Threaded and Coupled Connector Analysis Using Abaqus CAXA

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Abstract: Analysis methodologies developed for evaluating three threaded and coupled connectors quantitatively are presented. Two new non-dimensional parameters for assessing the seal leakage and load shoulder separation are introduced for the purpose. Stress Amplification Factor (SAF), defined in API Specification 16R, is scrutinized for what type of stress is to be used and which reference point the alternating stress is measured from. As a result of it, loading sequence Mean Tension with Two Alternating Moments (MT2AM) is proposed for SAF calculation.

Keywords: Oil and Gas, Riser Connector, Load Capacity, Seal Leakage, Load Shoulder Separation, Fatigue, Stress Concentration Factor, Stress Amplification Factor.

1. Introduction

Threaded and coupled (T&C) connection traditionally is used for down-hole casing, but it is becoming popular in deepwater riser application for three reasons: 1) its short makeup time, relative to the flanged connection, 2) its immunity to the problems associated with weld, and 3) the weight saving because of high strength material being used. But because the thread profile is cut on the riser pipe base metal, the cross section area of the most critical first thread root is smaller than the riser pipe. The connection is hence weaker than the connecting pieces, which violates the first rule in connection design. In conjunction with the stress concentration due to notched geometry (thread), it makes riser designers think twice before selecting T&C connector as the connection.

For the above reasons, a major oil company had funded three vendors to design a fit-for-purpose T&C connector for its completion and work-over riser (Craig, 2007). Comprehensive design verification and testing program was developed by this major oil company for evaluating the connectors. Vendors were to design the connector by analysis; however, both analysis verification and testing were to be done by third party for consistency and objectivity.