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# Improving Joint Integrity

*Three-part approach helps to reduce costs and increase production and quality.*

*By Pete Fuller*

The wind-energy market has been calling for the need to reduce maintenance costs now and especially after the production tax credits expire. Mechanical joint integrity accounts for a large portion of the maintenance scope.

Load-indicating washer being installed during base-bolt tension check. (Courtesy: Torkworx)

Torkworx, being a leader in controlled bolting solutions, has a laser focus on power generation. It has been pivotal in the development and evolution of specific products and services proven to reduce maintenance costs while improving WTG joint integrity.

Torkworx approaches its solution in three parts, all designed to reduce cost while increasing production and quality. The three realized parts are technology, service, and equipment.

## TECHNOLOGY

On the technology side, Torkworx looked at how to reduce the overall costs and liabilities associated with torque and tension checks. Monitoring the bolt load was the obvious solution. But how to make it happen, and where to start? A bolting project on a slew-ring bearing application in the steel industry used a proven product manufactured in the U.S. This product allowed the monitoring of bolt load in real time on critical joints. This quality fastener company specialized in customer-driven solutions and began revising the design to fit Torkworx's application.

The result of the revision was a load-indicating washer designed for base bolts that reduces equipment costs and completion times. This washer measures the bolt load by simply attaching a gauge to the coupler immediately identifying any load loss. Load-indicating hardware can be installed on any mechanical joint and, with advancements in wireless technology, the data can be sent in real-time from remote locations.

Torkworx base bolt service truck on location. (Courtesy: Torkworx)

Imagine the cost reduction by removing the need for technicians to climb and use bolting equipment to perform these checks. For example, knowing a blade-bolt joint was failing before it caused any damage would be advantageous.

## SERVICE

On the service side, Torkworx looked at its internal service department and how it could improve production and reduce costs. Thanks to bolting equipment and experience, contractors and owner/operators have asked Torkworx to perform thousands of base-bolt tension checks. Technicians are mechanics who can climb, so tensioning work is nothing new. Using a specialty company like Torkworx frees up customer manpower. This reduces the cost to complete

## ALSO IN THIS SECTION

Torkworx WTG specific rental fleet is constantly growing. (Courtesy: Torkworx)

the scope because specialty companies concentrate on nothing else but their specialty service, making them more efficient.

Torkworx has introduced some automated pressure reading systems along with equipment that has a reduced footprint. These innovations allow Torkworx to perform the task faster and with exceptional quality in reporting, which will increase customer confidence in the service. This new technology can also be used to monitor target pressures and completion times so Torkworx can observe performance in real time. This reduces costs, allowing Torkworx to provide a reduced per WTG rate. The savings in time and manpower are immediate realized benefits for customers that are clear and justifiable.

## EQUIPMENT

On the equipment side, Torkworx listened to the market and began assembling turbine specific WTG tooling packages. Torkworx has been doing this on the conventional turbine side for a decade, so offering rental on specialty tooling made sense. It has been able to assemble a sizable specialty tensioner and electronic torque kit inventory. Contractors having a difficult time keeping up with equipment demands and repair costs along with the staggering initial investment now have immediate access to the required tooling at a fraction of the cost.

Load-indicating washer with gauge attached confirming the load remained after the tensioning procedure. (Courtesy: Torkworx)

**Pete Fuller** has been in the bolting industry since 1997 beginning as a technician in the petrochemical and refining industry. He was recruited into the power generation industry to build and lead a startup bolting company, which he did successfully. In 2008, the company was sold and he and a select few of other key players from the bolting industry started Torkworx, LP where he remains the directing partner. For more information, contact Torkworx at support@Torkworx.com.

# Bolting Technology Advancements

*Understanding the difference between transducerized and current-control tools.*

*By Paul Bundy*

Why is using a transducerized tooling system important? To understand that importance, the accuracy difference between transducerized and current-controlled tooling needs to be explained.

## CURRENT CONTROLLED

Current-controlled (open loop) tools are a dedicated system consisting of a tool, cable, and controller. They are pre-calibrated in a lab using an external transducer on a rundown fixture. The tool is operated on the external transducer at set torque points. The amount of current supplied by the system is matched up to the torque reading of the external transducer. The lab will input these torque readings that the system translates into the amount of current it needs to supply to achieve the amount of torque required.

Unfortunately, current controlled tooling is an open-loop design. Once the tool is removed from the external transducer, there isn't any true torque feedback into the system. The system simply supplies the per-set current, and the operator has to accept the torque was properly applied. However a number of things affect the torque output but not the torque readings of the system. Things such as temperature, gear wear, voltage, and motor performance all affect the torque output, but the system is unable to adapt and compensate for these changes.

It's simply all guesswork. It's also a dedicated system. Something as simple as changing out the cable voids the calibration.

## TRANSDUCER CONTROLLED

Transducer controlled (closed loop) tools like the AcraDyne HT system from AIMCO have the transducer built into the tool itself at the output shaft. The transducer is constantly measuring the torque in real time and feeding that back into the system. Variations of temperature, gear ware, voltage, and motor performance do not affect the accuracy of the transducerized system because they all happen before the transducer.


**The AcraDyne HT (High Torque) series used in the wind industry (primarily) for critical bolting when high torque is required. (Courtesy: AIMCO)**

The system will simply keep applying power until the transducer reads the requested torque before shutting off. The AcraDyne HT system also records date, time, and rundown information of up to 32 different preset torque jobs stored in the controller. All the recorded torque data is easily exported to Excel with the touch of a finger.

The calibration of a transducerized tool is in the tool itself, not the system. Tools, cables, and controllers are all interchangeable. When the annual calibration is due, the tool is all that needs to be sent, not the whole system.

**Paul Bundy,** AIMCO's Energy Services divisional sales manager, has been with AIMCO for 28 years and has been managing the Energy Services division of AIMCO since 2010 when AcraDyne, a division of AIMCO, launched its high torque series of transducerized tools ranging from 1 nm to 8,100 nm.