

N211. Steam Generator Tube Evaluation By Ultrasonic Testing

Framatome has developed computerized equipment for inspecting pressurized water reactor (PWR) steam generator (SG) tubes using a rotating ultrasonic probe. Mainly devoted to the examination of the roll transition zone at the tube sheet secondary side level, the testing system can operate independently for specific tube inspection, or it can be integrated into a broader purpose system for sleeve weld testing, etc. The testing results are displayed in real time by means of two eight-level coded colored maps. Applications range from mockup testing to on-site inspection.

SG tube bundles are one of the most sensitive items in PWR coolant systems. In particular, the roll transition zone at the tube sheet secondary side level is critical to the integrity of the second confinement barrier. This zone generally undergoes nondestructive examination during periodic in-service inspections, using either eddy current testing methods or leak tests. Other methods, such as camera endoscopy or ultrasonic testing, can also be applied. Utilities rely on accurate and reliable data from these inspections, which support their decisions to leave the situation as it is, perform preventative repairs, or plug the defective tubes.

In 1987, Framatome's Technical Center began a program to develop SG tube ultrasonic examination equipment with two goals:

- To develop tools and methods enabling an overall examination of a SG tube section some 50 mm long, located within the roll transition zone in less than two minutes, including the following inspections: detection and sizing of circumferential and longitudinal cracks; internal profilometry; and tube-wall thickness measurement. The testing results would appear in real time as eight-level coded colored maps with automatic issuance of a diagnostic report.
- To apply these methods to the in-service inspection and follow-up repair operations (such as steam generator tube sleeving), and finally to create multipurpose ultrasonic testing equipment within the scope of tests carried out in its laboratories.

Taken from , "SG Tube Evaluation by Ultrasonic Testing," Francis Bodson, Nuclear Plant Journal, September-October, 1992, p. 96.