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INSIDE:

- **EMPHASIS: TOP PRODUCTS OF 2005**
- **ROUNDUP: SECONDARY OPERATIONS**
- **SPOTLIGHT: MATERIALS (WIRE, ROD, BAR)**

PLUS:



Throw a Wrench Into Your Fastener Applications

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Joint failures due to loose and broken fasteners are often a very expensive problem resulting in untimely repairs, replacement of equipment, production downtime, unhappy customers and loss of business. Sometimes it is also a dangerous situation, and one that can lead to lethal disasters. As a result, from demolition machines to top-fuel dragsters, the industry is adopting an innovative fastener locking system that utilizes a unique wrenching technology to put a stop to failures and costly downtime, service and equipment replacement.

What causes mechanical fasteners to loosen and shear is usually some external force such as vibration, torsion, shock or temperature changes. In the past, Design Engineers were forced to use bolts with insufficient stretch because of a tight fit or other configuration problems. Regardless of the cause, once joint integrity is lost, even the most advanced equipment is likely to fail.

Product Design Engineers and Service Technicians know that attempts to save on costs by using commercial fasteners are often false economy. Indeed, skimping on quality fasteners sometimes results in spending more rather than less, not only for scheduled maintenance that could be avoided, but particularly when equipment failures result.

Generally, fasteners loosen and back out because that is the reverse of the mechanics applied in their installation. When that likelihood is obvious, Mechanics and Engineers might apply creative measures such as wiring, welding, piercing and staking of bolts or the use of engineering adhesives on threads. Whether or not such countermeasures actually work, the process usually begins with using a wrench to install a bolt.

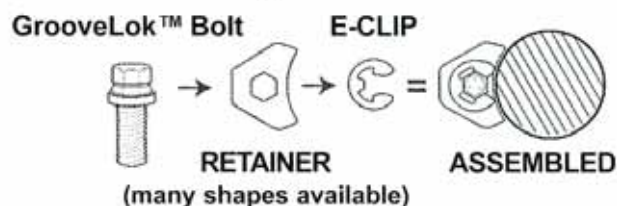
Throwing a Wrench Into Traditional Fastener Technology

That basic installation procedure has caused one fastener manufacturer to look "back" to the wrench for a solution to fastener and joint failures. Engineers at STAGE 8 Locking Fasteners, Inc., San Rafael, CA, USA,

asked: If a wrench is a good tool for bolt tightening, couldn't a retainer be used like a wrench to lock a bolt tight? The answer was yes, but like most seemingly simple concepts, it took many years to develop and test locking "retainer" fastener designs that would serve the diverse applications of the firm's customers.

Today, firms in many industries are using the resulting retainer-based locking fastener systems to solve a variety of critical joint problems. This active mechanical locking system virtually eliminates critical joint failure due to bolt loosening to nearly eliminate fastener replacement, emergency repairs, costly downtime, loss of customer trust and potential liabilities.

STAGE 8 makes the only active mechanical locking fastener designed to stop joint failure/production downtime by preventing thread loosening from starting. Its patented GrooveLok™ fastener locking system acts like a small wrench locked onto a bolt head. The locking retainer is braced against a nearby abutment (e.g., frame, casting or protrusion) to lock a bolt or nut in place. If there is no abutment to brace against, a bridge retainer can fit over two or three bolts to lock them together, or a retainer can be bent over an edge or a frame. For counter-bored applications, the locking fastener system offers a secondary counter-bore, a milled slot adjacent to the main counter-bore, into which a locking retainer (i.e., "wrench handle") is fixed. Once installed, fasteners never need to be re-tightened because loosening never has a chance to start.



The patented GrooveLok™ fastener locking system acts like a small wrench locked onto a bolt head.

The system retrofits existing components, is fully reusable and has been used in items as small as eye-glass screws, to nuts as large as 8" (203 mm) used for holding generator propellers in a hydroelectric dam. To date, the system has no reported failures in more than 10 million installations including industrial, mining, construction, manufacturing, automotive, railroad and miles-deep oilfield drilling assemblies.

Keeping it Together at 360 MPH

Sometimes engineers and mechanics accept frequent service intervals, including repeated tightening of fasteners as a fact of life. When it comes to extreme joint applications, they might be even more resigned.

On the racetrack, engineers are forever searching for improved fastening solutions to battle the extreme

abuse racing puts on machinery. Take for example the fasteners used to hold the hub bushing on the rear end assembly of a 7000 HP top fuel dragster.

"We had problems with the way our old fasteners were retaining," said Engineer **Jeff Capek** of **Strange Engineering**, a Morton Grove, IL, USA manufacturer of racing equipment. "Due to extreme pressure and vibration, the hub was moving around and flexing on the axle. The fasteners would back out, so we tried staking them, which was just a temporary solution. Some racing teams actually welded these fasteners to the steel bushing, to keep them from rotating out. But then the fasteners can shear off if the bolts aren't big enough. The bushing walks out and then the hub moves around on the axle—a dangerous situation as it causes erratic handling at speeds over 300 MPH."

STAGE 8 Locking Fasteners are used to hold the hub bushing on rear end assemblies made by Strange Engineering.



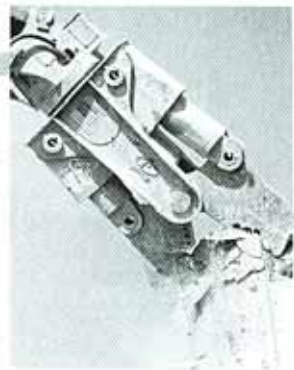
Capek added that loose fasteners in the rear end of a top fuel dragster or funny car can get chewed up in a bearing or in a gear. "You could wreck a US\$20,000 rear end assembly, simply because four screws came loose. And, you could lose prize money and ranking, or somebody could get hurt."

Capek contacted STAGE 8 for help. "We sent some parts and STAGE 8 mocked up what it thought would work. The company is willing to customize fasteners if needed, but in our case we were able to use something off the shelf. So, we tested the prototype and we have had no problems at all in field trials. The hub runs true and everything stays together," Capek said. "There's no maintenance, and you don't have to check to see if the fasteners are tight, because they are mechanically locked. This is still a prototype situation for us, but so far these new fasteners are looking good."

Preserving Demolition Equipment

Because, vibration, shock and heat energy are the natural enemies of joint integrity, **Stanley LaBounty**, the Two Harbors, MN, USA division of **The Stanley Works** of New Britain, CT, USA (the maker of Stanley Tools), has now incorporated this new fastener technology into some of its tool designs. One such tool is the Universal Processor, best described as a large, hydraulic pair of scissors attached to and powered by a hydraulic excavator. This tool is used to take down large structures such as bridges, buildings, above ground storage tanks and other structures.

Stanley LaBounty Universal Processor uses GrooveLok™ fastener technology in its pivot jaw assembly to avoid premature pivot failures, costly downtime and warranty issues.



"This tool is subjected to extreme vibration and loading," explained Stanley LaBounty Project Engineer, **Mike Swanson**. "It is used to crush concrete and cut beams, and is about the most demanding application you can think of. You have everything from beams and walls to buildings falling down on the product—one of the harshest environments imaginable."

Swanson said the company wanted to avoid fastener problems on the machine's newly designed jaw pivot assembly (where the upper, moveable jaw connects to the lower jaw) that might create expensive downtime and require costly warranty service. "We wanted to enhance the service life of the pivot. While conventional fasteners were desirable from a cost standpoint, they would not have provided the reliability needed for a primary tool that must endure the extreme stresses and environmental harshness," he explained.

"After reviewing STAGE 8 designs, we decided GrooveLok might be a good way to avoid premature pivot failures. We field tested the setup and it worked well. We now use them in our production," Swanson said.

Cost-Performance Perspective

When it comes to fasteners and many other commodity items that may be engineered into a product, cost is always a consideration—or should be. Yet, savvy engineers also evaluate cost-performance benefits of components that can make their products better, safer and less expensive to operate. Even though slightly more expensive, the use of specialized fasteners could result in major savings through prevention of premature failures as well as the related service costs.

And use of an active mechanical design like GrooveLok could eliminate costs associated with fastener inspection. Finally, when fastener clamp load is critical, you might want to consider this new locking retainer technology. Put a wrench in your application.

To learn more, contact STAGE 8 or Circle 201.



Company Profile...

Stage 8 Locking Fasteners, Inc. is a privately held company that provides engineered upgrades for the automotive, railroad, manufacturing and industrial markets worldwide. For over 20 years, the firm's proprietary GrooveLok™ Active Mechanical Fastener technology has offered product assemblers simplicity and performance.