

N212. Development of Unique In-Service Inspection Equipment for Reactor Pressure Vessels

The American Society of Mechanical Engineers requires an examination of reactor pressure vessel (RPV) seam welds every 10 years. The RPV of older BWRs cannot be approached from the outside of the RPV and, because of the very narrow gap between the RPV and the surrounding metal insulation, cannot be inspected with the outside diameter (OD) inspection equipment such as the inspection system used for most BWRs.

Japan Atomic Power Company's (JAPC) Tsuruga Unit 1, an older BWR plant, has a RPV that cannot be approached from the outside. Inside diameter (ID) inspection equipment was developed for the examination of the RPV shell seam welds. A major consideration in the development of this new equipment was that the design must pass an ultrasonic (UT) head through a very narrow gap between reactor internals without any interferences. This UT inspection equipment was used to inspect the RPV shell seam welds of Tsuruga Unit 1.

The power source panel supplies power to the control and operation panels and to the motors used for moving the carriage and mast. The control panel supplies power to the motors used for moving the arm and the UT head and detects encoder and limit switch signals. The operation panel displays the conditions of each component of the manipulator on a program operation display and has the operation instruction buttons. This panel also has a TV monitor showing the operating conditions of the manipulator.

The data acquisition unit consists of a system controller, an ultrasonic testing unit, and an ultrasonic waveform recorder. A computer controlling the whole of the data acquisition unit, a floppy disk, etc., are mounted on the system controller.

A flaw detector, a DAC, etc., are mounted on the ultrasonic testing unit. Waveforms displayed on the flaw detector are recorded in video tapes loaded into the ultrasonic waveform recorder.

The data processing unit processes UT data collected by the data acquisition unit. The results of processed UT data are output in various tables and figures.

In June 1991, the UT equipment was used to inspect both the upper and lower part of the RPV at the 20th scheduled outage of Tsuruga Unit 1 and performed extremely well.

Taken from, "Development of Unique ISI Equipment for RPV," Katsumi Tokunaga and Takayuki Aoki, Nuclear Plant Journal, September-October 1992, p. 87. For further information, contact Takanao Nishimoto, Japan Electric Power Information Center, Inc. 1726 M Street, Suite 403, Washington, DC 20036. Phone: (202) 955-5610, Fax: (202) 955-5612