

# Why Wrenches Break And What Can Be Done About It

Richard B. Wright, Chairman, Wright Tool Co.

I am not going to list a bunch of safety tips (70 can be found at [www.wrighttool.com](http://www.wrighttool.com), our safety video, and many other places). However, wrench breakage and the associated hazards, costs and lost time can be greatly reduced by better understanding its root causes and possible corrective measures.

### Handling The Pressure

We should not blame all wrench breakage on users. Fasteners have gotten stronger and they are being tightened to higher torques. And, due to potential conflicts with past designs and tighter tolerances in many applications, we can't just make wrenches heavier.

Wrenching problems seldom occur during original assembly because fasteners are usually clean and oiled, and assembly tools are in good condition. Tests show loosening torques in the range of 100 – 200 percent of the tightening torque, and occasionally 300 percent or more. Whether a particular wrench is capable of delivering the amount of torque required depends, first of all, on its basic strength, but is also influenced by the looseness of the fit.

If the wrench is badly worn or if the fastener is undersize for any reason, including wear or damage, the amount of torque that the wrench/fastener combination can deliver to the threads is reduced. The result may be either wrench breakage or damage to the fastener. Both the required torque and the strength of a wrench are difficult to predict. Because removal torque varies, a wrench that is inadequate will not be inadequate 100 percent of the time. Trouble free assembly provides no assurance of reliable disassembly. Also, the manufacturer needs to make sure that there is space to accommodate wrenches of adequate strength.

### Get A Grip

High strength fasteners may provide more reliable joints or save time and money by requiring fewer fasteners to install, but require that wrenches be of good quality and kept in good condition. The 12-point head is typically smaller than the 6-point head in relation to the bolt size. More teeth and the smaller size fastener means that the wrenches encounter loads that are approximately twice what would be produced by the same strength of fasteners of 6-point design. But, current standards do not call for 12-point wrenches to have any more strength than 6-point wrenches, and they are typically the same diameter.

Therefore, greater care should be used when turning 12-point fasteners, and it may be necessary to limit the tightness of 12-point fasteners to less than their maximum strength to avoid wrenching problems. High strength fasteners should always be

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tightened with a torque wrench or other load measuring techniques to avoid over-tightening. This will help prevent loose fits and avoid breakage from the resulting vibrations. A better approach is to use a spline headed fastener, because spline wrenches have approximately twice the strength of 12-point wrenches with the same diameter.

### Damage Control

Many people think the only danger in using a wrench that is slightly too large is rounding the corners of the fastener. However, even a slight amount of damage to the corners of the fastener makes it impossible to apply full torque.

Wright tool runs many tests on different designs of wrenches and fasteners. For these tests to be meaningful, we measure everything and hold the wrenches to extra tight tolerances. Our tests showed that even small changes in clearance made a surprisingly large difference in strength. When faced with a hard to remove fastener, it may be necessary to use not only a high-quality wrench but a relatively new one. Another step is to use a 6-point wrench instead of a 12-point wrench on 6-point fasteners. They deliver a little more strength when new, and hold up better when worn.

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