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Abstracts

David Addison, Keith Hopkins, and Brad White
Oxygenated Treatment at Huntly Power Station Unit 2: Preliminary Results from Steady State and 2-Shifting Operation

Concerns over flow-accelerated corrosion (FAC) damage in the feed systems of the four Huntly Power Station 250 MW units and the corresponding risk to personnel and plant led to a decision in 1995 to eliminate the use of an oxygen scavenger (hydrazine) on all units and in February 2000 to a decision to go ahead with a trial of oxygenated treatment (OT) on Huntly Power Station Unit 2.

The injection system, designed in-house, incorporates a single oxygen injection point between the condensate polisher and LP heater 1, injecting to a concentration of 50 $\mu g \cdot kg^{-1}$ dissolved oxygen based on condensate flow.

Oxygen injection on Unit 2 commenced in October 2001. During oxygen injection, the deaerator is operated with the vent to condenser shut. Soluble and insoluble iron and copper measurements are made at the economiser inlet, boiler downcomer and main steam primary sample points. Problems have been experienced with the injection system control, passing valves in the deaerator leading to oxygen loss, air inleakage at the chemical analyser wet racks and analytical issues with dissolved oxygen and oxidation reduction potential measurements.

Immediate changes in oxide layer morphology were observed during an internal inspection after two weeks of OT operation with previous FAC-damaged areas now showing the growth of a hematite dominated layer, giving an early favourable result for OT operation.

Preliminary results from corrosion product sampling have indicated that no copper migration in the steam to the turbine has occurred and there is a decrease in insoluble iron levels during steady state operation. 2-shifting operation has led to a slight increase in the insoluble iron levels being detected above steady state values.

Charles Emslander and Alan Waddingham
Intergranular Corrosion in a Stainless Steel Reheater

Stainless steel has been used in power boilers for over 40 years in the hottest sections of the superheater and reheater. One of the most common alloys used in these sections is SA 213 TP304H. It provides a good balance of mechanical properties and corrosion resistance to minimize the effects from coal ash corrosion, high temperature oxidation and long term creep mechanisms. However, recurring failures in a stainless steel reheater prompted a root cause analysis and the development of an eddy current testing method.

Michael A. Sadler
The Resin on Resin Technique for Minimising Sodium Levels in Water from Condensate Polishing Mixed Beds

The mechanisms by which traces of impurities can escape being removed by the ion exchange resins used in condensate polishing plants are generally well known. They can still be a problem when attempting to prepare very high quality water such as when using condensate polishing to purify condensate. Some of these mechanisms can be controlled by attention to the design and operation so that the effect known as equilibrium leakage often becomes the predominant mechanism controlling the leakage of ionic impurities in the treated condensate. Equilibrium leakage can itself be controlled by reducing the levels of ionic impurities remaining on resins after regeneration and so a considerable amount of effort has been directed at improving regeneration processes. When regenerating mixed beds it is essential to achieve as complete separation as possible, but although improvements can be made, some resin cross-contamination inevitably occurs. Several proprietary processes exist that seek to correct this problem and some have proved very effective. A simple non-proprietary technique, "Resin on Resin", represents a different approach to reducing the trace leakage of sodium that result from a small quantity of cation resin being entrained in the anion resin and so becoming sodium contaminated. The paper discusses the application of "Resin on Resin", the possible theoretical basis for its action and the results that have been reported by power stations that have adopted its use.

S. Ian Garbutt and Robin Walker
Quantitative Air Ingress Leak Detection in Power Plant Turbine Condensers

Power plant main turbine condensers often suffer from degradation in back pressure resulting in reduced output. When this is due to increased air ingress, it is not necessarily a function of ineffective detection, but had more to do with the fact that the source of the air ingress is often difficult to locate.

Current methods of detection are either qualitative or quantitative in terms of the overall air ingress into the system. This, however, presents the problem to plant engineers of establishing the largest source(s) of air ingress. By their very nature, power plant vacuum systems are extensive and have remote/tortuously linked connections with the condenser, thereby providing a multitude of potential air ingress sites. Working on the 80/20 rule, the ability to quickly locate, from a few measurements, the largest sources of air ingress would represent a powerful tool and one of significant financial benefit.

A technique developed over several years by QuantiFlo and used successfully in UK power plants is that of "Quantitative Air Ingress Measurement". Using strategically located tappings, the technique enables the plant engineer to rapidly focus on areas of high air ingress rather than spend valuable time finding "in-leakage" that when sealed, produces little or no change in condenser back pressure.

Two case studies have been conducted within British Energy power plants. The first reduced the average condenser back pressure by 2.3 kPa (approximately 13 MW electrical) and highlighted areas for further potential gain. The second reduced the total air ingress from 0.0374 $kg \cdot s^{-1}$ (0.0288 $m^3 \cdot s^{-1}$) to 0.0160 $kg \cdot s^{-1}$ (0.0123 $m^3 \cdot s^{-1}$).

Michael Thompson, Anthony Dal-Corobbo, and Bassam Zaid
Cooling Tower Experience at Osborne Cogeneration

Cooling water for the 180 MW Osborne Cogeneration plant is sourced from a saltwater river. To comply with the local Environmental Protection Authority licensing requirements for the cooling water discharge temperature and concentration, a cooling tower and dilution water system are employed. The tower is a five-cell, counter flow, induced draught type. Biocides are dosed intermittently with no cooling tower blowdown and recirculated until measured chemical residuals decrease below detectable limits before blowdown is reinstated.

To date, the adopted cooling water system chemical dosing and operational regime is providing good scale control and biological activity has been confined to the cooling tower proper with no reported drop in performance of the single main condenser.

Slime growth is problematic and ongoing below the tower fill, particularly on the outer structure. Bacteria testing of slime samples indicates vibrio strains are the main species present.

Biocide dosing automation is being pursued and alternative biological control programs investigated for the effective control of this slime growth.

Albert Bursik
Inch-by-Inch Approach or the Problem with the International System of Units

PowerPlant Chemistry® receives submissions from many different countries. In many papers, the authors disregard all internationally accepted rules for using units. In nearly all the papers submitted traditional units are used which are easily understood in the country of the authors, but which are hardly understandable outside of it. PowerPlant Chemistry® journal converts the traditional units into the correct SI units and writes the traditional units – as supplemental information – in parentheses following the correct units.

Starting with this (August 2002) issue, PowerPlant Chemistry® will exclusively use SI units without any additional information. To help our authors and readers, the most important rules are summarized and the typical mistakes are listed in this paper. The readers and in particular the potential PowerPlant Chemistry® authors are encouraged to spend some time learning the correct application of SI units. It is certain that you will need this knowledge in your work, even in the United States. A great help in understanding the whole matter is reading and using the NIST (United States Department of Commerce National Institute of Standards and Technology) Special Publication 881. This publication may be downloaded free as a PDF file from the page http://physics.nist.gov/Pubs/SP811.

Luis Carvalho, Rosa Crovetto, Gerry W. Sauve und Paul Sehl

Elektrische Leitfähigkeit nach stark saurem Kationenaustauscher und die Anlagenverfügbarkeit – eine Untersuchung in 20 Anlagen

Die Reinheit des Dampfs und des Kesselspeisewassers ist eines der wichtigsten Parameter zur Gewährleistung der Verfügbarkeit und Zuverlässigkeit von Kraftwerksanlagen. Die Hersteller von Dampfturbinen verknüpfen zunehmend schärfere Dampfreinheitsanforderungen mit den Garantiebestimmungen für ihre Anlagenlieferungen.

Elektrische Leitfähigkeit nach stark saurem Kationenaustauscher (Säureleitfähigkeit) ist – mit einigen Einschränkungen – der wichtigste Überwachungsparameter der von den Turbinenherstellern geforderten Dampfreinheit. Niedermolekulare aliphatische Säuren, Kohlendioxid und anorganische Anionen beeinflussen die Säureleitfähigkeit. Nach den Literaturangaben sind die Korrosionseinflüsse von organischen Säuren nicht endgültig geklärt und erfordern weitere Untersuchungen.

Unabhängige Stromproduzenten (independent power producers, IPPs) arbeiten, anders als die meisten Kraftwerksbetreiber, mit einem Minimum an Personal. Die IPPs würden, wenn sie die strengeren Dampfreinheitsanforderungen versuchten zu erfüllen, unter höheren Kapital- und Betriebskosten durch notwendigerweise verbesserte Wasserbehandlungsanlagen und komplexere Überwachung leiden. Zusätzliche Laborausrüstung und eine sinnvolle Interpretation der gesammelten Daten stellen ebenfalls eine Belastung des typischen hocheffizienten IPP-Betriebes dar.

Dieser Beitrag berichtet über eine Untersuchung von zwanzig Anlagen, hauptsächlich Kraftwerksanlagen, in ganz Kanada, die im Druckbereich von 6,2 bis 19,65 MPa arbeiten. Es werden die während dieser Untersuchung ermittelten Daten (elektrische Leitfähigkeit nach stark saurem Kationenaustauscher, Gehalt an organische Säuren, Laufzeiten der Turbinen und die Angaben zu Revisionen bzw. Inspektionen dargestellt. Die Konzentration an organischen Säuren, die Säureleitfähigkeit und der Gehalt an ausgewählte anorganischen Anionen zeigen keinen Zusammenhang mit der Anlagenverfügbarkeit in untersuchten Kraftwerken.

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