Analysis of welding distortion using finite element method

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ABSTRACT

Welding distortion is experienced during the fabrication of many structures and the control of the distortion within limits is one of the important requirements for a practising engineer. The analysis of welding distortion is needed for taking precautionary measures during fabrication. In earlier times, empirical cum analytical type of analysis was popularly employed but with the advent of powerful computers, numerical techniques are becoming popular for the analysis of welding distortion in various structures. In this paper, the analysis of welding distortion during circumferential welding of a thin pipe using finite element method is discussed. The analysis is of transient thermal elastic plastic in nature as the accumulated plastic strains caused by the localised heat input are responsible for the distortion in the component. The thermal and elastic plastic analyses are carried out using four noded bilinear degenerated shell element which assumes that the thermal and stress gradients in the local thickness direction are negligible. For carrying out the finite element analyses, computer programs are written in C language and are run in a PC with 80486 configuration and 25 MHz clock speed. Due to the limitations in the memory size, the analyses are carried out using out of core technique which involves many memory operations during the formulation and solution stages. The details of the models, the solution techniques and the thermal, displacement and stress results are presented in this paper. ❑