Understanding torque will save you headaches in the long run

Are torque techniques running wild in your shop? Does it always seem to be up to one's own interpretation as to the best method? Are your mechanics using "feel" cheater bars or other guestimates?

Well, it's time to grab the reins and gain control.

First, though, you must understand what exactly you are trying to control.

Know, for example, that engine components are extremely sensitive to torque loads. Because of this, recommended torque settings and bolt tightening patterns must always be followed to avoid warping two mating surfaces or having a component break or distort because it doesn't have room to expand as the engine heats up.

Compressor-driven air guns are efficient, but watch your air pressure settings carefully. When possible, put a pressure regulator/gauge on each hose rather than a single regulator/gauge for multiple hoses.

Three things affect the amount of torque:

- The bolt's diameter.
- The grade (tensile strength) of the bolt.
- The amount of friction.

An example of this third point would be the need for more torque to stretch the bolt when the mating surface is soft, such as aluminum or copper, compared to a metal that is stronger and harder like steel or titanium. Soft metals compress before you reach the desired torque specification, while harder metals withstand the applied force with less compression. This harder metal will also allow you to get higher torque loads and reduce the chance of the fastener losing its torque later.

How metal hardness affects torque

When thinking about metal softness and the amount of torque required, you must be cognizant of what torquing the fastener might do to the mating surface.

If the mating surface is aluminum, for example, avoid conical head fasteners. These are typically used in applications where protrusion of the fastener above the mating surface is unacceptable. A few examples would be a set screw, certain lug nuts and carriage bolts. These types of fasteners will create unacceptable tensile stress between the

Beam style torque wrenches are the least expensive but don't have the precision of other designs.

Clicker style torque wrenches give you great accuracy. You simply dial in the exact torque you need, and when the wrench hits that force level, it clicks and releases tension on the fastener.

parts you are attempting to join and leave indentations in softer metals.

For this type of application, you're better off using a pan head or round head bolt or screw because they disperse the force more evenly on the mating surface, which eliminates high tensile stress. You could also use a flat washer to increase the surface area in which you are applying force.

Compressor consistency

So now that we've determined what torque needs to be applied by identifying the type of fastener and the mating surface, we need to know how to regulate the amount of torque to apply.

If you're using an air impact wrench to tighten fasteners, you can attach air regulators to each hose, which allows you to adjust the pressure. The downside is that if the compressor bogs down or malfunctions, you won't know unless you double-check your work with a calibrated torque wrench. In reality, that doesn't always happen. Some people will opt out of the regulator for each hose and instead let the compressor fill up and shut off, and then back down the pressure.

This will cause the same inefficiencies of the individual air regulator example. Once the air compressor drops down and fires back up, you will lose consistent torque. If someone else is using the same compressor but requires more pressure, they will not be able to get it until you have finished with your work.

When using an air gun, the fastest way to maintain torque values is with torque sticks, which are typically calibrated to release in increments of 5 foot-pounds.

Applying torque accurately

The best alternative to applying torque with an air impact gun is to use torque sticks. These can be purchased individually or in sets. They will start to flex once the torque level reaches their designed limits. This will prevent you from overtightening or wringing a bolt off when tightening fasteners with an impact wrench.

Another great tool is the manual torque wrench. In our experience with servicing equipment, it is the most accurate. Not only do you dial it into the amount of torque you desire, but you also get to feel it directly.

If this is your go-to method, there are still things that you must be mindful of. The first is what type of torque wrench is best

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Measuring torque

There are three common procedures for checking the torque applied to bolts after their installation. Take the reading on a torque gauge when:

1. The socket begins to move away from the tightened position in the tightening direction, referred to as the "crack-on" method.
2. The socket begins to move away from the tightened position in the untightening direction, called the "crack-off" method.
3. The fastener is retightened to a marked position.

In this third method, marks are first scribed on the nut or bolt head and the joint surface, which will remain stationary when the nut is rotated. (Avoid scribing or marking the washers since they may rotate with the nut.) The nut is backed off by about 30 degrees, followed by retightening so that the scribed lines coincide.

Proper care of torque tools

Torque tools require care, calibration and preventive maintenance. Wipe down the tool with a dry cloth (no chemicals) after each use and store it in its case or where the environment won't affect it and no other tools will slam into it.

Do not use this precision measurement tool to loosen stubborn bolts. If you apply greater force than the tool is designed for, you can cause severe damage, with the result being inaccurate readings.

Finally, these tools should be calibrated on a scheduled basis, such as the number of hours or cycles they go through. Each manufacturer has its own recommendations, but a good rule is never let it go beyond 5,000 uses or 12 months (per ISO Standard 6789) without being calibrated.

Most professional industries prefer you calibrate them closer to the 3,000-use range. The exception would be if you noticed abnormalities, such as dried grease, loose components, or parts of the tool showing excessive wear or corrosion. This would require an immediate calibration or even replacement. EW

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