

THE DESIGN & ANALYSIS OF FASTENERS & BOLTED JOINTS

- ❖ **Introduction to Threaded Fasteners:** This introduction includes basic terminology on threads and bolts.
- ❖ **The Strength of Bolts and Nut:** Basic strength terminology, property classes of bolts and nuts, markings on bolts and nuts.
- ❖ **The Stress Area of a Thread:** How strong is a thread? What is its effective cross sectional area?
- ❖ **Fastener Failure Modes:** An overview of the ways that threaded fasteners can and do fail.
- ❖ **Methods of Tightening Threaded Fasteners:** An overview of the main methods used to tighten threaded fasteners.
- ❖ **Torque Tightening of Threaded Fasteners:** How to determine the appropriate torque value for a fastener. Test and calculation methods commonly employed to determine the torque value.
- ❖ **Tightening Tools for High Speed Assembly:** An overview of the tools and methods used for high-speed assembly.
- ❖ **Torque Auditing:** How to check the torque that had been applied to a fastener. (The 'crack-on', 'crack off', 'marked fastener' and 'go-no' torque auditing methods.)
- ❖ **Tightening Procedures:** The importance of using a tightening procedure on complex joints.
- ❖ **Basics of Bolt Loading:** How a bolted joint sustains a direct load.
- ❖ **Vibration Loosening of Threaded Fasteners:** What causes threaded fasteners to self loosen? Main theories on the causes of self loosening. The effectiveness of different locking methods. How to design joints so that self loosening will not occur.
- ❖ **An Outline of VDI 2230 – Systematic calculation of high duty bolted joints:** This presentation gives an overview of the methodology of this German standard that is used world-wide.
- ❖ **Preload Requirement Charts:** determination of how to establish the likely cause of a bolting problem and how it can be resolved. Used with friction grip joints axially loaded.
- ❖ **Bolts in Direct Shear and Axially Loaded:** The effect of combined shear and axial loading - bolt interaction curves.
- ❖ **Fatigue Failures:** Explanation of fatigue, the endurance limit and how this applies to threaded fasteners.
- ❖ **Thread Stripping and Thread Stripping Calculations:** Determination of the shear area of a thread, the shear strength ratio for various, commonly used joint materials and the determination of the forces needed to shear internal and external threads.
- ❖ **Hydrogen Embrittlement of Fasteners:** What type of fasteners are susceptible to this type of failure and how can it be prevented.
- ❖ **Fastener Finishes and Corrosion:** Galvanic corrosion and the common finishes used on fasteners.
- ❖ **Galling of Fasteners:** What is galling and what types of materials tend to be affected. How it can be prevented.
- ❖ **Shear Loads Applied to Bolted Joints:** Determination of how to distribute the loads between a bolt group subjected to in-plane forces and moments. Derivation of equations and examples in their use. This includes activities/calculations for participants to complete
- ❖ **Combined shear and tension joints:** Determination of how to distribute loads between a bolt group subjected to out of plane forces. Derivation of equations and examples in its use. This includes activities/calculations for participants to complete
- ❖ **Open forum/discussion:** Implementing the lessons learned. Computer aided analysis of bolted joints.

All information is subject to change