

PVP2014

Pressure Vessels & Piping Conference 2014

July 20-24, 2014, Anaheim, California, USA

A Survey Method to Optimize Bolted Flanged Joint Assembly Torques for ASME B16.5 Flanges

Anita Bausman
VSP Technologies
Kingsport, TN

A. Fitzgerald (Jerry) Waterland, III
VSP Technologies
Prince George, VA

ABSTRACT

The three critical components within a bolted, flanged connection are the flanges, gasket, and bolts. Until recently, simplified flange assembly target torque values for ASME B16.5 flanges were routinely determined by considering just one or two of these primary components.

One approach considers only the gasket. Gasket-based target torque values are selected to optimize the gasket's sealing performance by ensuring compression between minimum and maximum seating stress ranges, or based upon achieving specific levels of gasket Tightness (T_p). Another approach, fastener-based torque values, simply targets a specific bolt preload during assembly, typically some percentage of bolt material yield stress. A third approach optimizes gasket seating stress or tightness within the specific preload stress range of particular grades of fasteners. None of these approaches consider the physical limitations and capabilities of the flange itself, which can result in flange damage due to excessive bolt preload or the lost opportunity to gain fatigue resistance and reliability when low fastener preloads are selected [1].

While detailed Finite Element Analysis (FEA) could meet this objective, cost and time constraints limit the number, size, and materials to be considered. The objective of this method to optimize target assembly torques for B16.5 flanges is to identify the likely maximum safe assembly bolt load not exceeding the compression, yield, or tensile limits of any of the three flange components. It is recognized that some localized yielding does occur. Existing industry efforts to study and optimize target torques are surveyed, reviewed, combined, and extrapolated to determine acceptable torque values that conform to selected component limits. The limits are chosen consistent with normal practice in the chemical, process, and power industries.

