

EFFECTS OF CHLORINE DIOXIDE AND SOME WATER QUALITY PARAMETERS ON THE FORMATION OF THMS IN WATER TREATMENT PLANTS

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ABSTRACT

The presence of trihalomethanes (THMs) in drinking water has attracted the attention of both researchers and professionals, because of the harmful effects of these substances on human health. Chlorine dioxide (ClO_2) is an alternative to chlorine because it is an oxidizing agent rather than a chlorinating agent, and therefore, will not form chlorinated disinfection byproducts such as THMs under typical water treatment conditions.

The present study was conducted to determine the effects of Chlorine Dioxide, Temperature, Turbidity, Hydrogen ion concentration (pH), Total Organic Carbon (TOC), and contact time on the formation of THMs during treatment process. A small-scale pilot plant of a compact model is designed and constructed at Environmental Engineering Department lab (Babylon University). It is simple in operate and made of galvanized iron of its components and locally available materials.

Total Trihalomethanes (TTHMs), their speciation compounds (THM₄), and varieties of water quality parameters were monitored by addition different doses of chlorine dioxide and alum to raw water pipe entering the pilot plant. The input flow rate was ($0.36 \text{ m}^3/\text{hr}$) with characteristics (as average) (Temperature, Turbidity, Alkalinity, TTHMs, pH, and TOC) are (28 °C, 27 NTU, 140mg/L, 0.1545 mg/L, 8.22, 1.4 mg/L) respectively.

All runs were done during April, May and June of 2012. The linear correlations were calculated between THM concentrations and ClO_2 dose or selected water quality parameters, in an attempt to identify one or more parameters that could be used as surrogate in THMs investigation. (HS – GC - ECD) with Gas chromatography analysis techniques were used to measure the THMs concentrations. It was noticed that TTHMs concentration increases as temperature, TOC, and pH increase, and average TTHM levels detected in all runs, does not exceeded the USEPA's Stage I (limit of 80 $\mu\text{g/L}$), while exceeded the stage II limit in all sampling measurements.

KEYWORDS: Trihalomethane, Drinking Water, Temperature, Turbidity, pH, TOC