NORD-LOCK GROUP

EXTENDING THE LIFE CYCLE OF MINING EQUIPMENT

WHY LUG WEAR SHOULD NO LONGER BE ACCEPTED AS UNAVOIDABLE ON HEAVY-EQUIPMENT FLEETS

Expander®

REPAIRING PIVOT LUGS AGAIN AND AGAIN: IS THIS STILL 'ALL IN THE LINE OF DUTY'?

Authors Gene Roberts and Rod Whipple, Nord-Lock Group

In this paper, we discuss a proven technology that eliminates the downtime and cost that accompany excessive wear between heavy machinery pivot lugs and the conventional pivot pins that secure them. We highlight cases that demonstrate the value in the field of this technology. Further, we suggest preemptive steps that onsite personnel can take to ensure a smooth transition from old-style pivot pins to draw benefit from the new technology.

Cat 793B Stabilizer Link Assembly

Challenge: stop accepting pivot-repair cost and downtime as facts of life

Whether it's a 400-ton haul truck or a Swiss watch, every machine with parts that pivot has to contend with friction and wear. A glance at the out-of-round bore of a lug on an ultra-class haul truck's steering system tells the story: The pivot pin was harder than the lug. The softer metal has worn away. And without corrective action, excess play in the joint will mean increasing loss of stability, safety, and control.

The traditional PM solution (after, in many cases, lancing and cutting out the old pin) is to weld new metal into worn pivot mounts, rebore the lug, and install a new pin… just like the one that wore out the bore in the first place. Next PM cycle, repeat. Time-consuming and costly? Sure, but that's the way it's always been done.

Today, however, pressures for life-cycle extension and downtime reduction have never been more intense. So it's more and more difficult to accept conditions like these:

- An Arizona mining company found it was servicing drag-links on suspensions on its 23 Liebherr T282B haul trucks every 8,000 hours. That meant lengthy down time — a full 12-hour shift — for each machine, at an estimated cost of $27,000 per truck.
- One Wyoming mining operation, with a fleet of 50 Cat 793B trucks, was servicing stabilizer link assemblies every 10,000 hours. Each service and repair logged 12 unproductive hours per truck. Analysis of the replacement process on-site put the total cost per pin at more than $8,000.
- A mine in Michigan, operating 17 Cat MT4400 trucks, was sustaining five days of downtime per machine per PM cycle, as machinists welded and line-bored radius rods. A company official estimated downtime losses across the fleet at more than $2.5 million per cycle.

In each of these cases, and many others, experienced maintenance teams put the blame for repeated, labor-intensive repairs on conventional pivot pins. Obviously, the time to look for a better pivot-pin technology is now.

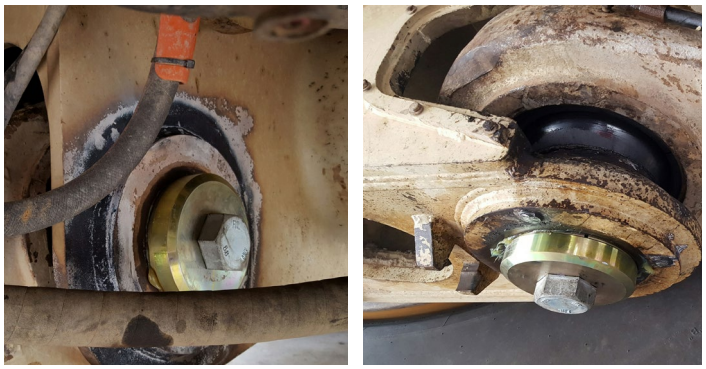
But still we meet maintenance managers who don't realize the improved technology is already here. It's a smarter pin system that eliminates most wear and tear on lugs, once and for all. And it's been proven for decades in industries that depend on heavy equipment — like mining, construction, oil and gas, and forestry — across the United States and around the world.

> "Because welding and line boring are nonexistent or limited, the Expander System greatly reduces repair time. Not having to maintain pivot mounts every few thousand hours means our operating costs will be significantly lower."
>
> — Les Tabbert, Maintenance Shop Lead, Westmoreland Coal Co., Alberta, Canada

Solution: a cost-effective system that stops pivot-pin wear in its tracks

What if damage-prone pivot pins were actually engineered for the job? What if they could:

- Slip into position just as easily as old-style pins;
- Adapt to out-of-round bores tightly enough to eliminate destructive play between parts;
- Distribute working loads evenly throughout the bore;
- And, as a result, eliminate pin-to-lug wear completely?



Liebherr T282 drag-link ends

Previous examples are just some of the advantages of the Expander System, a cost-effective solution developed by the hands-on engineers at Nord-Lock Group. Want proof? Here's what happened at the three mines mentioned:

- At the Arizona operation, every haul truck's drag-link suspension depended on a total of eight pivot pins. Excessive bore wear meant taking each machine down for maintenance every 8,000 hours. Lancing out the old pins, welding and line-boring, re-bushing, and pinning typically took a full 12-hour shift. When the mine ran a 15-month, 9,500-hour trial with Expander, the test truck showed zero movement or wear in the bores. Those results convinced the mine to install Expander pins on all 23 trucks in its fleet.
- The Wyoming maintenance shop made the Expander System standard throughout its 50-truck fleet after a test showed massive savings on the stabilizer link repairs. Expander reduced pin installation time from a 12 hour shift to a single hour while simultaneously extending pin life from 10,000 hours to 50,000 hours. The mine has since added Expander Pins to the Rear Suspensions as well.
- At the Michigan mine, conventional radius-rod repairs necessitated downtime that was costing $30,000 per day, per truck. A two-man team of machinists was taking at least a week of 10 to 12-hour shifts to weld and line-bore each of 17 trucks. Adopting the Expander System dramatically reduced downtime and cost. With old-style pins, repairs on 17 trucks (at five days per truck) added up to 85 days of downtime. With Expander, projected productivity gains — not including substantial labor savings — total $2,550,000 per cycle.

Smoothing the transition: moving up from conventional pins to the Expander System

The Expander System is designed for easy installation with ordinary tools. That's one reason maintenance supervisors report that the new technology is trouble-free. After making the change, our contacts in the field offered these transition tips:

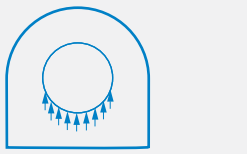
- Follow the instructions exactly. "For example, Expander says to set the recommended torque, then run the machine through its full range of motion, and then double-check the torque to be sure everything is seating properly. On something like an excavator, after you put the machine back to work, be sure to check the torque one more time at the end of the shift. The only issues we've had were when the guys got too impatient — they just finished the install and away they went without checking he torque again."
- Safety first. "Observe the procedures your operation has in place, including the simple stuff like wearing personal safety gear and making sure the equipment you're working on is properly staged or cribbed or stabilized. You want to get the job out of the shop, but you want to stay in one piece yourself."
- Find ways to be flexible. "In the mining industry, sticking to the torque schedule can be an issue. The machine goes out for 12 hours, comes back in, and then has to go back out right away. So we sat down and rethought our mine's work schedule. Now the main job still gets done, and we get the most out of the machine and the new parts we've installed."
- Insist on education and training. "It won't take long, so make sure everybody who works on installation and maintenance has seen, or heard of, or used the new system. All the old skills still apply, but your people have to be aware that there's a new device in the shop."

EXPANDER SYSTEM

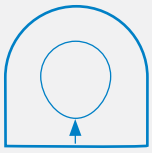
Under torque, the tension washers push the expansion sleeves up the tapered section of the axle, locking the system into the lug ears and eliminating movement that causes pivot wear. The double-sided locking mechanism provides increased stability, security, and a backlash-free joint. Field installation, for reduced downtime and cost, is easy. For high-vibration applications, Nord-Lock's special vibration-resistant washers are integrated.

The basic Expander System is a patented pivot technology with a design including:

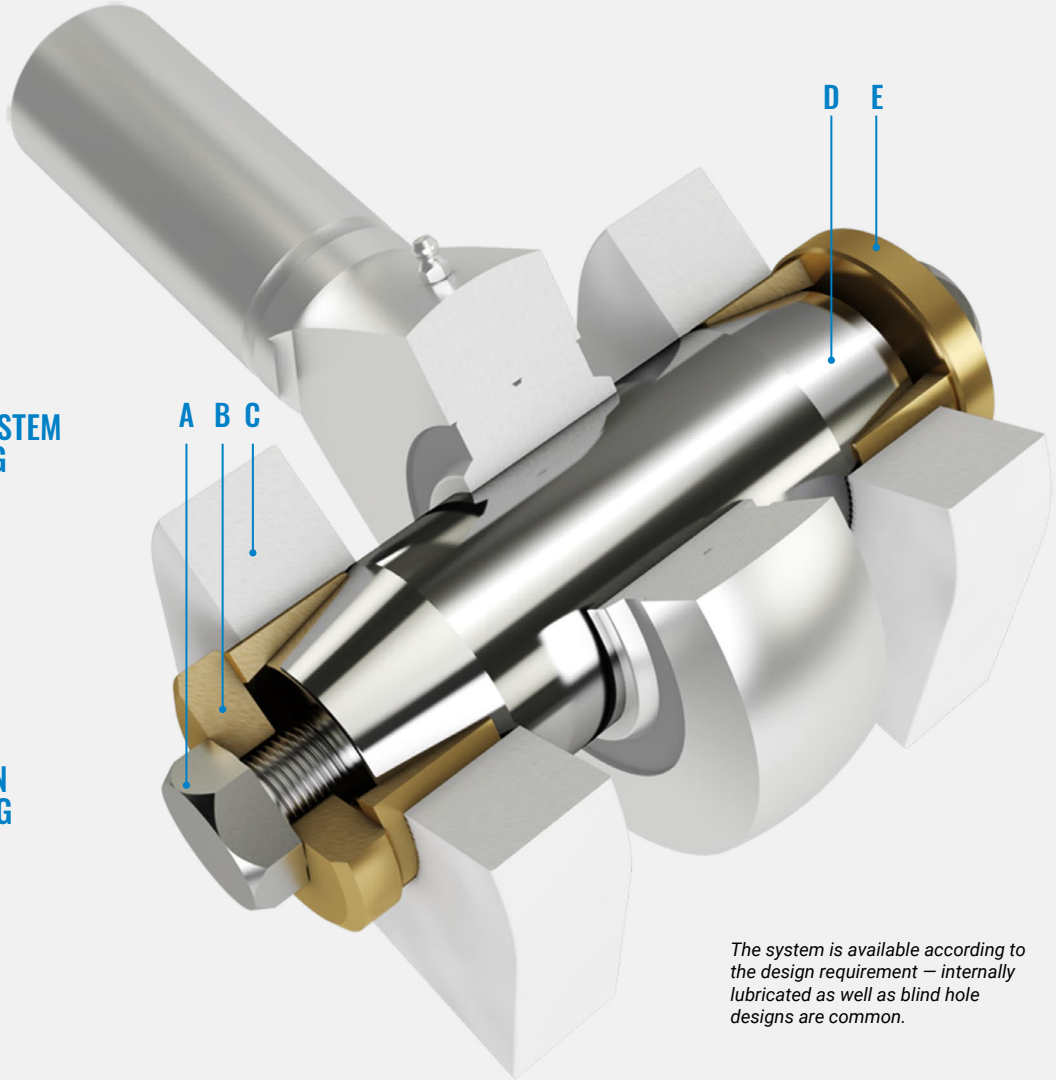
- Tapered axle/pin
- Expansion sleeves and tension washers
- Fasteners



EXPANDER SYSTEM FORCE ON LUG



TRADITIONAL STRAIGHT PIN FORCE ON LUG



The system is available according to the design requirement — internally lubricated as well as blind hole designs are common.

How it works

A

When the fasteners are tightened, the washers press the slotted expansion sleeves up the tapered ends of the pin.

B

The sleeves expand to conform with wear patterns in the lugs and lock the system in place.

C

Expander System fits into the existing lugs without expensive welding and line boring.

D

Once installed according to instructions, the system locks solidly to both lugs for significantly improved stability.

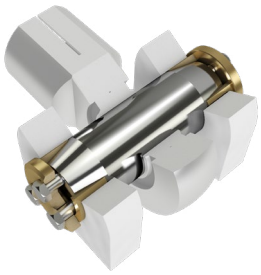
E

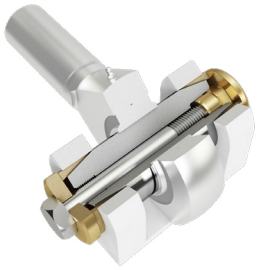
Removal and reinstallation are equally easy, and comes with a lug wear warranty of 10,000 hours.

LIFETIME WARRANTY
10 YEARS / 10,000 HOURS
Expander

The perfect pivot pin for any requirements

Expander Systems are used in new machines for best lifetime and high quality feel or as a repair solution during service, regardless of the application, big, small, large volume or one piece production we have the solution for you. With experience in designing systems for more than 80,000 applications our design teams in Americas and Sweden knows how to help you achieve what you want with your pivots. All systems can be supplied with or without internal greasing and material certificates.

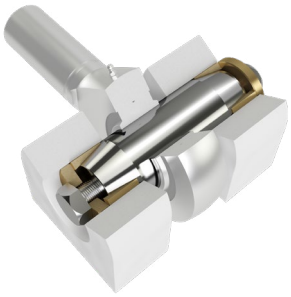


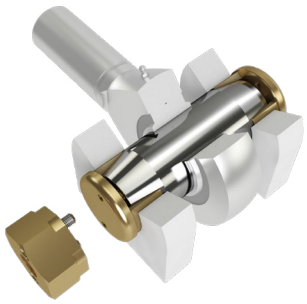


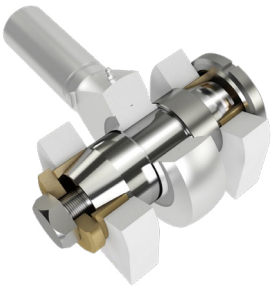
We design and manufacture any size, diameter and length of pin.

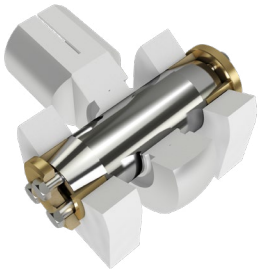
Our designs can be adapted to the needs of the application such as space constraints, single side mounting or flush mount.

Special is standard for us — we do designs such as axial locking of bearing and have a vast experience in adapting for extreme environments or enhanced safety requirements.









VALIDATED, VERSATILE, AND FIELD-TESTED

Expander Systems have been field tested for more than 50,000 hours without a failure. We've developed more than 80,000 pin locations for a large variety of machine makes and models. Ask your Expander System representative about custom designs for your specific needs.

About the authors:

Gene Roberts has spent more than 20 years supporting customers worldwide, through his work in product development, OEM business development, manufacturing, and sales.

Rod Whipple is an industry veteran with 10 years of technical sales experience. He supports Expander dealers, representatives, and end users by providing physical and technical support in the field.

PIVOT PIN ENGINEERING EXPERTISE

Now it is your turn to make lug wear a thing of the past. Whatever challenges lug wear is causing your excavators, mobile cranes and dump trucks, we will work with you to maximize uptime and minimize maintenance costs.

Over 30-years of advancing and perfecting our pivot pin technology has given us unprecedented expertise in the sector. No matter your engineering challenge — Expander System has the perfect pivot pin solution for you.

To learn more about Expander or connect with our regional sales teams visit
www.expandersystem.com

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