The industry is experiencing a rise in the use of synthetic rope products and electric winches. **LAURA HATTON investigates**

**A lighter alternative**

Both steel wire ropes and synthetic fibre types have advantages and disadvantages, depending on equipment type, loads and frequency of use. Compared to steel wire ropes, for example, synthetic products are lightweight, easy to maintain and corrosion free, while wire ropes require maintenance and are susceptible to corrosion. Both rope types are, however, vulnerable to elemental occurrences, including wear and abrasion, Junaid Makda, Nylacast marketing manager, points out.

“From winch to the lifting attachment, the rope on a crane comes in contact with a number of different materials and components,” Makda explains. “Abrasion, for example, can typically occur on a rope when it is being wound on a winch.”

To prevent this problem from occurring, UK manufacturer of polymer-based products, Nylacast, has designed a low friction spooling shell which more effectively guides the rope to be wound. The company has also developed custom made rollers, guides, sheaves and pulleys, all manufactured from low friction polymer. The result is a synthetic component that is more accommodating to the rope compared to metal, as well as being corrosion resistant.

Manufacturer FibreMax is offering a new series of synthetic products, including a range of crane pendants. The pendants are custom made and are available in a range of breaking strengths and lengths up to 150 metres. Longer lengths are available for luffing jib tower cranes, the manufacturer adds.

Wilco van Zonneveld, FibreMax business development manager, says, “Our synthetic pendants have up to 90% less weight compared to steel pendants, no structural or construction stretch, high fatigue and a service life that is five times that of steel. The reduction in weight can help increase lifting capacity and boom length. The pendants have low assembly weight and are easy to transport, handle and install. In addition, they are corrosion free.

“The lightweight synthetic cables are used as boom suspension ropes (pendants) to replace heavy steel plate pendants or steel wire rope pendants. They can be used on all sorts of cranes, including crawlers, wheeled mobiles, luffing jib tower cranes and offshore cranes.”

**Latest products**

Product manufacturers are also looking at synthetic fibre products as an alternative to steel wire. Bergen-based manufacturer of link chains Load Solutions, for example, has teamed up with manufacturer of synthetic products DSM Dyneema, to design and develop a synthetic link load chain. The link chains, branded as Tycan, will be made from DSM’s ultra high molecular weight polyethylene (UHMwPE) fibre, which is branded as Dyneema.

Dietrich Wienke, DSM Dyneema new business development manager, says, “DSM Dyneema and Load Solutions came together because we both understood the overwhelming advantages of link chains made with Dyneema. Our fibre is the only fibre in the world capable of giving the Tycan chains what they need: superior strength at lowest weight, unbeatable bending fatigue and abrasion resistance, plus excellent outdoor performance and endurance even in very harsh operating conditions.”

Advantages of the Tycan chain include its ability to float on water and its resistance to chemicals and the effects of seawater. The chain can hold loads up to 600 tonnes and can withstand shock loads. In addition, the chain can be wrapped over cargo edges without suffering or causing damage.

Kjell Veka, Load Solutions managing director, explains, “The heavy steel chains that the cargo lashing market has relied on until now are difficult and noisy to use, they can rust, and they are tough on cargo, equipment and lashing crews. Tycan chains with Dyneema are up to eight times lighter than regular steel link chains with the same strength.”

In the crane industry, manufacturer Manitowoc joined forces with manufacturer of synthetic rope Samson, to create a new alternative to wire ropes. The result was the Bridon Dyform langs lay rope
ROPES & WINCHES

We have seen a growing trend of synthetic crane rope being used in high rise crane applications. The synthetic fibre is supplied by DSM Dyneema. The Union PowerMax Plus rope has undergone field trials at coal mines in Wyoming, Texas and South Africa. The results showed that PowerMax Plus lasted more than twice as long as their previous drag ropes, increasing the time between rope replacements, the manufacturer says. PowerMax Plus is part of Union’s PowerMax Plus family of products for drag ropes which also includes PowerMax PFV Plus, and PowerMax MD Plus.

**Industry standards**

Despite the rising popularity of synthetic materials, there are few standards for synthetic products, especially when compared to steel ropes and associated accessories. For wire ropes, manufacturers have to meet the EN12999 standard for cranes. In addition, crane manufacturers include information regarding safety checks and discard criteria on wire ropes and winches. Crane manufacturer Hiab, for example, has included information in the instruction manual regarding daily checks. “If a wire is damaged then the driver should contact an authorised service centre,” Lotta Clausen, Hiab vice president of communications, adds. “In addition, if any of the winches do not work properly the driver gets an error message via the Space security system.”

Cranes manufacturer Tadano also includes information on discard criteria in operation manuals. “We clarify the criteria of wire rope replacement at daily and monthly inspections of wire ropes for breaking, wear and corrosion, details of which can be found in the operation manual,” a spokesperson from Tadano says. “We don’t adopt synthetic wire rope yet; however, we are researching and reviewing FibreMax crane pendants are custom made and are available in a range of breaking strengths and lengths up 150 metres.

The introduction of the Manitowoc KZTM100 synthetic rope, which has since been introduced on all Grove rough terrain and truck mounted cranes (excluding the RT9150 and TMS9000). The synthetic fibre is supplied by DSM Dyneema.

“The KZTM100 Synthetic rope is 80% lighter than wire rope and boasts torque neutral construction that eliminates load spin and cabling,” a spokesperson from Manitowoc says. “The new hoist material also makes for easy handling, reeving and installation as it reduces kinking, bird caging and damage from other types of cable-spooling issues. The KZTM100 is corrosion resistant, requires no lubrication, is durable and easy to work with.”

Synthetic materials have also been used in the new Union PowerMax Plus steel drag rope from rope manufacturer WireCo. “The wire rope has plastic enhancement that protects the rope core from material intrusion and fatigue,” a WireCo spokesperson says. “It also has improved abrasion resistance and an increased service life.”

The Union PowerMax Plus rope has undergone field trials at coal mines in the future.”

Manufacturer FibreMax has its own discard criteria in place, as Wilco van Zonneveld explains, “We have inspection and discard criteria on hand for our pendants during installation or before transport and storage. Our synthetic pendants are protected from damage and chafe by multiple layers of polyester webbing material. The outer layer is supplied in black as a standard colour but can be supplied in the colour of the crane as well, depending on customer specifications. The inner cover has a contrasting colour (generally red) which indicates that the pendant needs to be inspected or repaired whenever this colour is visible.”

For synthetic ropes, manufacturers are looking to develop criteria similar to the steel rope discard ISO 4309:2010 Cranes, wire ropes, care and maintenance, inspection and discard. Manufacturer of steel wire and synthetic ropes, Bridon, for example, is involved with a number of projects with the objective of developing performance related criteria for synthetics. To help increase industry knowledge, the company uses the Bridon Technology Centre (BTC) for testing both synthetic and steel ropes in development.

John Churchill, technology director for Bridon, says, “Advances are being made in synthetic material performance, but it remains quite sensitive to mechanical damage. Sharing learning from field trials of multilayer spooled, fully synthetic deep-sea trawl warps can actively inform development of synthetic crane rope. In addition, demands and extensive experience of the challenges of specialist high capacity cranes can identify the performance requirements and limitations of such ropes.”

**Winch requirements**

Performance requirements and the effects of spooling are also influencing the design and function of winches. To meet the latest building designs that fall into the ‘supertall’ category of skyscrapers (buildings above 380 m), winches primarily need to offer high line speeds and have the ability to spool hundreds of metres of rope onto a drum. One example to meet these demands is the 215 LBR 120 winch from Manitowoc.
The 215 horsepower-rated electric winch accommodates up to 580 m of rope on the drum and, when working in single fall, this hoisting unit can lift loads of 2.3 tonnes at up to 256 m per minute.

From Germany-based mechanical engineering manufacturer Zollern is an electrically driven rope winch. The winch was originally designed for a draw works on a truck mounted onshore drilling device and is designed with an asynchronous motor and a specially designed drive unit and gearbox. To accommodate working on future drilling rigs, which will offer drilling depths of 5,000 m, the motor and planetary gear have been housed inside the rope drum.

Holger Graf, Zollern marine technology segment manager, says, "The new Zollern compact electric winch can be used in each type of crane, including shipboard cranes or bulk material handling cranes. In principle it is an electrically driven crane winch with an electric motor that is patented, is also on the model. To reduce wear on the main wire rope, two hydraulic cylinders allow for the adjustment of the lifting height without moving the drum of the hoisting winch.

From crane manufacturer Palfinger is the rope tension control (RTC) and the synchronised rope control (SRC) system. The RTC is an automatic rope tensioning device that makes it easier to fold and unfold the crane with the rope reeved in and the fly jib mounted, the manufacturer says. The system automatically adjusts the rope length to match the movements of the crane.

Similar to the RTC, the SRC system automatically adjusts the rope length and maintains a constant distance between the pulley head and the hook block during operation of the rope winch. This allows loads to be traversed horizontally at a constant height without the operator having to adjust the rope winch. Sensors in the roller head are used to avoid collisions between the hook block and the pulley head. The system sends signals directly to the Paltronic 150, a spokesperson explains. "If the SRC is activated, it automatically makes the necessary adjustments to ensure that the distance between the pulley head and the hook block remains constant during any crane movements that lengthen or shorten the rope length. If the knuckle boom or fly-jib is lowered, the SRC again adjusts the rope winch to keep a constant distance between the lower block and the roller head," a spokesperson from Palfinger adds. The systems are available for SH crane models (SRC from PK 10002 SH and RTC from PK 27002 SH).