

# Fastener Integrity Assessment and Performance Improvement Program

There are a number of concerns about the integrity and performance of threaded fasteners used in the United States. Failures have been reported, attributed to the following causes:

- ✓ Use of improperly certified or counterfeit fasteners
- ✓ Loose, broken, or missing fasteners
- ✓ Corrosion damage or wastage due to leakage
- ✓ Stress corrosion cracking
- ✓ Improper installation or preload control
- ✓ Faulty design, poor material choice

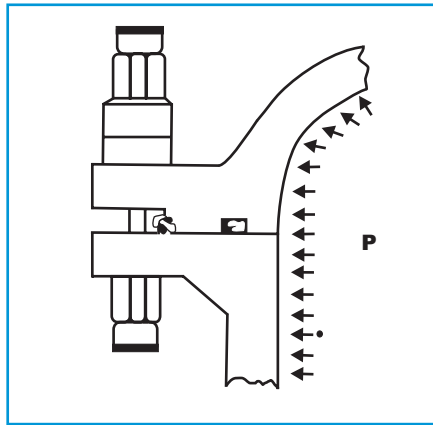


Figure 1  
Bolted Closure Under Internal Pressure

The U.S. Congress is concerned about fastener failures as evidenced by the passed Fastener Quality Act - Public Law 101-592 on the subject, which highlights the impact of counterfeit fasteners and material quality.

Industry groups, such as the Electric Power Research Institute (EPRI), Industrial Fasteners Institute (IFI), American Society of Mechanical Engineers (ASME), and the Bolting Technology Council (BTC), have made a number of recommendations for improving the integrity of threaded fasteners. These recommendations focus on materials; procurement and receipt inspection; installation and maintenance methods; and training.

Aptech Engineering Services, Inc. (APTECH) has an experienced, multi-disciplined team to address these concerns. We offer a systematic approach to your unique situation, including a scoping task to identify recurring problems that need resolution. We can perform root cause failure analysis and mechanical testing, if required. The **benefits** of our service include:

- ✓ Evaluation of problems and identification of needed upgrades to resolve concerns with current installation
- ✓ Improvement in specification, procurement, receipt inspection, installation, and problem solving to alleviate concerns about counterfeit fasteners or substandard materials for the future.
- ✓ Standardization on a few fastener grades to reduce inventory costs.
- ✓ Better training, maintenance practices, and a high level of awareness to increase the reliability of bolted joints (i.e., fewer leaks, less downtime, and reduced potential for accidents).
- ✓ Implementation of a proactive bolting program to satisfy any foreseeable requirements which

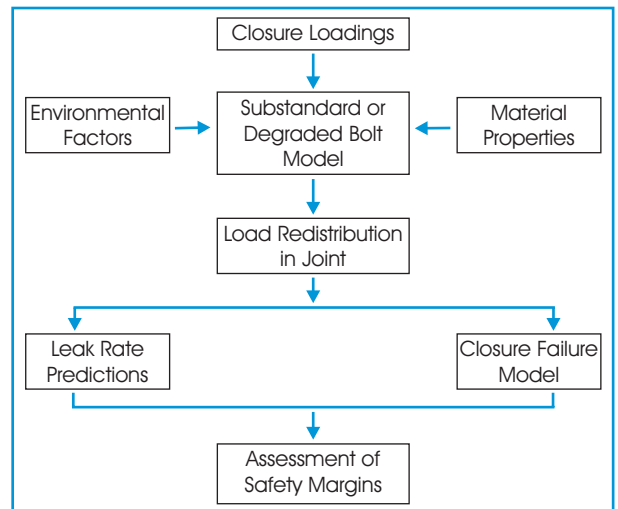


Figure 2  
Closure Integrity Assessment Strategy

Continued on reverse.

## APTECH can perform the following tasks:

### Current Practices Determination

We suggest site interviews to determine your company's approach to the use of fasteners.

### Condition Assessment

A statistically-based inspection of a typical installation will be conducted to assess the impact of substandard material in critical applications.

We will propose evaluation strategies and demonstrate in-place testing technologies available to characterize and solve problems.

If you have an existing risk assessment or failure modes and effect analysis, we will assist you in its use in quantification of risk due to substandard material.

### Material Review

Your fastener materials inventory will be reviewed with the objective of reducing inventory by standardizing on fewer grades of fasteners. This will result in inventory savings and reduce the chances of installing improper or inadequately certified bolting in the plant.

### Procurement Specifications

Standardization ordering specifications for fasteners will be provided and will simplify the ordering process by assembling all of the pertinent requirements in standard documents. This will alleviate the confusion which often occurs when a variety of fastener materials are ordered to different codes and standards.

### Approved Vendor's List Development and Audits

The need for an approved manufacturers' and subcontractors' vendors list will be assessed given the level of corporate commitment to receipt inspection and testing. A procedure or corporate policy will be provided to assure vendor acceptability (including subcontracted testing and inspections) to meet the requirements of applicable codes and standards. We will provide auditors as staff augmentation and/or assist in their training.

### Receipt Inspection Program

A standardized receipt inspection program can be provided and is **highly recommended**. Counterfeit fasteners will be kept out of the plant and the warehouse by (1) a standardized ordering system, (2) buying only from approved vendors, and (3) a receipt inspection program.

### Design, Assembly, and Inspection Manual

A fastener manual can be provided which is a consolidation of fastener specifications, preload and joint stress calculation methods, and assembly procedures. It will standardize and document the methods used to design joints, select fastener preload, choose gasket stress, and specify assembly methods (including tools, procedures, and preload control).

The manual will include a procedure for cataloging, correcting, and tracking progress in correcting problem joints. Tools and assembly procedures can be reviewed to determine those most effective for critical problem joints. Procedures and criteria can be provided for the inspection of fastener and joint components at assembly and at disassembly. Included will be the criteria for continuing service with degraded fasteners.

### Training Program

APTECH can provide a training program with modules tailored for your engineers, designers, craft labor, supervisors, and warehouse personnel. This is essential to the effectiveness of the fastener program. The objective of the training is to provide your people with the basic information that will inform them on the importance of threaded fasteners and their role in effective use of threaded fasteners.

### Training and Maintenance Aids

APTECH is licensed by EPRI to distribute a series of videotapes and a manual on Bolting Practices to companies in non-power industries on a sub-license basis. The videotapes and manual provide crucial instruction/information on bolting practices and aid dissemination of knowledge to personnel.

**If you would like additional information, please contact us at our Corporate Headquarters.**

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