

IN THE GROOVE

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INTERNATIONAL

New assembly hall expands output capacity

Lebus International Engineers GmbH has opened a second production hall at its premises in Finning, near Munich, in Germany. The 900 square-metre assembly hall increases production capacity by more than 30%.

Fitted with a 10-tonne capacity overhead crane, the new hall is being used for assembling spooling devices and compensators, and for mounting and bolting flanges to drums. It is also used for stocking cast drums and half-produced parts. It frees up the main hall to be dedicated to machining and for expansion of the paint shop.

The new building also houses additional office space, washroom and canteen facilities and a lecture room for customer training events.

Adjacent land has also been purchased for future expansion.

Further investment in the business has also been made in new CNC machines and in management systems. Approximately €100,000 has been invested in sophisticated Incoplan software from Incotec that manages the planning of all resources, scheduling, production and delivery.

Lebus's German operations are bucking the trend in the worldwide economic downturn, and is experiencing no slow down in workload. While slowdown in the global market for construction cranes has resulted in some postponements of high-volume/low-margin orders from tower crane and mobile crane manufacturers, the offshore sector and other industries such as mining continue to drive growth at Lebus.

Consultancy work is also flourishing, as more and more winch, hoist and crane users turn to Lebus for independent advice to resolve their wire rope spooling problems.



The new assembly hall (above) frees up more space for machining and welding in the main hall (below)



Internal audits ensure continuous quality

Quality is a subject that Lebus takes very seriously. Not only is every Lebus drum engineered with such precision and quality that it comes with a lifetime guarantee, but internal processes are also just as thoroughly monitored.

Lebus quality management systems are certified in accordance with DIN EN ISO 9001 by both DNV and Lloyds Register. For the past five years the internal quality audit has been carried out by Berthold Durst of Durst Management Systeme. Each year, he spends two days at the Lebus premises in Finning, near Munich, examining the management processes. His internal audit report aims to help Lebus improve by identifying any corrective or preventive action.

Tim Seidenather, operations and quality manager at Lebus,

says: "As the company has grown, the interfaces between departments has required processes to become more formal, and the quality audits help in this. In the past five years, since bringing in Berthold Durst, we have had no non-conformity reports from the external auditors, and so no need for follow-up reports. This saves us time and money."

Berthold Durst adds: "Some companies just do only what they need to get the certificate. I prefer companies whose first motive is to make improvements and see the certificate as a side benefit. Lebus is this type of company."



Quality auditor
Berthold Durst

Customer focus

Lidan Marine AB

Lidan Marine has been producing winches and handling systems for more than 100 years. In the beginning, the fishing industry was its main source of income. Knowing how to deal with demanding conditions led to work in offshore and naval work, and in RoRo (roll on/roll off) ramps. These three sectors are now its core businesses, within which it can claim to be the leader in high-technology winch and handling systems, with unique expertise in lightweight technology, compact, shockproof constructions and heave compensation technologies. Another specialisation is multi-purpose handling equipment and motion-compensated winches.

Lidan Marine's philosophy is to help its customers work in all kinds of conditions, whether it is rough seas, rough competition or just plain rough times.

For the offshore sector, Lidan Marine develops and supplies umbilical winches and launching and recovering systems for underwater vessels. Lidan also offers state of the art technology for active heave compensation (AHC) that guarantees safety even under heavy sea conditions. Lidan Marine also develops high-tech winches and handling equipment for other demanding marine environments such as dredging, diving, as well as seismic and oceanographic systems. All are equipped with Lebus drum sleeves.

The Deep Sea RoRo market comprises a small number of operators with a combined fleet of around 400 ships, but it continues to grow in line with rising car exports around the world. Almost half of the worlds RoRo ships are fitted with the Lidan Marine ramp handling systems with true constant tension technology - an innovation which made the company



RoRo vessel with Lidan Marine winches for ramp handling



A Lidan Marine launch and recovery system for Remote Operated Vessels (ROVs)

a leading RoRo supplier as early as the 1970s. Lidan developed its first ramp handling system for naval RoRo ships in 1984, for the US Navy. Lidan today holds more than 60% of the world market for RoRo ramp handling equipment.

Over the years, Lidan has also developed a large number of winch and handling systems for military applications. A military environment creates extremely high demands on quality, function and

delivery reliability. Ever-increasing demands for low weight, compact design, mobility, flexibility and multi-functionality continuously present new challenges. Its multi-purpose cranes can be used for loading and rescue, as well launch and recovery of remote-operated vehicles ROVs.

Heave-compensated cranes and winches facilitate handling operations between harbours and ships, as well as between ships and other objects. Its first generation active heave-compensation technology for underwater warfare dates back to beginning of the 1990s.

New stranding machine extends Diepa's capabilities

Diepa, a leading German producer of wire ropes, installed a new stranding machine in October that increases the maximum diameter of rope that it can offer from 80mm to 120mm. It can also now produce much larger coil weights - up to 100 tonnes instead of 25 tonnes.

The KVM 16x1400 machine was installed by Sket Verseilmashinenbau GmbH, which has supplied most of Diepa's 60 other stranding machines in a cooperation that stretches back 30 years. The new machine stands 85m long and represents an investment of Euro 5m. It has been running round the clock, seven days a week, stopping only for bobbin and programme changes. It can produce all ropes in Diepa's brochure, whether normal or Lang's lay, rotating or non-rotating.

Compacted ropes, which are well suited to multi-layer spooling, are a Diepa speciality. Managing director Michael Gehring explains: "A compacted strand has, for the same tensile strength, a much smaller outer diameter or, to put it another way, for ropes having the same diameter, compacted strands will take considerably more load. And their rate of wear is much less."

Diepa began in 1873 with hemp ropes and has been producing steel wire rope since 1920. It is now in its fifth generation of continuous ownership by the Dietz family. The company secured its first patent in 1936 when the Diepa brand, from Dietz Patent, was established. It produced its first rotation-resistant rope in 1943 and in 1951 made the first wire rope with a synthetic inner component.

Today it employs more than 400 people, mostly in the 17 production halls that cover almost 50,000 square metres.

Despite the current global recession, the company is still barely able to keep up with demand. It continues to expand with further employees taken on in January and seven more stranding machines from Sket being added this year. Michael Gehring adds: "With our new KVM 16x1400 machine we reach new markets for larger mobile and excavating cranes, offshore technology and wind farms which should more than compensate for any possible reduction in demand from old markets."

Editor's note: Lebus works closely with all major producers of wire rope and welcomes their news for *In The Groove*

Whiplash! – Preventing rope resonance

When Siemag M-Tec, a German supplier of mining equipment, commissioned parallel grooved sleeves from Lebus for a series of winches, we were alerted to the details of the application. The winches, destined for a Norilsk Nickel mine in Russia, are designed to operate at 26.49rpm to hoists loads to depths of up to 2.15km using 46mm wire rope.

Only one of these details had the potential to create a problem. The grooves of Lebus drums are parallel except for two crossover points on diametrically opposite sides, each moving the rope half a pitch along the face of the drum. This groove pattern is central to the Lebus multi-layer spooling system. It ensures that the rope spools smoothly every time, guaranteeing the performance of the winch and maximising the life of the wire rope.

However, if the drum is rotated at ultra high speeds, as in this application, the rope is susceptible to harmonic resonance. Vibration is induced in the rope at the crossover points, and the fast steady rhythm of crossover points can increase the vibration. As students of physics know, resonance occurs when the frequency of an applied force is the same as the natural frequency of the vibrating body. If the vibration in the rope coincides with the vibration in the hoisting machinery above,

the result can be waves in the rope, creating whiplash. The solution in this case is quite simple, although the calculations that lie behind it are not.

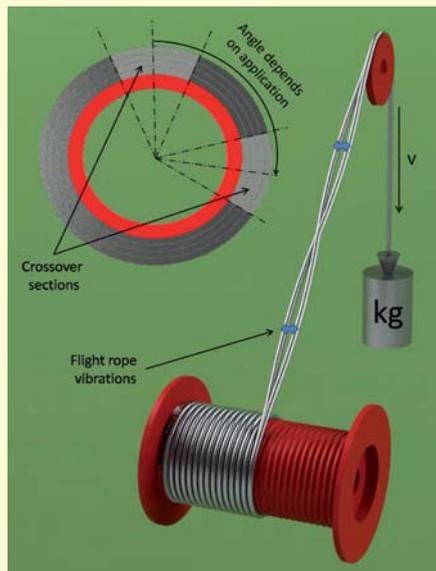
Harmonic resonance is prevented by changing the offset of the crossover points, so that they are not diametrically opposite each other. This creates an uneven tempo in the spooling action and disrupt the coincidence of rope and drum vibrations. To verify the optimum offset for the groove crossover points for

Siemag's winches, Lebus worked with Canadian consulting engineer GL Tiley & Associates of Flamborough, Ontario, a specialist in analysing materials vibrations in mining equipment.

Tiley's engineers calculated that the Lebus sleeves on Siemag's winches in this application should have the crossover sections offset at 85 degrees (measured from their midpoints) rather than the conventional 180 degrees.

Lebus is now producing 12 sets of sleeves for Siemag M-Tec for this application, for delivery in stages to February 2010. All the drums are between 5m and 6m in pitch circle diameter and 1200mm long between the flanges. They will carry 2150m of 46mm diameter wire rope in up to five layers.

Critical rope resonance frequencies



China's ZPMC looks to Lebus



ZPMC, the largest manufacturer of dockside cranes not just in China but also the world, looks to Lebus for assistance with spooling systems. For its ship-to-shore cranes, ZPMC usually uses large, long winches with simple helical grooving, but in some applications there is not the space for a large winch. Instead it uses smaller winches with the rope spooled around the drum in many layers. For these, it comes to Lebus.

Examples include container cranes supplied by ZPMC to Euromax Rotterdam in the Netherlands and to the Port of Zeebrugge in Belgium. Lebus also supplies the sleeves for ZPMC's huge floating cranes. On ZPMC's 7,000-tonne floating crane, both main drum and auxiliary drum have a pitch circle diameter (PCD) of 1535mm and are 3636mm long between the flanges. They are designed to hold 3940m – nearly 4km – of 60mm diameter wire rope in 11 layers. The boom hoist drum has a PCD of 1525mm, is 2884mm between the flanges and holds 3530m of rope in 12 layers.

The hoists on ZPMC's 4,000-tonne floating crane are barely less impressive, with the main drum having a PCD of 1500mm

and a length of 2366mm between the flanges. It holds 1820m of 60mm rope in eight layers.

Relations between ZPMC and Lebus have become increasingly close in recent years. Last year, for example, Lebus managing director Cris Seidenather took up an invitation from the directors of ZPMC to make a presentation to senior managers and engineers. "I am very grateful for the warm hospitality that is always shown to me when I visit ZPMC," says Mr Seidenather.

• **Wilson Crane**, another Chinese manufacturer of dockside and floating cranes, has also turned to Lebus. Based in Nantong, Wilson Crane was established in 2004 by Wilson Heavy Industry. It has invested US\$450m to create two world class fabrication yards in Nantong and Zhoushan, as well as a marketing and design office in Shanghai.

Lebus has supplied sleeves for the main, auxiliary and luffing drums of a pair of 1600-tonne capacity floating cranes that Wilson is building for MLC Shipbuilding in Malaysia. The main drum has a 1251mm pitch circle diameter (PCD) and is 2129mm long between the flanges. It holds 1473m of 56mm diameter wire rope in nine layers. The first set of sleeves (three pairs) was delivered in January and the second set in March.

As with the ZPMC sleeves mentioned above, the order came through the Lebus distributor, Powertech (China) Ltd.



ZPMC container cranes

Engineers' Corner

Avoiding problems with dead turns

The most common cause of problems relating to multi-layer wire rope spooling is when upper layers of rope crush lower layers and cause damage to the rope. Most often, the problem occurs at the start of the third layer. With a rope spooled in multiple layers, each successive layer of rope exerts force on the ones beneath. Normally, this is fine and is essential for maintaining the perfect spooling pattern. However, problems occur because, too often, the first two or three turns on the drum, known as the dead turns, have been initially spooled onto the drum with insufficient tension, for fear of damaging the rope clamp outside the flange. These are called the dead turns because, for safety reasons, they never leave the drum. If the rope is the right length for the application, even when it is unspooled to its maximum length, these two or three dead turns should always remain on the drum.

To avoid slackness in the dead turns, cable should be spooled onto the drum with a minimum tension of either 10% of the working load or 2% of the breaking strength of the wire rope, whichever is higher. This assumes the rope's safety factor of breaking load to working load is 5 to 1. If the safety factor of the rope is 3 to 1, the tension while spooling should be about 1/3rd of the maximum load, although precise tension required depends on the rope construction.

If there is insufficient tension on the dead turns, which is a common problem, they will not hold their position tightly in the groove once the third layer pushes down onto the second layer (see diagram). When a rope is crushed, its strands separate from the core, resulting in what is known as birdcaging. Having tight lines over loose lines is poison to effective multi-layer spooling.

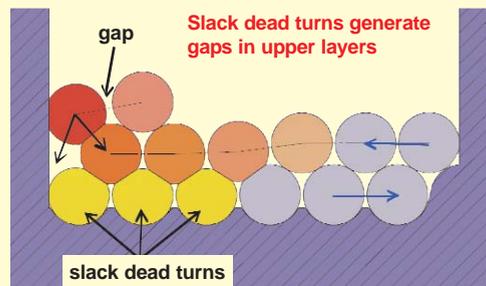
Using compacted ropes may help to a degree, since they are less liable to deformation than normal ropes. Using Lang's lay rope, where the wires are bound in the same direction as the strands, may also help to a degree because there is less pressure on the strands and

outer wires below. However, in each case, there will still be some deformation and this is sufficient to cause problems.

Lebus has devised a couple of solutions to this. Most commonly, we use the functional end groove reduction technique. We weld a thin plate to the base of the flange to narrow the pitch of the first groove by an order of approximately 2%, depending on the type of rope being used. (The precise amount of reduction needed is a judgement we can make based on many years of experience.) A degree of force is then applied, using a wooden mallet, to fit the turn of rope into its groove. This protects the dead turns from deformation.

Another solution is one that we used in the mid 1990s with British dockside crane manufacturer Stothert & Pitt. We produce a drum with a second chamber outside of the flanges to house four or five dead turns on a smooth subsidiary drum before the rope feeds through a hole in the flange and onto the grooved main drum. We also used a similar approach for BKT self-erecting tower cranes, using a subsidiary drum for the crane erection procedure. The principle is to get the critical loose lines into a separate compartment and prevent the possibility of having tight lines sitting over loose lines.

Even after solving the problems caused by loose dead turns, there is still the natural phenomenon in multi-layer spooling of rope friction in the cross-over sections of parallel groove drums. While wire rope can withstand this, ultimately it will cause damage. However, the life of the rope can be extended by several hundred percent by using the cut-and-slip procedure at appropriate intervals. Every so often - the frequency depends on the intensity of the application, but might be every six months - the rope should be fully unspooled off the drum and detached from the clamp. Then by cutting a short section from the clamped end - say, 300mm or 500mm - and re-clamping, when the rope is spooled back onto the drum, different sections of rope will be subject to the friction generated at the cross-over section.



About Lebus rope drums

In 1937 Frank LeBus, a supplier of equipment to oilfields, patented the use of a groove bar on hoisting drums to guide the spooling of rope. In the 1950s he refined the grooving geometry and came up with the LeBus Counterbalanced Spooling System, which today remains the most effective and sophisticated way to ensure that wire rope wrapped around a hoist drum in multiple layers continues to spool onto and off the drum totally smoothly, and in a way that maximises the life of the rope. Tests have shown that a Lebus drum, with grooves designed specifically to match rope size, can extend rope life by more than 500%.

Today, the term 'Lebus' is often used incorrectly to refer to any drum with parallel grooves. In fact, only a drum or sleeve produced by Lebus can truly claim to be a Lebus drum.

About Lebus International

Lebus International Engineers GmbH is a sister company of the US company Lebus International Inc., still owned by Charles Lebus, grandson of the inventor of the Lebus system. It also has sister companies in the UK and Japan. Lebus International has manufactured Lebus drums and rope spooling systems in Germany since 1962 for a wide range of onshore and offshore winching applications. Products include:

- Rope drums with grooves cut directly into them (with or without bolted or welded flanges, as required)
- Grooved split sleeves that can be placed over smooth, ungrooved drums – good for retrofitting and for applications where drums may require replacing in future.
- Spooling accessories such as spooling angle compensator and cross thread spindles.

Contact us:

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