framatome

PWR Live Training

Live Training Course at the PKL Test Facility

Understanding the thermal-hydraulic system behavior of pressurized water reactors (PWR) through live tests at the PKL test facility

Challenge

Operators in nuclear power plants have to be prepared for any kind of operational or accidental transients. Understanding the thermal-hydraulic behavior of a PWR is a key aspect for a better incident or accident management.

Solution

Framatome offers a comprehensive training session that combines a theoretical classroom course with live test days held on the PKL test facility by simulating accidental scenarios for a practical experience of the thermal-hydraulic behaviors of a PWR.

The PKL test facility is a scaled-down replication of a 4-loop type PWR that simulates the thermal-hydraulic system behavior of the full-scale power plant under accident conditions.

Conducting live tests at the PKL test facility on previously defined scenarios allows the demonstration and analysis of PWR thermal-hydraulic behaviors with focus on:

- Complex physical phenomena relevant to PWR operation in parallel with progress of accident scenarios
- Efficiency of accident management measures

The live training improves the fidelity of the thermal-hydraulics effect demonstrations over conventional simulator training.

Skilled instructors have an extensive experience in conducting and interpreting integral tests as part of international programs (OECD). Based on their wide training experience you will improve your understanding of the observed phenomena, including details of PWR thermal-hydraulics associated with the chosen test scenario, as well as test parameters, operator actions and switching operations in PWRs.

Customer benefits

- Increased safety and understanding of thermal hydraulic behaviors through cutting edge process visualization tools and comparisons
- High fidelity of thermal-hydraulic behaviors through tests results unmatched by conventional simulators
- Benefit from the experience of our skilled trainers

PKL control room panorama

Your performance
is **our** everyday **commitment**

Technical information

PKL test facility

The PKL test facility is scaled to simulate the thermal-hydraulic system behavior of the full-scale PWR reactor under accidental conditions in order to:

- Analyze overall system responses and system interactions
- Demonstrate safety margins and evaluate operating procedures

Parameter studies and tests focusing on separate effects contribute to:

- Supplying unique experimental data for thermal-hydraulic system code development and validation
- Detailed understanding of complex PWR thermal-hydraulic phenomena

The PKL test facility is the worldwide only 4-loop experimental test facility of its kind for integral system behavior models.

Live test scenarios

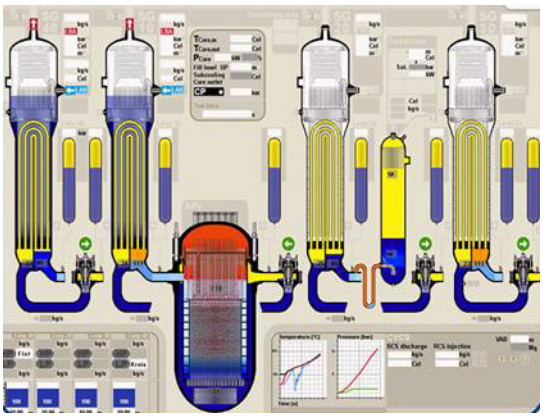
A variety of scenarios can be conducted as live tests:

- Small-break LOCA (Loss of Coolant Accident) with additional safety system failures, employment of accident management procedures (e.g., primary/ secondary bleed-and-feed measures)
- Main steam line breaks
- Station blackout transients with accident mitigation measures to prevent core melt scenario, efficiency of bleed-and-feed procedures
- Failure of RHRS (Residual Heat Removal System) scenarios under cold shutdown condition
- Systematic studies of thermal-hydraulic phenomena involving single-/two-phase natural circulation or reflux-condenser conditions with/without non-condensable gases

PKL 4-loop configuration

- Heights scaled 1:1
- Volumes scaled 1:145
- up to 10 % of nominal core power
- max 50 bar of primary pressure
- max. 60 bar of secondary pressure

The PKL test facility provides all safety and operational systems of primary and secondary sides.



Online process visualization

Key figures

Database available comprising of more than **200** accident scenario experiments

Control panels with switching elements corresponding to NPP

Observation of individual measuring signals (up to 1500) providing high level of detail

Process visualization tools

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