



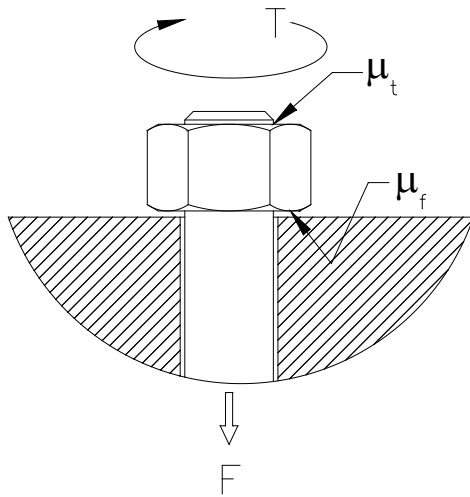
THE IMPORTANCE OF LUBRICATION ON BOLTING

In a bolted connection, it is important to torque the bolts and nuts properly to achieve the required bolting force that is used to keep the parts together. The recommended bolt make-up torque is calculated based on the bolt size, material, etc. and the friction force between the threads and at the nut face. The friction force is affected greatly by the lubrication and lubricating method used on the bolt.

To illustrate the importance of lubrication, consider a simple case where a bolted connection has one 1.00”-8UNC bolt and 361 ft-lbf make up torque is specified to achieve the 30988 lbf desired bolt force. Using the power screw equation or **PWRSCREW** computer program, the resultant bolt forces and different lubricating scenarios were calculated. As shown in the following table, the resultant force is about: ½ of the desired force when the bolt and nut are not lubricated, 2/3 when the threads are lubricated but not the nut face. On the other hand, the parts could be overstressed if a very low-friction coating or lubrication was used.

Input Torque (Ft-Lbf)	THREAD LUBRICATED (Coeff' of Friction μ_t)	NUT FACE LUBRICATED (Coeff' of Friction μ_f)	Resultant Force (Lbf)	% of Desired Bolt Force
361	No (.25)	No (.25)	15124	49

	Yes (.13)	No (.25)	19320	62
	Yes (.13)	Yes (.13)	30988	100
	Yes (.07)	Yes (.07)	65433	211



Proper lubrication of the bolt and nut is not only to keep the parts together. It also helps to minimize corrosion and, galling, aid disassembly, etc.

Spec API 6A, Appendix D lists the recommended torques for different bolt sizes, depending on material strength and lubricating methods. The calculated torques used 0.13 coefficient of friction, which assumed that the threads are lubricated with thread compound which meets API Bull 5A2, and a 0.07 coefficient of friction if fluoropolymer coating such as Xylan 1052 or bake-on moly was used.
