Safe Tourque Values – STV from “Airheads Beemer Club Archives” by Sam Van Wyck

Because 85 to 95% of typical tightening torque serves only to overcome friction, a modest change in the lubricity of the bolt/nut/object relationship can result in major changes to applied torque. A typical distribution of torque when applied to a fastener is:

- Bolt Extension: 8.1%
- Nut/Face Friction: 39.6%
- Thread Friction: 45.4%
- Prevailing Torque: 6.9%

Wet or Dry?

It is the "wet or dry" question that effects the general formula for determining Safe Torque Values (STV). Any substance added to the threads of a fastener, whether it be anti-seize, Locktite, spit or camel dung, effects the torque and clamping force characteristics. To make things even more interesting, the volume and viscosity of the substance, the binding or lubricating qualities, the number, pitch and diameter of the bolt threads ALL combine to make your next R-bike Tech Day a calculator filled bunch of fun.

Let's see how easy this all is: "What if I want to determine the STV of a 1/4" , 16 thread pitch, Grade 5 bolt using Loctite 271 Red in the a "normal volume"? Simple: The substance you apply to the threads has a "K-factor" which is an adjustment factor from a pure "dry" application. I don't know the exact K-factor for spit but the K-factor for Loctite 271 in normal amounts is .22. The clamping force of a 16 pitch, 1" diameter, Grade 5 bolts is 2,000 lbs.. So the STV, based on my poor memory of *the most basic torque formula is: >.22 X .25 X 2,000*, or 110 inch/pounds For some reason that doesn't look right so don't take that as gospel because I normally use a computer generated program "Torque" that calculates everything down to exacting and often times boring details.

What does Locktite Technical Staff say?

The Locktite Corporation Technical staff recommends: **Decrease the specified torque values by 20% when using the Locktite Purple, Blue or Red on dry bolt specs!** I confirmed this today with Loctite by telephone. The 20% decrease in specified torque helps to prevent over torquing the bolt during installation but also helps prevent over torquing when removing the bolt or nut. Pre Load Torque and Break Torque - It was either Newton of Hugh Hefner that was once quoted: "What goes on must come off". The same is true for fasteners. I have always called the torque to put an item on the "pre-load" and the torque required to remove a fastener the "break" torque. *ALL fasteners will lose torque over time*, that is why it is important to periodically check the head and cylinder torque values. The pre-load and break-free torque values and whether you apply Loctite to the threads is very important. Why? Because Loctite will significantly reduce the amount of loosening effects on the fasteners. If you applied full torque to a bolt with Locktite and later tried to remove it, the effort to break the bolt free would be excessive and could result in bolt fracture or a pulled stud from the crankcase.

- Check your torque setting periodically.
- Use stock nuts, bolts and lock rings.
- If you use Locktite or Anti-Seize or anything, be aware it has a big impact on the torque values.
- Most bolt and stud *failures result from under torquing rather than over torquing.* The reason for this is that a loose bolt will experience a sustained bending force that will eventually fatigue the bolt, the item being fastened (cylinder head) or object being fastened to (aluminum R-bike engine case).
- A change in the bolt/nut will effect the torque specs, nylock nuts, split lock rings, stainless steel bolts/nuts, flange or non-flanged nuts/bolts.