Study on Minimization of Weld Deformation for Core Shroud by Application of Design Optimization Technique

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Abstract

Core shroud is fabricated by thin steel plates to minimize a thermal effect due to neutron irradiation. By reason of this, the weld deformation occurred during manufacturing has been raised seriously since Palo Verde nuclear power plant.

In this study, a method to minimize the weld deformation is investigated by application of the optimization technique to core shroud design. For this purpose, variation of welding area and shift of reinforcement location are utilized to demonstrate the changes before and after optimization. The results show that the welding area on core shroud can be remarkably reduced by design optimization so that the weld deformation will be minimized.

A Spring Back Calculation Model for the Sensitivity Analysis of Tube Design Parameters of Helical Steam Generator

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Abstract

The spring back phenomena occurring in the coiling process of a steam generator tube induces the dimensional inaccuracy and makes the coiling procedure difficult. In this research, an analytical model was developed to evaluate the amount of the spring back for SMART steam generator tubes. The model was developed on the basis of beam theory and elastic-perfectly plastic material property. This model was extended to consider the effect of plastic hardening and the effect of the tensile force on the spring back phenomena. Parametric studies were performed for various design variables of steam generator tubes in order to minimize the spring back in the design stage. A sensitivity analysis has shown that the low yield strength, the high elastic modulus, the small helix diameter, and the large tube diameter result in a small amount of the spring back. The amount of the spring back can be controlled by the selection of adequate design values in the basic design stage and reduced to an allowable limit by the application of the tensile force to the tube during the coiling process.