Computational Modeling of Baffled Disinfection Tanks

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Abstract. The present study focuses on understanding the flow dynamics of baffled disinfection contact tanks through the use of computational fluid dynamics (CFD). In particular, we seek to address the key question: for a given footprint of a contact tank with a fixed inlet configuration, how does the hydraulic efficiency of the tank depend on the configuration of internal baffles? In order to define guidelines for hydraulically efficient baffle tanks, we perform a total of 36 high-resolution three-dimensional simulations to quantify the efficiency of a laboratory scale tank as a function of the dimensional relationships between the inlet width, channel width, tank width, tank length and baffle opening length. Simulated flow through curves (FTC) and longitudinal velocity profiles show good agreement with previous experimental results. Our analysis of residence time distribution (RTD) curves obtained for different tank configurations of the same footprint indicate that an optimum configuration that approaches near plug flow conditions may exist and can be defined by the dimensional relationships examined in this study.