framatome

RODLINE

Digital rod control system platform for seamless integration and reliability

Framatome's Rodline is a robust, fully digital rod control system that delivers precise reactor power control, enhanced reliability and simplified maintenance while addressing system obsolescence.

Challenge

Reliable rod control at nuclear power plants is essential for regulating reactor power and maintaining the safety margins required during all operating conditions. This requires continuous management of control rod movements based on multiple operational signals, interlocks and protection system inputs.

At the same time, rod control systems must deliver high availability, precise control and dependable performance while remaining easy to operate and maintain throughout the plant lifetime.

These operational requirements drive the need for a robust, reliable and modern digital rod control system capable of supporting safe, efficient and long-term reactor operation.



Solution

Framatome's Rodline solution provides complete rod control system functionality for nuclear power plants, supporting the insertion and withdrawal of control rod clusters to regulate reactor power and provide the required negative reactivity margin during reactor shutdown.

The solution consists of a control cabinet and power cabinets that work together to manage rod movement, process operational inputs and generate the currents required by the Control Rod Drive Mechanisms (CRDMs). Its digital architecture combines advanced control functions, standardized power modules and integrated maintenance capabilities to ensure reliable and precise rod control.

Built on more than 40 years of operational experience, Rodline is a robust and proven technology that simplifies operation and maintenance while supporting modernization and new-build projects worldwide.

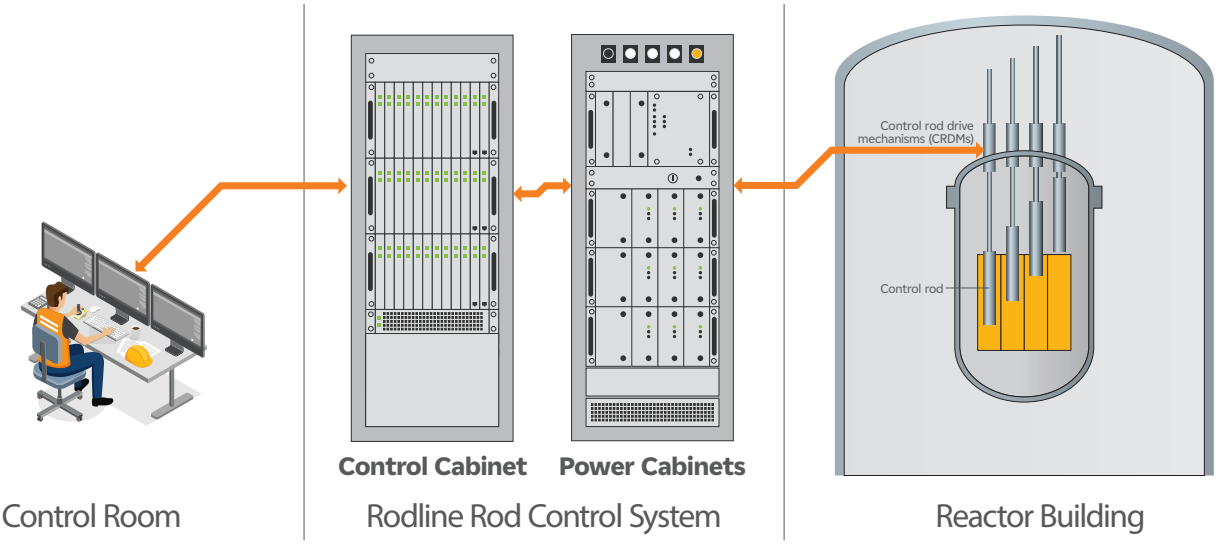
Customer benefits

- Enhances Reliability: Provides a reliable, proven digital technology built on more than 40 years of operational experience.
- Simplifies Maintenance: Reduces repair time, simplifies maintenance activities and minimizes operational impact.
- Reduces Lifecycle Costs: Minimizes spare parts inventory and storage requirements through a standardized module design.
- Facilitates Troubleshooting: Enables faster fault identification and diagnosis, helping operators perform repairs more efficiently.
- Improves Technical Performance: Delivers precise and reliable rod control through a simplified architecture, improving performance, responsiveness and reliability.

Technical Information

- Combines a control cabinet and power cabinets to manage control rod movement and regulate reactor power.
- The control cabinet processes operational inputs and manages rod movement through predefined control programs and interlocks.
- Each power cabinet combines a cycler and power converters to control CRDM coils.
- Integrated double-hold functionality prevents spurious reactor trips in the event of a fault.
- Maintenance functions support troubleshooting and repair activities during reactor operation.
- Standardized MDP and ALSYN modules provide power, control and surveillance functions for all coil types.
- Hot-swappable modules simplify maintenance and reduce spare parts requirements.
- The cycler manages movement sequences, fault handling, testing functions and communication with the control cabinet and HMI.
- Can be implemented using Framatome technology or qualified PLC platforms.
- Customized HMI solutions can be provided on demand.

Rodline System Architecture



Key figures

16M+ cumulative operating hours with zero rod drops for the cycler.

49M+ cumulative operating hours with zero rod drops for the power section.

References

Rodline and previous generations:

- France 56 units
- Belgium 5 units
- China 22 units

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