

Influence of flange geometric configuration and bolt stress on joint integrity during assembly using FEA

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Abstract-

The aim of this study is to develop a procedure suitable to determine the maximum bolt pre-stress required for the proper gasket seating in bolted flange connections. The proposed method is valid for all the flange types and assumes that the gasket leakage must be limited so as to not affect the flange joint integrity. A 3D finite element model is used in which elastic–plastic behaviour of the flange material, non-linear gasket material behaviour and non-linear flange–gasket contact are assumed. The final goal of the developed work is to update, using a more realistic perspective, the recommendations given by ASME PCC-1 Appendix-O for bolt pre-stress values when applied to standard dimensional ASME flanges. Additionally, in this work, the effect of the straight portion length of the flange hub at its welded connection with the connected pipe and the fillet radius at the hub-flange transition on the stresses and strains distribution are also addressed.

Index Terms- Bolted joint integrity; Flange; ASME PCC-1; WRC-538; Elastic–plastic

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