

Study of various Depth Analysis methods for Foreign Objects Wear using ECT Array Probe

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Steam generator (SG) tubes are used as a heat transfer channel of a nuclear power plant, and also make the pressure boundary between the primary and secondary side of the plant. SG tubes are checked their integrity using eddy current nondestructive inspection because of the fast inspection speed during each overhaul period. Major defects in SG tubes include pitting, crack, and wear, etc. Recently the wear caused by foreign objects from outside of the tube is increasing worldwide as the tube material is replaced to Inconel 690 which has high crack resistance. The shape of wear by foreign object (FO) may differ based on the FO's shape and their contact condition with the tube. This paper classified the wear shape into seven; circumferential, axial, football, tapered hole, flat, tapered, and 45 degree tapered, which are based on the wear patterns founded in the field. Each specimen has various size of depth from five to ninety percent relative to tube wall thickness. ECT array probe was developed as one of the eddy current test method scores of years ago, and could detect circumferential defect with high inspection speed of twenty inch per second using electrical send-receive sequence. It has not been used to inspect SG tubes in Korea, whereas in other field used to detect various defects. This paper observed the inspection frequency and sensitive coil sequence of the probe for the FO wear, compared the manufactured wear points with the ECT signal results which are evaluated the signal amplitude relatively by FO wear specimens and ASME standard. The review of the ECT array probe signal by the FO wear defects is expected to help us to know how the ECT sizing is close to the actual depth and whether the methods could be applied to wear sizing.