ABSTRACTS

Wythenshawe Boiler Rig – Thirty Years of Support to the UK Nuclear Power Industry
Andy Rudge, Ian S. Woolsey, and Andrew Moore

The Wythenshawe Boiler Rig in Manchester, UK, recently celebrated thirty years of operation in support of the UK nuclear power industry. The Boiler Rig, owned by EDF Energy and operated on EDF Energy’s behalf by Serco plc, is a full scale once-through boiler test facility for the investigation of chemistry and corrosion related topics. This paper presents an overview of the design and operation of the Boiler Rig together with some of the technical highlights from its thirty years of operation, many of which have relevance to power plant operations beyond those plants for which the work was performed.

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Flow-Accelerated Corrosion (FAC) in HRSGs
R. Barry Dooley and Robert W. Anderson

The paper provides information on flow-accelerated corrosion (FAC) programs for heat recovery steam generators (HRSGs) gathered from one-day assessments of 19 HRSGs worldwide. The primary goal of these assessments was to assist operators in being proactive in identifying the key drivers for flow-accelerated corrosion, but they have also provided a clear picture of exactly where the weaknesses in addressing FAC are occurring. The paper outlines the approaches to optimizing the cycle chemistry to avoid FAC. These key messages can easily be applied by operators to change the current situation of waiting for FAC failures and damage to occur.

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Reflections on FAC Mechanisms
Derek H. Lister and Shunsuke Uchida

Flow-accelerated corrosion of carbon steel in steam-raising systems is obviously dominated by fluid-dynamic parameters such as turbulence and by water chemistry that promotes dissolution of the normally protective magnetite film; the mechanism is often formulated simply as the product of the mass transfer coefficient and the undersaturation in dissolved iron. Additives to the coolant, such as dissolved oxygen or ammonia, and elements in the steel, such as chromium, are then considered to inhibit flow-accelerated corrosion (FAC) by making the magnetite less soluble.

This approach can be useful for predicting locations susceptible to FAC and for supporting proposals for palliative treatments, for example. It is rarely an accurate predictor of FAC rate, however, which may be attributable to its being applied in situations where surface reactions play a part. These issues are discussed in the light of recent research results and it is suggested that mechanisms introducing elements of mixed control may often be more appropriate.

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This conference marked the first international gathering of scientists and engineers at a meeting focused on the subject of FAC in fossil and combined cycle steam and power systems. By design the meeting was linked with FAC2010, organized by Electricité de France (EDF), a conference focusing on FAC in nuclear power stations, held in May 2010 in Lyon, France. Common attendees of the two conferences helped to connect the knowledge from the fossil and nuclear areas. The conference was timely in that it was held at a time when many organizations are placing increased emphasis on FAC. The technical program and attendee perspectives resulted in clarification of many questions related to FAC while also identifying aspects requiring additional attention. A number of conference papers will be published in the PowerPlant Chemistry journal.

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CS Energy's Flow-Accelerated Corrosion Experience (Part 1 of 2)
Ian Richardson, Bruce Kerr, Ian Rawlings, Denis Doucet, and Gary Joy

Flow-accelerated corrosion (FAC) is a common problem encountered by operators of thermal power plants around the world. This two-part paper describes the experiences of the Australian electricity generation company CS Energy in identifying and addressing the problems associated with FAC. This paper discusses the different approaches and strategies used to deal with both single- and two-phase FAC in drum boilers with copper alloyed feedwater heaters, drum boilers with all-ferrous metallurgy, once-through supercritical units, heat recovery steam generators (HRSGs) and air-cooled condensers (ACCs).

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Determination of Copper in Salt Cooling Water by Anodic Stripping Voltammetry to Optimise Condenser Performance
Natasha Cudmore

Successful management of the ferrous chloride dosing system and the Taprogge ball condenser tube cleaning system at Eraring Power Station (EPS), NSW, Australia, relies on measurements of copper in the salt cooling water prior to and after each condenser pass. However, obtaining an accurate copper measurement in the challenging matrix of salt water used has proven difficult. EPS conducted trials of two methods for the measurement of copper in natural waters, differential pulse anodic stripping voltammetry (DPASV) and graphite furnace (electrothermal) atomic absorption spectroscopy. This paper discusses the results of copper measurements from the various trials undertaken on the condenser systems. Based on the trials of this instrument, DPASV was chosen as the preferred method of analysis for the purposes of optimising condenser performance and efficiency, minimising ferrous chloride chemical dosing and tube corrosion, and maximising heat transfer.

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