

Fixed In-core Detector Monitoring System

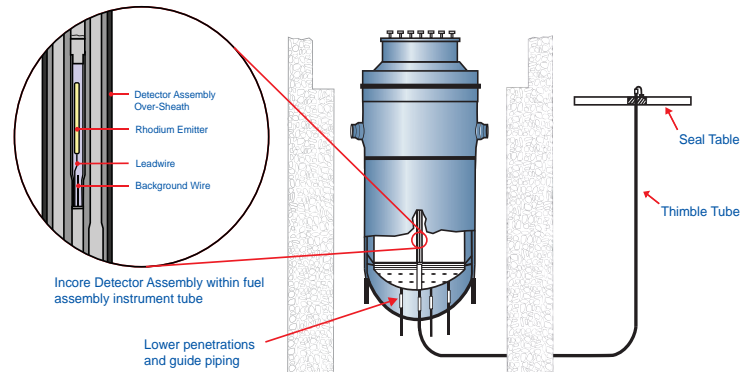
Continuous Monitoring of Core Performance

Plant operators need fixed in-core detector systems with the ability to enhance reactor operation through continuous, real-time monitoring of actual core conditions in B&W, Westinghouse, and Combustion Engineering pressurized water reactors. AREVA's simple, reliable monitoring system provides 24-hour monitoring and on-line assessment of actual core safety limits with a real-time display. This increases the overall guidance available to operators and improves the ability to navigate transient conditions and to detect and diagnose core anomalies.

Compared to movable in-core detector systems, which acquire only periodic "snapshot" power distributions, fixed in-core detector systems, with full-time monitoring, can expand the allowable operating window and improve reactor operating margin. The continuous monitoring feature of AREVA's fixed in-core system allows utilities to safely operate closer to reactor limits, providing a 10- to 15-percent increase in operating margin in some plants. In contrast, movable in-core detector systems, with fuel performance measurement approximately once per month, rely on forecast conditions to determine core operating limits, resulting in unnecessarily restrictive limits.

High Reliability and Less Maintenance

AREVA's fixed in-core detectors are highly reliable due to their inherently simple design with no moving parts or need for an external power supply. The fixed in-core system eliminates movable components such as the channel selectors, drive units and manual isolation valves, along with associated mechanical and electrical problems. Less maintenance means reduced cost and reduced radiation exposure to maintenance personnel.



Fixed In-core Detector System utilizing existing vessel penetrations and thimble tube in a Westinghouse-Type reactor, requiring no facility modifications.

Customized Core Monitoring Solutions

AREVA can configure fixed in-core detector assemblies to a utility's specifications. Plus, the assemblies can be positioned in the reactor core through the existing instrumentation guide tubes. The basic fixed in-core detector assemblies contain rhodium emitters. A computer work station and specialized AREVA software eliminate the need for many of the collateral hardware, software and electronic devices required for movable in-core detector systems.

Features and Benefits

- Provides continuous, accurate information on core conditions
- Increases core operating margins
- No moving parts: requires no maintenance
- Reduces maintenance costs and personnel radiation exposure
- Helps identify core anomalies and failed reactor components
- Reduces feed and bleed volumes
- Reduces human error and minimizes LCO (limiting conditions of operations) violations and reactor trips
- Eliminates the need for many off-line calculations
- Allows faster return to full power following shutdowns
- Extremely low failure rate

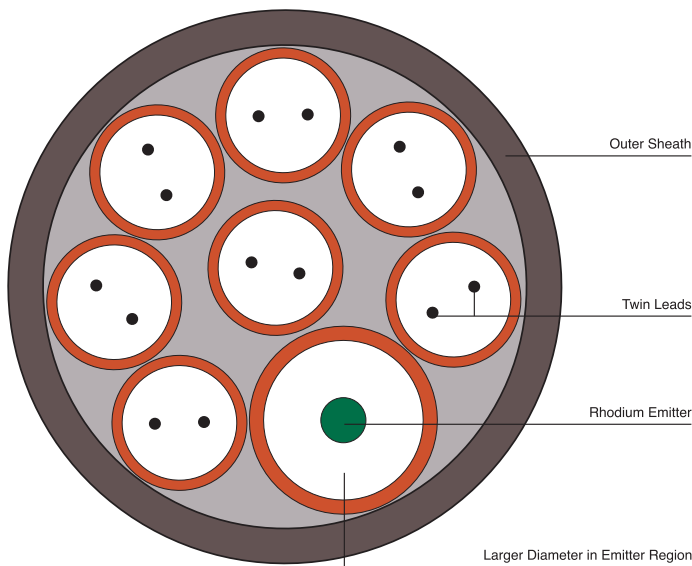
Rhodium In-core Detector Assembly

A typical fixed rhodium detector assembly consists of an outer in-conel sheath containing five to seven rhodium detectors (depending on the application) and a thermocouple. The rhodium emitters are approximately 16 inches long and are positioned within the assembly so that their emitters are between fuel spacer grids.

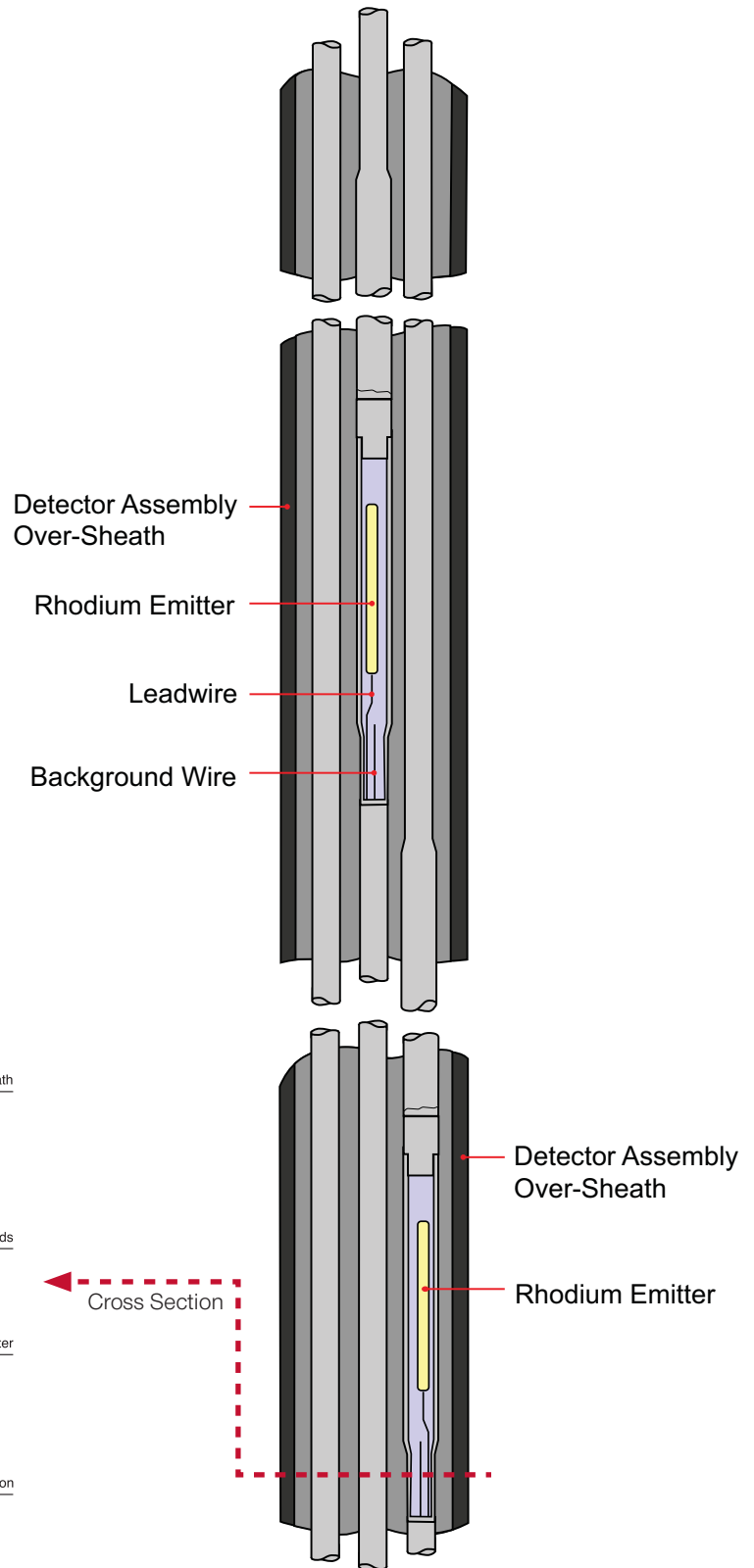
The rhodium detector system delivers a full-core power map approximately every six minutes.

Fixed In-core Detector System Features

- Fixed, self-powered neutron detection assemblies (Design life is six to ten Effective Full Power Years)
- Designed for pressurized water reactors
- Integrated thermocouple
- Proven in-conel sheathing of all parts
- Designed for use in B&W, Westinghouse, and Combustion Engineering Reactors
- Detectors can be manufactured to meet customer-specific interface requirements



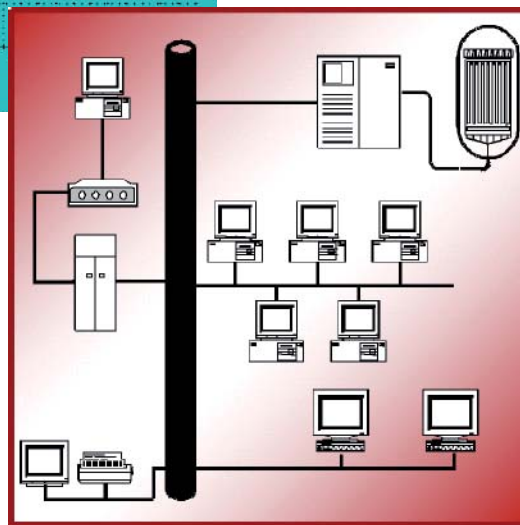
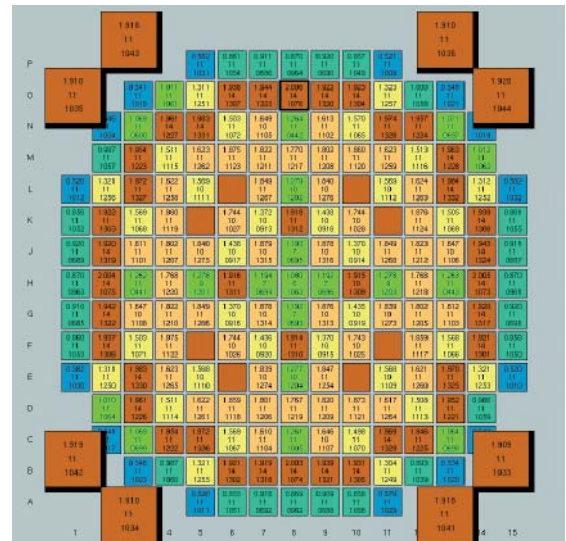
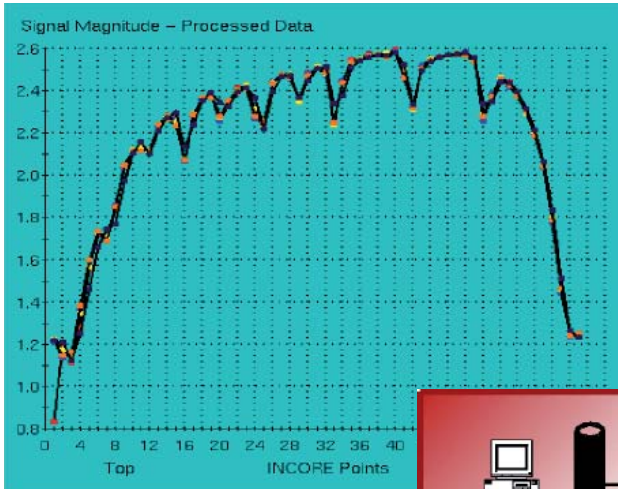
*Advanced Twin-Lead In-core Detector Assembly
(For higher accuracy; longer life)*



User-Friendly Signal Processing

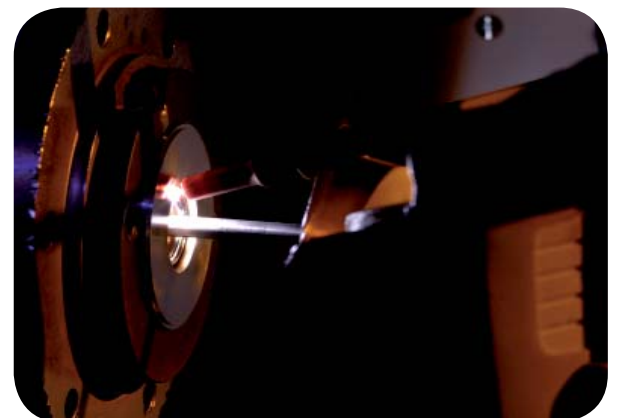
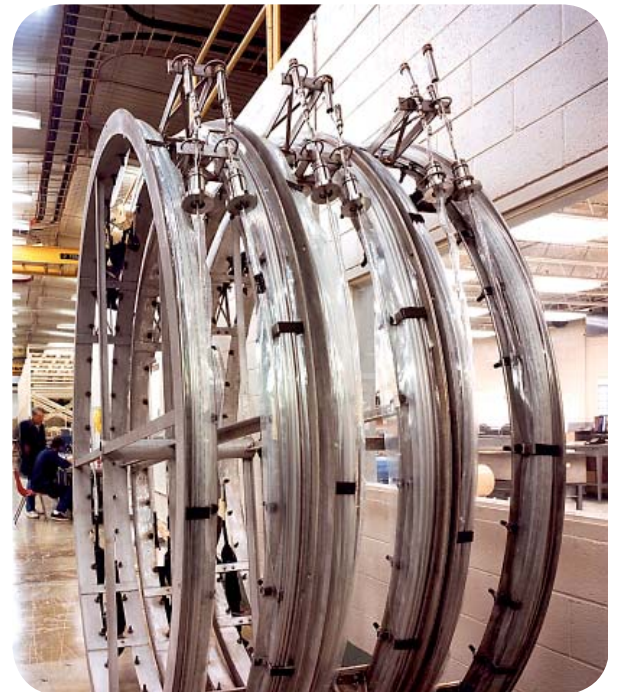
A typical full in-core detector system has approximately 50 fixed, self-powered neutron detector assemblies linked to a computer and display system. Signals from the emitters are compensated for background, then amplified, multiplexed and transmitted to the plant on-line computer and engineering computer work stations. Core conditions can be displayed on a PC or workstation, printed as a hard copy, saved to disk, and accessed off-line. The core power map profiles the condition of the core, its power level, and how it is functioning. It can be used to alert plant operators to core anomalies and failed reactor components.

Supporting Your Site with Faster Startups and Efficient Operations



In-core Detector Manufacturing

AREVA is a global leader in the design and fabrication of high technology systems such as our complete line of fixed in-core detectors. Fabrication is performed at AREVA's Solutions Complex, located on Mt. Athos Road in Lynchburg, Va.



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