

BOLTED

THE END OF LUG WEAR

**GET TO KNOW THE INNOVATIVE PIVOT
TECHNOLOGY THAT ELIMINATES PLAY**

MATCH-FIT

**THE BEST WAY
TO COMBINE
NUTS AND BOLTS**

DOCK OF THE BAY

**WASHERS MAKE
DOCK CRANES
RUN SMOOTHLY**

HARD TO BEAT

**30 YEARS OF
HYDROPOWER
EXPERIENCE**

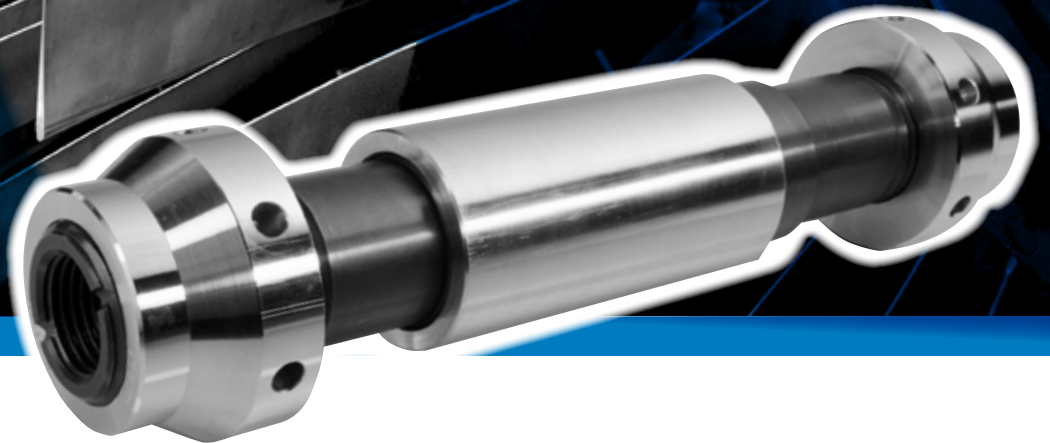
RECYCLING MAGIC

**GIVING SCRAP
METAL A NEW
LEASE OF LIFE**



HYDRAULIC COUPLING BOLT

HyFit, the new
advanced hydraulic
expansion bolt



Superbolt HyFit is designed to deliver high performance torque transmission for critical load rotating shafts and couplings. HyFit is ideally suited for steam and gas turbines. The solution can replace all designs of coupling bolts for every type of coupling requiring truly fitted bolts.

It has innovative design features that address the challenges commonly experienced with alternative coupling bolt solutions to ensure safer, more reliable installation and removal procedures.

With Superbolt HyFit you will benefit from both operational improvements in coupling performance and time savings during plant maintenance periods.



Bolted magazine is published by the Nord-Lock Group and strives to increase knowledge about bolt assemblies. The Nord-Lock Group is a world leader in bolting technologies and offers a wide product portfolio, including Nord-Lock wedge-locking solutions, Superbolt tensioners, Boltight hydraulic tensioning and Expander System. For further information visit www.nord-lock.com

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EDITOR-IN-CHIEF:

Carin Esberg Lagerstedt
carin.lagerstedt@nord-lock.com

PRODUCTION:

Spoon, Malmö
www.spoonagency.com

EDITORIAL MANAGER:

Ulf Wiman
ulf.wiman@spoon.se
Martin Östling
martin.ostling@spoon.se

LANGUAGE COORDINATOR:

Kristin Ludvigsson
kristin.ludvigsson@spoon.se

TRANSLATIONS:

Språkbolaget www.sprakbolaget.se

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Illustration: Dan Hambe

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Feel free to contact us with any comments:
bolted@spoon.se

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NORD-LOCK
GROUP

Who is your biggest competitor?

Recently, our CEO Ola Ringdahl was interviewed about the development of Nord-Lock Group and our role in the fastening industry. When asked, "Who is your strongest competitor?" he answered, "We only have one main competitor and that is 'ignorance'. For us, the challenge is to change an industry that continues to believe that bolting procedures must be a certain way. Many people still accept cumbersome, even dangerous, bolting assembly as well as retightening. Traditional methods such as deformed threads, welding, double nuts, locking wire, adhesive or bolt heating are still commonly accepted – even when they are far from practical or efficient."

The somewhat surprised interviewer commented: "You didn't even mention the competitors that copy your original technologies!"

"They are not our real competitors," Ola said. "We welcome those who participate in our quest to modernise the bolting industry, but the copy companies don't contribute to this. Our engineering and sales departments invest a lot of time and energy in educating and supporting customers. Our main challenge is to open the industry to new ideas and more effective solutions. We are creating a new market."

I guess you can say that Nord-Lock Group is simply busy making the world a safer place by offering the industry's most effective solutions to any bolting problem.

Speaking of old problems, in this issue of *Bolted* we focus on lug wear, which is common in pivot joints. But why does it occur, what solutions exist, and do they solve the root cause of the problem? Read all about it on page 8. You will get more Expander information in our customer case from Denmark on page 12.

Don't miss the good news about our recently launched lifetime warranty initiative on page 17 – another first from Nord-Lock Group!

Thank you for reading!


CARIN LAGERSTEDT
MARKETING MANAGER



08



12



15



CONTENTS

08 Ending lug wear

All moving pivots will sooner or later experience lug wear – end of story. Or maybe not: there is a solution that will potentially end this problem.

12 Not wasting time

Recycling metal scrap into new raw materials is tough on machines. But there are ways to minimise costly downtime.

04 SECURED BY THE NORD-LOCK GROUP

07 THE EXPERTS

15 Experience talks

Few can beat Mike Bruno's experience of Superbolt. For more than 30 years in the hydropower industry, it is still his go-to choice.

16 Nuclear safety

When transporting radioactive substances, there is no room for failing equipment. Nord-Lock washers help secure new containers.

17 OUTLOOK – THE WORLD OF BOLTING

SECURED BY THE NORD-LOCK GROUP

WORDS: ROXANA ORTIZ PHOTO: PACECO

HARBOUR GIANTS

CUSTOMER:
PACECO ESPAÑA S.A

ESTABLISHED:
1967

SHAREHOLDERS:
MITSUI GROUP AND URSSA, S. COOP.

PRODUCTS:
QUAY CRANES, YARD CRANES, SERVICES AND SYSTEMS FOR CONTAINER HANDLING

NORD-LOCK PRODUCT:
NORD-LOCK 20 / NL20

OFFERING CRANES, services and systems to the container-handling industry, engineering company Paceco España (Spain) must adjust to its customers' needs. As ships get bigger, quay and yard cranes must increase height and reach, while also becoming more efficient. Today, Paceco España can load and offload ships from 25 container lines. The company currently produces one of the largest and most efficient cranes on the market, the Portainer Malaccamax, which

maximally offers a 72.5-metre outreach, a 52.5-metre clearance under spreader, and a 30.48-metre rail span.

Paceco España first connected with Nord-Lock in 2009, when there was a problem with one of the company's quay cranes. The crane, with a 65-ton load capacity, had problems with the fixing of the gantry reducers – the gearboxes that move the quay crane along the dock. During operation, the fixing screws vibrated loose.

During their problem analyses, Paceco España's engineers connected with Nord-Lock and when it presented a solution, Paceco España was pleasantly surprised. "We have been using their washers since 2009, and haven't had any problems with bolted connections being subject to vibrations since then," says engineer Pelayo Bobes. "With Nord-Lock washers, we have been able to provide total customer satisfaction and in turn saved both money and time." ■

NO MORE LOOSE SCREWS DUE TO VIBRATIONS

Looking for a solution to their problem with loosening fixing screws, Paceco España turned to Nord-Lock. The resulting solution has stopped vital screws from vibrating loose.





DEEPWATER TENSIONER SOLUTION

CUSTOMER: SUBSEA INNOVATION, UNITED KINGDOM		APPLICATION: OFFSHORE STRUCTURES	PROJECT: STRUCTURAL PIPELINE REPAIR CLAMPS FOR EPRS
LOCATION: AUSTRALIA	BOLTIGHT PRODUCTS: 14 UNITS OF M120 AND 10 UNITS OF M150 BOLT TENSIONERS		

BOLTIGHT SOLUTIONS continue to be employed on more and more specialist applications in a multitude of markets worldwide. One example of this is Subsea Innovation, a UK-based company that serves the offshore industry. This company has been supplying subsea structures

for over 25 years, and recently secured a multi-million-pound contract in Australia.

For this project, Boltight has supplied tailor-made bolt tensioning equipment for structural split repair clamps. These are part of the Emergency Pipeline Repair System (EPRS) for gas pipe-

lines off the north and northwest coasts of Australia. Boltight designed and produced two sizes of tensioner to suit M120 and M150 bolts. These tensioners are used to tighten the main bolts located around the clamp body and are activated remotely using a hydraulic control system.

The tensioners have been designed as per Subsea Innovation's specifications, with Boltight adding its experience of supplying such solutions. The long-stroke, double-acting design means that they operate in both directions, so they can be reset without recovery to the surface. They are ideally suited for subsea use.

Boltight worked with Subsea Innovation to agree on testing and operational specifications, ensuring that the applied bolt tension is correct and that the overall EPRS system operates properly when called upon. All parts were supplied by Boltight within a strict delivery window.

The EPRS in Australia will act as a contingency if the main lines transporting gas need to be repaired. ■

ALASTAIR MACDUFF



SOLID JOINTS FOR RUGGED TERRAIN

CUSTOMER: HATTAT TRAKTÖR	LOCATION: CERKEZKOY, TEKIRDAG, TURKEY	PRODUCTS: TRACTORS FOR AGRICULTURAL APPLICATIONS
HORSE POWER RANGE: 50-102	NORD-LOCK PRODUCTS: NORD-LOCK WASHERS NL8 AND NL10	

A PRODUCER OF agricultural vehicles for close to 20 years, Turkish company Hattat Traktör knows that, when the going gets tough, it is the durability and reliability of their products that save the day. The company's customers often deal with rugged terrain for long periods, racing against time to maintain productivity, so their machinery must be able to withstand tough conditions such as handling vibration.

Early in 2017, when Hattat Traktör was testing a new tractor model, they realized that the joints on the air compressor-engine connection bracket were loosening because of vibration. According to the company's vibration analysis, this problem could have been solved by a costly and time-consuming change in the bracket design, or by replacing the loosening bolts with stronger ones.

At this point, the company's research and development department started looking for new components for their design. After days of

research and evaluation, they found Nord-Lock washers, which had the potential to save them from a more costly solution.

During the tests, Nord-Lock washers proved that they could solve the problem, and this solution was much cheaper than having to change the bracket design. With Nord-Lock washers in place, the vibration caused no more loosening, to the relief of Hattat Traktör customers, who can now rely on their red tractors, even under the harshest conditions. ■

EKIN CALISIR



PHOTO: HATTAT



ASK THE EXPERTS

Do you have a question about bolting technologies? Put the Nord-Lock Group experts to the test.

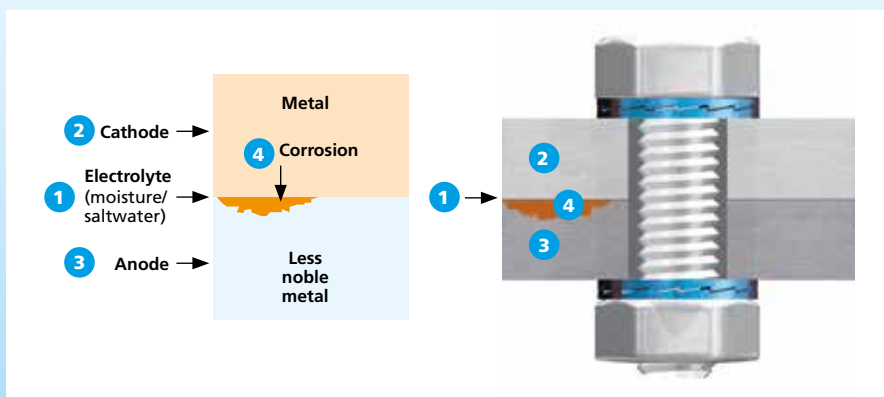
How to match materials correctly

Q: Can I use Nord-Lock stainless steel washers with steel bolts?

A: You can, as there is no difference in thread pitch between steel and stainless steel bolts. However, it is always best to use the same material for all parts of the joint. If you use a stainless steel washer together with high-strength fasteners of grade 10.9 or 12.9, you might deform the washers. These are only surface-hardened, and with a very high pre-load, the softer inside might incur "plastic deformation". Steel bolts of grade 8.8 or lower might work in many applications, since the mechanical strength of grade 8.8 is similar to the one for stainless steel washers.

Another important aspect to consider when designing a bolted joint, including stainless steel washers and steel bolts, is corrosion, especially so-called galvanic corrosion, which may reduce the product life dramatically. Galvanic corrosion damage is induced when two dissimilar materials are coupled in an electrolyte. When a galvanic couple forms, one of the metals becomes the anode and corrodes faster than it would by itself. The other material becomes the cathode and

Galvanic corrosion when coupling different materials



Galvanic corrosion requires the presence of an electrolyte, for example moisture or saltwater. The process starts when the electrolyte comes between the parts: the less noble metal will dissolve, and electrons will move to the nobler metal, which will corrode slower than it usually would.

corrodes slower than it would alone. Nord-Lock steel washers with Delta Protekt coating use the principle of controlled galvanic corrosion. Zinc

material in this coating protects the cathode (the washer steel material).

AB

The markings of nuts and bolts

Q: What do the markings on bolts and nuts mean?

A: Bolt heads and nuts are often marked with numbers, letters, dashes, slashes, dots, or an assortment of other marks. Fasteners commonly have two different markings: a unique manufacturer identification symbol – such as letters or an insignia – and information about the fastener strength. Such markings differ based on how the fasteners were made. See the table to the right for the alloyed steel metric and stainless-steel metric fasteners that comply with ISO standards. UNC thread fasteners mainly comply with ASTM standards.

Due to lack of space, markings can be missing on smaller sizes, such as those with diameters below M5 according to ISO 898-1. However, the bolt class must be marked on the head above this size.

Table of markings for ISO metric fasteners per material:

Alloyed steel		Nut
Applicable standard	ISO 898-1 – Alloyed steel bolts	ISO 898-2 – Alloyed steel nuts
Marking and related information	Numbers X Y X x Y x 10 = Yield strength; X x 100 = Ultimate strength, in MPa unit. Example: grade 10 9 Rp0,2 = 900 MPa; Rm = 1000 MPa	Number X X x 100 = proof load. Remember that the nut class “ X ” shall always be equal to or greater than that of the bolt! Example: grade 10 Sp = 1000 MPa
Stainless steel		Nut
Applicable standard	ISO 3506-1 – Stainless steel bolts	ISO 3506-2 – Stainless steel nuts
Marking and related information	N X - Y Y N : group of stainless steel. X : class of performance Y Y : class of strength. Y Y x 10 = Ultimate strength in MPa. Example: A 4 - 8 0 ; Austenitic material class 4; Rm = 800 MPa	

DT



THE END OF LUG WEAR?

In many industries, lug wear is simply accepted as an unavoidable fact of life. But does it need to be? Could the Expander System offer a viable solution?

WORDS:
NIC TOWNSEND

PHOTO:
NORD-LOCK

ILLUSTRATIONS:
DAN HAMBE



Any machine with moving pivots will eventually experience lug wear. The most common are applications subjected to heavy loads and vibrations, such as mining and construction equipment. Other common applica-

tions include industrial presses, wind turbines and moveable bridges. Any moving pivot in just about any application will experience lug wear at some point – the higher the demands, the faster the onset. When it happens, it will lead to a loss of precision and control.





➔ There are three main reasons why lug wear is inevitable when using conventional straight pins:

1. Lugs are typically made from softer material than the pin, causing them to deform when the two come into contact.

2. There is no pressure distribution in the lugs. This is due to the play between the lug holes and the pin, which is needed to mount the pin. When the pin is loaded, all pressure from the pin is forced onto thin lines in the lug holes.

3. The play enables the living force applied to the pin to hit the lug holes with full power as the equipment's moving direction changes.

THE MOST COMMON solution to lug wear is to repair the lugs with welding and line boring. The first step of this is to unload the pivot and dismount the pin. Then the line boring equipment needs to be lined up and "mounted" to the equipment. The worn lugs are rebored, filled up with weld, and finally rebored with a fine cut to the original diameter and tolerance. After removing the line boring equipment and repainting the lugs, a new replacement pin is installed. This whole process can take anywhere from a few hours to a few days, depending on the size and complexity of the installation. During this time, the machine is inoperable.

Despite the time and costs, this method is generally accepted as unavoidable. "It's just something everybody does because everybody else does it, and they're not even aware that there is another way," says Jonny Wiberg, development & research engineer, Expander System. "Repairs are just accepted, and people don't even look for another solution."

Over the years, engineers have searched for better solutions to the lug wear problem. None of the previous attempts has proven universally effective. One option is to use a pin that fits as tightly as possible into the lug's holes, practically eliminating the play between the two, and ensuring the best possible pressure distribution for a straight pin. Not only does this make the pivot expensive and the pin difficult to mount;

"It's just something everybody does because everybody else does it, and they're not even aware that there is another way"

JONNY WIBERG, DEVELOPMENT & RESEARCH ENGINEER, EXPANDER SYSTEM



Wherever there are moving pivots, there will eventually be lug wear. Even though heavy machinery is extra susceptible, there might also be lug wear in applications such as moveable bridges and wind turbines.



over time, the lug hole will expand anyway.

Using the temperature method, the pin is frozen and then allowed to get warmer and expand once installed, creating a perfect press fit in the lugs. Tolerances of both pin and lugs need to be exceptionally tight – down to some hundredth of a millimetre, or tolerance grade 6. This significantly increases the cost of the pivot. Pivots with frozen axles are often considered maintenance-free, but they are impossible to maintain, as the axle can't be removed.

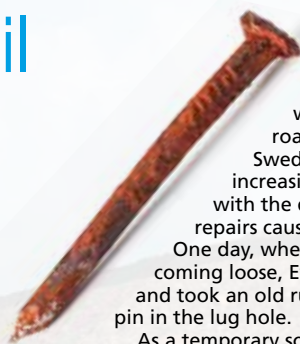
ANOTHER SOLUTION is to improve the strength of the lugs with bushings. However, this will only prolong the onset of lug wear, and will not eliminate the problem completely, as the bushings need to be replaced several times during the equipment's lifetime.

None of these solutions will completely re-

move the need for costly and time-consuming lug repairs. In contrast, the Expander System can potentially eliminate lug wear once and for all. It works by using a pin with tapered ends and expanding sleeves on each side. When it is installed, the sleeves expand radially, so that they fill the lug to create an exact press fit.

AS THE SLEEVES of the Expander System expand into the lug, they can take up unevenness or deformation, eliminating the need for welding and line boring. This significantly reduces the time needed for installation as well as the machine downtime. The most time-consuming process for installing the Expander System is the dismantling and removal of the original pin – a process that is also necessary before welding and line boring. In a recent example, the Swedish Expander System company was asked to do a cost

How a rusty nail led to an award-winning innovation



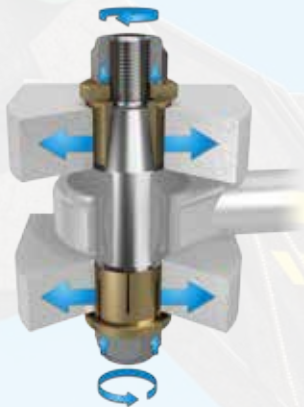
In the 1950s, twin brothers Everth and Gerhard Svensson were building roads throughout Sweden, and becoming increasingly frustrated with the downtime and repairs caused by lug wear. One day, when a pivot pin was coming loose, Everth improvised and took an old rusty nail to fix the pin in the lug hole. As a temporary solution, the rusty nail worked quite well and inspired

Everth to develop the Expander System. For many years, the twin brothers used expander products as they continued to build roads. However, it wasn't until 1986, when Everth's son Roger realized the ingenuity of his father's solution, that the concept was patented and the company Expander System Sweden AB was founded. In 1987, the Swedish Minister of Industry awarded the Expander System with the Innovation Development Award, in memory of Alfred Nobel.

Today, the Expander System is installed in millions of machine joints globally. ■



EXPANDER SYSTEM



When installed, the sleeves of the Expander System pin expand radially, filling the lug to create an exact fit.

comparison for a 70-millimetres axle. Considering the cost of the expansion bolt, the cost of pin removal and installation, plus the income loss from downtime, the total cost of the Expander System solution was calculated at around 500 euros. A conventional pin was around a third of the purchase price, while the costs of removal and installation remained the same. The time needed for line boring, in addition to the time taken for the transportation of line boring equipment, and the loss of income from significantly higher downtime, all contributed to a total cost estimation of over 2,300 euros.

USING THE EXPANDER SYSTEM will not totally eliminate the need for boring, but for the welding process. It will eliminate the lug wear problem for the lifetime of that pivot. Using conventional pins, lug wear would inevitably return and the repair procedure would need to be repeated. In a typical application, this happens three to four times during a machine's lifetime or every 3,000 or 4,000 hours. This means that the cost savings can amount to thousands of euros – for each machine. ■



GETTING OVER 6,000 EXTRA OPERATING HOURS



LUG WEAR IS a widespread problem for machinery pivots. It has cost users of machinery lots of money through the years – for repairs as well as for downtime. This is something that the Expander System can put an end to.

The Expander System will in most cases cost more than a traditional straight pin. But when all costs are fully calculated, including the time and costs associated with welding and line boring, and the loss of production due to downtime, the Expander System will prove to be significantly more cost-effective. The full extent of savings depends on many different variables, but it is fair to say that the higher the frequency of lug wear and the higher the costs of downtime, the greater the potential savings.

For Swedish construction machine supplier Maskinia AB, every minute of downtime for machine repairs means lost income. This is why they have been using the Expander System since 1999.

Recently, an excavator was brought in for repairs after 3,700 hours of operation. Using the Expander System, the boom mounting axle was replaced in just 6 hours. By contrast, the repair would have taken 3–4 days if it was replaced by a traditional pin, using the common method of welding and line boring.

Lars Malmén, Aftermarket Manager at Maskinia, says that, “The Expander System admittedly costs more than a traditional axle, but if you include repair time and stoppages with loss of income, the difference is clearly to the advantage of the Expander System. If you add the fact that Expander offers a 10-year function warranty, you can count on at least 10,000 problem-free operating hours – compared with the 3,700 that is regarded as normal for a traditional pin.” ■



The waste recycling business is at the forefront of sustainable work practices. The focus is increasingly on resource management and turning waste into new raw materials.

BIG OPPORTUNITIES FOR SMALL BUSINESS

Danish company Viggo Bendz has recently started supplying Stena Recycling with the Expander System for their grab machines - a potentially lucrative development for a small independent operator.

WORDS:
ALASTAIR MACDUFF

PHOTO:
NORD-LOCK GROUP, VIGGO BENDZ



AS PRICES continue to be down in the steel and metals industries, developing a successful partnership with a major customer can go a long way to securing profitability for a small business. The Danish company Viggo Bendz is based in Høng, on the west coast of Sjælland, the largest and easternmost of Denmark's islands. The company employs eight people and delivers solutions and equipment for crushing, demolition and sorting. Poul Erik Jakobsen is owner and CEO. He took over the running of the business in 2006, just three years after it was formed. "When I started," he says, "we were mainly dealing with excavators. Then one day I had a realization that the company would not survive in the future if we only sold certain kinds of bolts. We needed to expand our range in order to compete."

THE ABILITY TO ANTICIPATE change has been important to Viggo Bendz from the outset. Currently, one half of their business is parts for excavators such as teeth, buckets, cutting edges, hydraulic hammers and grabs. However, the other 50 per cent of their turnover comes from machines and complete plants for the environment and recycling business. Contractors are the main users of the Expander System bolts that they distribute, yet they have been well aware of Expander System's potential in the recycling business, where Stena Recycling is one of the main players.

Located in five markets – Sweden, Denmark, Norway, Finland and Poland – Stena Recycling



"Being able to offer reliable, long-term solutions gives us the chance to target customers in waste recycling and other sustainable businesses."

POUL ERIK JAKOBSEN, OWNER AND CEO, VIGGO BENDZ

is committed to sustainability in their business practice. The two companies have had a long relationship, with Viggo Bendz supplying standard bolts for over a decade. However, they recently offered Stena Recycling the Expander System to test on their so-called 'orange peel grabs' (see picture). With this kind of machinery subject to wear and tear through constant and prolonged use, Stena Recycling have now taken the opportunity to employ a solution that will reduce the need for maintenance and will increase the safety and machine life cycle, Jakobsen believes. He says that, "By introducing the Expander System, Stena Recycling is saving money. Because of the quality, it represents a long-term investment for them. The industry is tough at the moment, due to the market price for steel and metals. Longer machine life obviously means both greater sustainability and profitability."

THE IMPORTANCE of supplying a sustainable solution to today's market is something that Viggo Bendz knows well. The waste recycling business is one segment that is at the forefront of sustainable work practices, as companies increasingly focus on resource management and turning waste into new raw materials. More organizations are looking toward employing technology that enables this process and fits in with their sustainability strategy. Being able to supply a pivot solution that improves the durability and longevity of moving mechanical parts, means contributing something vital to the business of customers and to the environment as a whole. →



Grab machines work constantly and repetitively, developing pivot wear over time, which lead to machine reparations and downtime.

➔ As for being a smaller independent company in the current business climate, there are significant advantages according to Jakobsen. “We are focusing on quality products, which means that it is not always the cheapest solution for the customer. It is vital to us that we provide excellent service. Because of our size, we can be flexible and change direction quickly to help our customers and our own business if we need to.”

BEING A DISTRIBUTOR for the Expander System suits Viggo Bendz’ business model. They have a market presence all over Denmark, covering industries such as construction, mineral and scrap recycling. Currently Expander System accounts for around 200,000 euros of their annual turnover. Like almost every modern business, raising the company’s profile nationally has meant increasing their online presence. “We are focusing

a lot on social media now,” continues Jakobsen. “Once a week we try to upload a case story to Facebook. Every time we upload an Expander System case, we get a couple of new customers. This is something that we must continue to use to our advantage.”

WITH PRICING BEING crucial to compete successfully in the market for the foreseeable future, Viggo Bendz is both positive and pragmatic about its current position. “Yes, it is all about price,” Jakobsen says. “However, with Expander System we do not have so many direct competitors. Being able to offer reliable, long-term solutions gives us the chance to target customers in waste recycling and other sustainable businesses. Even travelling around locally, you see how many grabs and different machinery are in operation. This potential is exciting for us.” ■

FACTS:

THE SOLUTION

CLIENT:

Viggo Bendz.

END CUSTOMER:

Stena Recycling.

LOCATION:

Denmark.

PROJECT:

To provide solution for pivot wear on grab machinery.

NORD-LOCK GROUP PRODUCT:

The Expander System.

BENEFITS GAINED:

- Longer machine life.
- Less maintenance.
- Improved reliability.
- Increased uptime.

The Expander System: cost-effective and sustainable

WITH ITS FOCUS on sustainability and cost-efficiency, the waste recycling industry is tailor-made for long-term bolting solutions. Grab machines work constantly and repetitively, collecting, sorting and distributing waste of all kinds. Naturally, they develop pivot wear over time. Standard bolt fittings and joints become worn, leading to enforced machine reparations, which in turn lead to downtime.

THE DIFFERENCE with the Expander System is that it is installed directly into the existing mounting on the machines, and involves a simple process which avoids welding and line boring. As well as being cost-effective in terms of longer machine life and increased uptime, it also adheres to sustainability

principles, requiring less equipment and repeated repairs. By prolonging the lifetime on cylinder rod ends and moving mechanical parts, Expander System contributes to the increased safety and productivity of hard-working grab machinery.

The Expander System is installed on over 10,000 types of machines, covering more than 80,000 different pivot applications so far. The most common industries where they are being used are construction, manufacturing, oil & gas, mining, marine and agriculture.

WITHIN WASTE RECYCLING, The Expander System is not the only Nord-Lock Group solution to be hard at work. Several companies currently employ Nord-Lock Group products, including



large UK waste services company Biffa. They have been using the wheel nuts on all their Mercedes trucks since 2012, having found them safer, more reliable and cheaper to source than standard locking wheel nuts.

"Every day, there are new challenges"

When it comes to long-term Superbolt users, American Mike Bruno is hard to beat. More than 30 years ago, he was involved in one of the earliest installations of Superbolt tensioners in a hydropower turbine. Today, he continues to praise the performance of these tensioners. Here, he shares some inspirational insights.

WORDS:
CHAD HENDERSON

PHOTO:
JOHN KELLY

You first worked with Superbolt tensioners at Diablo Dam in 1984. How did that come about?

"I was a machinist working at Seattle City Light, the electric utility for Seattle. We worked out of the machine shop down there, and we would go up and be labour support at Diablo Dam. In 1984, they were doing a stator-rotor inspection on the turbine, so they had to remove the rotor; that involves taking the thrust bearing apart, which is mounted on the turbine shaft. It is very important that the thrust block is perpendicular to the shaft within less than one-thousandth of an inch. Otherwise, it will have run-out and wobble."

How did the Superbolt tensioners help with that?

"Back then, to get the right tension in the bolts, you had to heat the bolts so they would elongate, do the installation, and then wait for them to cool overnight. If the thrust bearing wasn't sitting right on top of the shaft, you had to do it all over."

"The engineers at Diablo Dam had been in contact with Superbolt, and they modified the bolts so you didn't have to go through this long process. Instead, we could tighten up those little bolts. If the thrust bearing wasn't exactly perpendicular, you just tweaked the bolts on the opposite side. It was a very labour-saving modification."

Today, you work at Wells Dam. What do you do there?

"I've been with the Wells Hydroelectric Project for about 17 years, managing and monitoring the project. What I've always enjoyed about my work is that every day there are new challenges or something that you've got to fix. We've got air systems, electrical systems, mechanical systems, hydraulic systems – all these different auxiliary systems that feed the turbines that run 24 hours a day."



Mike Bruno first came across Superbolt tensioners during the Diablo Dam project back in 1984. They have been part of his arsenal ever since. He now says that, "They're very reliable."

How has the dam been modernized over the years?

"One of the ways that it has been modernized is that we have installed PLCs on the majority of our alarm systems. Today, we have over 2,500 alarm points on different systems. This allows us to set more parameters for the alarm points, and we can also trend over time and compare with different machines. If something is starting to fail, you can set up a parameter to get an alarm so you can look into it before the failure actually happens."

"We are also using Superbolt tensioners when rebuilding our turbines. They're being used in the load screws that hold the turbine bearing shoes in place, and in our turbine's outer head cover, where you can't access the bolts with a big wrench because it's close quarters. They're very reliable." ■

FACTS: MIKE BRUNO

TITLE: Project Superintendent, Wells Hydroelectric Project, Douglas County Public Utility district

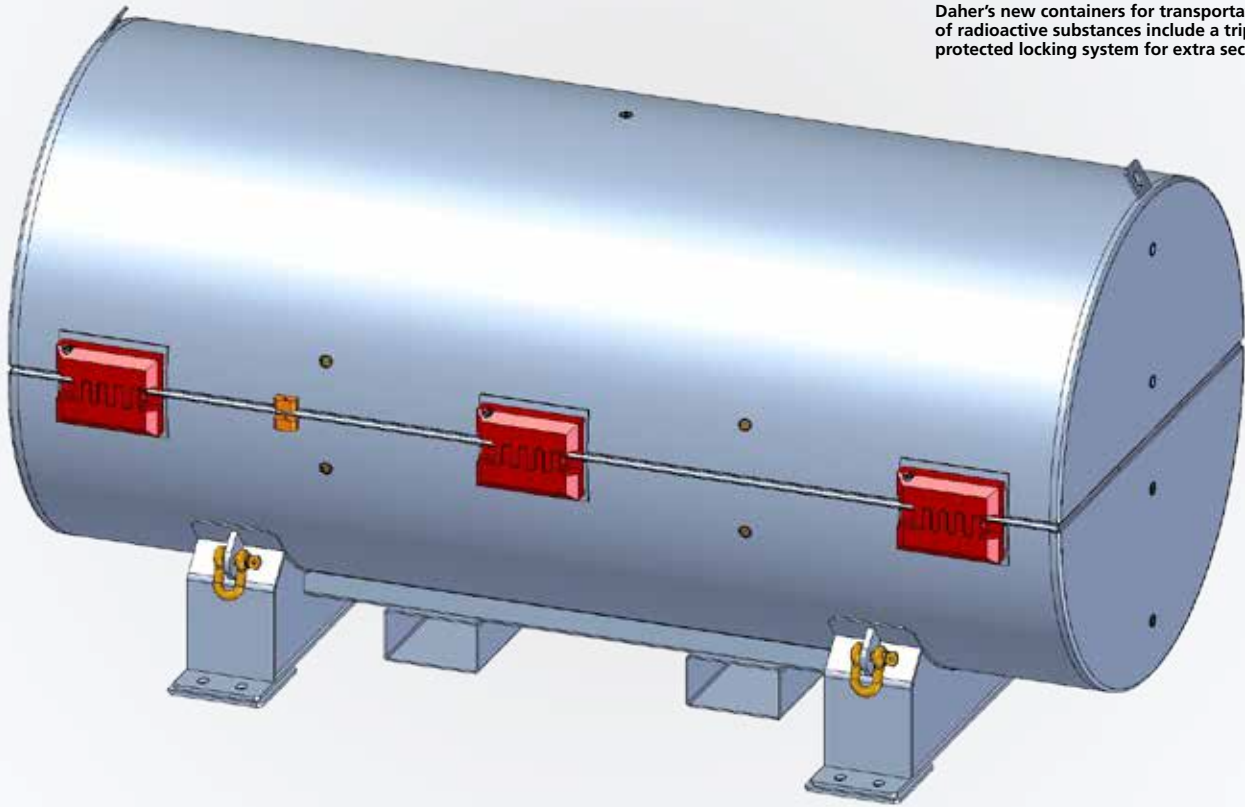
AGE: 60

LIVES: Chelan, Washington

BACKGROUND: Has a degree in industrial technology from Shoreline College; also studied at Cogswell College. Worked at Seattle City Light as a hydro machinist and foreman until 1990, then as a mechanical supervisor for the Skagit River Hydroelectric Project until 2000. Since then with Wells Hydroelectric Project.

PASSION: Married with three grown daughters, two granddaughters. Enjoys bow hunting and playing golf.

Daher's new containers for transportation of radioactive substances include a triple-protected locking system for extra security.



Triple-protected for nuclear safety

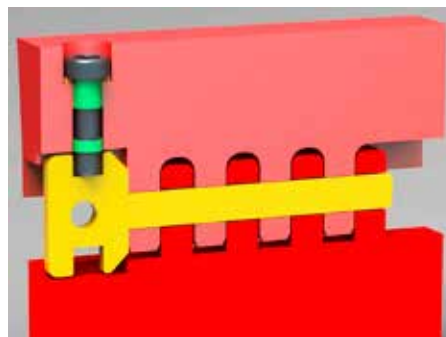
WORDS:
ULRICH SCHAMARI

ILLUSTRATIONS:
DAHER NUCLEAR TECHNOLOGIES

THE CHALLENGE Daher Nuclear Technologies GmbH, located in Hanau close to Frankfurt am Main, Germany, develops containers for transportation of radioactive substances. For obvious reasons, these containers must be extremely safe.

Designing a new container for uranium hexafluoride transports, the company had to consider the very stringent international and national requirements, including the recommendations of the International Atomic Energy Agency (IAEA) for transport by road, rail and sea. A container that fulfils these requirements must, for example, be resistant to the mechanical and thermal loads that can occur in case of an accident.

These mechanical accident loads are defined by a sequence of tests that include a 120-centimetre fall, followed by a 9-metre fall, followed by a fall from 1 metre onto a spike. The container must remain sealed, so that the subsequent thermal test, a fire, doesn't jeopardise the container's safety.



Each lock is secured by two bolts. A pair of Nord-Lock wedge-locking washers under the second bolt ensures that the container remains safely locked.

THE SOLUTION Daher set out to design the container locks so that the locking bolts would, under no condition, come loose or be lost during the loading of the container onto a lorry or during transport. The company's intensive search for the optimal solution led to Nord-Lock wedge-locking washers of type NL16-254SMO. These

safety washers are an important component in Daher's triple-protected locking system: the lock is secured with a bolt, which in turn is locked in position by another bolt. The wedge-locking washers from Nord-Lock are located under the second of these bolts. Each container has six locks and each lock is equipped with a Nord-Lock washer pair.

THE RESULT Thanks to the use of Nord-Lock wedge-locking technology, the locking systems on the Daher transport container for the nuclear industry can no longer be worn by vibrations or stress, but remain tightly and securely locked. Daher was also pleased to find how cost-effective the use of the Nord-Lock product is, and how easy the maintenance is. If needed, the wedge-locking washers can be replaced at any time to ensure that the transport containers remain in top condition. The containers have a service life of more than 30 years – something that the Nord-Lock washers contribute to. ■

Nord-Lock offers industry's first ever Lifetime Warranty

UNDER THE NORD-LOCK GROUP'S new Lifetime Warranty concept, each of the company's products will now be covered by the most comprehensive warranties in its respective market.

"We were the first to develop the wedge-locking washers, multi-jackbolt tensioners and expander pivot pins, and now we're the first in our industry to introduce lifetime warranties," says Ola Ringdahl, CEO of Nord-Lock Group. "This is a very bold and important step for us, and continues our journey of being first."

Nord-Lock washers and Superbolt tensioners will now be covered by a lifetime warranty that guarantees they will stay in place and fulfil their function for the entire lifetime of that connection.

THE LIFETIME WARRANTY CONCEPT will also see warranties on other Nord-Lock Group products greatly enhanced and expanded. The Expander pivot pin continues to be covered by its warranty lasting for ten years or 10,000 hours of operation – by far the most generous warranty for any pivot pin on the market.



Nord-Lock is also setting the standard for the best warranty conditions for hydraulic tensioning equipment, with Boltight standard products, which are now guaranteed to function for three years, or 10,000 cycles.

"OFFERING A LIFETIME WARRANTY is a very clear way of showing that we have absolute confidence in our products," Ringdahl adds. "It's proof that we genuinely believe that the quality of our products is the best in the industry."

The Lifetime Warranty concept was officially launched at the 2017 Fastener Fair in Stuttgart, Germany, and will be marked by a specially designed logo. ■

NIC TOWNSEND

"Offering a lifetime warranty is a very clear way of showing that we have absolute confidence in our products."

OLA RINGDAHL, CEO, NORD-LOCK GROUP



Superbolt withstands piping-hot steel

SAFETY. The JFE Steel Corporation's West Japan Works is one of the largest and most advanced steel mills in the world. Like all steel plants, the operating conditions are exceptionally demanding on machines and equipment, and potentially hazardous for personnel – especially the hot rolling mill, where molten steel is flattened and stretched into thin sheets. The temperature of the steel will reach at least 450°C (842°F).

Until recently, the fasteners that connected the decelerators and pinion stands on the hot rolling mill, were tightened using a 300-kg weight, which was suspended from the ceiling via a crane. The weight would be pulled from a makeshift scaffold, before

letting it hit the wrench like a hammer. Overall, the procedure involved five people: three to pull the weight, one to fasten the wrench, and one to operate the crane. It took an hour to tighten each bolt, and the multiple safety risks for the personnel involved were considerable.

Switching to Superbolt multi-jack tensioners has turned one of the riskiest maintenance tasks in the plant into one of the safest. Each connection can now be secured by one person in just 15 minutes. With eight bolts on each mounted application, the overall reduction in downtime and increase in productivity is significant.

In fact, Superbolt multi-jack tensioners



have proven so successful that they have been implemented in JFE Steel's other hot rolling mills in Fukuyama and Chita. ■

KEISUKE OKADA & NIC TOWNSEND

Taking the next step with “all-in-one” technology

SUPERBOLT has its origins in the US steel industry and has been providing a wide range of bolting innovations for a variety of industries since the 1970s. Its ongoing success within Nord-Lock Group’s portfolio is based on a knowledge of customer challenges and a commitment to supplying practical solutions to the market.

Launched in December 2016, HyFit and VersaTite tensioners continue Superbolt’s tradition of versatility. Superbolt multi-jackbolt tensioners have been on the market since 1984, allowing bolted joints to be tightened mechanically, without specialized skills or heavy tooling. HyFit is hydraulically actuated, while VersaTite uses both mechanical and hydraulic tightening. Easy to fit and remove, they are offering safe and efficient operations and increased uptime to customers worldwide.

“TO HAVE BOTH MECHANICAL and hydraulic options is a huge advantage in many industries,” says Steve Brown, Global Product Manager, Expansion Bolts. “HyFit is ideally suited for use on high-speed couplings on gas and steam turbines, and on marine propulsion



drives. Traditionally fitted bolts must have a close tolerance. The fitting and removal of these are often problematic and can lead to damage of the couplings and costly downtime for customers.”

Both HyFit and EzFit (previously named EB, mechanical Expansion Bolt), are designed to offer a simple easy-to-fit solution that, once tightened, will provide a long and reliable lifespan.

VERSATITE, AS THE NAME SUGGESTS, is a versatile tensioner that allows customers the flexibil-

ity of both hydraulic and mechanical tensioning and removal. Combining the speed of hydraulic tensioners and the accuracy of the Superbolt mechanical variant, it has been developed to improve operations in several industries since its launch at the Power-Gen International show in December 2016. “This type of ‘all-in-one’ technology represents the next step for Nord-Lock Group in terms of providing the market with a new generation of bolting solutions,” Brown says. ■

ALASTAIR MACDUFF

New video spotlights railway safety



THE NEW NORD-LOCK GROUP film is well worth watching – and sharing. An important and timely customer testimonial, the YouTube video tells the story of how Irish Rail started

using Nord-Lock washers two years ago, after experiencing problems with a locking-wire mechanism on their wheel sets. Vibrations were causing bolts to loosen, resulting in

significant safety concerns. The film spotlights the benefits that Irish Rail is now enjoying since adopting the Nord-Lock solution.

IRISH RAIL OPERATES and is responsible for the internal railway services in the Republic of Ireland, as well as a service between Dublin and Belfast in Northern Ireland.

“Since the introduction of the Nord-Lock washers, we have not had one instance of a bolt coming loose, which gives us a lot of comfort from a safety point of view,” says Conor Doyle, Senior Fleet Technical Support. “There has been a massive cost-saving in that the old arrangement with wire-locking was time-consuming. When using the Nord-Lock washers, it is a much safer, reliable and repeatable process.” ■

ALASTAIR MACDUFF

Watch the film on our website:
www.nord-lock.com/irish-rail



HAPPY ENGINEERING

We know what it is like to invent something others never imagined. We also know that being determined and focused is what drives any development process forward.

The belief that people can change the world by imagining that anything is possible; engineers who go to work each day determined to take on the world's most difficult bolting challenges.

That is why we empower those who dare to dream of new things, who challenge convention and push boundaries, securing the critical infrastructure we all depend on.

We are proud to be original innovators. Being the first to offer a full lifecycle warranty across all our technologies, enabling engineers to shape modern living in the decades to come.

**LIFETIME
WARRANTY**

**NORD-LOCK
GROUP**

**NUMBER ONE
IN BOLTING**

**THE INDUSTRY'S FIRST
FULL LIFECYCLE WARRANTY**