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Improved mixing of hydrogen peroxide injection in advanced oxidation process treatment using computational fluid dynamics

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ABSTRACT

The main issues with ozone-based advanced oxidation processes (AOPs) occur in the type of poor mixing, residual oxidizing agents, inadequate concentration control, and by-product formation. This study focused on improving the mixing effect of hydrogen peroxide by slightly modifying the existing injection facility by performing computational fluid dynamics (CFD) on the existing hydrogen peroxide injection system of the ozone-based AOP. CFD analysis showed that conventional diffuser systems were inefficient for mixing oxidizer and feed water. The mixing ratio was low since the momentum of the feed water could not be overcome by the hydrogen peroxide injection flow, and the length of the contact pipeline was not sufficient for the oxidizer to mix with the feed water. The problem could be overcome by increasing the number of diffusers to increase the injection flow of hydrogen peroxide. This study excluded dissociation and reaction between hydrogen peroxide and contaminants or scavengers, so further studies are needed.

Keywords: Advanced oxidation process; Computational fluid dynamics; Diffuser; Dispersion; Mixing; Hydrogen peroxide

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