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Plan ahead for shutdown success

While many of us think of jetting off to the sun and getting away from all the rain for a summer vacation, those involved in plant maintenance are gearing up for one of their busiest periods of the year.

This is the time to maximise the time available and carry out that essential repair, replace old equipment, change the layout or simply carry our routine maintenance that would be difficult and disruptive when the plant is operating normally.

With most businesses having enjoyed a very busy 12 months, much equipment is in need of a good service and overhaul. With such a variety of equipment and situations - from changing a light bulb to installing a 500 tonne reactor - the methods and equipment needed is truly diverse.

Elsewhere in this issue, we look at the growth in the range of small two man push around lifts and the relationship with the Work At Height Regulations introduced about two years ago. These new lifts are providing a safer alternative to ladders, trestle tables, boxes and chairs - still considered by many as basic access equipment for simple maintenance and repairs.

Remember, working at height is any height or situation where there is ANY risk of causing personal injury from a fall. An average of 14 people die and a further 1,200 are seriously injured as a result of falling from low-level ladders and steps, so take the correct measures to prevent injuries and correctly re-evaluate the access equipment to be used.

Equipment such as this push around lift provide a safe alternative to ladders, trestle tables, boxes and chairs for maintenance and repairs.

Tracked spider platforms can access most problem areas

Access all areas

Deciding on which type of access machine is needed for a specific task should always take into consideration how and where the unit can gain access. Many push around/ self propelled lifts have been designed to go through single door openings and fit into elevators. This makes entering buildings and moving between floors much easier.

For larger plants where space is not critical, larger scissor lifts and articulated and straight boomed machines can be used. For those almost totally inaccessible areas, crawler mounted spider platforms may be able to help. Their ability to reduce height and width in transport mode means they can get through very narrow entrances. Good gradability means they can often travel up and down staircases and go over rough terrain before unfolding and offering good working heights. All this means that most 'problem' areas can be reached.

Articulated platforms offer the 'up and over' facility which again may make access to certain areas much easier. If space is not a problem, the straight boom platform takes some beating. Faster and more rigid than articulated machines, the straight boom is also much less expensive to hire.

Large, narrow width scissor lifts with platform extensions adding to both the length and now the width are available. And if you are concerned about black tyres marking a floor, they can be covered with 'socks' to reduce the damage.

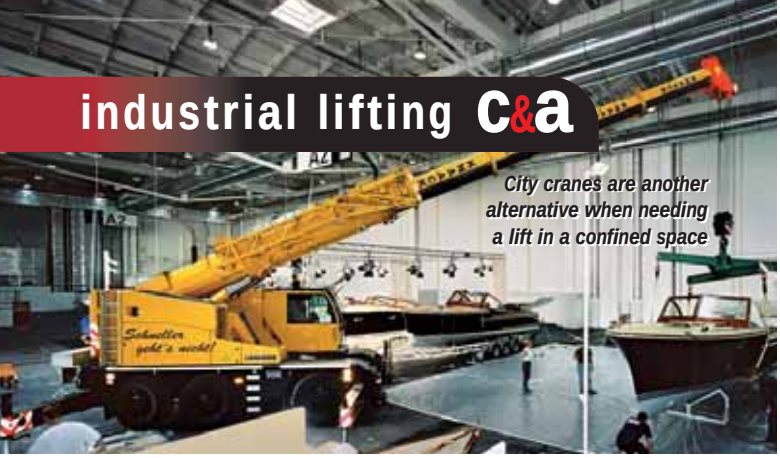
Pick and carry

The traditional method for smaller machinery moves and lifts is the pick and carry crane, most of which are now produced in Italy.

The two leading manufacturers, Valla and Ormig are both represented in the UK and Ireland with an increasing number available for hire. Ormig offers practical capacities from 10 to 60 tonnes, While Valla has a wider range of mostly electric/ battery powered pick and carry cranes from two tonnes to 90 tonnes. These cranes are ideal for installing or moving heavy machinery having been designed to work in space-restricted, low headroom situations.

While the larger pick and carry cranes are best suited to specialist plant installation crews, the smaller pedestrian controlled Valla cranes are also a useful tool for plant maintenance staff to use for routine equipment shifting and placing.

Pick and carry cranes such as this Ormig are designed to work in space-restricted, low headroom situations.



City cranes are another alternative when needing a lift in a confined space

Light footprint with compact crawlers

A more recent option to industrial lifting is the tracked mini crane from suppliers such as the Unic and Maeda. The compact lightweight cranes can move into tight locations close up to the machinery to be moved, raising it enough to place in skids or trolleys. When it comes to placing the machinery in a new location, they can be ideal in a wide range of situations. One major advantage they have over the wheeled pick and carry cranes is their very low weight and ground bearing pressure, ideal for sensitive floors.

The larger mini crawler cranes also offer pick and carry capability. Kranlyft, the Maeda distributor, is due to bring in two new models in this category. The larger model - the LC1385M-2 - is significantly bigger than the other cranes in the Maeda range, with a capacity of between 7 to 8 tonnes at two metres. Fitted with a 16 metre five section main boom, the unit can lift 2.6 tonnes to full height and more importantly can pick and carry to a maximum of two tonnes.

If space really is a problem, Italian manufacturer Kegiom Lifting introduced a mini crawler crane earlier in the year. Kegiom claims that the 350 E4 Plus mini crawler can lift more than two tonnes with an outrigger base of just 1.7 metres - the best in its class. However, the crane can also pick and carry up to 1.25 tonnes adding additional versatility for plant maintenance and replacement work.

Another item of lifting equipment that is finding uses outside of its usual sector is the loader crane. Large lorry loaders are not new, but mounted on a tractor unit and used primarily as a crane, they have taken the place of small All Terrain or City cranes in some areas. The largest can lift to about 30 metres and can be fitted with a double winch rope on remote control giving the best of both worlds - lorry loader and crane. One big advantage of this system is the fact that the lorry loader uses remote control allowing the operator to be alongside the lift giving better control and precision when lifting and placing the load. Additionally the articulated boom is excellent in low headroom situations, while its zero tailswing can offer advantages in tight spots.

When the going gets impossible……bring in the experts

For the most challenging of machinery moves, there is often no option but to call in specialist industrial rigging companies such as LGH Megalift or Ainscough Vanguard. With their vast experience and equipment, they will usually be able to find a solution no matter how tricky the lift or shift.

Larger mini cranes also have a pick and carry capability. Here a Meada is being lifted into its operating area.

However for all lifts, planning thoroughly is the critical key. The total cost of dropping a load can be astronomical - in one case where a wire rope broke, the costs amounted to over $1.5 billion! And this in an accident where no-one was injured.

Plan and allow for surprises

Poor planning and the lack of ability to adapt to unforeseen changes are often the main causes of accidents. And when planning a lift don't just concentrate on the cranes - check items such as chains and web slings and other lifting items are adequate for the job and in good condition. These items are often more liable to mis-use and damage.

One method to prevent damage when using chain blocks, is to use an overload protection system such as Load Safe. Currently available for Bulldog chain blocks and lever hoists it uses a special clutch mechanism which eliminates the risk of the equipment being excessively overloaded and subsequently damaged.

To prevent damage when using chain blocks, use an overload protection system such as Load Safe.

When lifting with conventional blocks there is no safeguard incorporated in the design of the equipment to prevent excessive overloading, so correctly judging when the block or rigging reaches its acceptable limit is often down to the skill and experience of individual operators. It is an all too common practice to increase lift capacity by adding leverage in the form of slipping a long pipe over the lever hoist handle or using additional personnel to increase the manual effort on the hand chain. This practice is suicidal and has no place in the modern workplace.

As already mentioned the most important aspect of any lift is planning. Most accidents are caused by a lack of or poor planning combined with unforeseen changes on the day. Anticipating and planning for unexpected changes is often the difference between a safe controlled lift and a panic solution, particularly given the time constraints on plant shutdown work. The key is to not to try and 'make-do' but to know where you can obtain different slings or lifting gear quickly, if for example, a vessel or machine arrives on site with different lifting points than were planned for.

An unusual application for a truck mounted lorry loader. The largest can now lift to about 30 metres.

With such a wide variety of equipment now available, the skill is in choosing the right item and using it safely and efficiently. There is a saying - 'most problems are caused by the nut between the controls and the seat'. Plan ahead and make sure you have all the right elements - equipment and personnel - in place before you start.

When its really tight, call in the specialist rigging and moving companies.

Working under cover

Installing heavy machine parts under a very low roof is not the normal environment for a 500 tonne mobile crane. However a recent job for one of Ainscough's new Liebherr LTM 1500-8.1 mobiles demonstrated that anything is possible.

Ainscough's 500 tonne Liebherr working under cover.

The area where the new parts had to be placed was surrounded by sensitive service trenches, which meant that the installation crane could only be positioned in an adjacent assembly bay of the building.

The task was further complicated in that there was only 14.5 metres of headroom to pass the new machine parts under the existing overhead crane girders between the two building bays. Because of this height limitation it would subsequently be necessary to extend the 500 tonne crane boom with the load suspended, in order to achieve the necessary set down radius.

Having positioned the outriggers, the LTM 1500's counterweights were installed using the client's overhead crane, as the roof above the mobile crane was too low for these to be assembled in the normal manner. Ainscough then used a 100 tonne Liebherr LTM 1100/2 to offload and install the LTM 1500's rear winch assembly as it was too heavy for the overhead cranes.

The 35 tonne machine parts were lifted and slewed under the overhead crane girders on a 21.3 metre boom and then, with the load still suspended, the crane boom was telescoped out to a 26.5 metre length, in order to reach the necessary 24 metre set down position.

While passing under the overhead cranes, and at the final set down radius, clearance between the underside of the roof and the top of the crane boom was only a few centimetres.

This clearance was maintained by having an observer positioned on the top of the overhead crane to direct the crane operator in this delicate task,particularly when releasing the load.

Record reactor

Moving a 477 tonne reactor last month tested specialist heavy-haulage and lifting contractor Felbermayr's equipment to the limits. With a length of 23.5 meters and a height and width of more than seven meters, the reactor is sizeable. However at almost 500 tonnes, the assembly-hall crane did not have the load-carrying capacity necessary to transfer the reactor to the low-loader for the 200 metre journey to the ship.

The solution was to erect another lifting frame with a maximum load-carrying capacity of 300 tonnes, using it in combination with the assembly-hall crane.

Once positioned on the low-loader, its short journey from the manufacturing hall to the harbour basin was still not straightforward. In order to achieve the necessary tractive force, a 600 hp, 8x8 drive tractor was used. However the vehicle - weighing 17 tonnes - had to be ballasted to a total of 40 tonnes to allow the tyres enough grip to pull the trailer.

The next problem for Felbermayr was loading the reactor onto the boat. Although there were two gantry cranes capable of lifting loads of up to 600 tons together, the reactor - at 23.5 metres - was too short to be attached to both gantry cranes. After much consultation and calculations it was decided that just one of the cranes could complete the lift. "Overall, this was the toughest lift for Felbermayr," explains project manager Peter Stöttinger.

The reactor was built in Hall 10, situated on the premises of the Felbermayr branch in Linz. With an area of 220,000 square metres it is the only place in Austria were these reactors can be manufactured because it offers the facility for onward transport.

Raising the roof?

Miller Park, home of the Milwaukee Brewers baseball team

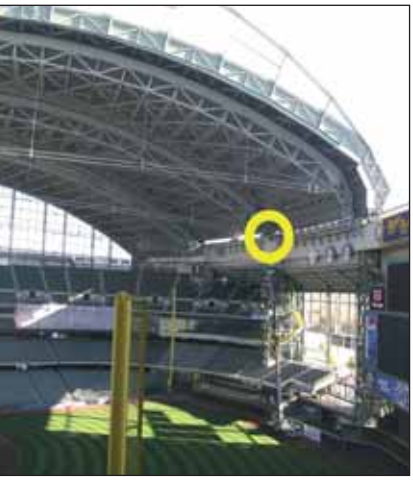
Not quite a plant shutdown as we know it, but certainly a major repair job that had to be completed in a tight 'time window' with an impossible to move deadline. Here we look at how Millar Park the Milwaukee Brewers' 12,000 tonne baseball stadium's sliding roof was refurbished.

Costing about $400 million, the Milwaukee Brewers' baseball stadium was built in 2001 with a capacity for 42,400 fans. The structure uses a sliding roof with a span of 183 metres to cover the spectators and the 122 metre natural grass centre field.

Work began on replacing ten powered carriages (bogies) supporting the five movable roof sections the day after the Brewers finished their final game of the season at Miller Park in September 2006.

Designed in the shape of a fan, each of the roof sections making up the 12,000 tonne roof is pivoted at its home-plate end and riding on two bogies at its wide (outfield) end 183 metres away.

The original-equipment bogies proved inadequate for their massive burden, and the day after the Brewers September home finale, the roof had to be left in a partially open position when a bogie guide roller shattered.



The roof is being lifted at the point circled in order to replace a bogie.

The 6.7 metre long original-equipment bogies, two at each of the far corners of each fan-shaped roof section, were fitted with pairs of double-flanged wheels to ride in an in-line fashion on an eight inch-wide single circular track approximately 42 metres above ground level. Additional safety is provided by guide rollers that follow the sidewalls of the main track bed. A drawback of the old bogies was that with a relatively wide bearing surface the outside of the wheel wanted to travel further than the inside, about 140 mm in the worst case. It was this differential that may have caused a snapping sound as the bogies rolled along the rail and possibly the failures.

Part of one of the ten two-wheel bogies being replaced.

The wheels on the new bogies have spherical rolling surfaces, to allow for minor bogie tilt, and the wheel axles are turned such that the bogie naturally follows the curved track. Additionally, the new bogie design employs four wheels arranged in two pairs, instead of the previous two-wheel design.

The new 7.3 metre long bogies each weigh either 49 or 66 tonnes, depending upon its location and are powered by 45 kW motors via gear boxes and massive roller chains.

Raising the roof

In principle, the replacement of each bogie was straightforward: lift the roof a little, remove the old bogie, then position the new bogie and lower the roof onto it. In practice it proved a little more complicated. There was extensive work to prepare the roof panels for jacking - brackets to lift against had to be designed, fabricated, and installed, as well as jacking platforms.

An old bogie being moved out. Two hydraulic Enerpac jacks are lifting against an add-on jacking bracket, as are another two jacks on the other side of the tracks.

Lateral movement during the lifting process also had to be taken into account. Working 183 metres from the pivot ends of the roof panels, thermal expansion and contraction were significant, and wind effects could not be ignored.

The stadium roof sections were jacked in ten separate lifts, one for each bogie replacement. Each time, the roof was lifted 102 to 152 mm, the old bogie driven out under its own power, a new bogie rolled in, and the roof lowered back into place on a spindle bearing. A 500 tonne crane lifted bogies to and from the ground.

The lifting weight of the roof panels ranged up to about 800 tonnes, so a capacity safety margin was provided by using four Enerpac 300 tonne, 700 bar, 300 mm stroke hydraulic cylinders for each lift. The cylinders were connected to a common manifold fed by an Enerpac 9.3 kW, 700 bar electric pump.

To provide for lateral movement during lifts, the jacks rested on a 38 mm thick steel plate, then a sheet of Teflon, and then a sheet of polished stainless steel.

In this lift, the hydraulic jacks were arranged in a quad-cluster, fitted with spherical load caps and resting on a Teflon 'sandwich' to allow for lateral movement.

The bottom line

All ten of the new bogies were in place and the roof ready for the new season, at a total cost of between $13 and $15 million.

A new bogie in place. One wheel and two guide rollers are visible.

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