

**Abstracts****Stress Corrosion Cracking due to Carbon Dioxide and Organic Impurities in the Steam/Water Cycle  
Josef Denk and Robert Svoboda**

Carbon dioxide and organic species such as formates or acetates are present in many steam cycles of power plants. However, there is only limited knowledge available concerning their effect on stress corrosion cracking of turbine steels. In the case of CO<sub>2</sub> these data are often controversially discussed. Based on the known mechanisms of stress corrosion cracking of low pressure rotor steels, literature results, company-internal investigations and service experience, the effects of carbon dioxide and organics are discussed.

It is known that both types of impurities can reduce the pH of the condensed steam if this is not compensated by a proper water treatment and may enhance most types of aqueous corrosion of steels, including stress corrosion cracking. The scope of the present investigation was the identification of specific corrosion effects, other than the pH effect. There are some indications of such ion-specific effects, especially for acetate, under very specific test conditions. However, the relevance for real service conditions seems to be limited.

Plant experience feedback indicates that the pH effect of organics has caused some failures in steam turbines, but specific corrosion effects could not be identified unambiguously. It is therefore concluded that specific corrosion effects of these substances are not of prime importance. The priority for protecting the steam turbine against corrosion by carbon dioxide and organics is therefore maintaining a sufficient local pH value.

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**The Role of Metal Complexes in Nuclear Reactor Decontamination**

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Chemical decontamination is the process of removal of radioactivity from corrosion products formed on structural materials in the nuclear reactors. These corrosion products cause problems for the operation and maintenance of the plants. Removal of the radioactive contaminants can be achieved by dissolving the oxide from the system surface using organic complexing agents in low concentrations known as dilute chemical decontamination (DCD) formulations. These organic complexing agents attack the oxide surface and form metal complexes, which further accelerate the dissolution process. The stability of the complexes plays an important role in dissolving the radioactive contaminated oxides. In addition, the DCD process is operated through ion exchange resins for the removal of the dissolved metal ions and radioactive nuclides. In the present study, the kinetics of dissolution of various model corrosion products such as magnetite ( $\text{Fe}_3\text{O}_4$ ), hematite ( $\alpha\text{-Fe}_2\text{O}_3$ ) and maghemite ( $\gamma\text{-Fe}_2\text{O}_3$ ) have been studied in the presence of complexing agents such as ethylenediaminetetraacetic acid (EDTA), nitrilotriacetic acid (NTA), hydroxyethylethylenediaminepentaacetic acid (HEEDTA), and 2,6 pyridinedicarboxylic acid (PDCA). The reductive roles of metal complexes and organic reducing agents are discussed.

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**Alternative Water Sources for Industry**

Troy Walker and Les Lloyd

Australia's record-breaking drought has placed increasing emphasis on the importance of the security of water supplies for both domestic use and industry.

The decrease in the availability of water that has traditionally been seen as easy to treat is driving some users to investigate alternative sources of water. Developments in water treatment technology have enabled the use of a range of processes to produce this water reliably at ever decreasing costs. This increasing acceptance of new technologies has seen recycling of plant waste streams, municipal wastewater re-use and seawater desalination, among others, become commonplace.

This paper surveys the trends in water treatment for industry both in Australia and internationally with a review of technologies and case studies of operating plants.

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**The Effect of Temperature on the Contamination of Condensate with Organic Impurities**

Tamara I. Petrova, Valery I. Kashinsky, Viktor A. Rogovoy, Aleksander E. Chub, and Aleksander A. Kryuchkov

The results of tests on the effect of condensate temperature on the washing out of organic and inorganic impurities from anion resins used in condensate polishing units at fossil power plants are presented. It is shown that elevated condensate temperature results in increased washing out of these impurities.

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**An Investigation of the Sorption/Desorption of Organics from Natural Waters by Solid Adsorbents and Anion Exchangers**

Boris Michailovich Larin and Anatoli Stepanovich Sedlov

The results of laboratory and operational tests at thermal and nuclear power stations on anion exchangers and solid adsorbents of makeup water treatment plants with regard to the sorption/desorption of organic substances in natural water and condensate are presented. The resins Amberlite™ IRA-67, IRA-900, IRA-958Cl, Purolite® A-500P, Dowex™ Marathon, and others were tested. Retention of up to 60–80 % of the "organic" material on the anion exchangers and organic absorbers installed at different places in the technological scheme of the water processing unit was attained. The possibility of a partial "poisoning" of the resins and the degradation of the working characteristics over the first year of operation are discussed.

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**Plasma Systems in Power Engineering**

Tomáš Blejchař, Rostislav Malý, Pavel Kolat, and Martin Dluhoš

Plasma technology is currently being investigated as an alternative to heavy fuel oil and gas in the process of ignition of pulverized-coal/air mixtures at the start-up of pulverized-coal boilers and in the stabilization of combustion. Low-temperature plasma generators have been successfully tested at a Czech power plant and have now been handed over to the operator for further application. The process of ignition with plasma technology is described, as well as the results of the on-site tests. The development and application of mathematical modelling of the flow in the design of the generators is discussed.

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