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Investigation of the effect of bio-dispersants on condenser tube fouling and thermal performance

Nagel, Louw

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Abstract

Bio-dispersants and biocides are currently dosed into a wet-cooled recirculating cooling water system at a coal-fired power station. Although these chemicals are being used, no improvement in the heat rate or condenser performance is observed at the power station where the research was conducted. A portable offline test facility that operates in real time was used to monitor the fouling heat transfer resistance on the water side of condenser tubes, while various bio-dispersants were dosed at various concentrations in the individual test condenser tubes. Cooling water tapped off from the main turbine condenser flowed through the test facility. The fouling factors, cleanliness factors, friction factors, mass gained and bacterial counts of the set of chemically dosed tubes in this test facility were continuously monitored against the untreated tubes in this facility. The results indicated that the dosing of two of the three bio-dispersants worsened the heat transfer across the tube walls and fouling layers of the titanium condenser tubes, at times increasing the fouling factors up to 5.2 times higher than the non-dosed controls. The fouling resistances of each test was related to the impact on cycle efficiency and it was found that load losses up to 243 MW could potentially be obtained with incorrect chemical dosing. It is recommended that further studies should be carried out to investigate the effect of combined dosing of bio-dispersants and biocides on biofilm formation and heat transfer across the tube walls and fouling layers of titanium condenser tubes.