

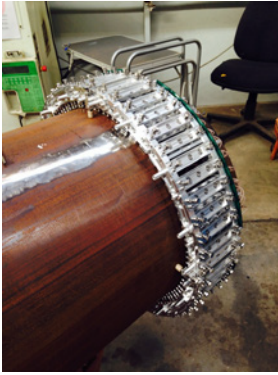
MONITORING WITH HIGH-TEMPERATURE PERMAMOUNT

Long-range ultrasonic testing was identified as a potential means of investigating inaccessible structural pipes in nuclear power plants. Only the top sections of pipes are accessible to perform the inspection and guided waves were the only potential technique for monitoring this hard-to-reach area.

The inspection consists of sending a circular pulse of low-frequency ultrasound down the wall of the structural pipe. This pulse is reflected by features, such as changes of sections, and by the far end. Response consistency from features and from the far end indicates that the structural pipe is in the same condition since the start of the monitoring program.

Eddyfi Technologies inspection teams perform tests at every available opportunity when the plants are offline, but this activity affects other work being done in the limited available time. The need to shorten the time spent testing and the need to collect long-range guided wave test data frequently, even when the plant is in-service, led to discussions about the possibility of producing a tool that could be permanently installed and could survive the boiler operating temperature of 200 °C (392 °F).

To this end, Eddyfi Technologies designed and manufactured a permanent high-temperature system, illustrated here.



System (w/o external cover) during trials

Once installed, this system eliminates the need to access the area to perform inspections. It also eliminates the need to remove and reinstall insulation. Inspections may therefore be conducted with minimal disruption to other operations and while the reactor is online. This further opens up the possibility for continuous monitoring.

APPLICATION SPECIFICATIONS

- Ultrasonic performance equal to or better than existing tools

- Working temperature 200 °C (392 °F)
- Stable performance over time at that temperature

CHALLENGES

- Choices of materials
- Design for satisfactory ultrasonic and mechanical performance at high working temperatures
- Design for mounting in restricted access area
- Manufacture of high-temperature ultrasonic transducers

BENEFITS

- Improved transducer coupling efficiency, giving more uniform signals
- Improved reproducibility
- Less labor-intensive installation and operation
- Minimal requirements to enter the boiler pod once installed
- Ability to monitor the spines without taking the plant offline