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ABSTRACTS

Corrosion and Deposits in Water-Cooled Generator Stator Windings: Part 2: Detection of Flow Restrictions

Robert Svoboda and Russell Chetwynd

Useful methods for detecting flow restrictions in stator bar cooling channels include review of operating parameters and history vs. original design, of generator cooling water chemistry, of strainer and filter clogging history and of results from diagnostic chemical cleaning, as well as monitoring of stator water flow vs. pressure drop, individual stator bar water flow measurements, monitoring of on-line stator temperatures, visual inspections, and DC high-potential (Hipot) testing. A combination of these methods can be selected under consideration of plant specific hardware features and cost-to-benefit relation.

A proactive approach to detecting flow restrictions is recommended in order to permit advanced planning of any needed corrective actions, thus reducing the risk of unplanned maintenance downtime, or even component failure. Managing flow restrictions at an early stage reduces the risk of severe plugging of conductors that may well prove difficult to remove later on.

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The Future of Nuclear Power Plant Chemistry Control

Daniel M. Wells, Paul L. Frattini, Keith Fruzzetti, Susan Garcia, Joel McElrath, and Michelle Mura

Chemistry control in nuclear power plants continues to evolve in the types of additive chemistry and purification technologies applied, as well as in how important parameters are monitored and controlled. New chemistry technologies are being evaluated, qualified, and demonstrated throughout the industry that have the potential to fundamentally alter and significantly improve chemistry control in these plants. Many of these technologies could improve operations and maintenance, as well as economic viability.

For example, filming products (including filming amines) could significantly reduce pressurized water reactor (PWR) secondary flow-accelerated corrosion (FAC) and corrosion product transport, improving steam generator (SG) performance and reducing the need for SG chemical cleanings. The application of potassium hydroxide (KOH) to the reactor coolant system (RCS) for pH control in "Western-designed" PWRs may ultimately result in significant cost savings for the industry, both relative to the cost of the bulk chemical it replaces (compared to costly enriched lithium-7, ^{7}Li), and in the reduced risk of lithium-assisted corrosion issues of irradiated stainless steels and zirconium-based fuel cladding alloys. In boiling water reactors (BWRs) materials mitigation technologies such as online noble chemistry continue to expand throughout the industry, with utilities seeking more options – including continuous application, which would reduce the overall cost of the

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application. Demonstration of these technologies over the next few years will further the ability of other plants to complete their own cost-benefit analysis and start utilizing them.

Regarding chemistry monitoring in nuclear power plants, most continue to rely on manually intensive methods for both sampling and analysis. Several utilities have applied online monitoring methods for some parameters but may still struggle with maintenance of older instruments. Many utilities may have purchased older generations of technologies only to find the maintenance costs and performance did not live up to expectations. Outside of nuclear power plant applications, technologies such as online ion chromatography and inductively coupled plasma (ICP) analyses have continued to evolve and improve, and are applied widely. Moving to completely automated and higher frequency analysis of chemistry parameters may allow for reducing the total number of monitored parameters while also moving toward fully automated plant chemistry, which may eventually include automated control. This paper highlights the current development status of these new technologies and provides a vision for the overall future impacts of full utilization in nuclear power plants.

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An Evolution in Cooling Water Treatment

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For over four decades, the most common water treatment program for power plant and large industrial cooling tower systems has relied on a combination of inorganic and organic phosphate (phosphonate) chemistry. The formulations were designed to minimize scale formation and provide corrosion protection, primarily through precipitation chemistry and operation at an alkaline pH. Two important factors are driving an evolution away from phosphate-based chemistry towards polymer treatment methods. One is the increasingly problematic issue of phosphorus discharge and its effects on the formation of toxic algae blooms in receiving bodies of water. The second is the growing evidence that well-formulated polymer programs are more effective than phosphate/phosphonate technology for scale prevention and corrosion protection. This article examines important aspects of this evolving chemistry, and how it can improve cooling system reliability at many plants.

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Report on the PowerPlant Chemistry Forum in Delhi, India

Tapio Werder

This contribution is a report on the seventh PowerPlant Chemistry Forum (PPCF), held in Delhi, India, on November 22–23, 2018. The PPCF Delhi was organized by Waesseri GmbH, publisher of the PowerPlant Chemistry Journal, together with the International Association for the Properties of Water and Steam (IAPWS). Both SWAN Analytische Instrumente AG, Switzerland, and Forbes Marshall Pvt. Ltd., India, provided financial and organizational support by their sponsorship.

The agenda consisted of six sessions covering different aspects of water/steam cycle chemistry: cycle chemistry for fossil supercritical and subcritical units, chemistry in generator cooling water systems, cycle chemistry in nuclear plants, sampling and instrumentation as well as new technologies were the topics covered during the two days. Each session consisted of two to three presentations given by an expert in the field, followed by open floor discussions. A short summary of each presentation is given in this report.

For the first time in this series of events, a workshop on the activities of the IAPWS was included in the agenda. During this workshop the formation of a preliminary national committee of India was discussed and an initial group of interested experts formed as a result.

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