

Total Integrated Solutions

Petracarbon (Thailand) Co., Ltd is a hi-tech company with their primary goal to promote advanced repair & maintenance technologies for oil & gas, chemical, petrochemical, oil refining industries in Thailand and in neighbouring countries.

Beside the usual services, we are also an approved training provider from ECITB (Engineering Construction Industry Training Board) for delivering the Mechanical Joint Integrity (MJ) training courses, that is in line with industry standards and practices.

This ECITB MJ course which focus on skills in performing various techniques using range of bolting tools, which enable delegates to learn isolation, dismantling, alignment and tightening techniques on various type of flanges, as well as inspection of components as per industry requirements.

- MJ10: Hand Torque Bolted Connection
- MJ18: Hydraulically Tensioned Bolted Connections
- MJ19: Hydraulically Torqued Bolted Connection

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**this issue**

Best Practices - Joint Integrity Management

Program **P.1 to P.3**

Joint Integrity Management (JIM) Program

The Joint Integrity Management Program provided by Petracarbon's PSI Services team is aimed at helping our clients in the Oil & Gas and Chemical industries monitor, maintain and manage their flanges in order to achieve optimum health, safety and operational efficiency standards.

Importance of Joint Integrity

Preventing and reducing risk of leaks, longer life for joints, greater levels of materials reuse, traceable results all adds up to enhanced plant integrity, enhanced plant reliability, eliminate unplanned shutdowns and reduced through life cost. Thus, operators should always be looking for ways to prevent them from occurring in the first place.

There are several essential elements in an effective joint integrity management program. They are:

1. Ownership
2. Best Practices
3. Criticality Assessments
4. Proper Training
5. Joint Identification and Tagging
6. Record Keeping
7. In-Service Inspections
8. Leak Management
9. Learning and Continuous Improvement.

1. Ownership

When it comes to ownership, every joint integrity management program should have an established owner. This person needs to be responsible for implementing the program, carrying out periodic maintenance and communication through the organisation. They also need to be in charge of setting expectations for the program, rollout new processes, develop new procedures, support risk assessments and monitoring its effectiveness.

2. Best Practices

It's important to encourage the use of best practices when constructing joints. Operators should seek, identify and benchmark against best practices and using guidelines and standards from the industries and associations. Such as ASME, API, CEN, BS EN and the UK's Energy Institute (EI). Example:

- Guidelines for Pressure Boundary Bolted Flange Joint Assembly. ASME PCC-1-2019.
- Guidelines for the management of the integrity of bolts joints for pressurised systems - 2nd Edition

The best practices should be applied within the organisation's JIM programs, processes, procedures and documentation.

3. Criticality Assessments

In a typical large refinery constructions, there might have as many as 50,000 flanges. Some of the flanges can be associated with water, high temperature application, cryogenic, thermal expanding &/or high risk hydrocarbon pipelines. Thus, joints should undergo criticality assessments.

ECITB MJI Trainings



This joints should be categorized into a minimum of 3-part scales; low risk, medium risk, and high risk. The risk assessment process should assess its media, temperature and pressure and be rated according to the leak and loss potential, the risk of human injury and the environmental impact, among others important factors.

Based on this risk analysis, the type of bolting, inspection process and testing can be determined for each level of risk.

For high risk joints, a dedicated contractor that specializes in bolting might be required. For low risk joints, the facility's own general technicians may be sufficient, providing they meet the industry training standards as the Qualified Bolting Specialists as specified by ASME and/or the Competent MJI personnel in the assembly of the bolted connections validated by ECITB. It is considered a best practice to rate every joint in the plant irrespective of the level of risk as stated by most of the established standards and guidelines.

4. Proper Training

Everyone involved with the program should be properly trained and qualified to work within each level and risk. They should know why the integrity management program is in place and how it works. Likewise, any personnel who inspect, repair or install the joints should be properly trained in their job.

A designated person should be assigned to manage the competency of assemblers, establish requirements for critical and non-critical joints and oversee the complete joint cycle, make-up and inspection.

Operators could approach ECITB MJI approved training providers as they will train the assemblers to reach a competent level involving the Mechanical Joint Integrity activities.

For Mechanical Joint Integrity in bolted connection techniques, there are at least 4 courses. Combination of courses are also available.

These training will cover isolations, dismantling techniques, inspection of components, alignment techniques and clamp connectors as well as assembly and tightening techniques in specialist critical bolting.

The technical training standards are:

- MJI10 - Hand Torque Bolted Connections
- MJI18 - Hydraulically Tension Bolted Connections
- MJI19 - Hydraulically Torqued Bolted Connections
- MJI-23 Powered Torque Gun Bolted Connections

5. Joint Identification and Tagging

This process is critical to ensure that technicians are aware of which bolted joint is currently under work and into which level of risk the equipment is categorized. In a turnaround or construction environment, as many as 2,000 to 3,000 workers can be on site at any time, which can become chaotic. Therefore, a good joint identification and tagging program must be in place.

6. Record Keeping

Proper records should be kept on all activities performed on all joints. Having this information is helpful for future inspections and maintenance activities.

For facilities with numerous flanges, it can be tough to keep track of the installation records, maintenance status and other historical information related to the flanges. At times, the amount of paperwork can be overwhelming and having only physical records puts it at risk of being misplaced or even unintentionally destroyed.



Petracarbon is an ECITB MJI approved training provider for courses on tightening techniques in specialist critical bolting applications.



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Maintaining the information in a flange management software will help to ensure continuity and accuracy in data recording and can be crucial for large facilities and big maintenance projects.

7. In-Service Inspections

In-service inspections of bolted joints is an integral activity and is important for any joint integrity management program. Everyone involved with the management program should be trained to effectively gather data on the joints.

This area of joint assurance will look at the possible flange damage that can occur, the inspection methods available for detection of defects, and mitigation measures that can be put into place to minimize effects due to degradation and improper assembly.

Operators should ensure that QA/QC personnel are well-trained and well-versed in the fundamentals of bolting so they can support the craft, execute tasks effectively and recognize any deviations to mandated procedures during the QA/QC process. QA/QC cannot be retroactive. It must be ingrained into the process, as many of the inspections occur during pipe assembly. Once the joint is completed and closed, inspectors can no longer adequately inspect the bolted joint. For example, an inspector must inspect the flange face for damage during the assembly process, as this cannot be accomplished after the fact.

8. Leak Management

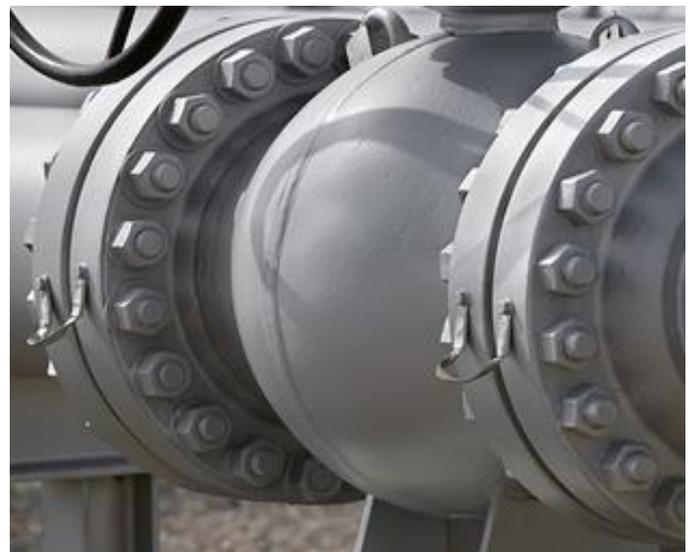
The objective of the Leak Management is to preserve the integrity of the bolted joint and prevent leaks. However, beyond just prevention, another significant part of leak management is dealing with leaks when they occur. This includes both repairing the leak and determining why it happened.

A good leak management program is a learning process. Operators must understand what caused a leak and ensure no recurrence. Leak decision trees and processes should be developed and implemented to ensure the highest degree of confidence in the bolted flanges. This analysis can also provide useful data for leak prevention on other

9. Learning and Continuous Improvement

Finally, it is important to periodically review the leak reports, inspection data and system records should be used to generate ideas to determine how effective the system is and how it can be improved in the future.

Feedback on good practices in integrity issues and causes or solutions to incidents should be provided both internally and externally in order to contribute for industry-wide continuous improvement.



Once the nine fundamental elements have been addressed and processes, procedures, training and competency management programs put in place, it is important to ensure those responsible for implementing and managing the Joint Integrity program on site are competent and fully versed in bolting in order to have a successful leak

