stability, while the 2,000 mm track width of the axle bogie provides maximum lateral stability. The reinforced locking positions ensure the optimum transmission of pulling and braking forces.

The handy radio remote control for all hydraulic functions is an additional advantage for the user. The strong design of the semi-trailer using high-tensile steel also protects the fragile freight against the effects of external forces.

“As part of the TeleMAX series, the WingMAX is extremely stable and safe to handle thanks to all these features, even when loaded with the longest wind turbine blades,” says Rainer Noe, describing the thoroughly thought-out character of the innovation.
Riga Mainz was required to realise this very special task for the first bridge during the course of only one weekend, thereby replacing a railway bridge in need of refurbishment with a new, 320-ton concrete structure, and without removing the overhead lines. The bridge is one of eight that run parallel to each other and cross the Mainzer Strasse in Darmstadt. The crane and heavy-load haulier from Mainz had been tasked to gradually replace all of them. There was, however, just one catch: while the first bridge is located close to the road, every other bridge is positioned six metres deeper in the direction of the track bed.

“We could lift the first bridges while parked on the road to their designated positions using a mobile crane. But we couldn’t reach the remaining structures in this way at all. At the very least, the use of a crane with a corresponding reach would be very complex and expensive. That is why we were looking for a more economical solution,” explained Uwe Langer, Managing Director of Riga Mainz.

**SPMTs provide Riga Mainz with a very efficient working method**

The Mainz-based company had one year to develop an economical solution for the complex combination of transport, demolition, and assembly. An important part of this assignment was the SPMT (Self-Propelled Modular Transporter) from SCHEUERLE. A side girder deck between the two electronically connected transport platforms served to accommodate the new concrete bridge. Altogether, 20 SPMT axle lines were required to carry the total load of 570 tonnes. On the side girder deck, Riga Mainz installed a certain process technology that it had developed itself and which, according to the company, is unique in Germany and provides a lifting capacity of 500 tons. Another advantage of the lifting system, for which a patent application has been filed, is the relatively low overall height. As a result, the transport including the cargo could pass safely under the overhead lines. This saved the client a lot of time and considerable cost.

**Multi-directional steering facilitated lateral bridge installation**

The Riga Mainz approach was as well thought-out as the transport modules and lifting technology. “We drive the two SPMT platform vehicles on the road under the old bridge, separate it from the anchorage and with the help of the SPMT modules, Riga Mainz positioned the new concrete bridge into the gap whilst keeping below the overhead lines.

Team performance: For the Darmstadt assignment, 20 SPMT axle lines from SCHEUERLE together with a special lifting system from Riga Mainz were used. The side girder deck between the two transport platforms was rented by Riga Mainz from Kübler.

Photo: Riga Manz
then push it out using the lifting system. Subsequently, we could move the old structure from the track bed onto the SPMT. Following this, we suspended the new bridge in the side girder deck and swung it over one of the other bridges onto the track bed. As soon as it reached the correct height, we carefully manoeuvred it sideways under the overhead lines into the resulting gap with the help of the electronic multi-directional steering and brought it into position there," explained Langer. Riga Mainz repeated this procedure until all of the eight bridges had been replaced.

**Riga Mainz plans purchase of additional SPMT axle lines**

"We couldn’t have completed the assignment without SCHEUERLE’s self-propelled transport modules," reported the CEO. "The SPMT is the best tool available for this! As a result, we will be purchasing additional SPMT axle lines from SCHEUERLE." The company had acquired its first SPMT axle lines back in 2001 and has continuously added to its fleet since then. Riga Mainz mainly uses SPMTs in order to move columns in refineries and the chemical industry.

**Riga Mainz: Lifting & transporting specialist**

Headquartered in Mainz with branches in Frankfurt and Ludwigshafen, Riga Mainz is one of the largest crane companies in the Rhine-Main region and specialises in lifting and transporting large and heavy loads. In addition, it carries out industrial plant erection, machine relocation and clean room assembly. The company also has a lot of experience in the areas of power plant construction, wind energy, tunnel construction and has had numerous assignments in complex industrial installations. Since a project planning department develops a tailor-made, economical and reliably implementable solution for every crane or transport task, so, where appropriate, Riga Mainz also develops its own transport and lifting equipment. This includes a spreader beam system that facilitates enormous flexibility when attaching loads.

**TII Group: Solution provider for complex transport tasks**

The TII Group is a manufacturer of heavy-duty and special vehicles. It is comprised of the Scheuerle, Nicolas, Kamag and Tilger brands, and provides innovative vehicles for logistics yards, public roads and industrial areas. Its heavy-duty vehicles with hydraulic pendulum axles support its customers from transport and logistics, building industry, plant engineering, air and space travel, and shipbuilding to energy, steel and mining – for realising a wide range of complex transport tasks. Transport assignments include construction machinery, wind turbine facilities, ships, antennas as well as entire factory plant. In addition to locations in Germany, France and India, the group has a global sales and service organisation.
As part of its vision to make Kempegowda International Airport, Bengaluru (KIAB/BLR Airport) a successful cargo hub, Bangalore International Airport Limited (BIAL) has opened India’s first on-Airport Public Bonded Warehouse. Operated by the Cargo Service Center (CSC), the 10,000 sq.ft warehouse facility will be under the jurisdiction of the City Commissionerate, Bengaluru Customs. This facility will reduce supply chain costs and facilitate trade at India’s IT hub and surrounding regions. The Public Bonded Warehouse will help re-export of goods, long-term storage of bonded cargo, assist in partial clearances, and allow value-added services such as labeling, packing and repacking services.

“At BIAL, our vision is to make BLR Airport a cargo hub, equipped with state-of-the-art infrastructure and cutting-edge technology to deliver efficient operations. In order to simplify processes and meet customer demands with the help of key stakeholders, including the Bengaluru Customs, BIAL has taken this step to set up India’s first on-campus Public Bonded Warehouse. This demonstrates BIAL’s commitment to support the Airport cargo community, as well as bolster the growth of BLR Airport as a cargo hub,” said Satyaki Raghunath, Chief Strategy & Development Officer, BIAL.

Due to the presence of IT and BT companies, multinational companies and retail brands, Bengaluru handles a large volume of imports. The new facility will play a significant role in boosting the economy of the region, by improving trade and connecting markets around the world. BLR Airport is the busiest and most preferred cargo terminal for manufacturers in South India.

“We are thrilled to partner with BIAL as an operator of the new Public Bonded Warehouse at BLR Airport. CSC is the largest cargo service provider in India, with a presence in Mumbai, Delhi and Ahmedabad. We already have a footprint at BLR Airport as an operator of the Cargo Village at the Airport. BLR Airport has tremendous potential to become the cargo hub for South India, and at CSC, we are excited to be part of this transformation,” said Tushar Jani, Group Chairman, CSC.

BLR Airport processed 99,154 MT of cargo in the first five months between April and August 2020, recording a 92% growth in Cargo Air Traffic Movements. It offers the largest air cargo terminal in South India, with a handling capacity of 570,000 MT and an average travel time of nine hours from major manufacturing clusters across South India. BLR Airport is emerging as the preferred cargo gateway for industries from the region, making it the third busiest Cargo Airport in the Country and the busiest in South India.

To bring further efficiencies into cargo operations, BIAL has announced the implementation of the Air Cargo Community System (ACS) to streamline the air logistics supply chain. This digital platform will enable seamless collaboration between all stakeholders in the supply chain to deliver superior and efficient cargo operations at BLR Airport.
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Strata raises 140 crore for Warehouse investment opportunity amid lockdown

Strata, a tech-enabled fractional investment platform for premium Commercial Real Estate (CRE), has raised Rs. 140 crore for a consortium of three grade-A warehousing asset opportunities amid the Covid-19 pandemic. Strata Avigna Warehousing I & II situated in Hosur, received 100% commitment from investors within just 42 days of its launch, while the pharma warehousing asset in Bengaluru was closed within a record time of just 7 days. The consortium of assets collectively computed for a total of 0.7 million sq. ft. of warehousing space.

The assets are expected to offer investors an average rental yield anywhere between 9.5% and 10% Y-o-Y, which is amongst the highest when compared to other investment opportunities such as – mutual funds, fixed deposits and equity markets. The consortium listed by the company offers investment opportunity assets that an investor can avail via the fractional ownership model.

The latest asset listing of the firm witnessed participation from a diversified set of more than 500 investors across HNIs’, family offices, top management from fortune 500 companies, retail and institutional, among others. Besides, the assets also secured tremendous traction from the NRI community and from investors across tier-II towns.

The assets offered by Strata being pre-leased properties, the investors can start enjoying rentals from the first month of investment itself. Minimum investment for the assets listed begins from ₹25-50 lakh. The investments being in liquid, one can easily sell off one’s stakes when required.

Commenting on the development, Sudarshan Lodha, Founder, Strata, said, “We have successfully raised funds for our investment opportunities even in such challenging times which clearly reflects the pent-up demand and high resilience of the sector and the confidence of our investors in our business model. With global supply chains diversifying away from China to India, greater penetration of e-commerce, faster shift to 3PL, and companies eyeing higher inventory levels, we foresee an approx. 30% growth in warehousing facilities in the coming years.”

“We are extremely bullish on the ‘Commercial Real Estate’ emerging as a non-volatile alternative investment asset class, especially in the post-Covid era. Strata aims to bring such one-of-a-kind investment opportunities in the CRE space for the masses. By fractionalizing Commercial Real Estate (CRE) and offering it on an easy-to-use online platform, Strata aims to democratise CRE, making it accessible for a much larger investor base.” he added.

Abhijit Verma, CEO, Avigna Space Industrial & Logistics Park, said, “We are very excited about our association with Strata. Our consortium brings the best of both the worlds – an unexplored investment opportunity in warehousing backed by a robust technology platform that presents a one-of-a-kind investment opportunity. Avigna is planning on developing multiple industrial and warehousing projects spread over 9 million sqft in the next five years across 7 cities, namely Bangalore, Chennai, Hyderabad, etc. We look forward to strengthening our association with Strata with new projects on the horizon.”

While ‘warehousing’ has been rapidly rising as a potential investment class in CRE, the trend picked up pace during the pandemic lockdown. With supply chain reconfiguration and a drastic behavioral shift resulting in a sudden boom in e-commerce, the Indian warehousing stock is expected to see a 30% Y-o-Y growth. A host of industry factors and favorable regulatory policies such as GST streamlining, corporate tax reduction, Make in India, National Logistics Policy, ease of doing business and boom in e-commerce, among many others, have been driving the demand for warehousing in India.

Offering access to live commercial real estate data and in-depth understanding of the commercial real estate (CRE) scenario through its investor dashboard, Strata simplifies fractional investment model, empowering its investors to make financially sound and well-informed decisions.
New Generation of COMANSA 11LC Series Flat-top Tower Cranes

In addition to improvements in the range, a new simple trolley with manual Reving change and a new CUBE M cab have been incorporated

Following an official online release to European customers in July, Comansa is proud to announce that all the experience gained over the years is readily available across the entire 11LC range and it will be soon expanded to the 16LC. Improvements include enhanced ergonomics due to new and simplified accessing elements not only to the cathead, but also to the jib sections for easy access to the trolley. Furthermore, a new single trolley is now available as an option which features a manual single-double reeving change by the operator directly from the ground.

New drives in the hoisting winch and trolley give new linear movements due to the attached potentiometers, which makes it possible to easily move and precisely position sensitive loads. In addition to this, a new version of the 18kW hoist mechanism has been added to the 6-ton versions, requiring less power supply while maintaining drum capacity and speed features.

Power Lift system comes standard, improving the load diagram by 10% at reduced speeds.

Optional 24kW and 37kW hoist motors feature the Effi-Plus system which increases significantly the hoisting and lowering speeds for light loads without increasing power or consumption. Another significant innovation is the new ‘M’ sized CUBE cab, together with a resized and redesigned platform for easier erection and maintenance. The fully glazed front of the cab allows complete view of the load and the work area, thereby maximizing performance. The improved positioning of the seat and body posture gives excellent comfort to the crane operator.

The Quick Set system, already available in the 21LC series, has been introduced in the 11LC family as an option. This technology is designed to simplify the commissioning of cranes. With Quick Set, the set up and calibration times have been significantly reduced using a system that leads to easier, safer, and more intuitive adjustments, thereby achieving faster and less labour-intensive calibration.

Comansa continues to propose four models: 11LC90, 11LC132, 11LC150 and 11LC160, adding to the product range a new 6-ton version of the 11LC150. All of them, as a Flat-Top design, bring their well-known advantages as easier, faster and safer assembly, longer life for the structure, and smaller distance between overlapping cranes.
Delivery of 10th Liebherr 1000 EC-H 40 High-Top tower crane within two years at the Grand Paris Express

Since May 2018, there have been ten 1000 EC-H 40 High-Top tower cranes with very high lifting capacities on the construction sites of the Grand Paris Express. The 1000 EC-H 40 is the largest Liebherr tower crane model operating in France. “The deployment of these cranes is interesting. Whereas the tower crane market in France generally demands lifting capacities of between 12 and 16 ton, machines with lifting capacities of over 25 ton are needed for the Grand Paris Express project. These large cranes are being used to place pre-cast tunnel lining segments at great speed,” says Christophe Zimmermann, Managing Director of Liebherr Grues à Tour France.

Tower cranes for underground work
The Grand Paris project includes the construction of four new lines (15, 16, 17 and 18) as well as the extension of line 14 to the north and south. As 90 percent of these lines run underground, most of the tunnel is being excavated with tunnel boring machines (TBMs). A total of around 20 TBMs are being used along the route. These machines work at great depths of 15 to 55 metres below the earth’s surface, at a speed of 10 to 15 metres per day.

The TBMs perform several functions, namely drilling, removing excavated material, and laying the reinforced concrete rings, i.e. pre-cast tunnel lining segments, which will form the arched ceiling of the underground railway tunnel. These elements generally weigh between 7 and 8 tons and are assembled to form a ring, which normally consists of 7 parts. The lining segments are delivered on site by truck. They are then unloaded and stored with the help of a 1000 EC-H, which is equipped with a 4-ton segment grab, and then lowered into the tunnel structure in batches of two or three. Once there, the pre-cast concrete elements are set down onto material handling wagons and transported to the tunnel boring machine, which then assembles them. The Micromove fine positioning mode enables this to be done with millimetre precision, despite the heavy weight of the parts. Other assistance systems, such as the electronic anti-collision system and oscillation damping also ensure precise, safe operation.

Reliable performance
The tower cranes are exposed to particularly heavy and repetitive mechanical loads in conditions like this. Eric Klingensteine, Special Projects Manager at Liebherr Grues à Tour, explains, “Tower cranes are the kind of hoist equipment that can meet the very specific requirements of this production logistics. In fact, tower cranes are in continuous operation for several months, and even years, on the construction sites of the Grand Paris. To prevent premature
A total of ten 1000 EC-H 40 cranes have been in operation in France since May 2018.

The 1000 EC-H 40 is the largest Liebherr tower crane model in France.

On the construction sites of the Grand Paris Express, the cranes are primarily used to supply the TBMs with pre-cast tunnel lining segments.

Customer service that rises to any challenge

The tower cranes have been an important part of the production chain from day one. Therefore, any unexpected machine downtime would lead to work slowing down and significant financial consequences. The Liebherr Service offers maximum availability and guarantees quick response times. To be prepared for all eventualities, Liebherr has set up a stock of spare parts located at its own service facility in Fontenay-Tresigny.

Extremely simple assembly

Package units matched to mobile crane performance and Connect & Work quick assembly connectors facilitate assembly. Jean-Baptiste Mengin, who works for Liebherr’s long-standing partner Europe Montage, and who has been responsible for coordinating the assembly of all 1000 EC-H 40 cranes at the Grand Paris sites, confirms this, “Assembly of the 1000 EC-H 40 naturally required much greater logistics resources due to the size of the elements to be assembled. But the assembly itself remains relatively simple as Liebherr has optimised the crane’s design to support this.”

About the Grand Paris Express

With 200 km of additional automated transit lines, the Grand Paris Express is doubling its current network and, as a result, is the largest inner-city project in Europe. From a total of 6 million daily rail passengers, 2 million will eventually use the Grand Paris Metro on a daily basis. In addition, the city will see transformation and increased density along the entire network. The construction of 71 new stations is already being accompanied by numerous urban projects. New neighbourhoods will be created, bringing together a variety of housing, shops, offices, and other facilities.

Several of the 1000 EC-H 40s on the Grand Paris construction sites are in operation 24 hours a day.
AMCS Technologies introduces IoT Lifting Web and Mobile Application Solutions

AMCS Technologies specializes in anti-collision and zoning safety systems for lifting equipment. It has developed its own telematics called IoT Lifting, which is composed of a web platform and a mobile application. These tools provide access to concrete and technical data in real-time on anti-collision systems and the use of the crane, in order to meet a real need of its customers. It collects all the information transmitted by the DCS 61-S anti-collision system relating to each crane on a mobile application as well as a web portal, and generates personalized statistics according to each site and company.

"Monitoring your site’s productivity with precision and remotely; knowing the daily activity of your cranes; managing your fleet, as well as carrying out remote diagnostics, are the objectives of AMCS technologies’ solutions. All our customers will benefit from daily feedback on the productivity of their construction sites and cranes equipped with our DCS 61-S anti-collision systems," says M. Chettibi, CEO, AMCS technologies.

Understanding IoT Lifting Web

By adding a SIM card (with a 3G/4G network) in the DCS 61-S system, it collects information continuously from the various sensors placed on the cranes. It is thus possible to store, send and receive this information on the web portal. With their personal logins, and different levels of access and functions, customers will be able to avail the following:

- Have access to the mapping of all of its sites equipped with DCS 61-S
- Manage their fleet of AMCS technologies products
- Remotely view the SUP 61 supervisors and the DCS 61-S screens placed in the crane operators’ cabins
- Analyze, download and share information
- Generate personalized statistics
- Carry out remote diagnostics

This telematics is not just about accurately monitoring job site productivity and crane activity remotely. It goes much further by allowing customers a real evaluation of productivity according to the concentration of the machines, along with automated management of the fleet of systems.

Since all the systems are mapped, the user has precise information on which sites his systems are installed, the address of any one, on which cranes and their numbers, the software version, serial numbers of the equipment, what elements of the anti-
collision kit are installed, how many cranes are interfering, how many prohibited zones are present, and so on.

The mobile application IoT Lifting composes as well brings this solution. Available on Android and IOS, it allows user to monitor accurately, remotely and in real time the data of cranes and the DCS 61-S information on wind speed, if the crane is in weathervane, the slewing angle, etc. Notifications are also sent to the user. With the advanced access rights, it is possible to neutralize the anti-collision and the prohibited zone functions within a limited radius around the site after an acknowledgment by the operator of the machine concerned.

AMCS technologies offers this new tool internationally as the SIM card of each DCS 61-S system operates in more than 170 countries.

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**GENIE® Z®-45 XC™ Boom Lift goes 3,280 ft underground**

A s part of the transformation of a disused iron ore mine in Salzgitter, Lower Saxony, authorized Genie® Distributors, Wienold Lifte, based in Emsbüren, supplied ETS Schacht Konrad Consortium with an articulating Genie Z®-45 XC™ (xtra capacity™) boom lift. Working at 1,000 m (3,280 ft) below ground at a constant temperature of 40°C (104° F), the machine is proving well suited for supporting workers in preparing and stabilising existing tunnels and newly bored storage chambers in Germany’s first deep geological repository for low and medium-level radioactive waste (Konrad Pit). GENIE articulating boom lift was chosen for its robust 4WD capabilities and increased lift capacity to support construction of radioactive waste repository.
Big booms are preferred for the maintenance of monumental structures. Recently, an HA41 RTJ PRO (HA130 RTJ PRO in North America) articulating boom was at work in India’s largest park to renovate a huge statue.

In India, the increasing awareness of the risks of working at height, and the complexity of the structural designs, has increased the use of material lifting equipment. Haulotte big booms are largely employed for industrial applications and outdoor construction. An HA41 RTJ PRO provided by rental company Shakti Equipments Pvt. Ltd. was used to clean the replica of the “Christ the Redeemer” statue in the large New Town Eco Park (Prakriti Tirtha), located in Calcutta, India.

The articulating boom features continuous outreach control and four simultaneous movements for highest productivity. The machine offers increased stability on uneven ground thanks to the front oscillating axle and the outstanding driving feature on rough terrain. The proportional controls and the embedded Haulotte Activ’Shield Bar system ensure maximum safety. Haulotte’s highest articulating boom HA41 RTJ PRO is appreciated in India for its optimized serviceability and ease of use.
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