

How To Prevent Threaded Assembly Failure

Our thanks to Loctite for allowing us to reprint the following article.

Threaded fasteners are the most common detachable hardware, used on thousands of products including automobiles, aircraft, household appliances, and industrial machinery. With more than 300 billion fasteners used annually in the U.S., it is crucial that these fasteners predictably and reliably maintain clamp force on the parts they join.

Why Threaded Assemblies Fail

Threaded fastener loosening due to vibration is the number one cause for catastrophic machinery failure. Such failure occurs when clamp load is not maintained. Gaps that naturally exist between the mating surfaces of threads directly impact the fastener's ability to stay tightly fixed. These tiny gaps allow side-to-side movement when exposed to vibration and thermal expansion or contraction. Side-to-side movement loosens the mated parts, reducing clamp load and ultimately causing the fastener to fail.

Mechanical locking devices were invented to solve the problem of loosening, but all designs have inherent flaws:

- Split ring or spring washers are designed for increased friction, which reduces clamp loads. These mechanical locking devices are not reliable when exposed to dynamic loads.
- Tooth or ribbed flange bolts are expensive and require large flange-bearing surfaces. They also can damage the surfaces of the mating parts.
- Tab washers, split pins, and castle nuts are costly and time consuming to lock as they require that components be lined up appropriately before being set.
- Nylon nuts increase friction, which results in inaccurate torque during assembly.

Many of these locking devices loosen over time when exposed to vibration, thermal expansion or improper torque. Mechanical locking devices require that the user keep an extensive and costly parts inventory to fit all fastener shapes and sizes. They do not seal the threads, leaving assemblies susceptible to rust and corrosion.

Preventing Threaded Assembly Failures

Invented more than 50 years ago by Henkel Corporation (then Loctite®), anaerobic threadlockers are single-component adhesives that cure into tough thermoset plastics when exposed to active metals and deprived of air. Threadlockers completely fill the voids between

interfacing threads, which prevents side-to-side movement and ultimately prevents loosening.



Loctite® threadlocker between the interfacing threads.

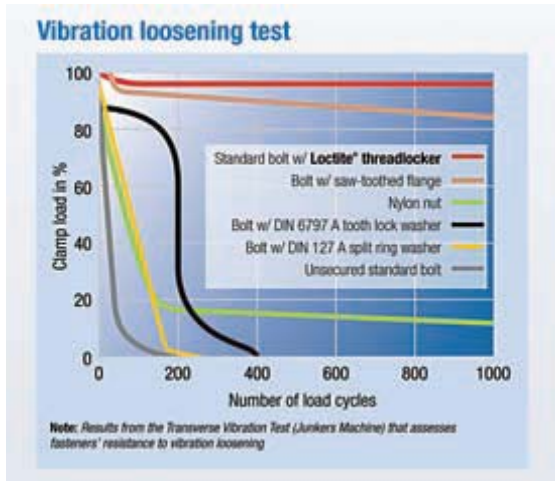
Threadlocking adhesives are the most reliable and cost-effective method of ensuring a threaded assembly will remain locked and sealed for its entire service life. Available in a variety of strengths, they offer excellent temperature resistance, rapid fixture/cure speeds, and easy dispensing. For ease of use, threadlockers are available in liquid, gel, stick, and tape forms, and can be used on any shape or size fastener. The newest threadlocking adhesives chemistries provide higher temperature resistance, improved oil tolerance, and primer-less performance.

Cost per locking application

Fastener Size	Split Ring Washer	Loctite® Threadlocker
3/8"	2¢	2¢
5/8"	9¢	5¢
7/8"	25¢	7¢

Note: Washer pricing based on 100 units purchased at an industrial distributor. Loctite® pricing based on 50-ml bottle price and number of drops required per application.

Loctite® Threadlockers offer lower cost per unit compared to most locking devices



Anaerobic threadlockers act as lubricants during fastener tightening, which allows applied torque to be converted into high clamp load instead of dissipating as friction or heat. Once cured, threadlockers provide a reliable seal, preventing leaks, galling, and corrosion that can seize threads and prevent disassembly.

Spec in Reliability with Anaerobic Threadlockers

Anaerobic threadlockers have dramatically increased the reliability of threaded assemblies.

To spec in reliability, specify Loctite® anaerobic threadlockers. When it comes to resisting vibration, preventing corrosion/leakage, improving quality, and reducing weight, size and overall cost of an assembly, mechanical fasteners just don't hold up.

Loctite® Threadlockers provide better clamp load retention compared to mechanical locking devices



How to Apply Liquid Threadlockers

For through-hole assemblies, threadlockers are applied where the nut and bolt will meet when fully tightened. For blind hole assemblies, threadlockers are applied to both the bolt and the mating threads. Low viscosity, water-thin liquid threadlockers can be applied post-assembly.

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LOCTITE

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