

1.12.16. ADVANCED APPROACH OF REACTOR PRESSURE VESSEL IN-SERVICE INSPECTION

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The most important task of every utility operating a nuclear power plant is the continuously keeping of the desired safety and reliability level. This is achieved by the performance of numerous inspections of the components, equipment and system of the nuclear power plant in operation and in particular during the scheduled maintenance periods at re-fueling time. Periodic non-destructive in-service inspections provide most relevant criteria of the integrity of primary circuit pressure components. The task is to reliably detect defects and realistically size and characterize them.

One of most important and the most extensive examination is a reactor pressure vessel in-service inspection. That inspection demand high standards of technology and quality and continual innovation in the field of non-destructive testing (NDT) advanced technology as well as regarding reactor pressure vessel tool and control systems.

This article presents remote underwater contact ultrasonic inspection equipment and developed advanced nondestructive techniques for the examination of the defined sections (reactor welds). Eddy current method is applied for clad surface examinations; visual inspection is used for examination of the vessel inner surface; and advanced phased array ultrasonic technique is applied for base material examination. The movement of probes and data positioning are assured by using new reactor pressure vessel tool concept that is fully integrated with NDT systems.

The successful performance is attributed thorough pre-outage planning, training and successful performance demonstration qualification of chosen NDT techniques on the specimens with artificial and/or real defects. Furthermore, use of advanced approach of inspection through implementation the state of the art examination equipment significantly reduced the inspection time, radiation exposure to examination personnel, shortening nuclear power plant outage and cutting the total inspection costs.