UNIVERSTI TEKNOLOGI MARA

PARAMETRIC STUDY OF NOZZLE CONNECTIONS IN ELLIPSOIDAL HEAD VESSEL

HASZEME BIN ABU KASIM

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ABSTRACT

In designing the pressure vessel equipment, the nozzle connection requires a careful study of many regions. One of the critical aspects in designing pressure vessels is the nozzle connections in the ellipsoidal head of two intersecting shells. Two of the most important design guide (codes and standards) for designing the pressure vessel are ASME (American Society of Mechanical Engineers) pressure vessel code and WRC (Welding Research Council) bulletins. Both ASME and WRC standards do not directly address procedures or provide acceptance criteria for the effect of external forces and moments imposed by a piping system to the nozzle, and do not deal with ellipsoidal heads. Therefore, a parametric study was carried out in this research. The aim is to understand the behavior of the nozzle connections in radial and non-radial orientation to ellipsoidal head vessel subjected to the internal pressure and various external loading using the Finite Element Analysis (FEA) method. All the results analysis for both radial and non-radial nozzle are presented as graphs of non-dimensional parameters against stress concentration factor (SCF) for each load case applied. For validation, an analytical investigation using thin shell theory was utilized for the radial nozzle due to applied internal pressure loading. The comparison results between both methods show that the FEA method was valid with less than 10% differences.

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