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CASE STUDY

World Leader in Mixing and Contacting Technologies

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Maximum Ozone Transfer Efficiency Across Broad Range Of Water Flow

GDT™ Ozone Injection & Degasification Skids and Pipeline Flash Reactor™

Gatineau, Quebec, Canada

The Problem: The design team for the intermediate ozone system at Buckingham Water Treatment Plant, located in Gatineau, Quebec, had limited space available for ozone contacting for the plant's 1.3 – 7.4 MGD flow, so a standard fine bubble diffusion basin for ozone disinfection was not an option. To minimize cost, the engineers proposed a non-ozone resistant pipeline constructed of HEDP for the process. And, in addition, it was essential to rapidly mix and disperse the sidestream dissolved ozone effluent into the bulk water flow to establish a stable dissolved ozone residual 5 meters downstream from the pipleline ozone contactor—a requirement necessary to meet disinfection standards and receive CT Credits.

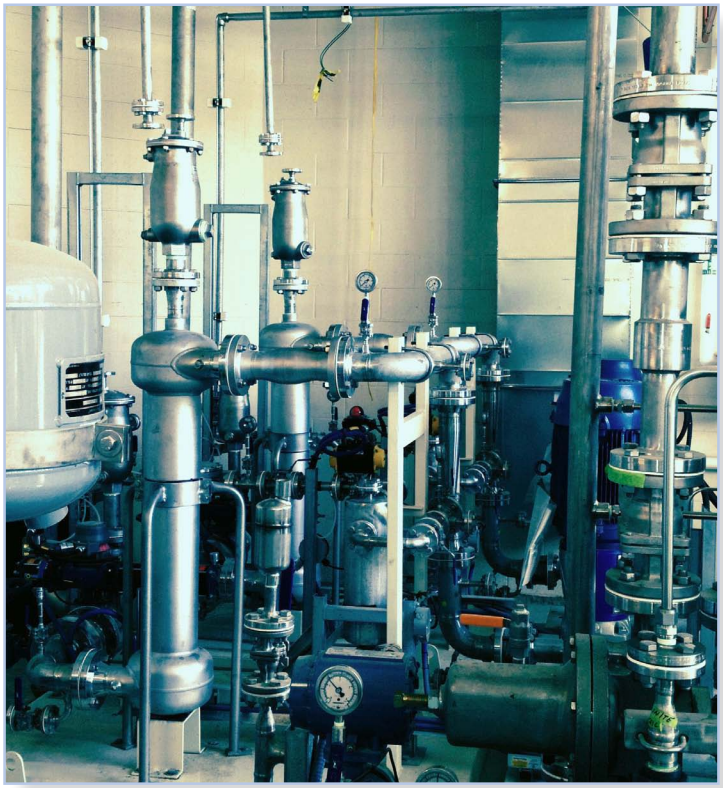

FIGURE 1: GDT Ozone Contacting Skids at Buckingham WTP

The Solution: To ensure against deterioration of the HEDP pipeline from ozone gas, the design team chose Mazzei GDT™ Contacting Systems (FIGURE 1) for ozone mass transfer and off gas removal. A GDT Contacting System transfers all of the ozone gas at the injector, which provides dynamic mixing and mass transfer, then removes any remaining undissolved gas bubbles with a GDT Degas Separator. The separator's bubble free, dissolved ozone effluent is then rapidly blended into the bulk water flow to provide the dissolved ozone required for disinfection, without exposing the HEDP pipe to ozone gas. At low plant flows, a single GDT system sidestream would

be sufficient to treat the bulk water flow. At plant flow rates exceeding 3.7 MGD, two GDT process trains would be used to handle the maximum ozone production required.

Initially the design team considered the use of a static mixer in the 42" pipeline to blend the sidestream ozone effluent into the bulk water flow. However, because raw water was gravity fed into the pipeline contactor, the allowable pipeline pressure loss at the point of sidestream mixing was only 1 mm of water at the peak design flow. Analysis by the team showed that a commercially available static mixer could not meet the required CoV across the pipeline flow range at this stringent pressure loss point.

In place of a static mixer, the design team selected a Mazzei Pipeline Flash Reactor™ (PFR) (FIGURE 2) to blend and mix the GDT sidestreams' effluent into the pipeline bulk water flow. Multi-phase computational fluid dynamics (CFD) modeling and analysis were required as part of the project's submittal requirements. The CFD simulations predicted that the PFR design would meet the sidestream mixing and pipeline pressure loss requirements.

FIGURE 2: PFR at Buckingham WTP

The Results: The Buckingham ozone system was commissioned in the summer of 2015 and continues to operated successfully. A stable dissolved ozone residual required for CT credits is easily maintained 5 meters downstream from the PFR as predicted by the CFD analysis. The pipeline contactor remains bubble free and only contains the low concentrations of dissolved ozone required for disinfection ($O_3 \leq 0.5$ mg/l) which can pass through the non-ozone resistant HEDP pipeline without deteriorating the pipeline structure.

Take a look at an animation to get a better understanding about how the GDT system or a Pipeline Flash Reactor works.

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For additional information on how Mazzei can assist with your water treatment goals, contact us at:

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