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Abstracts

How Repeat Situations Lead to Chemistry-Related Damage in Conventional Fossil and Combined Cycle Plants

R. Barry Dooley, Kevin J. Shields, and Stephen J. Shulder

The scientific understanding of most forms of chemistry-related damage in conventional fossil steam-water cycles and combined cycles with heat recovery steam generators (HRSGs) is very advanced and has been so for many forms of damage for more than 30 years. In spite of this, chemistry-related damage and the cost of availability losses related to deficient chemistry practices are often enormous. Damage and component failure incidents persist, in both fossil units and combined cycle units. Further, much of the damage is reported to be caused by damage modes that are well known and documented. It is thus very clear that the approaches taken by organizations operating fossil units to prevent such damage are frequently unsuccessful. Similarly, fossil industry usage of the response methodology by which chemistry-related damage events are reacted to (identification of the mechanism, assessment of the root cause, and implementation of actions to stop the mechanism) is often ineffective. Recent analysis of past cycle chemistry assessments and damage/failure reviews in over 100 organizations worldwide has lead to a very interesting new concept to prevent damage/failure proactively. This involves identifying repeat cycle chemistry situations which are allowed to continue by the chemistry staff or are imposed on the plant/organization as a consequence of inadequate management support for cycle chemistry.

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Corrosion Product Sampling in Power Plants under Water- and Steam-Cycle Conditions

Piti Srisukvatananan, Derek H. Lister, Chien-Ee Ng, Robert Svoboda, and Karol Daucik

Sampling of process systems is important in power plants because operating decisions often rely on water chemistry information. To obtain representative samples, a properly designed sampling system must take into account many factors. Sponsored by the International Association for the Properties of Water and Steam (IAPWS), an international collaboration among the University of New Brunswick, Canada, Alstom, Switzerland and DONG Energy, Denmark produced a comprehensive review of sampling techniques in nuclear and fossil power plants. This paper, reporting continuing work, includes a study on isokinetic sampling issues. A computational fluid dynamics (CFD) program was used to assess the collection efficiency for magnetite particles of sampling nozzles under water- and steam-cycle conditions. The effects of types of sampling nozzle and the velocities within the nozzle opening were investigated. It has been shown that for sampling magnetite particles from steam, where the fluid viscosity is low, the collection efficiency significantly depends on sampling velocity. Any practical sampling nozzle acts as an obstacle that disturbs the flow field and tends to remove the isokinetic condition. Although deviations from ideal sampling are small, in steam it is advisable to sample at appropriate rates. In liquid, sampling velocity has almost no effect within the ranges of the parameters studied.

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Press Release

15th International Conference on the Properties of Water and Steam and **International Association for the Properties of Water and Steam 2008 Meeting**

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The Unique Application of a Separate Bed Condensate Polishing System (TRIPOL®) in a 400 MW Combined Cycle Gas Turbine Power Plant – The Huntly Power Station Experience

David Addison and Les Lloyd

The use of condensate polishing on modern combined cycle gas turbine (CCGT) power plants is often neglected due to incorrect cost benefit assumptions and short term project objectives. This has resulted in very few CCGT plants worldwide having condensate polishing plants so the short term and long term benefits of condensate polishing have not been fully realised. The application of separate bed condensate polishing on CCGT plants has, until now, been unheard of. This situation has now changed with the construction and commissioning of Huntly Power Station Unit 5, a 400 MW CCGT plant that utilises a cost effective, high performance, easy to operate, separate bed condensate polishing system (TRIPOL®) that delivers clear short term and long term benefits over the entire life of the CCGT plant.

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Silica Release from a Condensate Filter Containing Glass Fiber Media

Andrew Howell

Air-cooled condensers (ACCs) are designed with a very large surface area of carbon steel due to the relatively poor heat transfer provided by air cooling and to the high cost of non-ferrous alloys. Transport of particulate iron from ACCs is commonly very high, especially during unit startups. A combined cycle plant subject to frequent shutdown/startup cycles was experiencing significant startup delays due to excessive iron in feedwater. In order to address the problem, a full-flow condensate filter was installed for startup operation. After installation, it was discovered that while iron was reduced to very low concentrations during startups as anticipated, high silica concentrations also accompanied filter use. The problem resulted from the presence of glass fiber filtering media that was significantly soluble in the high-purity, pH 10 water in the steam cycle.

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Procedures for the Measurement of Carryover of Boiler Water into Steam

A guidance document on the determination of carryover from drum boilers was developed within the IAPWS Power Cycle Chemistry Working Group. It was submitted to the IAPWS Executive Committee for review and was approved at the 2008 IAPWS meeting. This paper represents the complete technical part of this document. It outlines the considerations for periodic monitoring of carryover essential for chemistry control and the separation of mechanical carryover for warranty purposes. Total carryover is determined by measuring the mass concentration of sodium in the boiler water and in steam. The mechanical carryover represents the fraction of water entrained from the boiler drum into the steam and is determined by correcting the total carryover for any contribution of vaporous carryover. This document gives procedures and covers practical aspects such as the choice of the sodium compound, test conditions, analytical procedures, plant parameters, and operating conditions to be considered.

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The Effects of Fouled Anion Resin on Condensate Polishing Plant Performance at Dungeness B Power Station

Chris Bates

The return to power, after an outage, at Dungeness B Power Station was delayed because of problems in achieving an in-specification feedwater acid conductivity. Dungeness B has a full flow cation/mixed bed condensate polishing plant (CPP). Investigations showed that the acid conductivity was produced by carbon dioxide and organic impurities both by-passing the CPP and slipping through it. Resin analysis showed that the anion resin had severely impaired sulfate removal kinetics. The paper covers the work done to try and identify the nature and source of the organics and their effect on the anion resin. One significant finding was that the carbonate removal kinetics were as impaired as those for sulfate removal; this had not been previously experienced in the CPP at any British Energy plant.

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