A Study on the Quantitative Evaluation Technique of Volumetric Indications in SG Tubes

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The steam generator (SG) of the nuclear power plant is a key component that forms the pressure interface between the primary and secondary cooling systems. In order to maintain public safety and efficiency of power generation, structural integrity of the SG tubing must be maintained. Any defects or potential deterioration that may affect the integrity of the tube shall be detected in a timely manner by Eddy Current Testing (ECT) and appropriate repair, such as plugging or sleeving should be made if necessary. Among the factors that may affect the integrity of the tube, the wear defect is formed and grown by the mutual vibration and friction between the tube supporting structure and the tube regardless of the SG model. In addition, there are cases where the indications of wear due to the foreign material on the secondary side of the tubing and some corrosion-related IGA (Inter-Granular Attack) may show volumetric characteristics. In general, for the wear indications formed at the tube support structure, the depth is measured by quantitative evaluation using the wear scar standard tube. However, for the volumetric indications by foreign materials or some IGA, 100% drilled hole or flat bottom hole (FBH) signals fabricated on ASME standard tubes have been utilized for depth assessment. In the volumetric case, except for the indication of the wear at the tube support structures, there are many deviations between the depth of the actual defect and measured by applying the ASME standard tube. In this paper, four standard specimens (φ: 1, 2, 3, and 4 mm respectively) composed of identical FBH diameters different from existing ASME standard tubes are processed to improve these errors and quantitatively evaluate more accurate defect depth. Consequently, a method to quantitatively evaluate the size and depth of those volumetric defects has been implemented. From this result, it can be also utilized for providing a basic data of engineering evaluation of the related tube.