NAFEMS UK Regional Conference 2018 - Abstract Submission

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Please identify the event for which your submitting?	NAFEMS UK Conference 2018
Will you be the presenting author?	Yes
Presentation Title	Choosing Correct Mathematical Algorithm to Predict Stresses on Interference Fitted Structures
Relevant Themes / Keywords	Strcutural Integrity

Abstract (plain text)	Design application uses the cylindrical pressure vessel thick wall theory integrated into Lame equation to predict stresses, which are developed between cylinders due to contact pressure generated by interference fit. Problem on analytical model solved by equation of stress equilibrium in polar coordinates that permits D of E on axis of symmetry, restrained by plane symmetry on Z axis. Mathematical model is 2 DoF model and bounded by axis of symmetry Stress equilibrium is solved without body forces. Interference between those two cylinders are represented by over lapped structures on analytical model. FE models are expected to validate analytical; model , are featured by interference between those two structures, without any external loading, it is only restrained through symmetry plane and body forces generated by weight distributions through nodes are included on FE models. Stresses developed between cylinders are due to contact pressure generated by interference fit. Interference fit is diametrical differences between outer diameter of shaft and internal diameter of hub hole. Modelling interference fitting and choosing mathematical algorithm have influences on tangential stresses developed as a result of normal pressure imposed by interference. FE is capable to predicts stresses accurately using various algorithms available in FE analysis . The task also evaluated various features available in FE and compared the predictions with the analytical results using different algorithms of ¬ Penalty method, ¬ Lagrange, ¬ Augmented Lagrange, FE prediction of normal traction match with analytical solution to acceptable accuracy for all three schemes except at the contact edges. At the edge of contact, FE predicts 0.5 - 2% of negative contact pressure which could be due to the coarseness of the mesh. Among all the three algorithms, augmented Lagrange and penalty formulation gives better results with less run time. For the flat & round surface geometry, it can be concluded that the augmented Lagrange method gives better results followed by penalty formulation
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