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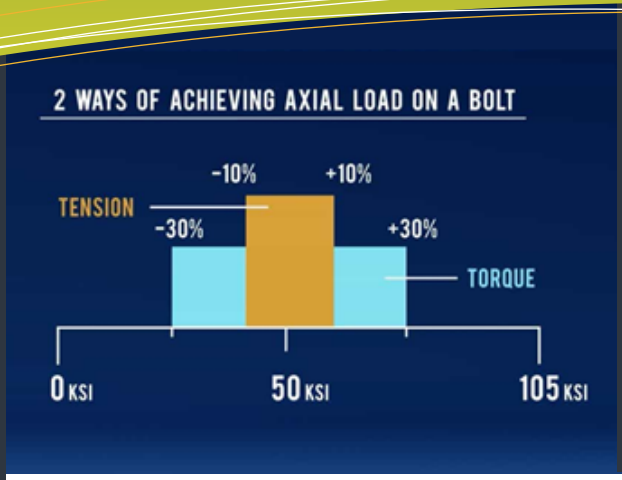
# TechTimes




## Total Integrated Solutions

Petracarbon (Thailand) Co., Ltd is a hi-tech company with their primary goal to promote advanced repair & maintenance techniologies 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 (MJI) training courses, that is in line with industry standards and practices.

This ECITB MJI course which focus on skills in perfoming 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.

- MJI10: Hand Torque Bolted Connection
- MJI18: Hydraulically Tensioned Bolted Connections
- MJI19: Hydraulically Torqued Bolted Connection

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## this issue



## Bolt Torqueing versus Bolt Tensioning

Before we start to compare between bolt torqueing versus bolt tensioning, let us remind ourselves what we are trying to achieve when we use either methods.

The objective in bolt tightening is to achieve the correct fastener preload (or also known as bolt load). Applied appropriately to a gasketed bolted connection, the bolt load creates clamping force (or clamp load) on the gasket to get a reliable leak free sealing effect.

Bolt torqueing and bolt tensioning are both legitmate methods to seal a joint. Bolt torqueing exerts a rotational force on the fasteners, whilst bolt tensioning involves stretching the fastener with a hydraulic load cell.

So, what is the differences and when should each be used?

Torqueing generates load by turning a nut on a helical thread. As the force is applied, the threading draws the nut face and bolt head closer together, stretching the bolt and creating the clamping force and it is more common but less accurate method for achieving the bolt load. This decrease in accuracy increases the risk of leaks which presenting the biggest pitfall of torqueing.

Torqueing is the most common form of providing load to a bolt. However, torqueing may lead to galling, which can bring breakouts to a halt! Furthermore, torqueing increases the risk of hand injuries by creating pint point hazards which is a great concern to operator safety. Nevertheless, there are some scenarios where torqueing is still a preferable choice. Such as working with short grip length, thin flanges which might bend under heavy loads or short stud length above the nut where studs cannot be changed due to blind holes. Thus, tensioning method is more accurate, faster and safer for achieving optimal load.

Another disdvantage of bolt torqueing is on the sequence in which bolts or studs are tightened. It has a substantial effect on the distribution of preload in a joint. Since in most cases, all bolts of a joint are not tightened simultaneously, tightening of a bolt effects preload in other previously tightened bolts in the individual or group. Such effects are

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

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Bolt tensioning, which is a hands-free bolting method, eliminates most of the setback of torqueing, by applying load in a different way. Instead of stretching one fastener one at a time, user can use multiple tensioners to stretch studs simultaneously. Once the stud is elongated through tensioning, the nut is turned down with a tommy bar, this will then lock in the desired bolt load before releasing the tensioning pressure. This process can be used on alternating studs of a flange to achieve 50% bolt tensioning (reduce tool coverage), or on all studs to achieve 100% bolt tensioning. Because the load applied directly to the stud, bolt tensioning substantially increases bolt load accuracy.

Achieving 50% bolt tensioning, as shown below, significantly reduces crosstalk as discussed earlier, increasing accuracy and worker safety.

In some cases, some bolted joint assemblies require the additional speed and complete elimination of crosstalk through 100% tensioning. See below picture, where each fastener is connected with a hydraulic tensioner.

With bolt tensioning, breakout is achieved by resuming the stretch transferring the load to the nut. This eliminating the opportunity for galling especially on stainless steel bolt and nut, reduce crosstalk and increase productivity.

Further to that, under normal circumstances when using torque tools, the accuracy is within ±30%. So if the target load is 50 ksi, then the actual bolt load on the fastener will be largely dispered, say between 35 ksi to 65 ksi. But with tensioning method, this will lower the bolt dispersion (±10%) and result to a more uniform and consistent loads on the flange connection.

In short, tensioning is safer, more accurate and faster, resulting in predictable scheduling for critical path activities during turnaround/shutdown. Thus, faster recovering of shutdowns mean fewer workers