Simulation Studies for Design of an Encircling and Annular Phased Array Probe for Ultrasonic Examination of Zircaloy Billet

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Abstract
Zirconium alloys are widely for core components in Indian pressurized heavy water reactors and boiling water reactors. One of the quality control steps during manufacturing of these components is the ultrasonic normal beam examination of zircaloy billet from which these components are made. Ultrasonic simulation study using CIVA has been carried out to design an encircling phased array probe and the annular phased array probe for normal beam examination of billet. The simulation study involved computation of sound beam profile inside the ingot and then using this profile in the defect response module to assess the effectiveness with which the defects of interest are picked-up. The paper describes is details the essential parameters which were optimized for design of encircling and annular phased array transducers for zircaloy billet. The analysis of beam computation and the defect response results obtained during simulation exercise are also discussed.

Keywords: Ultrasonic simulation, Phased array, Zircaloy, CIVA