

## Water Chemistry Consulting

### Minimization of Corrosion and Dose Rates

Water chemistry consulting helps you to improve chemical conditioning for optimum power plant operation and ensure plant integrity. Best practice solutions are identified for various original equipment manufacturer (OEM) plant designs.

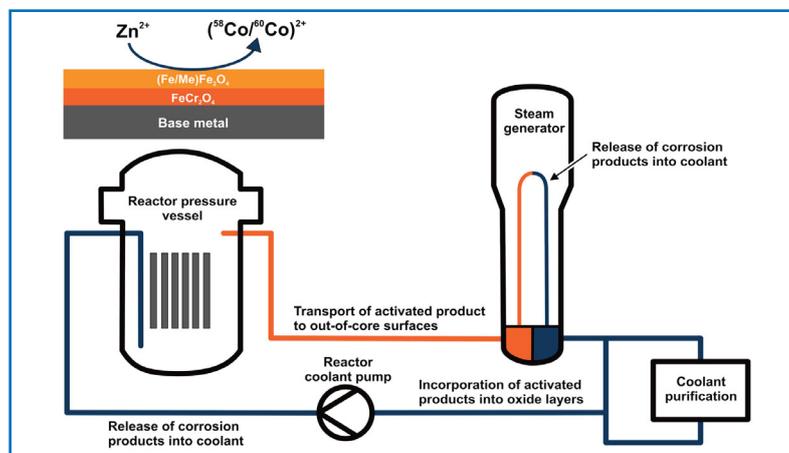
#### Challenge

Unsatisfactory chemical conditioning of nuclear power plants impedes ideal operation by allowing corrosion mechanisms and dose rate buildup. This leads to additional maintenance efforts, higher collective doses and, at worst, unscheduled plant shutdowns.

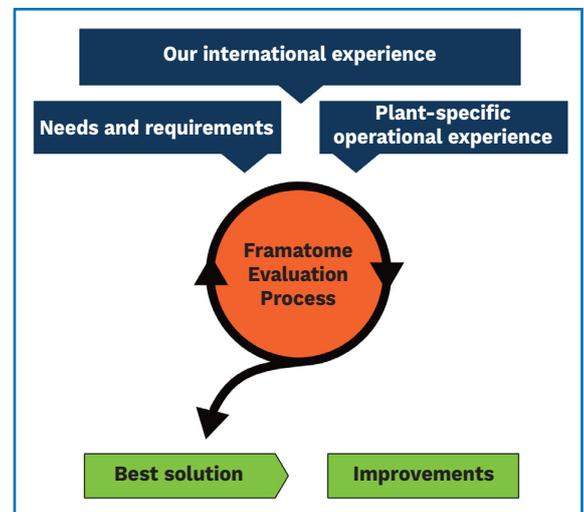
On the secondary side of pressurized water reactors (PWRs) and pressurized heavy water reactors (PHWRs) water chemistry plays an important role in the performance and the preservation of components. Corrosion phenomena, such as flow-accelerated corrosion and ingress of corrosion products and impurities into the steam generator (SG), degrades the performance and shortens the operating life of components.

#### Solution

Our Water Chemistry Consulting Services support you in avoiding high dose rates, preventing corrosion and ensuring reliable, safe and economic plant operation by optimizing chemical conditioning. All relevant parameters used, say, in design, selection of materials and operational conditions are taken into account in order to determine the optimum water chemistry for your specific plant.



Dose rate buildup mechanism and mitigation with zinc injection



#### Customer benefits

- Mitigation of dose rate buildup
- Safe and economic plant operation
- Prevention of corrosion
- Profit from our international knowledge base of various plant designs from different OEMs
- Research into and development of technological innovations ensures application of state-of-the-art power plant chemistry
- In-depth worldwide experience with different chemical conditioning regimes and guidelines accelerate the optimization of water chemistry
- Interdisciplinary approach facilitates optimal improvements which help to meet plant-specific needs and requirements

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

## Technical information

### Boiling water reactor (BWR) / P(H)WR primary side

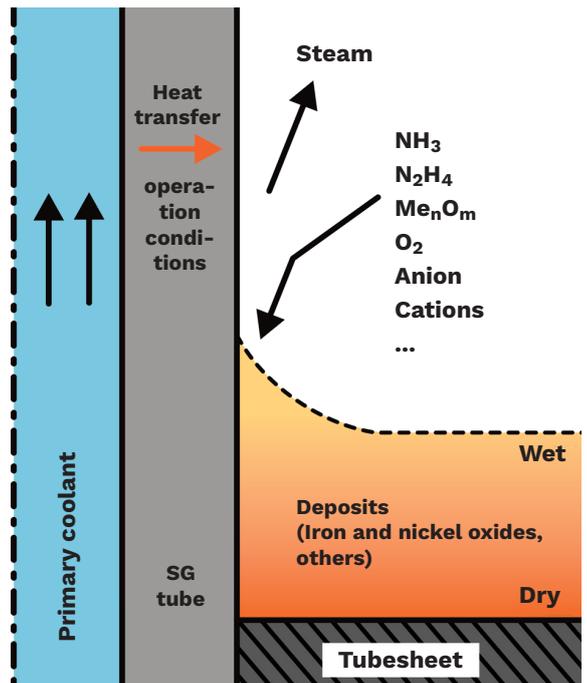
- Evaluation of
  - Dose rate reduction measures (e.g. zinc injection)
  - Integrity of components and related systems
  - Fuel-coolant chemical interactions
  - Integrity of fuel cladding
  - Integrity of coolant circuit
- Reactor core reactivity control (e.g. adaption of enriched boric acid)
- Documentation and training, e.g. chemistry handbooks and guidelines
- Root cause analysis

### P(H)WR secondary side

- Preservation of water-steam cycle (film-forming amines, FFA)
- Monitoring and evaluation of SG conditions
- Trouble shooting and evaluation of chemical parameters
- Assessment of data plausibility and consistency
- Overall design to reduce impurity and corrosion product level in the system during outages
- Recommendations to re-establish clean conditions
- Support for plant surveillance and water sampling
- Root cause analysis
- Documentation and training, e.g. chemistry manuals and guidelines



Effect of FFA on condenser floor (low wettability)



Accumulation of deposits on SG leading to potential aggressive environment

## References

- Zinc injection at several P(H)WRs
- Dose rate reduction study for Japanese PWRs
- Optimized plant startup for new plants and after (full system) decontaminations at P(H)WRs
- Water chemistry measures for safe fuel operation at BWRs with low zinc injection
- More than ten FFA applications at P(H)WRs worldwide
- Optimization of secondary side monitoring concept and improvement of sampling system (PWR)
- Regularly assessment of primary and secondary water chemistry data of PWRs
- Regularly chemical SG status evaluation and degradation remedies
- Technical support as OEM for water chemistry guidelines and editing water chemistry manuals for several PWRs, BWRs and P(H)WRs

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