Proceedings of the 7th International Conference of Recent Trends in Environmental Science and Engineering (RTESE'23)
Ottawa, Canada – June 04 - 06, 2023
Paper No. 165
DOI: 10.11159/rtese23.165

Chlorine Demand in Bicarbonated and Ferruginous Hot Springs in the Cundinamarca Region, Colombia

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Canada and Germany apply the same microbial and physical-chemical requirements to hot springs as for swimming pools in accordance with the Alberta and British Columbia Government Public Swimming Pool Regulations and the German DIN 19643 Standard, where they require the addition of chlorine to their waters. Chlorine is not added to hot springs in Colombia for the disinfection of their waters, only a constant replacement of the water is carried out, which does not guarantee the microbiological quality of hot springs. There has been little research on the demand for chlorine in hot springs in Colombia because by requiring water of natural origin, the quality of their waters is not regulated. In our study, laboratory tests were carried out with bicarbonated and ferruginous hot springs in the Cundinamarca region of Colombia, to determine the chlorine demand.

The tests were carried out as established by Standard Methods 2350 with three replicates of each test for a contact time of 10 minutes and a chlorine concentration of 100.47 mg/L Cl_2. For the bicarbonated hot spring, tests were carried out with chlorine doses of 0.5 to 10.0 mg/L Cl_2 with intervals of 1.0 mg/L Cl_2, where the typical chlorine demand curve was obtained, with a chlorine demand of 5 mg/L Cl_2. In the case of the ferruginous hot spring, the dose intervals were varied and additional tests were obtained with concentrations above 12 mg/L Cl_2 where the breakpoint chlorination was not obtained to determine the chlorine demand. Only combined chlorine was obtained where water reacts with organic materials and metals and disinfection does not occur. In Germany, the oxidation of organic matter, forming disinfection-by-products (DBPs), is not desired. In order to achieve this, the main effort is attributed to the filtration of the organic matter before addition of chlorine, thus largely avoiding the formation of DBPs. For this reason, it is important in future work to investigate how disinfection with chemical products could be carried out in this type of ferruginous hot springs to determine the dose of chlorine sufficient to satisfy the demand for chlorine and maintain a residual chlorine to eliminate enough pathogenic microorganisms.

***Keywords**:* bicarbonated, demand chlorine, ferruginous, hot springs.

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