Influence of inlet/outlet location on hydraulic disinfection efficiency of contact tanks

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Abstract. The focus of this study was to investigate the influence of inlet/outlet location on hydraulic disinfection efficiency of contact tanks. A concrete rectangular tank with three inlet/outlet location configurations (bottom inlet-top outlet, top inlet-bottom outlet, and bottom inlet-top outlet) and two outlet sizes (2-in.-diameter and 4-in.-diameter) was modeled with computational fluid dynamics (CFD) software. A bottom inlet -top outlet physical tank that is located at the hydraulics lab at Colorado State University in Fort Collins was used for tracer tests to validate CFD results. Excellent agreement was achieved between CFD results and tracer tests. A total of 14 CFD simulations were performed for baffled and un-baffled tanks at various flow rates in order to obtain the residence time distribution (RTD) curves for a passive tracer. Baffling factor (*BF*) obtained from RTD curves was used to estimate the hydraulic disinfection efficiency for the different configurations. Moreover, CFD simulations were used to analyze the flow fields to gain insights into the flow trajectories for the different configurations. It was found that the *BF* for un-baffled tank were too low (<0.1) to give a satisfactory disinfection performance regardless of the location configuration. For the baffled tank, the top inlet-bottom outlet configuration performed best with a *BF* of ~0.4. On the other hand, the bottom inlet-bottom outlet one gave the lowest *BF* of 0.3. Hence, a modification on the inlet/outlet location can result in gains in baffling factor in excess of 30%. The results also indicated that given the same tank geometry, the flow rate and small alteration of outlet size do not affect the hydraulic disinfection efficiency. In summary, the influence of inlet/outlet location on hydraulic disinfection efficiency of baffled contact tanks can be significant and thus should be highlighted.