World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:11, No:09, 2017

Alternative Biocides to Reduce Algal Fouling in Seawater Industrial Cooling Towers

Authors : Mohammed Al-Bloushi, Sanghyun Jeong, Torove Leiknes

Abstract : Biofouling in the open recirculating cooling water systems may cause biological corrosion, which can reduce the performance, increase the energy consummation and lower heat exchange efficiencies of the cooling tower. Seawater cooling towers are prone to biofouling due to the presences of organic and inorganic compounds in the seawater. The availability of organic and inorganic nutrients, along with sunlight and continuous aeration of the cooling tower contributes to an environment that is ideal for microbial growth. Various microorganisms (algae, fungi, and bacteria) can grow in a cooling tower system under certain environmental conditions. The most commonly being used method to control the biofouling in the cooling tower is the addition of biocides such as chlorination. In this study, algae containing diatom and green algae were added to the cooling tower basin, and its viability was monitored in the recirculating cooling seawater loop as well as in the cooling tower basin. Continuous addition of biocides was employed in pilot-scale seawater cooling towers, and it was operated continuously for 2 months. Three different types of oxidizing biocides, namely chlorine, chlorine dioxide and ozone, were tested. The results showed that all biocides were effective in keeping the biological growth to the minimum regardless of algal addition. Amongst the biocides, ozone could reduce 99% of total live cells of bacteria and algae, followed by chlorine dioxide at 97%, while the conventional chlorine showed only 89% reduction in the bioactivities.

Keywords : algae, biocide, biofouling, seawater cooling tower
Conference Title : ICBEESE 2017 : International Conference on Biological, Ecological and Environmental Sciences, and Engineering
Conference Location : Zurich, Switzerland
Conference Dates : September 15-16, 2017