

IN THE GROOVE

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Cable cars and funicular railways run smoothly with Lebus technology

Doppelmayr Garaventa of Switzerland is one of the world's leading manufacturers of cable cars, funicular railways and tram systems. It has installed systems all over the world, often with Lebus hoist drums, but is currently working on a project closer to home.

A new aerial tramway system, or gondola, will be installed this year to connect the Alpine towns of Lauterbrunnen and Grütschalp in Switzerland. Lebus has supplied a winch drum with Lebus grooving for the hoisting mechanism. The drum holds 1500 metres of 41mm diameter wire rope in up to five layers.

The drum is 4100mm diameter and 1089mm long between the flanges. This is so large that it has to be fabricated in two halves and air-lifted up the mountain by helicopter. Once up the mountain, the two halves will be connected. This is the same approach that Lebus required for the Peak Tram in Hong Kong that Garaventa installed several years ago.

Since April 2004, the towns of Ligerz and Prêles in Switzerland have been connected by a new funicular rail service. With Ligerz at 437 metres above sea level and Prêles at 820m, the journey by road winding around the mountain is long and slow, covering 15km. By funicular it takes just four and a half minutes to cover the 1200 metre direct route. The car carries up to 290 people an hour in each direction.

The new electric service, installed by Doppelmayr Garaventa, replaces a wheel and sprocket driven system built in 1912 by Von Roll.

To ensure smooth operations, the large winch drum at the top, which has a pitch circle diameter of 2500mm, has original Lebus grooving running the 728mm between the flanges. All Lebus groove patterns are designed specifically for the application and the type of rope being used. Here, the rope is 25mm diameter and spooled in six layers. Total length of the rope is 1,250 metres.

Engineered Lebus grooving not only ensures smooth spooling and prevents the rope from snagging, it also contributes to increased life expectancy of the rope. Tests have shown that rope life can be extended by as

The Ligerz-Prêles funicular has made more than 35,000 trips without the hoist rope needing replacing



much as 500% with the Lebus system.

The Ligerz- Prêles funicular seems to confirm this. It has made more than 35,000 trips so far and still has not needed a change of rope.

To help extend the life of the rope, the operators of the service have followed the Lebus slip-and-cut procedure.

This involves cutting off a short length of rope and re-spooling it. This moves the cross-over section so that a different part of the rope now bears the most stress. The first slip-and-cut operation has now been carried out at Ligerz-Prêles.

Garaventa reports that a similar tram system at Grutas de Garcia in Monterrey, Mexico, has made 55,000 trips with the same rope and is still going strong.

All Garaventa hoisting systems use Lebus drums. This enables them to have more compact winches that take up less space and wrap more layers around the drum. In single-layer applications, Lebus supplies Garaventa with helical grooved drums.



The 4100mm diameter drum for the new Lauterbrunnen-Grütschalp gondola

Karl Seidenather

Lebus International Engineers GmbH regrets to announce the passing of its founder, Karl Seidenather, at the age of 92.

Karl Seidenather was born on 10 June 1914 in Frankfurt, though his family was from Strasbourg in the Alsace region, so had dual French/German nationality. After studying engineering, he gained experience around the world. He spent some years in the 1940s and '50s working in Venezuela and in the USA. He settled with his family back in Germany again in 1957.

In 1962 Karl met Frank Lebus Jr, the son of the founder of Lebus International Inc. This meeting led to the two men setting up Lebus International Engineers GmbH in Germany that year. Under the management of Karl Seidenather, it started as a winch design office, subcontracting production. It soon grew and in 1967 Lebus GmbH set up its own fabrication facility in Inning, in Bavaria.

Karl retired from the business in the mid-1980s but always retained an active interest and continued to offer support and encouragement to his son Cris, who continues to run the business today, assisted by his own son Tim.

Karl Seidenather died on 15 September 2006.



Lebus helps Wirth build its biggest ever draw-works

Wirth is a leading German producer of tunnel boring machines, pumps and oilfield equipment. Among the equipment it produces for the oil industry are draw-works, which are special winches that lift and lower drilling pipes in oil wells. Wirth uses original Lebus grooved winch drums because in oil field applications any downtime caused by spooling problems is extremely costly.

Lebus is now supplying drums for Wirth's largest-ever draw-works, the GH 6000, which is rated at 6000hp and has a 11900kN line pull. Its maximum line speed is 24m/sec.

The winch drum has a pitch circle diameter of 1259mm on the first layer and it is 2400mm long between the flanges. It holds 840 metres of 17/8 inch (47.6mm) diameter wire rope in four layers.



A Wirth GH 3000 draw-works, similar to – but half the power of – the new GH 6000 that is now being developed

Ro-Ro seminar learns spooling lessons

Lebus customers Lidan Marine, MacGregor and TTS, a division of National Oilwell, held a joint technical seminar on 26 June on the subject of multi-layer spooling of wire rope.

Lebus supplies drum sleeves for winches manufactured by Lidan Marine, which are used on ship-to-shore Ro-Ro ramps made by MacGregor and TTS.

The seminar was organised to train Ro-Ro ramp operators to be able to recognise spooling problems before they lead to failure. In his presentation, Lebus International managing director Cris Seidenather explained the basic preconditions for smooth spooling:

- selecting the correct wire rope for the application
- correct drum design
- correct fleet angle
- correct pre-tensioning in the rope
- trained operators.

Michael Gehring, technical director of wire rope producer Diepa, also made a presentation on the selection of wire rope.

The key challenge in Ro-Ro ramp applications is that the height of the mooring where the ramp lands can vary depending on the tide and the dock. When the ramp has to be lowered below horizontal, it can double the tension.

If there is still more than one layer of rope on the drum at this point, the tension can cause damage to the first layer of rope beneath.

This situation can be avoided, Mr Seidenather told the seminar, if the system is designed so that the drum holds only the amount of rope that is actually needed, although to comply with safety regulations there should always be at least three dead turns left on the drum and never used.

Saipem pushes the boundaries

Italian offshore contractor Saipem has pushed the limits of spooling technology in recent years. Its pipe laying barges require vast lengths of heavy duty wire rope spooled in up to 14 layers or more.

Lebus has now completed its refurbishment of all 12 winches on Saipem's *Semac 1* pipe laying barge, removing old grooving and welding new split sleeves onto the drums.

Next up, Saipem's *Castoro 10* barge will dock in the Indonesian port of Batam in January for a similar refurbishment. The winch drums on this vessel carry three inch (76.2mm) diameter wire rope in 14 layers.



Saipem's *Castoro 10* pipe laying barge

Are you getting the right advice?

Or are you being sold too much rope?

Hoisting applications are likely to create wear and tear on wire ropes, especially in multi-layer applications, where outer layers put pressure on inner layers. Therefore regular and methodical inspection of ropes is essential for safety. After all, a crane or hoisting appliance is only as strong and as safe as the wire rope that holds the load.

If you are one of those companies that has to replace your wire ropes regularly, you know what an expensive business it is.

However, what your local wire rope dealer might not be telling you is that you can make your rope last much longer by adding a Lebus sleeve to your hoist drum. The Lebus system ensures smooth spooling, creating less wear and tear on the rope, increasing rope life as much as five times.

It is a small investment to create a big saving. Lebus sleeves are just two or three per cent of the cost of a new wire rope.

Thank you to our local authorities



Lebus International Engineers GmbH would like to express its gratitude to the Burgermeister and Gemeinderat – the mayor and town council – of Finning for the excellent support that they have given to the growth of the business.



The mayor of Finning, Fritz Haaf and, above, the Lebus factory

When Lebus moved to its new premises in Finning in 2002, planning permission was speeded through the system in just six weeks. Lebus has repaid the council's faith in the company by re-investing in the area, acquiring more land for a factory expansion (on course for next year) and increasing the locally-recruited factory workforce from 15 to 25. Lebus is also now taking on apprentices from the local farming community.

Dalia's massive drum



This is the drum of the 405-tonne winch on Total Fina Elf's new Dalia FPSO vessel.

As previously reported, the winch was made by NFM Technologies of France, to whom Lebus



International Engineers GmbH delivered a pair of grooved split drum sleeves. The drum is 2690mm diameter and holds up to five layers of Redaelli 120mm diameter galvanised steel rope, one of the biggest non-rotating wire ropes ever made.

Engineers' Corner

Achieving Perfect Pitch

Perfect pitch. It is a term that means one thing to a singer and another to a salesman, but to a Lebus engineer it means something totally different again, for pitch is the width of the groove on a winch drum.

For smooth spooling, the pitch of the Lebus grooving is finely tuned to the precise construction of the specific wire rope being used. Lebus grooves allow ample but not excessive clearance between successive wraps of rope.

The new European Standard, EN-12385 Steel wire ropes Part 4: Stranded ropes for general lifting applications, sets out tolerances for wire rope sizes. It states that a wire rope can be no thinner than its nominal diameter but may be up to 5% thicker. Therefore a 20mm diameter rope, for example, may be anything between 20mm and 21mm throughout its length to meet the standard.

Previously most rope producers worked to the DIN 3051 standard, which the new EN standard replaces. The old standard allowed tolerances of between -1% to +4%.

However, the Lebus multi-layer spooling system requires tolerances of between +2% and +4%. A 20mm diameter wire rope on a Lebus grooved drum, for example, must actually be between 20.4mm and 20.8mm diameter.

The rope needs to be slightly larger to compensate for the fact that it deforms to oval ('ovalises') and it becomes fractionally thinner under tension.

If spooling is only in two or three layers, diameters up to 5% greater than the nominal rope diameter can be tolerated because the rope is not under so much pressure and ovalisation is limited.

By working closely with all the major wire rope producers over the years, Lebus knows the behaviour of



every rope construction from every producer. This unique knowledge is how Lebus is able to get the pitch right for every type of rope, and guarantee success.

However, it is not just the rope diameter that Lebus must take into consideration when designing the groove pattern.

These include:

- Rope construction: A soft, flexible rope (non-compacted or not pre-tensioned) requires a smaller pitch because it has a greater tendency to stretch. For compacted rope in applications up to six layers and 25 grooves, Lebus cuts the pitch 4% to 5% more than the nominal rope diameter.
- D:d ratio: The smaller the D:d ratio, the larger the pitch required.
- Number of grooves: The more grooves there are, the greater the risk of failure if the pitch is too big.
- Number of layers: The more layers of rope, the more closely the pitch must match the rope diameter.
- Safety factor: If the rope is designed with a safety factor of five to one, then a 100 tonne breaking load rope will only be tensioned by a 20 tonne force. If the safety factor is three to one, it will be tensioned with 33 tonnes and so will be more prone to stretching and thinning.

For further information, contact **Cris Seidenather** at Lebus on the number below.

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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