

White Paper

# THE REAL COST OF INACCURATE TORQUE OUTPUT

*How transportation maintenance, repair, and operations facilities can help prevent wheel runoff crashes with precision torquing*

As far back as 1992, the National Transportation Safety Board conducted an investigation<sup>1</sup> into a string of fatal truck-wheel runoff accidents. "In the 3-week period alone between October 14 and November 4, 1991, three fatal heavy truck-wheel separation accidents occurred, including an accident in which the front left wheel broke off of a two-axle cargo van truck and careened into the path of an oncoming school bus carrying 46 fourth-graders and their chaperones. The 365-pound wheel slammed through the bus windshield, killing two children and a chaperone," stated the official document. Inaccurate bolt tightening was listed as one of the major causes of these horrific accidents. "Wheel failures involving broken studs, lugs, or loose nuts most frequently result from the improper tightening of the nuts or failure to retighten the nuts after the initial seating of the fasteners," wrote the report's authors. This problem is not new, but practical solutions are just starting to emerge.

## Precision where it matters most

When you assemble hub and wheel bearings or a wheel mounting system with an impact gun or clicker wrench, typical torque accuracy rate can vary 30% up or down from the engineering specifications. Such wide scatter can result in major equipment defects, costly repairs, and even human injuries and fatalities. When the stakes are this high, "guesstimating" torque is simply not good enough.

## An over-torqued bolt can bring the whole machine to a grinding halt.

Metal and alloy bolts are meant to stretch. If a bolt is torqued to engineering spec, a small amount of stretch is normal and won't cause any future problems. Small stretch doesn't change the physical properties of the bolt and allows it to get back to its original shape for re-torquing.

On the other hand, an over-torqued bolt is stretched so much that its physical properties are changed to the point of compromising its strength and durability. An over-torqued bolt is likely to crack, shear, come loose or break off, and cause major equipment damage or even human injury.

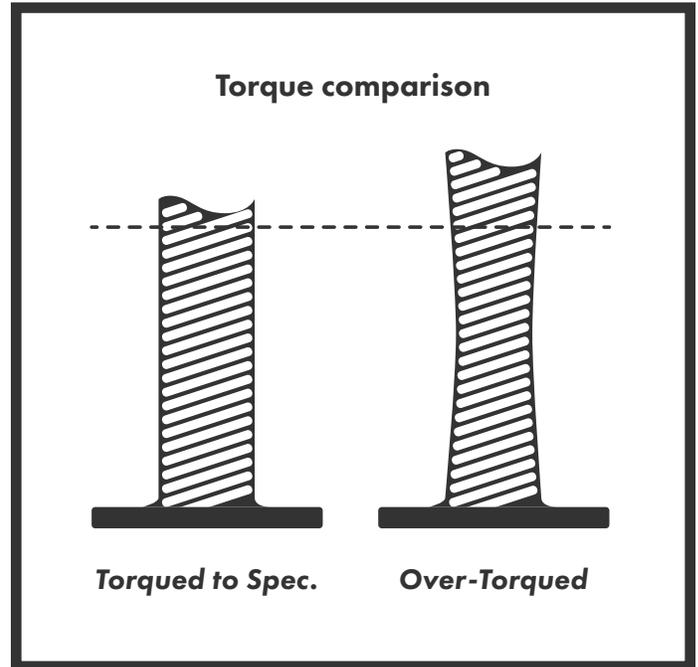


Fig. 1

## Torque vs. Torque-and-Angle Bolting Method

When working in smaller spaces, like a bus fleet garage or heavy equipment shed, you need your tools to be as versatile as possible. Having a torque tool that lets you set an accurate angle can go a long way toward higher accuracy. Cordless torque tools are even better for maneuverability and speed. A torque-and-angle tool can help you achieve greater accuracy every time.

In every torquing operation, the main objective is accuracy of preload (pounds of tension in the bolt). Preload, a function of torque, is based on parameters such as friction, which naturally vary. The graph in Fig. 2 shows the clear advantage of angle torquing over straight torquing: the black line represents the ideal theoretical preload-to-torque relationship, with dotted red lines representing the range of preload you may get for a given torque due to variation in friction.

If you torque to a value that is some percentage of the final desired value (represented by the leftmost black

dotted vertical line), then you tighten the rest of the way by turning through a predetermined angle (established by test). The scatter is then reduced to be closer to the ideal preload value (shown in green dotted lines).

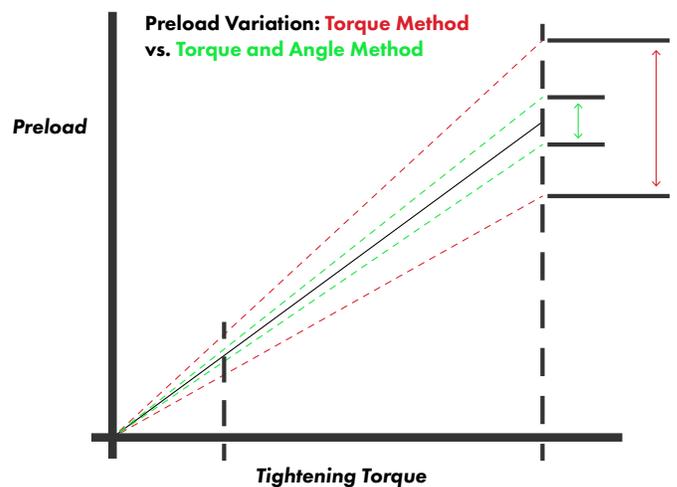
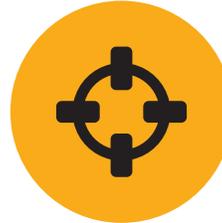


Fig. 2

## LION-.25 Battery Gun vs. Conventional Tools

How can you improve torque accuracy when conventional tools are not designed to do that? HYTORC recognized this problem and, building on decades of industrial engineering expertise, designed a solution—a cordless gun made specifically for smaller bolting applications, allowing you to work with greater efficiency and torque accuracy.

### Accurate Automated Control



Humans are prone to error more so than machines. A torque tool with digital controls can reduce potential human error when it comes to torque table interpretation and tool setup. Why leave accuracy to chance when you can consult a clear readout, adjust the tool on the go, and enjoy higher performance and higher quality of your bolting work?

### Reliable Data Recording



Over-torquing is starting to be recognized as a major cause of vehicle malfunction. That's why having a record of your own work done right can be a powerful defense against possible litigation. A tool with data recording capabilities can be a great help in quality of assurance. It's only a matter of time before OSHA and other government regulators will start requiring stricter documentation of bolting operations.

### Cost-Effective Operation



Compared with conventional torquing solutions used in smaller bolting applications, the LION-.25 gun doesn't require any extra tools to get the job done well, which helps the operator save time and money.

## HYTORC: Safety. Quality. Schedule.

HYTORC makes industrial bolting safer and simpler. Since 1968, the company's engineers have focused entirely on developing the highest quality industrial bolting systems. From steel mills and mining equipment to refineries, power plants, and wind turbines—HYTORC has developed solutions for every bolting application imaginable.

The LION-.25 Battery-Powered Torque Gun brings all of the industrial ingenuity of HYTORC to the commercial marketplace, because safety is equally important whether you are building a NASA spaceship, an Apache helicopter, or a school bus.



Source:

<sup>1</sup> National Transportation Safety Board Safety Recommendation H-92-102  
[http://www.ntsb.gov/safety/safety-recs/recletters/H92\\_102.pdf](http://www.ntsb.gov/safety/safety-recs/recletters/H92_102.pdf)