

# How to Stop Thread Galling on Stainless Fasteners

By Joe Greenslade

A few times each year we receive calls from fastener suppliers who are in conflict with their customer over the quality of stainless steel bolts and nuts. The customer's complaint is that during installation the bolts are twisting off and/or the bolt's threads are seizing to the nut's thread. The frustration of the supplier is that all required inspections of the fasteners indicate they are acceptable, but the fact remains that they are not working.

This problem is called "thread galling." According to the Industrial Fastener Institute's 6th Edition Standards Book (page B-28),

*"Thread galling seems to be the most prevalent with fasteners made of stainless steel, aluminum, titanium, and other alloys which self-generate an oxide surface film for corrosion protection. During fastener tightening, as pressure builds between the contacting and sliding, thread surfaces, protective oxides are broken, possibly wiped off, and interface metal high points shear or lock together. This cumulative clogging-shearing-locking action causes increasing adhesion. In the extreme, galling leads to seizing — the actual freezing together of the threads. If tightening is continued, the fastener can be twisted off or its threads ripped out."*

Carpenter Technologies, the fastener industry's largest supplier of stainless steel raw material, refers to this type of galling in their technical guide as "cold welding." Anyone who has seen a bolt and nut with this problem understands the graphic nature of this description.

The IFI and Carpenter Technologies give three suggestions for dealing with the

---

**Fortunately, stainless steel bolt and nut galling problems do not occur everyday, but when they do it usually creates a customer crisis.**

---

problem of thread galling in the use of stainless steel fasteners:

- Slowing down the installation RPM speed will frequently reduce, or sometimes solve completely, the problem. As the installation RPM increases, the heat generated during tightening increases. As the heat increases, so does the tendency for the occurrence of thread galling.
- Lubricating the internal and/or external threads frequently eliminates thread galling. The suggested lubricants should contain substantial amounts of molybdenum disulfide (moly), graphite, mica, or talc. Some proprietary, extreme pressure, waxes may also be effective. You must be aware of the end use of the fasteners before settling on a lubricant. Stainless steel is frequently used in food related applications which may make some lubricants unacceptable. Lubricants can be applied at the point of assembly or pre-applied as a batch process similar to plating. Several chemical companies offer anti-galling lubricants.

One such source, EM Corporation, suggests their Permaslik® RAC product for use at the point of assembly. They suggest Everlube® 620C for batch, pre-applying to stainless steel fasteners.

- Using different stainless alloy grades for the bolt and the nut reduces galling. The key here is the mating of materials having different hardnesses. If one of the components is 316 and the other is 304 they are less likely to gall than if they are both of the same alloy grade. This is because the different alloys work harden at different rates.

Another factor affecting thread galling in stainless steel fastener applications is thread roughness. The rougher the thread flanks, the greater the likelihood galling will occur. In an application where the bolt is galling with the internal thread, the bolt is usually presumed to be at fault, because it is the breaking component. Generally, it is the internal thread that is causing the problem instead of the bolt. This is because most bolt threads are smoother than most nut threads. Bolt threads are generally rolled, therefore, their thread flanks are relatively smooth. Internal threads are always cut, producing rougher thread flanks than those of the bolts they are mating with. The reason galling problems are inconsistent is probably due largely to the inconsistencies in the tapping operation. Rougher than normal internal threads may be the result of the use of dull taps or the tapping may have been done at an inappropriately high RPM.

Fortunately, stainless steel bolt and nut galling problems do not occur everyday,

*Continued on page 17*



*Joe Greenslade is President of Greenslade and Company, Inc. located in Rockford, Illinois. His firm specializes in providing manufacturing tooling and inspection equipment to suppliers of screws, bolts, rivets, and nuts throughout the world.*

*Joe is an inventor, author, and lecturer. He holds eleven U.S. Patents, has written over 80 technical articles for industrial trade journals, and has spoken frequently at trade association meetings and technical conferences on issues related to industrial quality for*

*the past ten years.*

*He is an Associate Member of the Industrial Fastener Institute and a member of the American Society of Mechanical Engineers B1 Thread Specification Committee. In 1992, Joe was recognized for his technical and innovative contributions to the fastener industry when, at age 44, he became the youngest person to be inducted into the National Industrial Fastener Show "Hall of Fame."*

## Thread Galling

(Continued from page 7)

but when they do it usually creates a customer crisis. Knowledge of why this occurs and how to remedy it can save the supplier much grief and many headaches.

Here are some questions that should be asked and the suggestions that should be made immediately when you are confronted with a customer's complaint about thread galling:

*1. Are you using the same driver RPM you have used in the past to install these stainless fasteners?*

If they say they are driving them faster than in the past or if they say this is a new application, suggest they immediately try slowing the driver RPM and see if the problem goes away. In general, a stainless bolt of a given size should be driven slower than a steel bolt of the same size.

*2. Are the bolts and/or internal threads lubricated?*

If they say, "no," suggest they try lubri-

---

## When thread galling occurs in stainless steel bolt and nut applications, do not panic.

---

cating the bolts and/ or internal threads with one of the lubricants listed earlier in the article. If this eliminates the galling, you might want to batch lubricate the remainder of the order to eliminate the extra work of applying lubricant at the point of assembly.

In applications where galling is a repetitive problem, it is advisable to supply the fasteners with pre-applied lubrication to eliminate future problems.

*3. Are you using the same grade of stain-*

*less steel for the bolts and nuts?*

If the answer is, "yes," you can suggest changing one or the other to a different grade.

Be sure the suggested grade meets their corrosion needs and changing the material does not cause a procurement problem.

When thread galling occurs in stainless steel bolt and nut applications, do not panic. Try the suggestions listed; one or a combination of these will probably resolve the problem immediately. □

### NEW ADDRESS!

## Greenslade & Company

2234 Wenneca Street  
Fort Worth, TX 76102  
817-870-8888, 817-870-9199 Fax

## **New Compound Overcomes Stainless Bolt and Nut Thread Galling**

Several times each year I receive calls from suppliers who have sold stainless steel bolts and nuts to a customer who is encountering thread galling problems during assembly at the time of their call. Stainless steel fastener users usually jump to the conclusion that the bolt threads are out of specification. Evaluation of the bolt and nut threads usually indicate that the threads are within specification and that is not the root cause of the problem.

For reasons not completely understood, some stainless steel bolts and nuts gall and seize in the threads while being assembled, even before the bearing surfaces come in contact with the assembly components. It is felt by many that thread roughness on either or both the internal and external thread is at least one of the factors contributing to thread galling.

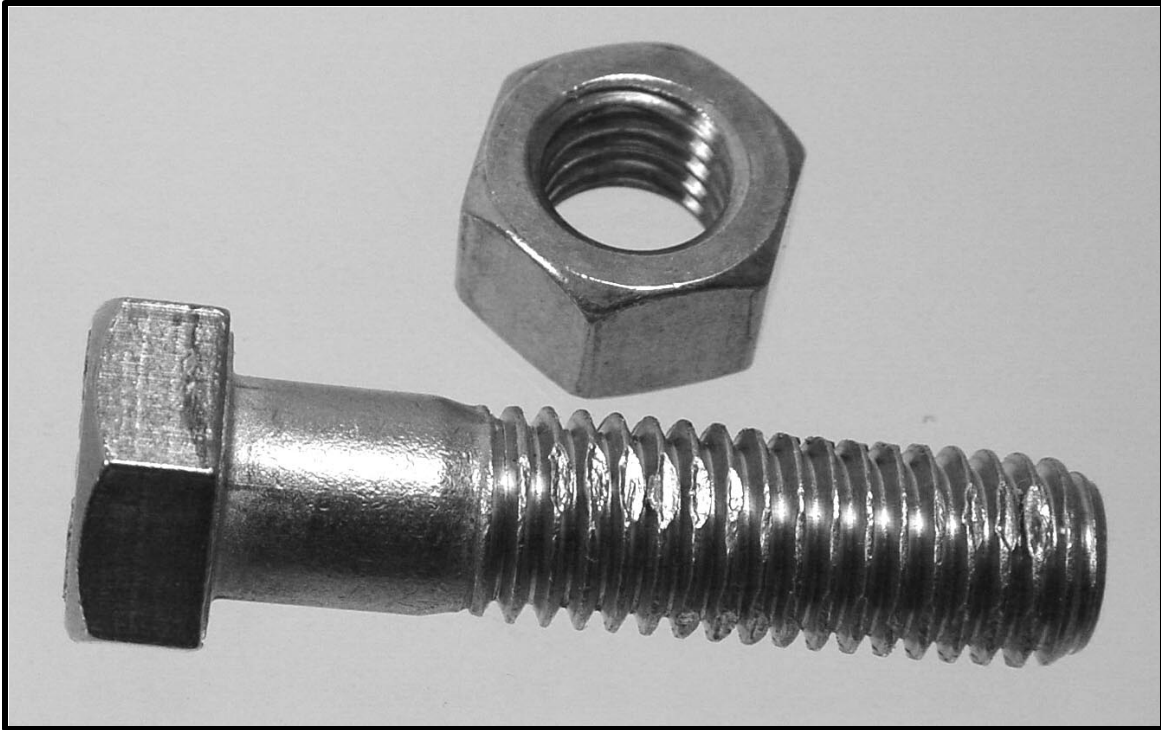
Several years ago I wrote an article about this subject and stated that there are three possible solutions to stainless steel thread galling:

1. Add a lubricant to the bolt.
2. Slow the driver speed if the fasteners are being installed with a power driver.
3. Mismatch the grades of stainless (make the bolts of 302 stainless and the nuts of 316 stainless) if possible.

All of these are still valid suggestions, but none of them is a full-proof solution. Those having a galling problem might have to try all three approaches to find the one that resolves their particular situation. The addition of some type of lubricant is probably the most commonly utilized solution.

Since writing the previous article on the subject of stainless steel thread galling, I have continued to seek even more dependable solutions to suggest for solving this troublesome problem. Recently a supplier told me of a new anti-galling compound he had tried that provided some amazing results. I was told that this compound could be put on severely nicked stainless bolts threads and that a nut of the same grade of stainless could be completely assembled on to the bolt without thread seizing and galling.

I like to verify performance claims for myself before passing the information on to others. In this case, I obtained some of the anti-galling compound directly from the compound manufacturer and conducted my own test. The pictures in this article are a record of my test.



Stainless steel bolt with intentionally damaged threads.

The threads of a 1/2-13 302 stainless steel bolt were severely damaged by striking them repeatedly with a hammer. It was reasonable to assume that a 302 stainless steel nut would not go on this bolt without completely seizing on the bolt's thread due to thread galling.



Anti-galling compound placed on bolt's end threads.



Nut goes entire length of bolt thread without seizing.

The compound was rubbed on the last three to five threads of the bolt's point end and the nut was started on the bolt. As would be expected, as soon as the nut encountered the bolt's thread nicks the torque required to rotate the nut immediately increased. What was not expected was that the nut could be screwed the full length of the bolt thread without the threads seizing together as a result of galling.

I would never suggest that a user try to use bolts with threads as severely damaged as those in my test. Based on these test results, I believe this compound can probably provide an effective solution to many, if not all, of the routinely occurring stainless steel thread galling problems.

Fastener suppliers who regularly supply stainless steel threaded fasteners should obtain some of this compound and conduct this simple, but dramatic test themselves. If they find the same results I did, they should consider keeping some of this material available for their customers when galling problems occur.

The anti-galling compound used in this test is called "**Fastorq® A/G**". This anti-galling compound is manufactured by Fastorq® Bolting Systems. Those wanting more information can contact Fastorq® at 800-231-1075 or go to their web sight at [www.fastorq.com](http://www.fastorq.com).