

## RodPilot

### The Digital Control Rod Drive Control System for Pressurized Water Reactors

The system combines modern components, state-of-the-art logic and a proven electronic rod drive control principle to provide enhanced reliability, higher availability and lower maintenance costs.

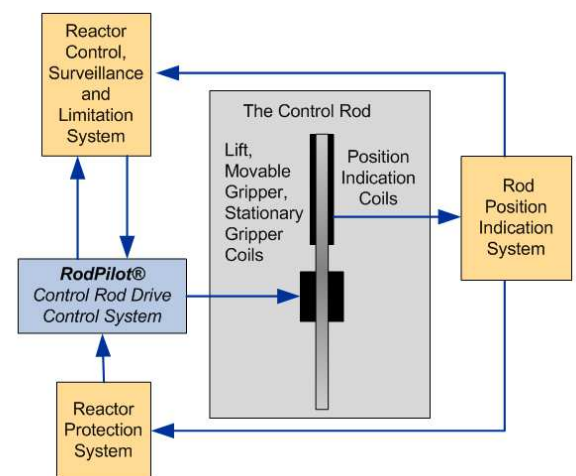
#### Challenge

Operators today are experiencing an increase in costs and lost time due to obsolescence of both power and control components.

#### Solution

To help mitigate this, RodPilot was designed with an emphasis on using standardized components and interfaces. The use of modern designs combined with widely used commercial off-the-shelf components virtually guarantees parts availability for decades to come.

- With RodPilot, Framatome offers an innovative and cost-effective system for controlling control rods in Pressurized Water Reactors. RodPilot controls the three operating coils of the control rod drive mechanism (lift, moveable gripper and stationary gripper coil). The rods are inserted into or withdrawn from the core, as required by the Reactor Control System.
- RodPilot is the first system to combine the power section and control function into one cabinet. The components of the power section were specially developed for RodPilot. The control section is implemented using TELEPERM XS components.
- The principles of operation from the previous electronic control rod drive control system have been retained. Additionally, many new functions were implemented; for example, RodPilot tolerates single failures, preventing spurious rod drops. State-of-the-art logic and modern hardware assure ease of maintenance, increased reliability and improved availability. The optional rod surveillance system automatically monitors the rod motion. Even slow changes in rod condition can be detected. Therefore, RodPilot is able to provide an indication for preventive maintenance on rods, increasing the overall availability of the rod control system.
- RodPilot is easy to handle during all phases of the product life cycle – during transportation, installation, commissioning, operation and periodic tests. This property has already been proven successfully in four operating units (see references). Since the RodPilot system has been in operation, all units have worked to the full satisfaction of the operators.



Interface between I&C and mechanical system

#### Customer benefits

- Compact and modular design
- RodPilot-10 as redundant and diverse mean to carry out the safety classified Reactor Trip
- Long-term availability of spare parts
- Easy handling (operation, commissioning and periodic tests)
- Cost saving of around 20 %
- Single failure protection regarding rod drop (increases availability)

**Your performance  
is our everyday commitment**

## Technical information

- Applicable in both new plants and upgrades in existing PWRs, such as plants from Siemens/KWU, Framatome and Westinghouse
- Independent from I&C control system platform
- Independent from power supply concept (AC & DC supply)
- Modules to supply 10A and 40A CRDM-coils
- Single rod control (failure of maximum one rod, exact current calibration and monitoring → lower wear)
- “Plug and Play” modular concept results in easy maintenance
- “Single failure protection” (no rod drop, emergency hold per rod)
- Self monitoring of currents and time sequences and automatic fault alarm/warning
- Modules to carry out the Safety classified Reactor Trip



Since April 2009 RodPilot-40 operates Koeberg Nuclear Power Plant with complete satisfaction of the plant owner.

## References

### In operation

- Koeberg Unit 1&2 (South Africa) – replacement – since 04/2009 and 10/2009
- Ling Ao Unit 3&4 (China) – new plant – since 06/2010 and 08/2011

### Under construction

- Olkiluoto 3 (Finland) – new plant
- Flamanville 3 (France) – new plant
- Taishan Unit 1&2 (China) – new plant
- Angra 3 (Brasilien) – new plant



Standardized withdrawable units (plug and play – hot swappable) minimize the repair time.

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