

Short Communication

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Control of Biofouling in Industrial Water Cooling System

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In all chemical process industries, cooling water systems performance is vital to achieve productivity and prolonged life of heat exchanger. In spite of having good control, the system can fail if adequate care is not taken to control biological fouling due to bacteria, algae and fungi [1]. The biocides used to control biofouling are either oxidizing or non-oxidizing type. Most of the halogenated compounds and halogens oxidize the protoplasm to form a stable nitrogen-halogen bond. It is, therefore, toxic to all living organism. However, the effectiveness of chlorine is decreased by the presence of organic matter and ammonia.

Since in the fertilizer industry, one cannot rule out the possibility of ammonia contamination which can decrease the effectiveness of oxidizing biocide. Therefore, it was felt to locate some effective non-oxidizing biocide to control the biofouling in fertilizer industry. In the present studies non-oxidizing type of biocide have been used.

Method based on minimum inhibitory concentration technique [2], which involves dilutions, spreading on the plates and counting of Colony Forming Units (C.F.U.). Test water was diluted from 10^{-3} to 10^{-9} time and 39 petridishes were prepared with nutrient agar for the evaluation of growth of bacteria while 39 petridishes were prepared with E&P media to study the behaviour of fungi. Out of 39, seven plates were reserved as control in both cases. In four plates 5 ppm and in two plates 50 ppm of biocide was added. After the preparation of plates a small volume of diluted culture 0.1 ml is applied directly on solidified agar and E&P media petriplates, and then culture is distributed with a spreader, all plates were placed for incubation for two days at the temperature of 37° and relative results were evaluated with the help of Colony counter.

Comparative result indicates that methylene-bis-thiocyanate has complete control of biofouling at 5 ppm level at 10^{-6}

times dilutions in the fresh and tower water. On the other hand at 50 ppm, biocide has an excellent control of biofouling at complete range of dilutions in all types of water samples.

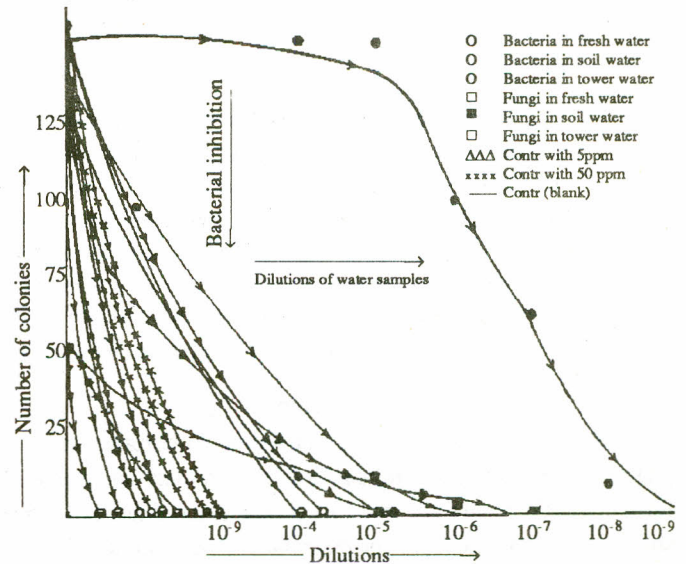


Fig. 1. Effect of dilutions on bacterial inhibition in various samples of water.

Methylene-bis-thiocyanate belongs to organosulphur compounds [3]. The kinetics of inhibition is a competitive one. In competitive inhibition mechanism, biocide remove the ferric (Fe^{+3}) ion from the reaction by complexing it as an iron salt. Removal of iron ion from the cytochrome stops the transfer of energy and causes immediate cell death. Although methylene-bis-thiocyanate is a very effective microbiocide in cooling water systems, but it is a pH sensitive and is rapidly hydrolysis in pH ranges above 8.0. For this reason, it is not recommended for use in systems where the recirculating water pH generally exceeds 8.0.

Key words: Control, Biofouling, Cooling system.

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