

# In the Groove



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## National Oilwell-Hydralift ensures smooth spooling for Solstad ships

The Normand Clipper, a massive cable laying vessel owned by Norwegian company Solstad Shipping, is being converted to use for a wider range of marine and subsea construction applications.

The conversion is being carried out by Ulstein Verft in Norway and is scheduled to be completed in June 2005.

The ship was built in 2001 as a pipe laying vessel but demand in this market slowed down. So Solstad decided to convert it for other offshore construction uses.

The conversion includes the addition of a 250 tonne crane, supplied by National Oilwell Norway (Hydralift). The crane has an active heave compensation winch. The conversion, which is costing 24 million euros, is similar to that carried out on sister ship Normand Cutter last year. In both projects, Lebus International Engineers supplied National Oilwell with four huge winch drum sleeves, with Lebus grooving to ensure smooth spooling.

On the Normand Cutter, the first vessel to be converted, the crane is 300 tonne capacity. The winch drums are 2,646mm diameter and 3,511mm long between the flanges. They hold 2,500 metres of 122mm diameter wire rope, supplied by Bridon Ropes.



Solstad's Normand Cutter, converted last year

The rope is wrapped in nine layers. With so many layers of rope on the drum, controlled spooling is absolutely essential - hence the use of Lebus grooving.

On the Normand Clipper, now being converted, the drums are 2,800mm in diameter and 1,505mm long between the flanges. They hold 2,600 metres of 96mm diameter non-rotating wire rope in 14 layers. The rope is made by Redaelli of Italy.

## Record demand for massive winch drums

The Lebus factory in Finning, near Munich, has all kinds of machinery for producing winch drums. The largest can produce drums up to 4.5 metres in diameter and 6 metres wide. Lebus technology also allows split sleeves up to 14 metres diameter to be made on this Braun turning lathe. It was bought in 1978 for mining industry projects but over the years investment in mining equipment declined. Just a few years ago the Lebus management was reviewing the viability of keeping it.

Today, however, this machine has never been busier, thanks in particular to demand from deepwater drilling projects, which use wire ropes up to 2,500 metres long. "Even before the year started, our biggest lathe was fully booked for the whole year," says managing director Cris Seidenather.



The Braun lathe can make drums up to 4.5 metres diameter

# Refurbishment instead of renewal saves Saipem time and money

Winches work hard and in aggressive environments, such as at sea, can become worn out after a number of years' service. Replacing them can be time-consuming and expensive, particularly when the lost revenue from the time out of service is considered.

However, it is not always necessary to replace winches. Often, refurbishment is a viable option – as one of Lebus International's customers has just this year discovered.

Saipem Indonesia, a subsidiary of the Italian company Saipem, realised that the six anchor winches at the rear of its Semac 1 pipe laying barge were worn out and had come to the end of their useful life. It contacted Lebus about replacing them. However, Lebus offered a refurbishment option instead, costing much less and taking just one week to complete. This solution saved Saipem many weeks of downtime and a lot of money.

"Many people think that they need a new drum but that is not always the case," says Lebus managing director Cris Seidenather.

Instead of taking out the winches, Lebus removed the old grooves and welded on Lebus split sleeves, false flanges (plates to make the length of the drum match the new grooving) and compensation plates.

Lebus also adjusted the level winders, which is a mechanical rope guide system. It also changed the gear ratio to match the number of pitches on the Lebus groove. This was done by just changing four sprockets.

"It takes us about six or eight hours per winch with two men working," says Cris Seidenather.

"Taking into account that we have reduced the downtime of the barge, we can estimate that this refurbishment option has saved Saipem hundreds of thousands of dollars."

The anchor winches on Semac 1 hold 2,800 metres of 76mm (3 inch) diameter wire rope in 14 layers. Lebus engineered the grooving on the new sleeves to meet these specifications.

## About Lebus split sleeves

Lebus split sleeves are an effective and economical solution for providing Lebus grooving on a smooth winch drum without buying a whole new drum.

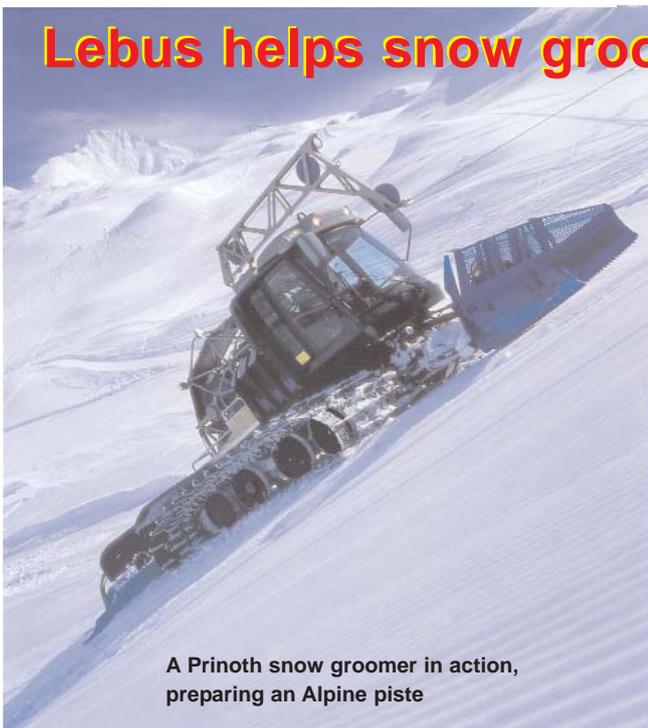
Lebus makes a grooved outer sleeve to meet the exact specifications of the customer's drum. The grooving is engineered to suit the specific wire rope that is being used.

The sleeve is then cut laterally into two sections. This way, the split sleeves can then be either bolted or welded onto an existing drum, as shown in this photograph.

Split sleeves are also interchangeable. This means that the same winch can be used with different types of rope simply by changing the sleeves



## Lebus helps snow groomers prepare the pistes



A Prinoth snow groomer in action, preparing an Alpine piste

Lebus International Engineers GmbH supplies some 75 grooved winch drums every year to manufacturers of snow grooming machines, including Prinoth.

These snow groomers, used in ski resorts around the world, could not climb up and down the steepest mountainsides without a winch. They anchor one end of a wire rope at the top and the winch on the machine pays out rope to lower the groomer down the hill. To get back up again, they simply use their winch to pull themselves back up again.

Prinoth's snow groomers use 10mm diameter wire rope, wrapped around a Lebus grooved drum (pictured right) in 13 layers.



# Lebus grooved drums for Dalia FPSO vessel

The new Dalia floating production, storage and offloading (FPSO) vessel goes into service for oil company Total Fina Elf later this year in the oil fields off the coast of Angola.

The Dalia FPSO is equipped with a 405 tonne capacity winch that is used to pull in the risers coming from a cable layer ship sited 500m away. The winch is rated for exceptional lifts at 535 tonne capacity.

The winch is being made by NFM Technologies of France, to whom Lebus International Engineers GmbH delivered a pair of split drum sleeves in February. NFM delivers the winch to project engineer Technip France, a subsidiary of Total, towards the end of the year.

The 2690mm diameter winch will hold, in five layers, the biggest non-rotating wire rope ever made. The 120mm diameter galvanised steel rope was made by Redaelli of Italy. Completed in January, it has a breaking force of 1200 tonnes, verified by tests at Bochum University in Germany.

Ropes up to 140mm have been made in the past but these have been only spin resistant, not fully non-rotation, according to Redaelli.

## From Shanghai to Vegas



Lebus International Engineers GmbH generated a lot of attention from visitors at the Bauma China exhibition in Shanghai last November.

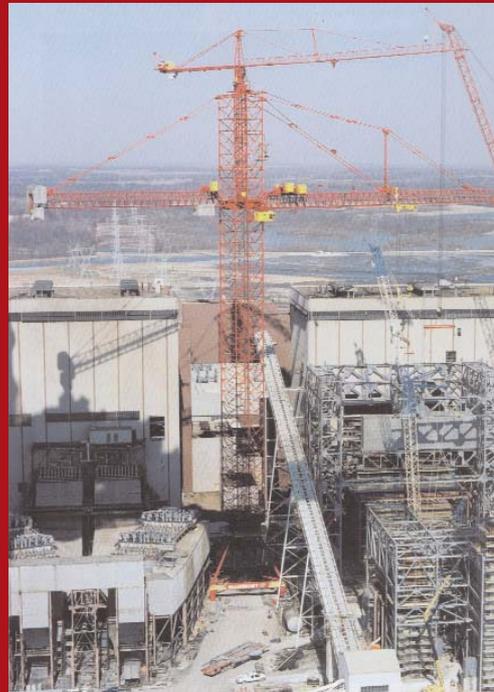
"It was amazing," says managing director Cris Seidenather. "We got so many people coming to the stand, wanting to know all about the benefits of the Lebus system and what makes it better than helical grooving for multi-layer spooling.

"Our new DVD, which shows how the Lebus system works, got a lot of attention too," he adds.

The company is also exhibiting this Spring at the Conexpo-Con/Agg show in Las Vegas, USA, sharing stand space with US parent company Lebus International Inc., of Longview, Texas. Conexpo runs 15-19 March.

## Did you know ?

The world's biggest tower crane, the Krøll K-10000, uses the Lebus system



In fact, Lebus supplies drums for all cranes built by Krøll, a Danish manufacturer that is part of the Favella Favco group.

The K-10000 lifts 240 tonnes out to a radius of 44m and at the end of its 100 metre jib it can lift 94 tonnes. At 10,000 tonne metre rated capacity, there is no other crane like it. On top sits an auxiliary crane just to service the big crane. This 400 tonne metre Liebherr (also Lebus drums) is as big as anything you are likely to see working downtown. Line pull on the K-10000's winch is 10,000kg. The drum is 1809mm between the flanges and 1500mm in diameter. It carries 30mm diameter wire rope in four layers.

The crane was designed for nuclear power station construction in the 1970s. Only 15 units were ever built. The first unit went to the USA but after the Three Mile Island nuclear accident in 1979, a second order was cancelled and it remained in Denmark. The other 13 units all went to the Soviet Union, with the last one delivered in 1986. However, only five were ever erected before the Chernobyl accident put an end to the Soviet nuclear construction programme.

In post-Soviet times, some of these units have re-emerged and K-10000s can be found at work today in Singapore, Norway and China. The photo shows one owned by Mammoet of the Netherlands working in Owensville, Indiana, USA in 2001. Note how small the motor car looks at the very bottom of the picture!

# Engineers' Corner

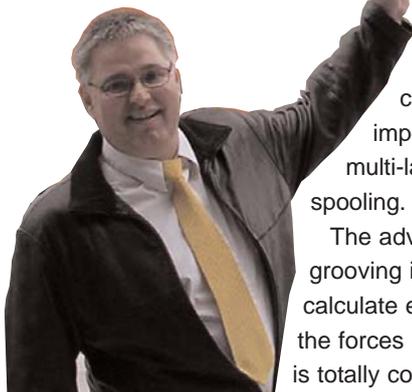
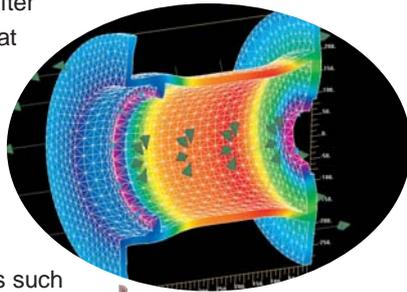


## Stress management

Eight, ten, twelve layers of wire rope – how much pressure does that exert on a steel drum?

A softer rope exerts more lateral pressure on the flanges (bending and sheering stress), while a harder rope exerts more pressure downwards onto the drum (hoop stress).

Calculating these stresses is the work of Lebus associate Dr Roland Ondra, who set up his own engineering consultancy in 1995 after gaining his doctorate at the Technical University of Munich. Roland specialises in stress calculations for engineering structures as well as amusement park rides such as rollercoasters. Since



Dr Roland Ondra and a computer image that he produced to show the stresses on a drum

working with Lebus, he has developed another speciality: calculating the forces imposed on a drum by multi-layer wire rope spooling.

The advantage of Lebus grooving is that it is possible to calculate exactly the direction of the forces because the spooling is totally controlled. With helical grooving it is impossible to calculate the stresses because the forces are not predictable.

## Technical Q&A

### What is the significance of fleet angles?

The fleet angle refers to the angle at which the rope comes off the sheave onto the winch. It is measured between the first fixed sheave and the flange of the winch. Correct fleet angle is crucial to smooth spooling. If the rope comes onto the drum at the wrong angle, the rope is likely to experience spooling problems and rope life will be affected. For a winch with Lebus grooving, the angle should be between 0.5° and 1.5°. At the same time, however, the design, tension and speed of the cable must be taken into account. In borderline cases, a Lebus specialist should be consulted.

### What tension is required when putting wire rope onto a drum?

The cable should be spooled with a minimum tension of either a) 10% of working load or b) 1% to 2% of the rope's breaking strength, where the breaking load to working load safety factor is 5 to 1. The higher factor (a or b) must be used. Where safety factors are 3 to 1 or less, the tension should be about 30% of the maximum load. Hand spooling will not give the required tension. The use of another hoist, or storage reel with capstan, is advisable. For this reason, it is best to plan ahead.

### Are hard ropes better than soft ropes?

In general, yes, because in multi-wrap applications hard ropes are better able to withstand the crushing effects of the outer layers and so are more likely to retain their roundness rather than deform to oval. The harder and rounder the rope, the better the pyramid shape as each layer of rope is added onto a Lebus groove drum. But the rope also needs to be soft and flexible enough to wrap around the drum, so a compromise is needed. Lebus works with rope producers to find the best compromise.

## 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

For any queries concerning wire rope spooling, Lebus products or details of how Lebus can help you, please contact:

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