Into the groove

The Lebus brand is synonymous with parallel spooling systems. Since the patent on that concept expired, the company has moved from being a general supplier, to trading on its expertise for special applications. Will North visited the company's plant in Germany

The LeBus family originally made a name for themselves as blacksmiths, serving the oil industry around Longview, Texas. Their first spooling products, brought to market in 1937, were square bars, with grooves to support helical spooling. These were fixed to drums, to make some improvements to spooling.

After the war, Frank LeBus investigated new ways of making spooling more efficient. The problem with helical spooling was that it offered no control over the position of the rope on multi-layer drums. His first product introduced a parallel groove, with a single crossover.

There was a problem with this design, however. The single crossover created a bump on one side of the drum. With a drum working at speed, that imbalance creates vibration which damages the bearings.

LeBus's solution was to add a second crossover on the opposite side of the drum, moving the rope along by half its width each time. This second crossover zone, and second bump, balanced the first, keeping the drum spinning smoothly around the axis, and removing the problem of mechanical fatigue.

This innovation was, in many experts' eyes, the key change that made modern lifting cranes possible. Without controlled spooling, rope ends up piled randomly over the drum. That might not matter much when you're winding up your garden hose after an afternoon's watering, but it matters a lot when you're lifting hundreds of tonnes. As the layers are added to the rope, all of that force is carried to the layers below, causing irepparable damage.

Helical spooling only goes part way to solving this problem. As layers are added, they drift to one side. That opens up a gap, and soon enough the top layer of

rope will cut down again into layers below.

With parallel spooling, each layer of rope is fully supported by the layer below. At every half rotation, the rope is pushed over to the next groove, ensuring that any potential damage happens within the crossover zone. Engineers can accurately predict the fatigue this will cause. On intensive applications, by carefully cutting the rope at regular periods, the crossover zone can be moved to new parts of the rope, spreading the wear caused in a predictable way, and extending the safe working life of the rope.

For many years, patents on the system meant that LeBus had an unchallenged role in the lifting industry. As these patents expired the company had to look for new sources of revenue. The company has two European businesses, one in the UK and one in Finning, near Munich. The German plant is run by Cris Seidenather. Here, Seidenather has focussed on developing Lebus (only the US part of the business retains the upper case 'B' of the family name) as a specialist supplier, not just of individual products, but of engineering expertise. Seidenather's arm of the business, Lebus International, GmbH, has agents in Shanghai, Hong Kong, and Brazil, and has clients around the world.

When you're engineering spooling systems to the degrees of tolerances Seidenather's clients demand, precision is everything. The groove pitch and crossover design must be precisely engineered to match the design and construction of the rope, the loads to be lifted and the number of layers to be spooled.

Priming drums

The starting materials for the drums and sleeves Seidenather manufactures are steel pipes and bent plate. To save weight, particularly on mobile cranes, Lebus uses high strength, light weight, 960Nmm steel.

For spooling systems up to 620mm diameter, the steel arrives in pipe form. This may either be used for sleeves, or for complete drums. For bigger systems, the steel arrives as precisely bent plate.

From the yard, the steel pipe and joined bent plates are taken to a lathe, used to cut the crossover grooves. Specially-engineered gearboxes and drives are fitted to the lathe to allow the cutting and machining of the Lebus grooving.

Round bars are passed through holes at each end of the spooling system, hammered into the groove, and welded into place. These will act as a ramp to lift the rope up a layer each time.

The drum or sleeve is then cut to the correct length, to a precision of a few millimetres, and the inside of the system machined to the correct diameter. For drums, holes are CNCd to fit the gear box.

From here, the fabricated spooling system passes over to quality control. Skilled operators check each groove by hand with metal rope templates. If any imperfections are found, they are ground out manually.

The fully assembled spooling system is then painted with primer, and flanges are fitted. A lot of the company's painting and finishing is handled by a subcontractor, before the parts are returned to Lebus.

"Any type of spooling damages rope," Seidenather says, "But on a Lebus drum, all the damage is in the crossover section [pictured, left] and can be predicted and accounted for." Perfect spooling, [pictured, right] ensures each coil is supported evenly by two coils below.

The flanges too are fabricated by a subcontractor and delivered as needed. They can be bolted in place, or welded. On bigger machines, with many layers of rope, there is considerable pressure from the rope pushing out, so it is vital that these are fitted securely.

When demand is high, a slightly different process can be used for some products. Here, drums are cast with grooves in place. Lebus then finishes the drums by hand. This is, Seidenather says, faster and allows for more reliable delivery during busy periods, but is no cheaper to do well.

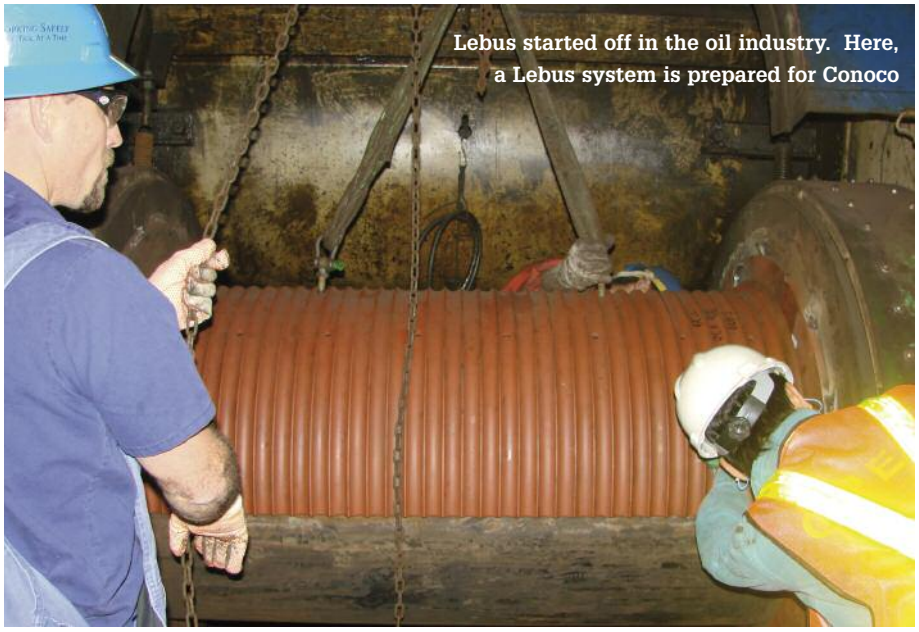
For applications that require many kilometres of rope, casting cannot give the required precision. Using casting for applications with only three or four layers of rope, however, frees up the workshop for these one-off and specialist jobs.

However the drums and sleeves get there, a final check is performed on each system before it is delivered to the customer.

Lebus doesn't just deliver spooling systems to order, but works with customers to design systems that will work with the special application ropes they plan to use. The company will load test the ropes, supplied by rope manufacturers to the customer's specifications, and calculate the flatness of the rope on the first layer and the crossover. This allows Seidenather's engineers, working with the customer and rope manufacturer's own engineering teams, to accurately calculate the pitch and diameter of the grooves needed for the spooling system.

This sort of custom solution is not a question of following fixed, easy, rules. So many factors (say, the type of drive used) can affect how the rope will behave on the drum. It is, Seidenather says, "A combination of science and experience — a feeling in the stomach."

This engineering expertise, this feeling in the stomach, is what allows Lebus to secure contracts with so many specialist users. With agents around the world, the company works with Chinese crane builder ZPMC on floating and dockside cranes, with Cargotec's Kalmar terminal crane division, and has supplied PPM, Kroll's K10000 and Mammoet's giant PTC, as well as a range of non-crane applications. ■



Lebus started off in the oil industry. Here, a Lebus system is prepared for Conoco

Some Lebus sleeves get pretty big…

…and some are even bigger