Pilot-scale drinking water treatment plant: effects of disinfection alternatives and filtration systems

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ABSTRACT

A pilot-scale drinking water treatment plant was designed and manufactured to control disinfection by-product (DBP) levels through better removal of natural organic matter (NOM) and the application of disinfectant alternatives that produce lower DBPs levels. The designed pilot plant consists of several stages including disinfection (by chlorine, chlorine dioxide, or ozone), coagulation–flocculation (using alum or alum + cationic polymer), and a sedimentation and gravity filtration system, such as sand or granular activated carbon (GAC). The efficiency of the designed plant was evaluated according to the water quality produced in terms of turbidity, pH, alkalinity, total organic carbon, and ultraviolet absorption at 254 nm (UV$_{254}$), phytoplankton, and DBP levels. Improved reductions of turbidity, algae, and NOM, and consequently lower DBP levels, could be obtained. The lowest DBPs levels were obtained through the treatment sequence: ClO$_2$/modified coagulation/GAC, due to the combination of the high oxidation powers of ClO$_2$ with the high adsorption capacity of GAC.

Keywords: Disinfection; NOM removal; Ozonation; Chlorine dioxide; Granular activated carbon

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