



Fastening Technology & Bolted/Screwed Joint Design

Course Content

- 1) **Standards and specifications**
 - a) National and international standards
 - b) Load bearing fasteners – applications
 - c) Fasteners for place-keeping, positioning
 - d) Blind rivets, snap-fits, etc.
 - e) Drive systems (ergonomics, space req., etc.)
- 2) **Material Standards**
 - a) Material groups – applications
 - b) Heat treatment
 - c) Mechanical properties, inch and metric standards
 - d) Chemical compositions
 - e) Marking requirements
 - f) Corrosion resistant steels
 - g) Thread engagements, blind holes
- 3) **Fastener Manufacturing**
 - a) Cold and hot forming
 - b) Machining and powder metallurgy
- 4) **Screw Threads**
 - a) Definition (tolerances, fit, etc.)
 - b) Inch standards
 - c) Metric standards
 - d) Mismatch potentials, inch/metric
 - e) Thread gaging methods
- 5) **Corrosion and protection**
 - a) The mechanism of corrosion
 - b) Material combinations
 - c) Types of corrosion
 - d) Plating and coating
 - e) Hydrogen assisted cracking (embrittlement)
 - f) Environmental considerations
- 6) **Quality**
 - a) Quality assurance standards
 - b) AQL or in-process control
 - c) Impact of the Fastener Quality Act
 - d) Selecting a quality supplier
- 7) **Joint Design**
 - a) Introduction and overview of approaches
 - b) Preparation and design goals
 - c) Design steps (suggested sequence)
 - d) Joint types and load conditions
 - e) Fastener (joint) failure facts
 - f) Factors influencing joint design
 - g) The highly stressed joint
 - h) Five basic rules for joint design
 - i) Joint calculation approach
 - j) Modeling the joint
 - k) Balance of joint forces
 - l) Developing a joint/force diagram
 - m) Calculating elasticities, bolt/joint
 - n) Force ratio and force introduction
 - o) Work sheets for estimation of sizes, properties, and friction coefficients
 - p) Calculating embedment (force loss)
 - q) Influence of torsional stresses
 - r) Design examples using manual or computer aided approaches
- 8) **Safety Factors**
 - a) Preload stress
 - b) External work load
 - c) Fatigue resistance (endurance limit)
 - d) Surface pressure allowance
 - e) Transverse, shear and comb, loads
 - f) Loosening
 - g) Good and bad joints, a summary
- 9) **Tightening strategies**
 - a) Qualifying joint integrity
 - b) Tooling choices
 - c) Auditing torque and tension
 - d) Joint signature analysis
 - e) Tension scatter with various tools
 - f) Load control systems
- 10) **Locking Methods**
 - a) Mechanism of loosening
 - b) Effectiveness of locking devices
 - c) Chemical locking
 - d) Mechanical locking
- 11) **Technical Communication**
 - a) SI Metric – units and usage
 - b) Blueprints – projection methods
 - c) ISO tolerance system