

Abstracts**Santhanam Ranganathan, Pandalgudi S. Raghavan, Raghavachary Gopalan, Madapuzi P. Srinivasan, and Sevilmedu V. Narasimhan**
The Dissolution Kinetics of Magnetite under Regenerative Conditions

Dissolution studies of magnetite were carried out under regenerative conditions in dilute chemical decontamination formulations. During regeneration of the formulation, the H^+ from the strong acid cation exchange resin gets released and the metal is absorbed on the resin. The efficiency of the regenerative process depends on the stability constants of the complexes involved and the selectivity on the ion exchange column. The regenerative condition helps to maintain a constant chelating agent concentration and pH during the dissolution experiment. Such a condition is ideal for obtaining data on the dissolution behaviour of the corrosion products with special application to actual reactor decontamination. The ethylenediaminetetraacetic acid (EDTA) based formulation used was found to be ineffective due to the high stability constant of Fe(III)-EDTA complex, which is not easily removed by the cation exchange resin. Hence, knowledge of the kinetics of magnetite dissolution under regenerative condition is of primary importance. The 2,6-pyridinedicarboxylic acid formulation is found to be better for the dissolution of Fe_3O_4 in both static and regenerative modes in the presence of reductants than nitrilotriacetic acid and EDTA.

Kenneth Tittle**The Continuous Measurement of Total Carbon Dioxide in Water/Steam Circuits**

The paper describes a robust monitor for the continuous measurement of carbon dioxide in water/steam circuits based on a gas permeable membrane system. Samples to be analysed are acidified to pH 3.4–3.6 to convert all the contained carbon dioxide species into 'free' carbon dioxide/carbonic acid. A fraction of this carbon dioxide is then diffused through a membrane into a stream of high purity water generating an increase in conductivity. This change in conductivity is used as a measure of the total carbon dioxide content of the original sample.

The paper describes the design, operation and calibration procedures used. The monitor can be used to measure carbon dioxide concentrations ranging from a few $\mu g \cdot kg^{-1}$ up to $mg \cdot kg^{-1}$ carbon dioxide.

The effects of sample temperature and flow rate are discussed together with possible interference from other species present in acidified samples. Some results of plant monitoring tests are also included.

Stuart Day

Oxygen Conversion of Collie No 1: Results from Operation at Predominantly Base Load with Overnight Load Reduction

This paper describes the conversion of a 300 MW unit with a drum-type natural circulation boiler from a hybrid treatment (all-volatile treatment from the condenser up to the deaerator inlet, reducing all-volatile treatment using hydrazine from the deaerator outlet to the boiler and the turbine) to the oxygenated all-volatile treatment. The reasons for the conversion were the occurrence of flow-accelerated corrosion, high iron levels in the feedwater and extended magnetite deposition in some parts of the cycle. Since the conversion, no iron levels less than $2 \mu\text{g} \cdot \text{kg}^{-1}$ have been measured, hence it seems that flow-accelerated corrosion is still active in some parts of the condensate and feedwater system. One of the interesting issues is the fact that in this unit the oxygenated treatment is practicable even with a Tripol condensate polishing plant which is operated in ammonia cycle.

Mike Caravaggio

Lambton Generating Station's Experience with HP Turbine Copper Deposition

This paper covers the understanding developed from, as well as the timeline and techniques that were used to address, rapid, dramatic HP turbine performance losses associated with copper deposition on two of four 500 MW coal-fired drum units at Ontario Power Generation's (OPG's) Lambton Generating Station (GS) over the last three years. The two affected units both had greater than 20 MW de-rates caused by copper deposition and 5–10 % losses in HP cylinder efficiency during the period. On one unit the HP cylinder was being replaced by a dense pack HP turbine (decision made prior to identifying the copper deposition issue), and on the other unit a physical clean of the turbine was opted for, with additional study being conducted for possible chemical cleans in the future. This paper outlines Lambton's current understanding of the copper transport cycle through a drum type boiler (based on industry literature and OPG/Lambton GS operating experience), as well as Lambton's experiences to date with the solutions chosen for addressing HP turbine copper deposition.

Albert Bursik

EN 12952-12:2003, Water-Tube Boilers and Auxiliary Installations – Part 12: Requirements for Boiler Feedwater and Boiler Water Quality – A European Standard Put to the Test –

In December 2003, Part 12 (Requirements for Boiler Feedwater and Boiler Water Quality) of the European Standard "Water-Tube Boilers and Auxiliary Installations" appeared. According to the Pressure Equipment Directive of the European Commission, this standard should ensure that the hazards associated with the operation of water-tube boilers are reduced to a minimum and that adequate protection is provided to contain the hazards that still prevail when the water-tube boiler is put into service. The standard is compulsory. Power plant chemists should keep in mind that noncompliance with this standard may have serious (legal) consequences.

This contribution considers whether this standard actually addresses all safety-related parameters and whether it abstains from setting parameters that are not related to equipment and personnel safety. According to the Pressure Equipment Directive demands, parameters important for economics, availability and steam quality as well as those relevant to the operation of other cycle components should not be dealt with in this standard.

Brad Buecker

Wet Limestone FGD Solids Analysis by Thermogravimetry

Wet limestone scrubbing is once again becoming a popular technology for removal of sulfur dioxide (SO₂) from power plant emissions. Critical to the operation of wet limestone flue gas desulfurization (FGD) systems is accurate chemical analysis of scrubber solids. The analytical technique of thermogravimetry is ideal for this application, as the instrument can give precise readings of the principal scrubber solids components, calcium sulfite/sulfate hemihydrate, calcium sulfate dihydrate (gypsum), and unused calcium carbonate. The data provides plant chemists, engineers, and operators with information needed to fine-tune scrubber operation and detect process upsets.

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