

N49. More on Mitsubishi's UNDERWATER VEHICLE FOR ULTRASONIC VESSEL INSPECTION

Mitsubishi Heavy Industries in Japan has developed a novel remote-controlled ultrasonic inspection system for pressure vessels that does away with the need for a cumbersome central mast manipulator. Mitsubishi believes its light-weight system will reduce the time it takes to perform in-service inspection and pre-service inspection in PWR reactor pressure vessels. The underwater ultrasonic inspection system is designed to:

- Reduce critical path time.
- Maintain high accuracy of positioning.
- Perform reliable data acquisition and evaluation.

To meet these requirements, Mitsubishi developed:

- **A Light-weight Vehicle.** The main body of this vehicle is effectively weightless underwater. The body has two base axes, one of which allows rotation through 360 degrees. Six propellers move the vehicle vertically and horizontally underwater and a driving mechanism with four wheels enables the vehicle to travel freely on the underwater wall. A water pump creates a vacuum attaching the vehicle to the vessel wall while inspections are performed.
- **An Underwater Manipulator.** The water-tight manipulator, which is carried by the vehicle, has six axes, each driven by a DC motor. An encoder is used as a position detector.
- **A Position Orientating Unit.** The underwater laser position orientating unit can automatically follow the movement of the vehicle. The vehicle's position can be obtained by reflecting the beam of an argon laser by a glass prism on the vehicle. The accuracy of the laser positioning is +/- 2 mm horizontally and +/- 5 mm vertically.
- **Optical Fibre Data Transfer System.** Optical fibre is used to transfer data from the vehicle to test equipment, ensuring high quality data transmission. By using optical fibre, the weight of the system is kept to a minimum and the vehicle's movement is not hindered greatly.

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