R E S U M O

MOTIVAÇÃO:

Welding technology is widely used in offshore structure construction because of the high productivity during the assemble process. The simulation accuracy of welding thermal transfer analysis is an important pre-requisite to ensure the reliability of thermal stress and deformation analysis.

OBJETIVO:

A finite element code, ABAQUS, will be used for the thermal transfer simulation. Temperature-dependent material properties, the convection, radiation boundary conditions and effects of latent heat will be included in this model. “Element birth” technology will be used to realize the multi-pass welding process. A FORTRAN subroutine will be employed to implement heat into the FE model and realize the heat source moving along the welding pass. The transient temperature distributions under different geometric parameters of Goldak’s heat source model and welding speed are investigated.

APLICAÇÃO NA INDÚSTRIA DO PETRÓLEO:

More and more offshore structures will be widely used for exploring the Pre-salt. Most of the structure will be assembled with welded connections. During the welding process, the deformation and residual stress will be occurred. These two factors will affect the ultimate strength of offshore structure. So, the research of residual stress and distortion is very important for the strength analysis of offshore structure. However, welding thermal transfer analysis is the base of thermal-mechanical analysis. So, the welding thermal transfer analysis should be researched firstly and accurately.

RESULTADOS OBTIDOS:

(1) A FORTRAN program base on the moving Goldak’s double ellipsoidal heat source model is developed to realize heat inputs into FE thermal simulation and heat source moving along the welding line. Welding temperature distributions are predicted using this subroutines program.

(2) The effects of welding speed and geometric parameters of double ellipsoidal heat source model are investigated. The results demonstrate that they have important effects not only to the peak temperature but also to the distributions rounding the welding line. But, temperature distributions in the area which far away from the welding line are uniform.

(3) The welding residual stress analysis should be done in the future. Further experiments are required in order to validate heat source model and to establish quantitative correlations between FE simulations and experiments.