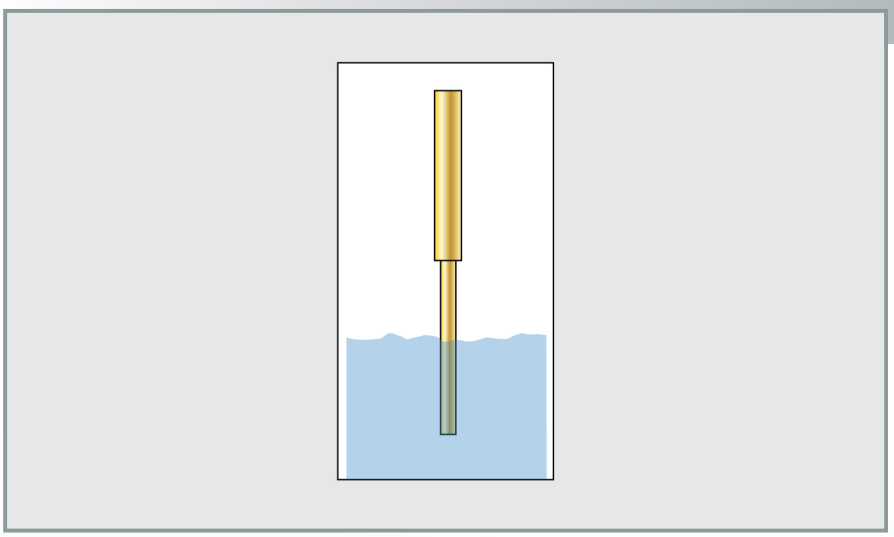
In-Vessel Torsional Ultrasonic Wave–Based Level Measurement System

UT-B ID 200702011



Technology Summary

At Three Mile Island in 1979, a partial meltdown of the core was caused by a sudden, undetected loss of reactor coolant water. In the past, a reactor's high temperature and pressure environment has complicated the implementation of level measurement devices. To effectively measure the level of coolant, ORNL has developed a torsional wave-based level measurement system. This system can be placed within a high temperature and pressure environment.

This invention operates by launching torsional waves into pipes to detect defects. It features an ultrasonic waveguide blade (several meters in length), positioned within the fluid region of a high temperature and pressure environment. An electrical assembly is positioned inside and works with the waveguide blade to launch and receive ultrasonic waves.

The electrical assembly and attached waveguide generate the traveling ultrasonic wave. The waves are then analyzed by a signal processing system to determine the level of the fluid. The level of the fluid can be directly determined because the speed of the wave propagation along the blade is proportional to the density of the fluid surrounding the blade and the level of the fluid in the vessel.

Advantages

- All components of the blade and assembly are within the reactor
- Use of a torsional wave launching technique in the sensor
- Gradually tapered ultrasonic waveguide blade
- ransducer is able to withstand temperature and pressure conditions of reactor
- No pressure tap (hole) needed in the vessel, a major safety advance
- Not sensitive to water flow conditions, improving accuracy
- "Live" measurements give operators confidence since they now have more than just a discrete set of measurement points

Potential Applications

- Fluid level measurement in high temperature and pressure environments, including mixed phase systems with temperatures up to 350°C

Patent

David E. Holcomb and Roger A. Kisner, *In-Vessel Implementation of a Torsional Ultrasonic Wave Based Level Measurement System,* U.S. Patent Application 12/724,818, filed March 16, 2010.

Inventors

David E. Holcomb[1] and Roger A. Kisner[2]
[1]Nuclear Science and Technology Division
[2]Measurement Science and Systems Engineering Division
Oak Ridge National Laboratory

Licensing Contact

Gregory C. Flickinger
Technology Commercialization Manager, Energy and Engineering Sciences
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.241.9485
E-mail: flickingergc@ornl.gov

PARTNERSHIPS