

ROD CONTROL CLUSTER ASSEMBLY LIFETIME MANAGEMENT

Innovative solutions by Framatome, proven in practice

Framatome Fuel Engineering and Field Services supporting customers' sustainable management of PWRs' Rod Control Cluster Assemblies' (RCCA) lifetime worldwide.

Challenge

The availability and planning of functional Rod Control Cluster Assemblies are essential for the safe operation of PWRs. In addition to safety, operators must also prioritize cost-effectiveness and waste management.

The main factors that limit the lifetime of RCCAs can be categorized based on their predictability: Mechanical damage, Fluence restrictions, Cracks in the cladding, Wear of guide cards.

Solution

Calculating the defect probability as a function of accumulated neutron fluence first requires compiling a suitable database. The more information available about the RCCA condition, such as insertion history, fluence, diameter evolution, and wear propagation, the more accurate the risk assessment will be.

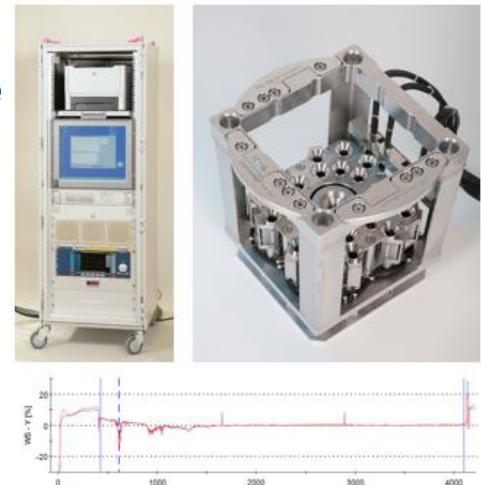
Diameter measurements of RCCA rods can:

- Significantly reduce uncertainty in risk assessments
- Enable operation of RCCAs beyond conservatively determined fluence limits

Mechanical wear of rods can be included in the assessment. Accurate fluence calculations are essential for optimizing RCCA lifetime management.

Customer benefits

- Optimize the number of RCCAs needed throughout the plant's lifetime
- Reduce nuclear waste through optimal use of functional RCCAs
- Mitigate the risk of RCCA shortages at the end of the plant's operational life



© RCCA eddy current measurement system featuring 24 EC coils.

Technical information

Framatome performs diameter measurements during the standard non-destructive eddy current testing. This can significantly reduce uncertainty in defect probability calculations.

- Test duration per RCCA (all rods): approximately 20 minutes for wear and diameter measurements.
- Test head installation options: spent fuel rack, fuel elevator, or sipping box.
- Accuracy:
 - Wear mark detection: $\pm 2\%$
 - Diameter measurement: $\pm 10 \mu\text{m}$

Key figure

+7,000 RCCAs successfully tested

Contact : sales-fuel@framatomē.com
www.framatomē.com

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is our everyday commitment**