

RPVL

Reactor Pressure Vessel Level Measurement System

Assuring reliable core cooling in pressurized water reactors (RPVs) in post-accident situations by monitoring the coolant level

Challenge

In post-accident situations such as a loss-of-coolant accident (LOCA) or loss of secondary feedwater, core coverage is necessary to assure continuity of cooling.

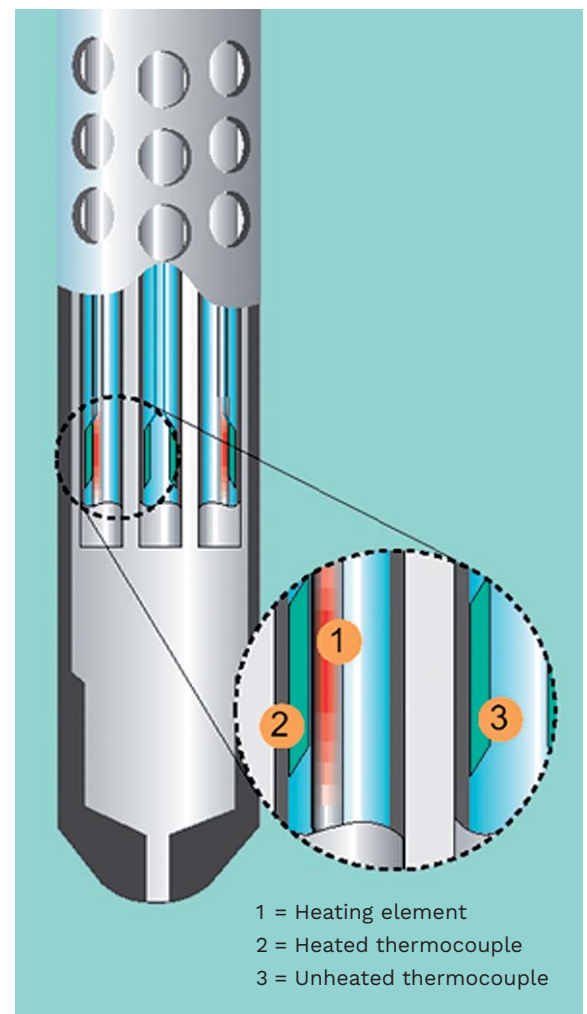
Solution

The Reactor Pressure Vessel Level Measurement System (RPVL) provides information on the coolant inventory to enable counter measures to be taken if necessary, for example, primary pressure relief, start and stop of coolant injection.

The basic principle used by RPVL is the change in heat transfer between water in a liquid and gaseous phase. For this reason a sensor comprises a heated and an unheated thermocouple. The level monitoring is based on the difference in temperature between the two thermocouples, which is higher when water is in a gaseous rather than liquid state.

Customer benefits

- Excellent reliability and availability thanks to well-established components providing robust signals
- Low operating costs thanks to a low level of maintenance based on standard test equipment
- Self monitoring with fast response and clear indication facilitates troubleshooting



Schematic illustration of a sensor

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Technical information

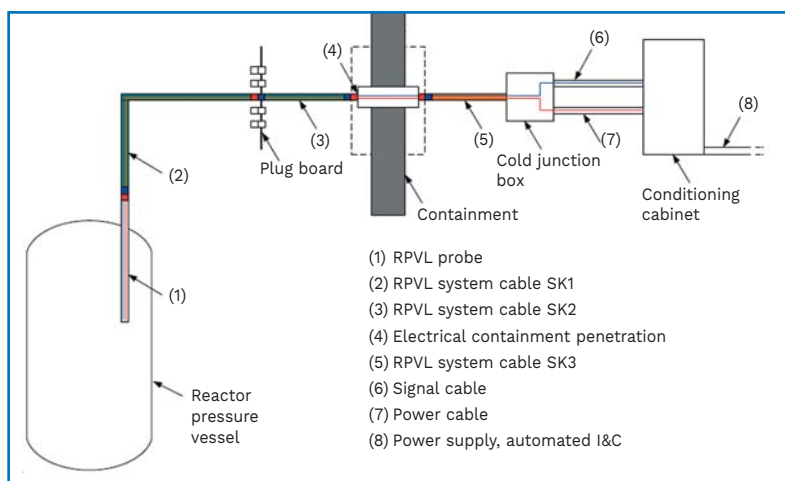
- Length of probe: 5–6 m
- Thermocouples: Type K
- Heating element: Ni-NiCr
- Number of sensors per probe: typically 3
- Type tests: KTA3505, RCC-E
- Proof of the function following an earthquake or air plane crash can be provided project-specific, as well as after operational aging, irradiation and consequent LOCA
- Duration of operation of the RPVL after a LOCA is at least one year

Proven Performance and Reliability

- RPVL has proven its performance during intense full-size tests representative of situations where the system had to evaluate the condition of the plant on the primary side.
- The measurement system profits from Framatome's experience in coolant level determination in the RPV. Operating experience with this measurement system has been gained since its first implementation in 2003.



Typical RPVL cabinet



Schematic view of the RPVL in an EPR reactor

References

RPVL is currently installed in 20 reactors worldwide (EPR reactors, Russian-type VVER reactors, KWU plants, and pressurized heavy water reactors).

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