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## Formation of Trihalomethanes during Seawater Chlorination

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### ABSTRACT

The use of seawater for industrial cooling is a vital technology that poses some of the most profound environmental impact on the water quality in the Arabian Gulf. Biocide (chlorine) is added to the seawater to control biofouling of the cooling system. This added chlorine reacts with bromide and other chemicals naturally exist in the water to form a wide range of oxidants. Regrettably, reactions between the residual oxidants and natural organic matter in the water lead to formation of toxic halogenated organic compounds that have detrimental effects on the environment when they are discharged into the Gulf. This paper describes the formation of trihalomethanes (THMs) in seawater cooling systems. Results of kinetic experiments have shown that concentrations of THMs increased rapidly with time during the first half hour. Chlorination of seawater has shown significant increase in total THMs (TTHMs) and in bromoform concentrations. Rapid decrease of UV absorbance at 254 nm was also observed during seawater chlorination which is indicative of natural organic matter degradation into small organic molecules including THMs and other by-products. The increase in chlorine dose was accompanied with an increase in TTHMs and bromoform concentrations. Linear relationships between total chlorine concentration and both final TTHMs and bromoform concentrations were established. First order exponential decay and exponential associate functions were developed to correlate chlorine dose with formed THMs.

### KEYWORDS

Chlorination by-Products, Seawater Cooling, Biocides, Trihalomethane, Bromoform

### Cite this paper

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