

Mechanics of Re-Torquing in Bolted Flange Connections

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It has been widely accepted that the phenomenon of time-dependent loosening of flange connections is a strong consequence of the viscous nature of the compression seal material. Characterizing the coupled interaction between gasket creep and elastic bolt stiffness has been useful in predicting conditions that facilitate leakage. Prior advances on this sub-class of bolted joints has lead to the development of (1) constitutive models for elastomerics, (2) initial tightening strategies, (3) etc. The effect of re-torque, which is a major consideration for typical bolted flange seals used on the Space Shuttle fleet, has not been fully characterized, however. The current study presents a systematic approach to characterizing bolted joint behavior as the consequence of sequentially applied torques. Based on experimental and numerical results, the optimal re-torquing parameters have been identified that allow for the negligible load loss after pre-load application.

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