

STANLEY ENGINEERED FASTENING FAMILY OF BRANDS

STANLEY. Assembly Technologies TUCKER AVDEL. INTEGRA **NELSON** ΟΡΤΙΛ POP'

Vibration Loosening





The ongoing trend toward lighter, smaller products leads to an increase in the amount of vibration in a joint

- Lighter materials vibrate more
- Most smaller fasteners can tolerate less vibration

The safety & reliability of threaded joints often determine the overall safety & reliability of mechanical and structural systems

Joint failure can be catastrophic





Engineering Challenges

Causes of threaded joint failure



Dynamic Load

- Vibration
- Changes in temperature
- Variable clamp load
- Operation outside of original design constraints



Assembly Process

Unable to achieve intended tightening torque in production environment

- space constraints
- lack of appropriate equipment



Consequences

- Product warranty recall
- Production plant shutdown
- Ecological damage
- H&S falling parts

STANLEY. Engineered Fastening

Our Purpose

Empowering engineers to create our future.

Reduce

environmental impact.

Improve

employee safety.

Improve

end-customer experience.

Optimize

production output.

Achieve lowest

total solution cost.

Purpose in Action

Helping Oshkosh improve quality while driving down install & service costs

Oshkosh Truck Corporation was experiencing vibration loosening on military, commercial and firefighting vehicles - despite using locknuts and adhesives. This led to unacceptable warranty and service costs

Testing of Spiralock[®] nuts and taps in critical Oshkosh threaded joints resulted in an end to the loosening problems as well as documented cost savings

- Simplified assembly eliminate thread locking compound
- Eliminate service & warranty cost



"Working with Stanley engineers was a great experience - We came looking for a nut to eliminate rattling and loosening, and we got one that eased assembly as well. We ended up with a better design and happier customers" <u>Peter Chard, Senior Manufacturing Engineer - Pierce</u>

Solving threaded joint failure



Solutions

- Mechanical lock through eliminating clearance between male and female threads
- 2. Mechanical lock to prevent relative motion at the bolt/nut head
- 3. Correct application of torque during assembly





1. Eliminating thread clearance



When a standard thread is tightened the tension in the bolt pulls the flank of the bolt thread against the flank of the female thread. This friction will hold the joint together. When a large enough vibration is generated it will exceed the frictional force at which point the bolt will try to move into the clearance between the bolt and the female thread.



SPIRALOCK™



The Application

Use with standard bolts:

- Aerospace NASA securing instrumentation
- Auto F1 and NASCAR chassis & cockpit
- Truck Turbo nuts
- Oil & Gas down-hole drilling equip
- Medical critical implants



Our Solution

- Qualifies as secondary retention
- Accommodates expansion at high temperatures
- Free-spinning
- Re-usable
- Fatigue-resistant
- Self-centring





The Challenge

- Extremely high temperatures
- Extremely high vibration
- FOD Falling Object Debris
- Common cross-threading
- Assembly & disassembly for maintenance & repair



Strategic Benefit

- Patented Product
- Locking fastener with
- unlimited locking performance
- Another innovative solution for our global customer base



SPECTRALOCK™

The Application

Use with standard nut or tapped hole

- Electronics Nylock patch replacement
- Auto Engine component
- Rec equip Husqvarna lawn mowers
- Adhesive replacement



Our Solution

- SPECTRALOCK will free spin into a conventional female thread
- Once torque is applied, the SPECTRALOCK bolt will engage with the female thread, having three contact points for locking performance.





The Challenge

- Failing adhesive solutions
- Breakage of special taps
- Cost pressure
- Complexity of assembly
- Debris from patches/adhesives causing equipment malfunction

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Strategic Benefit

- Production efficiency
- Lower Total Cost of Ownership
- Lower warranty rate



2. Mechanical lock at the bolt/nut head

WEDGELOCK[™] is a mechanical solution that delivers consistent application of sufficient clamp force to prevent relative motion between the bolt head or nut and the joint

- 1. Fastener head bearing surface ramps mesh securely together with washer ramps during fastener installation
- 2. This seated torque or clamp load forces the washer bearing surface locking serrations to embed into the application providing a secure locking mechanism

Under dynamic load, the head and washer wedge ramps ride up against each other creating greater bolt tension and clamp force. This action provides a positive mechanical locking solution minimizing and or eliminating the potential for fastener loosening



WEDGELOCK™

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The Application

Where locking is essential - e.g. runway lighting

- Standard internal thread
- Joining dissimilar materials
- Soft/problematic mating materials
- Screw thread forms e.g. tapping screw
- Thick platings



Our Solution

- Integrated ramps increase consistency of applied torque & eliminate head to washer slip point
- Locking serrations embed into the application bearing surface to create a secure mechanical bond





The Challenge

- Incorrect assembly lost/missing washers
- Joining soft materials
- Inventory reduction
- Serviceability of existing locking solutions



Strategic Benefit

- Poka-yoke Single washer SEMS assembly
- Ensures correct orientation of the washer
- Eliminates hazards of lost and miss-oriented washers
- Reduce SKU's (2/3 to 1)









SPIRALOCK™

- For use with standard male thread forms

SPECTRALOCK™



WEDGELOCK™

- For use with standard tapped holes

- Joining dissimilar materials
- Soft/problematic mating materials
- Screw thread forms e.g. tapping screw



STANLEY Engineered Fastening

The Stanley Engineered Fastening Difference

- Global manufacturing and R&D
- Local responsiveness: long-standing customer relationships
- Total Systems approach
- Continuous innovation & deep application engineering expertise
- Full lifecycle commitment to customer value





Next Steps

- 1. First step
- 2. Second step
- 3. Final step