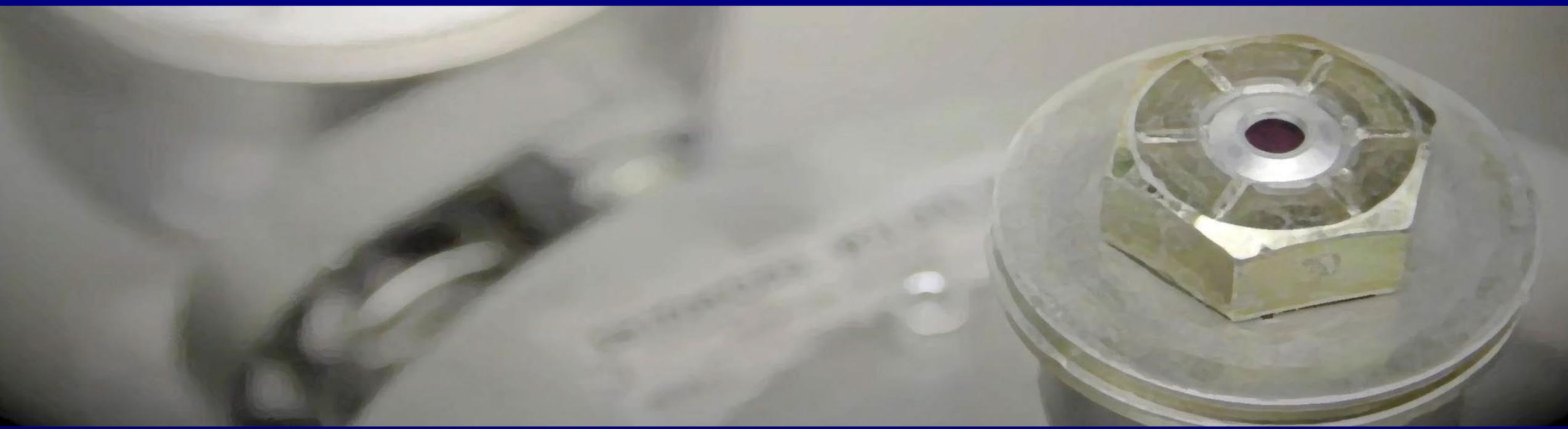
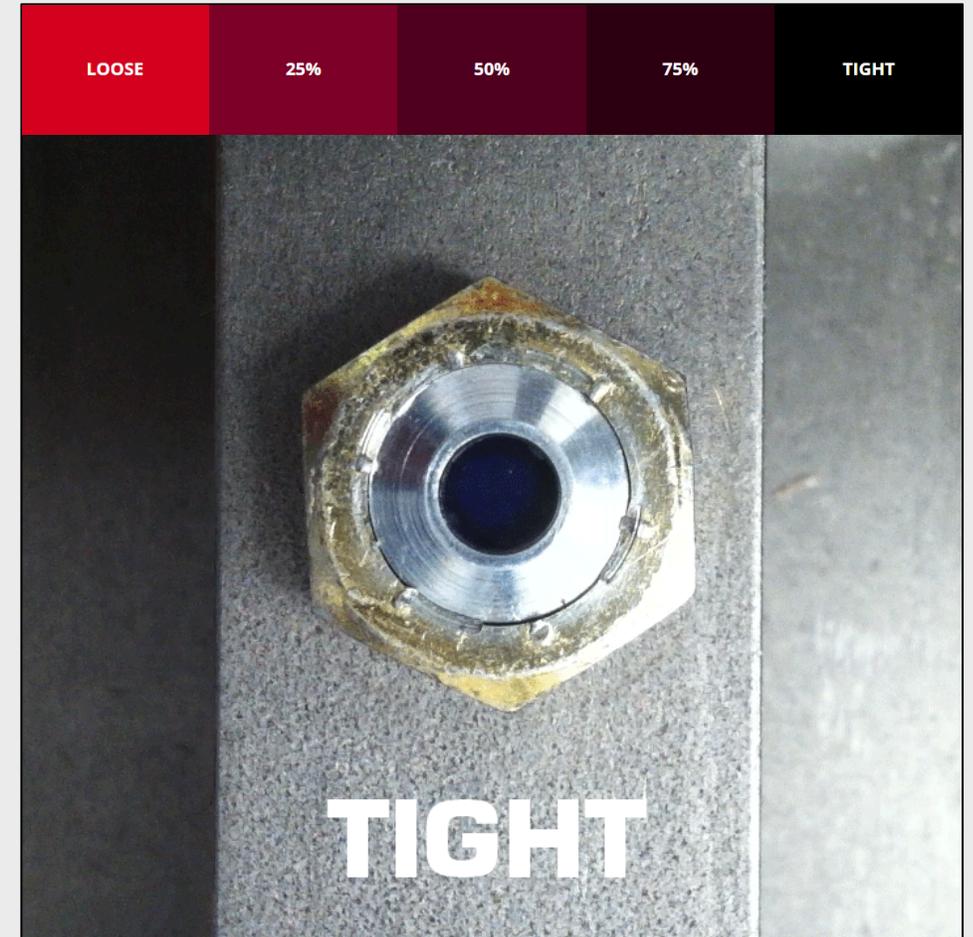


# SMARTBOLT DTI: PRODUCT INTRODUCTION

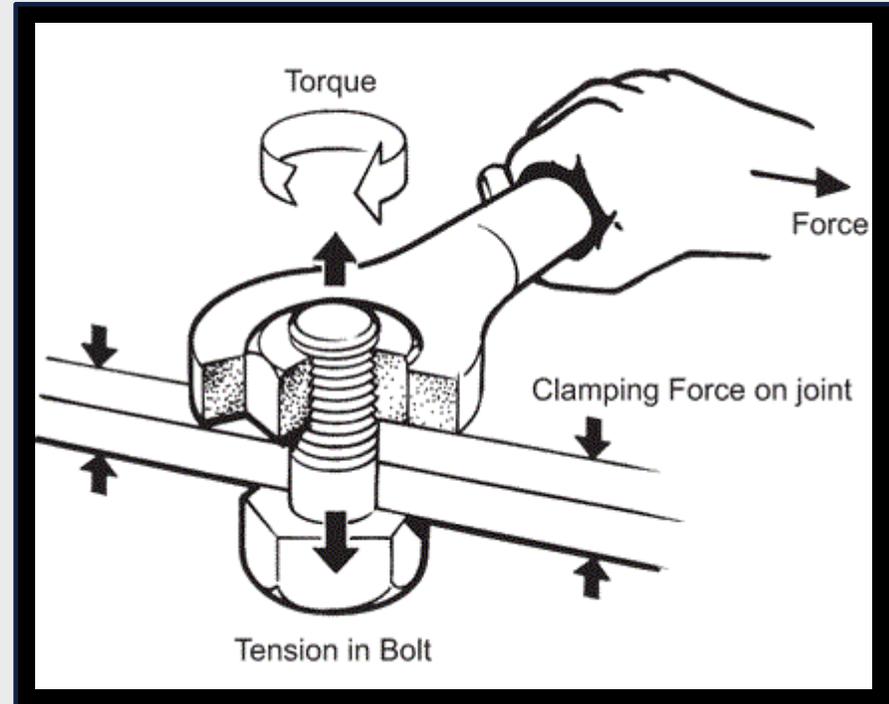
INDUSTRIAL INDICATORS



- SmartBolt DTI are load indicating fasteners with a vivid display of the clamp force of a bolted connection.
- The display of the SmartBolt DTI indicator is a game-changer for many industries and applications that rely on secure bolted connections for operational efficiency, safety, and reliability.



- Establishing and maintaining a specific amount of clamp force is the primary goal of bolting. Clamp force is what keeps a bolted connection tight and secure.



- SmartBolt DTI are designed to solve the challenges faced throughout the entire bolting process and have been implemented in a wide range of industries and applications.
- They ensure that proper clamp force is achieved at installation and is maintained over time.



**Renewable Energy**  
Wind Turbine  
Gamesa



**Factory Automation**  
Robotic Arc Welders  
Caterpillar Work Tools



**Cranes/Shipbuilders**  
Slewing Bearings  
Agrico Sales



**Manufacturing**  
Injection Molding  
US Farathane



**Mining**  
Mobile Stacking Conveyor  
Barrick Gold



**Oil & Gas**  
Pump Assembly for  
Hydraulic Fracturing  
FMC Technologies



**Heavy Equipment**  
Excavator Drilling Equip.  
Bay Shore Systems



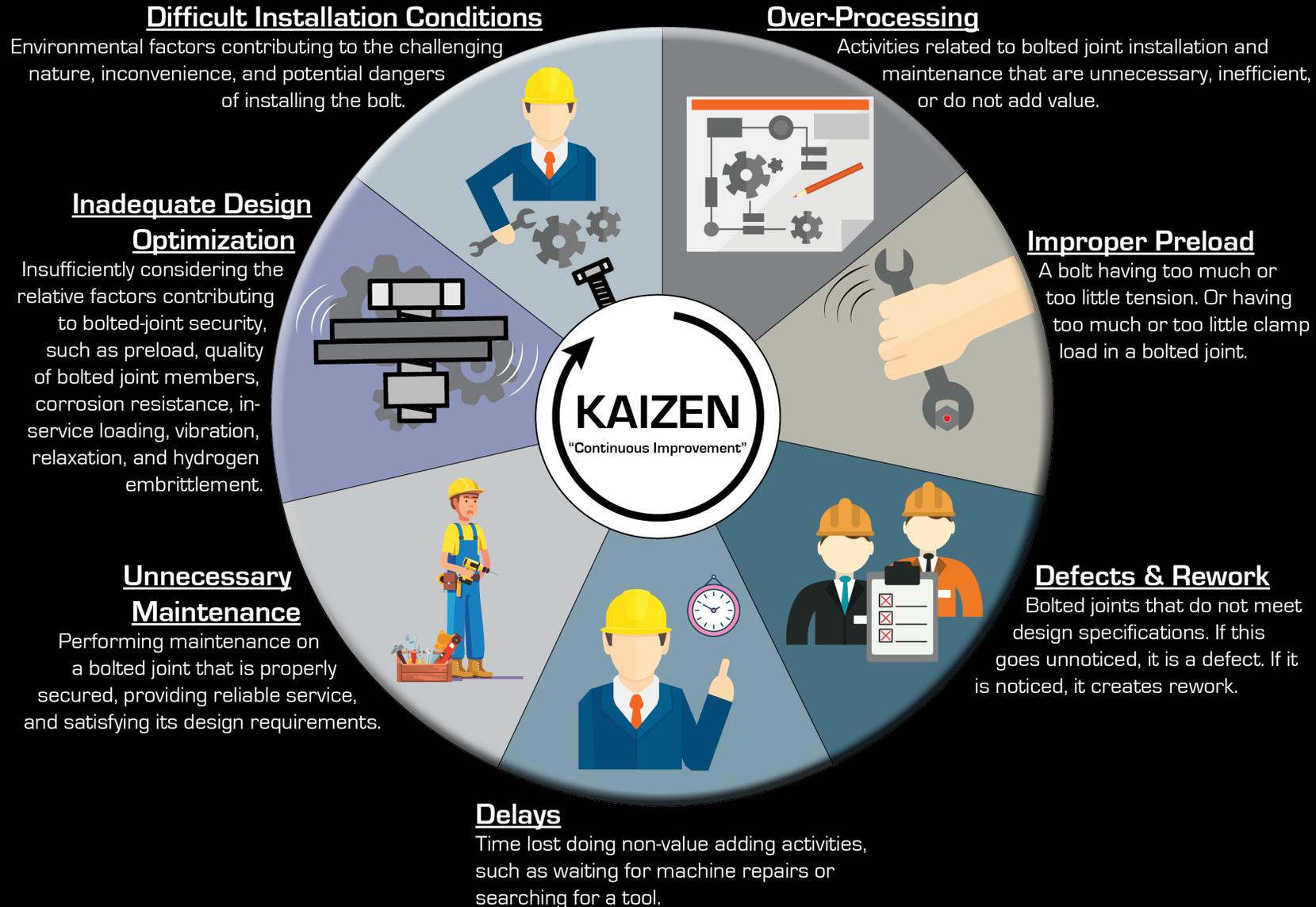
**Data Centers**  
Electrical Distribution  
General Electric, Eaton,  
and others



**Structural**  
NEXRAD Doppler Radar  
National Weather  
Service

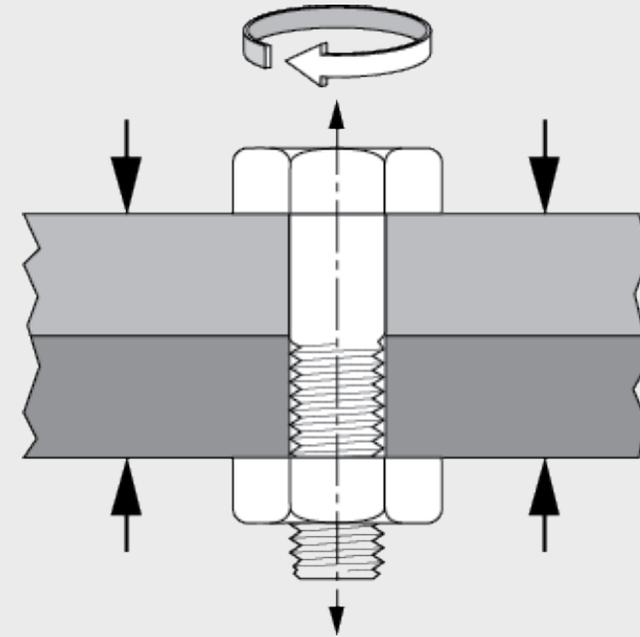


**Transportation**  
Heavy Duty Truck  
Suspension Assembly  
Volvo Trucks NA



## BOLTING WASTE: IMPROPER PRELOAD

- One of the most common bolting wastes is improper preload, which involves having too much or too little clamp load in a bolted joint.
- The existence of improper preload signals that there is a risk of bolted joint failure. It needs to be corrected as soon as it has been identified.



## ENSURING PROPER PRELOAD

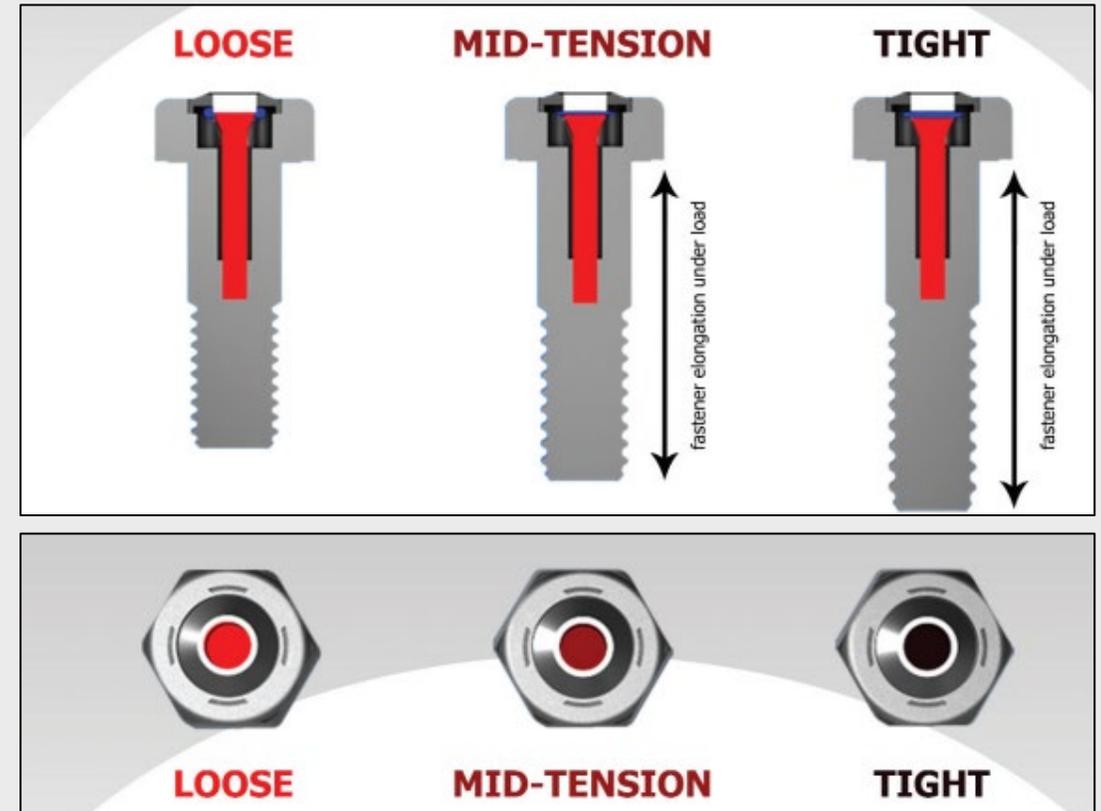


- **Indirectly without load indication.** Install and maintain manually with a torque specification and calibrated wrench.
- Variable nut factors make this difficult.

- **Directly with load indication.** Real-time visual indication of the clamp load in a bolted joint.
- Not affected by variable nut factors.

As a SmartBolt DTI is tightened, tension forces it to stretch, and the visual indicator changes color to represent the amount of tension in real-time.

- A **mechanical strain gauge** measures bolt elongation to determine tensile load.
- **Microindicator™ Technology** converts these measurements into a vivid color-calibrated display.
- The **DTI Load Indicator** is a color-calibrated real-time display of tensile load.



- High Visibility

The DTI Load Indicator produces a vivid red color when there is no tensile load on the fastener and a deep black color when design tension has been reached.



- Real-Time

Fastener load is shown in real-time with a calibrated color scale ranging from 0-100% of Design Tension so loose bolts can be identified immediately.

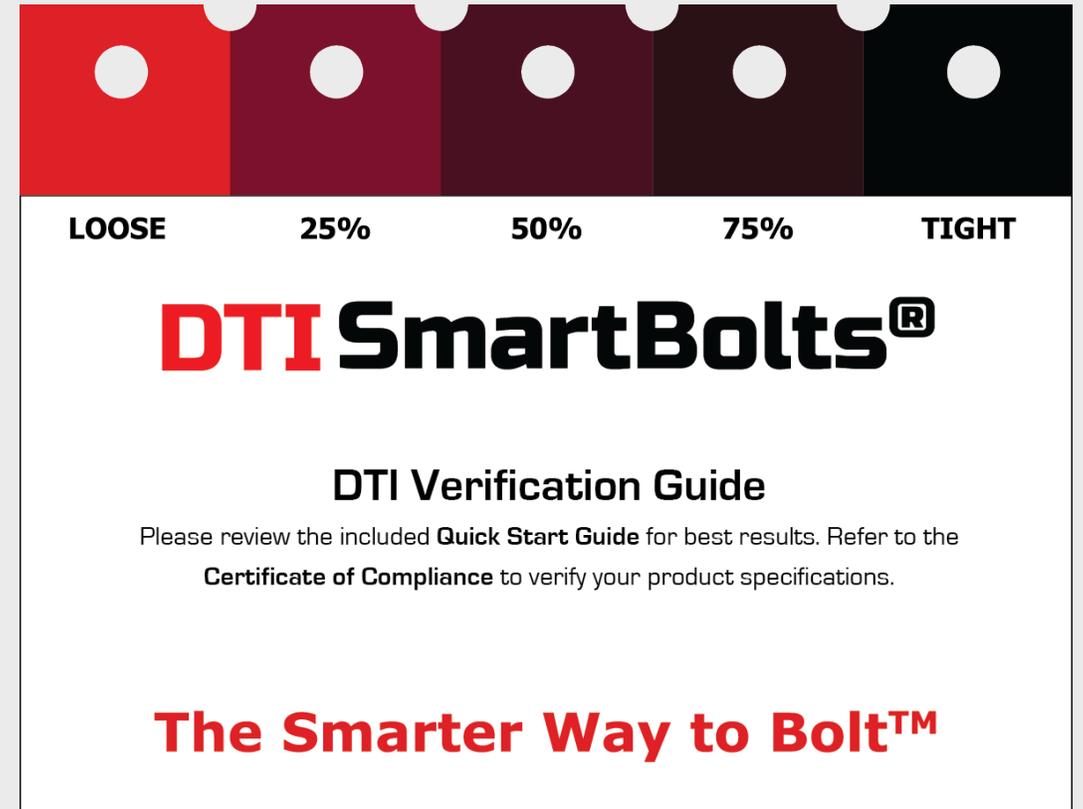
- Hands-Free

Visual inspections offer cost savings and performance benefits compared to traditional maintenance methods. A worker can verify clamp force without touching fasteners, pausing production, or powering down equipment.

## DTI Load Indicator



- **DTI Verification Guide**
- The Verification Guide is a calibrated color scale that enables accurate comparison and measurement of the indicator's color during installation and inspection.



The image shows a color scale for DTI SmartBolts. It consists of five rectangular segments with a white circular hole in the center. From left to right, the colors are: bright red, dark red, maroon, dark purple, and black. Below each segment is a label: "LOOSE", "25%", "50%", "75%", and "TIGHT".

**DTI SmartBolts<sup>®</sup>**

**DTI Verification Guide**

Please review the included **Quick Start Guide** for best results. Refer to the **Certificate of Compliance** to verify your product specifications.

**The Smarter Way to Bolt<sup>™</sup>**

- **DTI SmartBolt Datasheet**
- A datasheet is available for all DTI SmartBolt designs. This document includes relevant design information, including:
  - bolt dimensional and physical specifications
  - indicator design data
  - torque/tension relationship estimates

DTI SmartBolt Datasheet										
							Date:	12/6/2019		
Model Number			AA1CQ2R114							
HHCS	5/8"	11	3	8	Yellow Zinc	Partial	None	None		
Head Type	Nom. Dia	TPI	Length	Grade	Finish	Thread length	Special 1	Special 2		
<b>Design Tension, DT (klbf)</b>							19.0			
<b>Modified Proof Load, P (klbf)</b>							27			
<b>Modified Ultimate Tensile Load, UT (klbf)</b>							33.7			
<b>Minimum Grip Length, MGL (in)</b>							N/A			
<b>Maximum Tensile Strength Loss %</b>							0%			
<b>Design Tension, (%P)</b>							70%P			
<b>Installation Torque Estimate (K=0.17) (ftlbs)</b>							167			
<b>Installation Torque Estimate (K=0.23) (ftlbs)</b>							226			

- **Unlimited Cycles**

SmartBolt DTI can be tightened and loosened as many times as necessary. As long as the fastener is in good physical condition, the SmartBolt DTI will perform as designed.

- **Customize to Application Requirements**

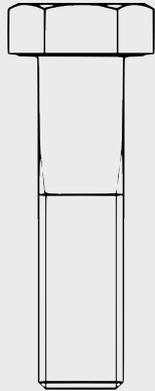
Design Tension can be customized from 30% up to 90% of a fastener's proof load.

- **No Battery, No Moving Parts**

SmartBolt DTI do not use a battery or moving parts to function.

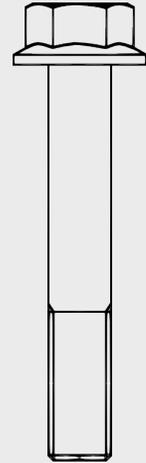
- **Compatible with Standard Tightening Tools**

SmartBolt DTI are fully compatible with the tools already in use at your site.



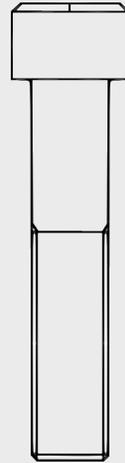
**Hex**

7/16" to 2-1/2"  
M10 to M64



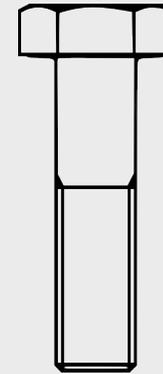
**Hex Flange**

1/2" to 2-1/2"  
M12 to M64



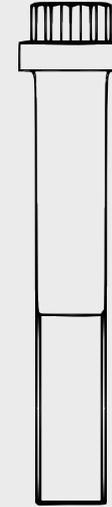
**Socket**

1" to 2-1/2"  
M24 to M64



**Heavy Hex**

1/2" to 2-1/2"  
M12 to M64



**12-Point Flange**

5/8" to 2-1/2"  
M16 to M64

<b>Design Tension Range</b>	<b>30-90% of Proof Load</b>
<b>Accuracy</b>	<b>+/-10% of Design Tension</b>
<b>Operating Temperature Range</b>	<b>-4°F (-20°C) to 168°F (75°C)</b>

## QUALITY

- SmartBolts are individually inspected and certified for use by qualified factory technicians
- One-Year Limited Warranty
- SmartBolts are manufactured in a facility that is ISO 9001 Compliant





## Safety

Limit risk and prevent accidents. Know that bolted joints are safe and secure.

- Early warning of failing bolts.
- Keep operators a safe distance from hazardous environments.



## Efficiency

Streamline installation and maintenance. Quickly verify clamp load.

- Inspect without powering down machinery or assembly lines.
- Identify and fix issues before they become problems.



## Reliability

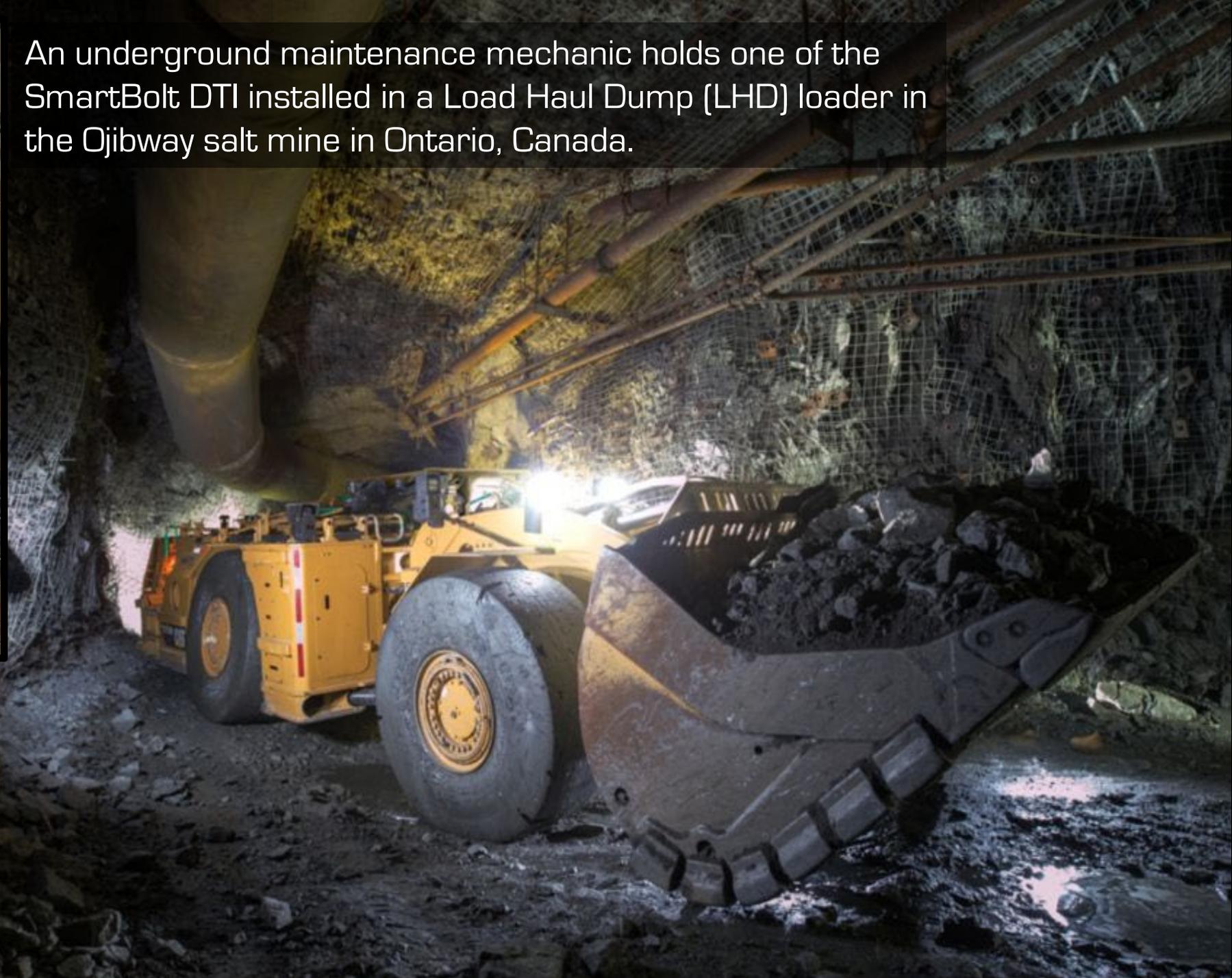
Build strong, dependable connections that meets the toughest standards.

- Ensure bolted joints are properly secure by directly measuring tension.
- Not affected by variable nut factors associated with torquing methods.

# SMARTBOLTS® INNOVATORS



An underground maintenance mechanic holds one of the SmartBolt DTI installed in a Load Haul Dump (LHD) loader in the Ojibway salt mine in Ontario, Canada.



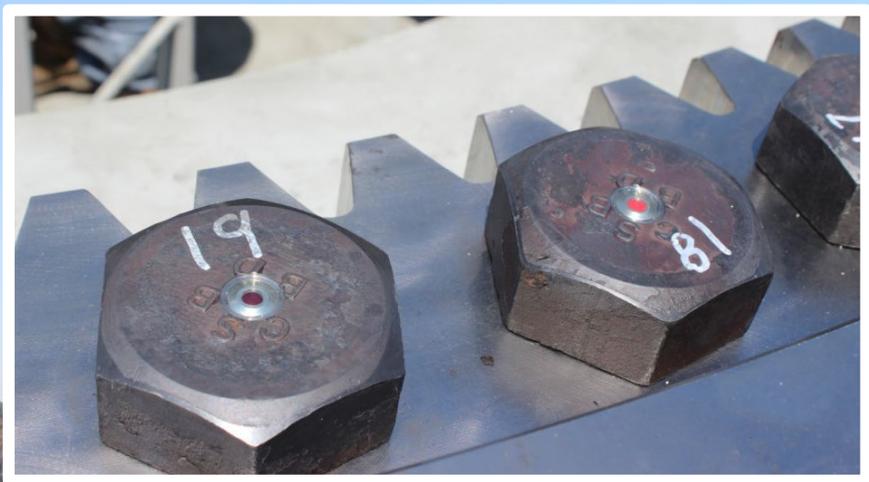


In the open-pit mines of Chile, mobile stacking conveyors transport and stack ore for future processing. SmartBolt DTI installed in structural joints of the truss frame provide visual indication that the critical joints are secure so the conveyor can operate reliably and continuously.



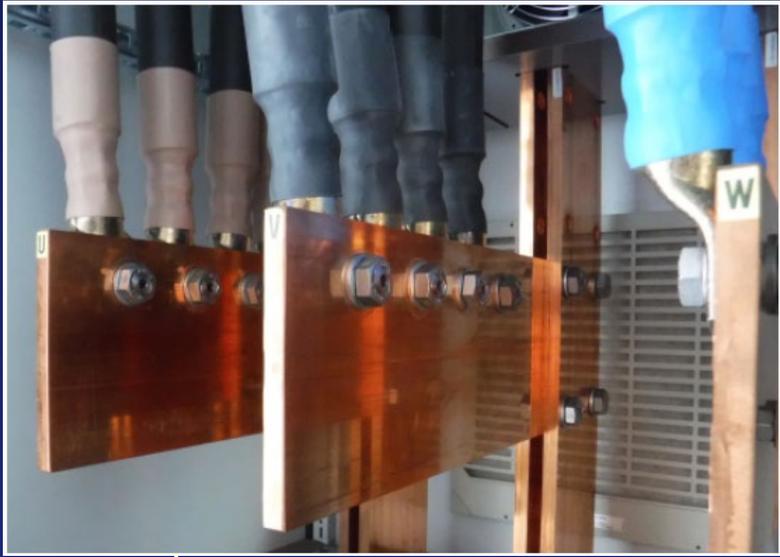
SmartBolt DTI secure critical pipe flanges within the engines of heavy mining vehicles to facilitate shale oil extraction in Alberta, Canada.





SmartBolt DTI in massive slewing bearings ensure grain is reliably loaded into transport ships at a rate of 150,000 bushels per hour in Louisiana, USA.





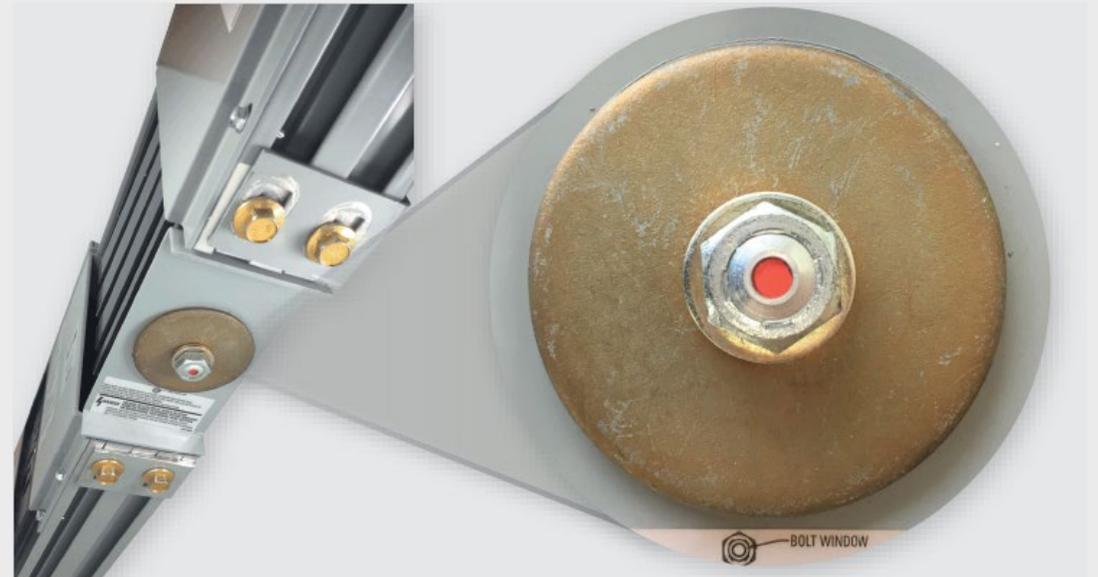
There are more than 1,500 bolts in the average wind turbine.

SmartBolt DTI in power conversion systems within Siemens 2.3 MW turbines reduce maintenance costs and improve operational safety in Washington, USA.





If you work in a facility like a Data Center, there's a good chance it relies on overhead electrical busway to keep the power flowing 24/7. And for the past two decades, many of the world's largest producers of busway have used SmartBolt DTI to keep critical bridge joints properly tightened.



# CONTACT AND RESOURCES



- Industrial Indicators
- [industrialindicators.com](http://industrialindicators.com)
- Load Indication, Control, and Monitoring Technologies
  - SmartBolts®
  - [smartbolts.com](http://smartbolts.com)
  - Advanced Bolting Products