

Nuclear Power Plants Optimize Water Chemistry with EPRI Software

EPRI's ChemWorks™ and SMART ChemWorks™ software applications speed chemistry monitoring, protect components, and improve staff productivity.

STP Nuclear Operating Company and many other utilities around the world are optimizing nuclear power plant chemistry conditions using EPRI's ChemWorks and Smart ChemWorks software. Applying the EPRI software helps nuclear plants:

- Quickly evaluate plant chemistry controls
- Reduce risk of damage to plant components
- Increase staff productivity
- Increase chemistry monitoring coverage
- Enhance early detection of chemistry problems

Water Chemistry Challenges

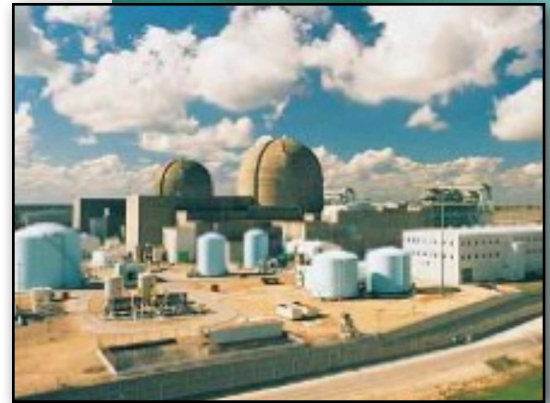
In nuclear power plants, water chemistry influences fuel performance, corrosion rates, radiation management, and overall operational reliability and economic viability. Optimizing water chemistry conditions improves fuel reliability and reduces corrosion and corrosion release from plant surfaces, potentially reducing negative impacts on equipment reliability and radiation fields.

Maintaining and understanding how an effective water chemistry program is applied in nuclear plants is increasingly being challenged by the retirement of veteran plant chemists and the transition to new chemistry staff. With the right knowledge and tools, however, plant chemistry personnel can make the most productive use of their time.

Optimizing Chemistry with Software

EPRI has developed a group of software applications that model and evaluate plant chemistry controls and monitor chemistry conditions to reveal potential problems that may affect plant availability and reliability. The software applications—ChemWorks™ and SMART ChemWorks™—are based on EPRI's MULTEQ computer model and database, which is considered the industry standard for high-temperature chemistry modeling.

ChemWorks™ is a desktop software application that provides the user interface for accessing the power of MULTEQ. ChemWorks enables users to better understand chemical behavior in high-temperature solutions by applying mathematical models to develop optimal chemistry programs and by applying chemistry controls that support long-term equipment reliability. Users



South Texas Project Electric Generating Station

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~ Daniel Bryant
*Chemistry Manager,
STP Nuclear Operating
Company*

can perform a variety of chemistry system evaluations, including high-temperature pH calculations for pressurized water reactors, evaluation of different amines on secondary system chemistry, hideout return evaluations for the secondary side of the steam generator, and corrosion product inventory estimations during shutdown. From these calculations, chemistry personnel can assess longer term corrosion control and life-cycle strategies.

SMART ChemWorks™ is a web-based application that performs real-time monitoring of a plant's water chemistry and issues automatic alerts to provide early warning of potential problems. The online system continuously monitors a plant's chemistry parameters via a data transfer tool installed at the plant. Smart ChemWorks™ performs virtual calculations based on unit-specific heat balance and chemical concentrations, identifies normal and off-normal conditions, and compares in-line instrument output to grab sample analyses.

SMART ChemWorks™ assists chemistry staffs by automating data analysis in a concise cross-system evaluation easily understandable to plant operators. If the system detects an anomaly, plant chemists are notified via email, text or paging. SMART ChemWorks™ online monitoring provides the ability to capture small changes over time using plant data and previous data trends, providing the plant chemists time to plan and implement a solution.

Benefits Across the Nuclear Industry

ChemWorks™ and SMART ChemWorks™ are in use at 17 nuclear power plants across the United States. South Texas Project chemists rely on the applications for developing optimal chemistry programs and continuously monitoring chemistry conditions.

"ChemWorks is used regularly to model global and localized plant chemistry conditions using our analytical chemistry results," said Daniel Bryant, Chemistry Manager, STP Nuclear Operating Company. "We use this information to validate that we are maintaining the chemistry environment needed to ensure we accomplish our long-term asset preservation goals."

The ChemWorks™ tools are also used outside the United States. Through international ChemWorks™ meetings, non-U.S. users receive training on the software and also provide valuable input into future development plans for ChemWorks™. The most recent meeting in Madrid was attended by more than 20 plant staff members from across Europe and Mexico, with focused discussions on the updated ChemWorks™ Toolkit and the Plant Chemistry Simulator.

User Groups and Implementation Support

EPRI hosts user groups for both ChemWorks™ and SMART ChemWorks™ users to exchange information, provide training, and gather input to enhance future applications. Through industry forums, newsletters, webcasts, and annual meetings, EPRI supports end user application of the codes that can lead to software modifications and improved functionality.

EPRI also offers maintenance and implementation support for SMART ChemWorks™ through supplemental user groups. Successful implementation of the software requires coordination among EPRI engineers and power plant team members. Support includes installation of the data transfer tool. Additional site-specific customizations are supported over the first three months as the model is developed and adjusted based on plant information.

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com)

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