# Impact Wrenches Are A Bolt Supplier's Worst Enemy

By Joe Greenslade

As long as bolts and nuts are used to assemble joints, suppliers are going to periodically receive complaints about breaking bolts. In most of these cases the supplier can find nothing wrong with the bolts through standard testing. Suppliers know that the customer is doing something wrong, but they do not know how to tell them without the customer thinking they are just trying to avoid their responsibility. The only effective self defense for the supplier is education and a tactful approach to investigating the complaint.

I receive many calls from bolt suppliers asking for my help regarding a customer complaining about breaking bolts with which they can find nothing wrong. I ask a series of questions so I can get a clear picture of what the situation is and what the actual root problem might be.

These standard questions are:

- What is the complete description, including finish, of the part being complained about?
- What is the exact nature of the complaint?
- What tests have been performed on this specific lot of parts and what were the results?
- Are the parts being lubricated on the assembly line? If yes, with what and why?
- What is the mating part?
- Has it been inspected to determine if it is conforming to all standards?
- What type of tool is being used to install the part?
- What is the torque value they are tightening it to? How did they arrive at it?
- How do they control the torque applied on the assembly line?
- Do they do torque audit on the seated bolts? If yes, do they audit the torque in the tightening or loosening direction?

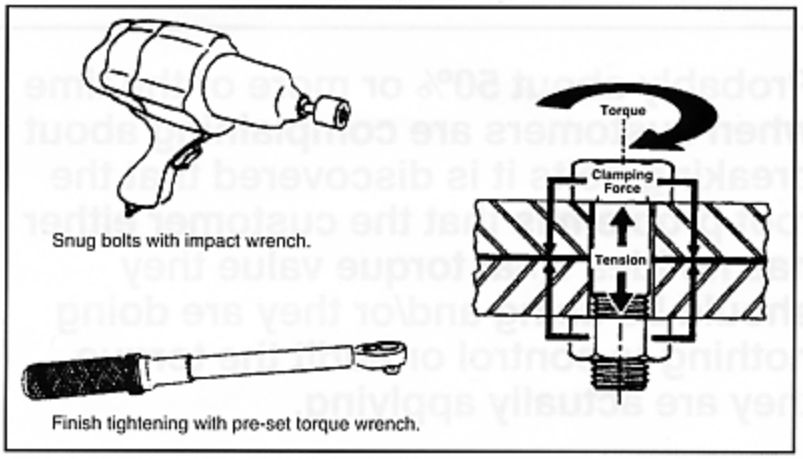


**Figure 1.** *Applying the proper torque procedures can prevent bolts from breaking.*

- When auditing with a pre-set "click" torque wrench, what do they do if the wrench clicks out at the set value, but the fastener did not rotate?
- Are the torque settings on the assembly tools and torque wrenches certified periodically? If yes, when was the last calibration of each?

Most of the times the supplier will have to go back to the customer to get all of this information. It is important to know all of this before trying to determine what to do or suggest to the customer as a solution. It is always advisable to send a company representative to the sight of the complaint to witness the problem first hand to avoid misunderstandings about what the customer is describing. An example of a real situation later in this article will illustrate why this is important.

Probably about 50% or more of the time when customers are complaining about breaking bolts it is discovered that the root problem is that the customer either has no idea what torque value they should be using and/or they are doing nothing to control or audit the torque they are actually applying. The only effective solution to this problem is to tactfully ask the questions listed earlier. The solution lies in educating the customer as to what torque value they should use and what they can do to effectively control and audit the installation torque.

Frequently it will be discovered the customer is using impact wrenches to install the parts. This is a big problem for the fastener industry and one which is not likely to improve in the foreseeable future.

This is a problem because most users of impact wrenches think they have some torque control, which they do not. This situation will not be improved soon because the fastener installers like impact wrenches; they are fast, relatively inexpensive, light weight relative to their torque output capability, and they give little torque reaction to the operator.

When asked about the torque control of

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## Impact Wrenches

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impact wrenches, most will say, "Our people know how many times to let it hammer." or "Our people know by the way it sounds." They may believe this, but they are in error.

Most impact wrenches are rated as to their maximum torque output. They may be somewhat accurate when used to maximum capacity, but very few fastener tightening torque values perfectly match the maximum output of a particular impact wrench. My guess is that, when driven to their maximum capacity, most torque wrenches probably vary at least 20% or more, and when seating fasteners at anything less than maximum, they probably vary twice that percentage. The torque output of air driven impact wrenches, the most popular type, is greatly affected by the air line pressure. This can vary greatly depending on how many tools are being driven simultaneously. The more tools being driven, the lower the air pressure at each tool, the lower the torque output and vice versa.

Most breaking bolt complaints are a result of customers applying too much torque to the bolt or nut. The bolt usually gets the complaint, because standard bolts and nuts are designed so that the bolt, not the nut, will always fail when excessive force is applied to the joint.

Tools that have much better torque control are nut runners with various types of clutch mechanisms for limiting torque output. The major objection users have to using nut runners is their high cost relative to impact wrenches. Also, they are generally slower in run-down and give more recoil to installers, tending to fatigue them more quickly. In very critical applications there are other more elaborate, effective and expensive solutions to assuring good joint tightness, but these are seldom used in routine assembly applications.

My suggestions to those who insist on using impact wrenches are these:

- Determine the specific torque value that is most suitable by first consulting a value from one of the available charts from reputable sources or calculating it by the formula T = FDK [Torque = Force (pounds of clamp) X Diameter (bolt) X K factor]. I suggest that value then be tested by driving 10 or more parts to failure and setting the seating torque value for that particular application at 60% to 70% of the average failure value.
- Installers should use the impact wrench merely to drive the fastener down snug, but not fully tightened.
- The final tightening process should be done with a pre-set "click" torque wrench. The operator should be careful to note that the fastener rotates using the torque wrench before it clicks out. If the fastener does not rotate it means the part is already past its targeted tightening value. If the fastener does not rotate it should be broken loose and properly tightened using the pre-set torque wrench.

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Many installers use the procedure above, but do not realize the point about the parts being too tight if the torque wrench clicks out without rotating the part. This is a point which must not be over-looked when dealing with a bolt breaking complaint.

I recently went to an assembly plant with a supplier to investigate a situation concerning breaking bolts. The assembly foreman assured us they had a seating torque specification and that they audited their assemblies with torque wrenches. He was sure this was a bolt problem even though the bolts met all of the strength specifications .

I asked to see the assembly operation first-hand. This is what I saw:

- The job specification sheet clearly stated the seating torque requirement was 90 to 110 foot pounds for the 7/16-14 socket head cap screw. Based on several charts this is reasonable.
- Six 7/16-14 socket head caps screws were being driven with an impact wrench into a flange application on a pump housing. The impact wrench was a popular air driven model with no torque control mechanism.
- The installer drove the six screws in a star pattern as he should, but after seating all six parts he went back to only the first two to retighten. This is incorrect. For flanges to be consistently seated over 360 degrees they should be partially tightened once around in a star pattern and then all fasteners must be tightened to the desired value on a second pass in the same sequence as the first.
- He then set the assembly aside and started on his next assembly without torque auditing the assembly.

When I asked the foreman about the torque wrench audit, he could not explain why it was not being done. When I suggested we do one to see if the screws were seated between 90 and 110 foot pounds, he agreed. I have my doubts about the audit ever being done since it took over 10 minutes to find the torque wrench.

It was a dial type torque wrench which was suitable for determining the actual seating values. The foreman did as I suggested and rotated the torque wrench in the tightening direction and stopped as soon as the part started to rotate. The six screws were seated between 115 to 155 foot pounds with no two seated at the same value.

The customer agreed their assembly procedure was probably the source of the problem instead of the bolts. I suggested they obtain a pre-set torque wrench and follow the procedure explained earlier in this article. According to the bolt supplier who followed up a short time later, the customer had followed the suggestions and the bolt breaking problem went away.

This is a very typical situation. Suppliers need to understand the importance of asking the right questions. Going through a customer's assembly process with them, knowing what to look for and what to ask can result in a fast resolution to problems and the development of a better relationship between users and suppliers. Impact wrenches and poor tightening practices are not going to go away. The best defense against these inevitable problems is to become a well educated supplier who is capable of informing and teaching his customers good fastening practices. ❑