

Rod Cluster Control Assemblies for PWRs

HARMONI RCCAs allow you to safely and efficiently control and shut down your power plant

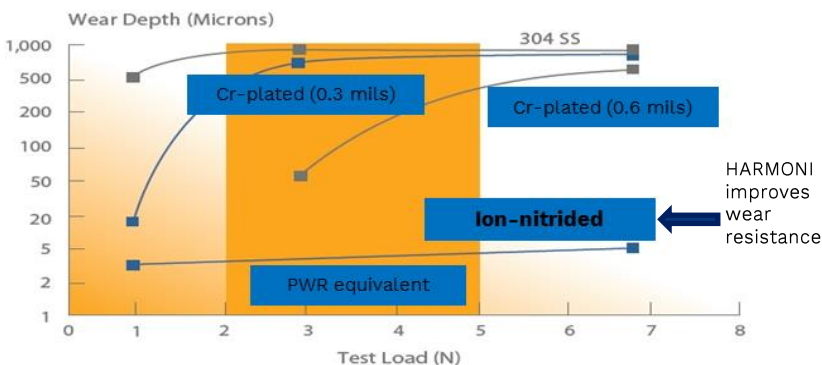
Challenge

Safety is of the upmost importance in the operation of any nuclear power plant. Key to reactor safety is both the ability to control the plant, and the ability to quickly and safely shut down the plant when necessary, whether for a fuel reload or in case of an emergency. Rod cluster control assemblies (RCCAs) are also used to control the reactor power throughout the cycle in order to adapt to electricity demand. In addition, whilst maintaining the highest levels of safety, plant operators must keep maintenance costs as low as possible in order to maintain competitiveness.

Solution

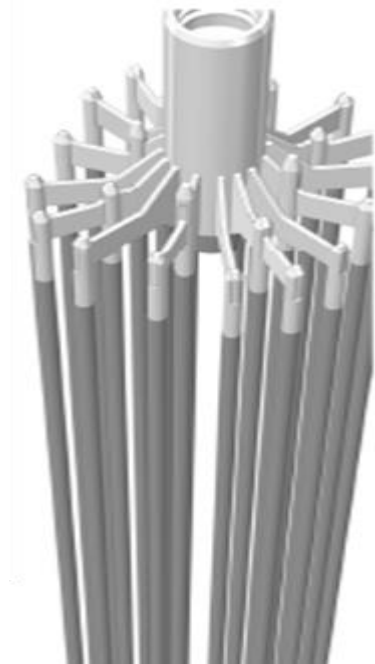
For almost four decades, Framatome has been designing and fabricating control components for pressurized water reactors. Our long-life designs are well recognized for their outstanding operating performance in Framatome, Babcock & Wilcox (B&W), Combustion Engineering (CE), Westinghouse-type, and Siemens/KWU reactors. HARMONI RCCAs are fully compatible with other reactor fuel and components. In addition, Framatome engineering support can customize products to meet plant-specific requirements.

Transitions to Framatome RCCAs have been successfully carried out world wide. In the US, the transition to HARMONI RCCAs is accomplished through a 10 CFR 0.59 review. Framatome is able to provide this service on request.



Wear testing results: Framatome's cladding shows significantly less wear than other RCCAs.

Your performance is our everyday commitment



Framatome's HARMONI Rod Cluster Control Assemblies for PWRs

Customer benefits

- A flex joint improves rod alignment and reduces drag in guide tubes
- An Ion-Nitrided surface treatment provides:
 - Superior wear-resistance
 - Proven performance worldwide
 - The most cost-effective RCCA replacement choice (especially for high-wear plants)
- Longer lower end plug provides a solid surface that prevents contact between the cladding and guide tube
- The design features ensure a significant gain with respect to the Ag-In-Cd swelling phenomena. A gain of two to three years of operation is obtained compared to previous RCCAs

Technical information

- Framatome has supplied control assemblies to many types of PWRs, in particular providing the following designs:

HARMONI designs:

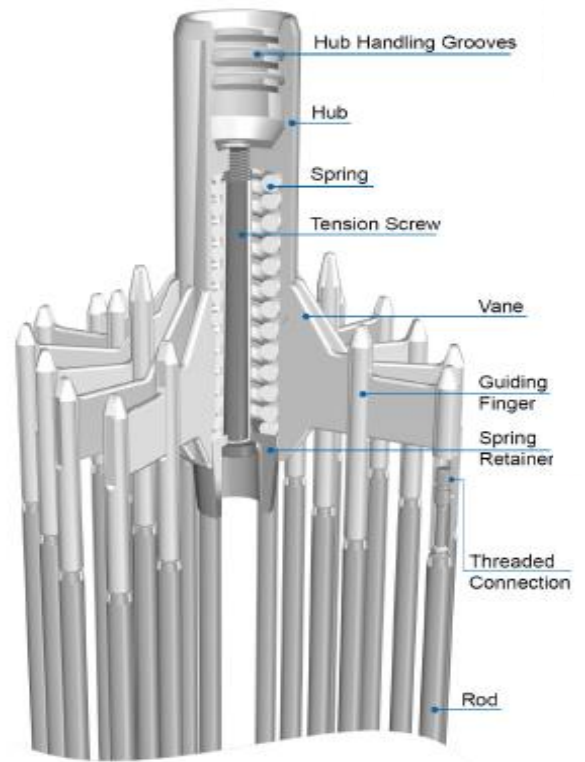
- 15x15 Ag-In-Cd RCCA (Ion-Nitrided)
- 17x17 Ag-In-Cd RCCA (Ion-Nitrided)
- 17x17 hybrid RCCA (Ion-Nitrided)

Other designs:

- CE 14x14 extended life
- B&W 15x15 standard
- B&W 15x15 extended life
- KWU 15x15 standard design (Ag-In-Cd absorber, not coated)
- KWU 15x15 coated design (Cr3C2 detonation)
- CE 16x16 extended life
- KWU 16x16 standard design
- KWU 18x18 standard design

Framatome's control assemblies are also available for further PWR designs.

Also available with features of PROtect products, the leading enhanced accident tolerant fuel program



Framatome offers RCCA design features that increase integrity and longevity (European version shown)

Key figures

101 reactors loaded with HARMONI RCCAs as of 2018

22,000 RCCA inspections have confirmed superior wear resistance in these reactors

References

HARMONI RCCAs have been loaded into 101 PWRs worldwide, in the following countries:

- Belgium
- China
- France
- South Africa
- South Korea
- Spain
- Sweden
- United Kingdom
- USA



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