

## Award-Winning Paper Highlights The Power Of Sidestream Injection

Source: [Mazzei Injector Company, LLC](#)

*Ozone system in Orlando boosted by replacing fine bubble diffusers with venturis*

A presentation by Tom Steinke of Mazzei Injector Company at the fall conference of the Florida Section of American Water Works Association (AWWA) on November 30, 2021 offered a detailed look at the improved operational control, ozone dosing and residual results, maintenance and safety achieved when the Orlando Utilities Commission (OUC) replaced three of its fine bubble diffuser ozonation systems with sidestream injection systems. Steinke's talk was based on "Evaluation of mixing, mass transfer, O&M, energy and material requirements for H<sub>2</sub>S Oxidation at the Orlando Utilities Commission WTPs," which recently received Florida Section of AWWA's Best Paper award.

The other co-authors of the paper were Srikanth Pathapati of Mazzei; Chris Schulz and John Healy of CDM Smith; and Brad Jewell, Quyen Newell, Eric Jones, and Robert Sumpter of OUC.

### **Better Mixing**

The Orlando Utilities Commission adopted ozone fine bubble diffuser (FBD) systems beginning in 1997 to remove hydrogen sulfide from well water into sulfate, solving a taste and odor challenge while also providing powerful disinfection. About a decade ago, the utility began replacing fine bubble diffusers with sidestream injection (SSI) ozone systems, which use venturis to inject and mix ozone into the water, followed by pipeline flash reactors (PFRs) to mix the ozonated sidestream into the main flow. So far, OUC has replaced three fine bubble diffuser systems with sidestream injection. The research team analyzed the impacts of the switch at Orlando's 40 MGD OUC Southwest and 27 MGD OUC Conway water treatment plants using advanced tracer studies and computational fluid dynamics (CFD) modeling.

While FBD systems rely on passive mixing for mass transfer, Steinke explained, sidestream injection engages in active primary, secondary and tertiary mixing through the highly efficient shearing and blending action of the sidestream injection system.

### **Monitoring ORP**

The result of improved mixing, Steinke pointed out, is a vast improvement in both mass transfer and solution homogeneity. In turn, the consistency of the solution in the sidestream injection system—above 95%—enables plant managers to monitor oxidation-reduction potential (ORP) as an indicator of oxidation of hydrogen sulfide. ORP monitoring had proven unreliable with fine bubble diffuser systems, where inconsistent mixing results in wide variations in measurements.

Steinke noted that the inability to accurately measure ORP and the slow mass transfer in fine bubble diffuser systems can result in frequent over-feeding of ozone. By contrast, the reliable monitoring in sidestream injector systems and instantaneous dissolution of ozone in the pipeline flash reactor permits much more precise, and economical, management of ozone in the venturi installations—reducing ozone production by 25% or greater.

### **Operation and Maintenance Benefits**

Steinke also detailed the advantages in maintaining sidestream injection systems rather than close manual inspection of thousands of fine bubble diffuser stones and the time-consuming process of replacing diffusers and gaskets. Operations teams no longer need to shut down plants for FBD inspections and maintenance, and workers do not have to enter confined spaces. We are continuing to evaluate reduced maintenance at the OUC plants to see how it compares in a side-by-side assessment of SSI and FBD at a Canadian facility which demonstrated, over a 25-year period, a reduction of downtime days and reduced O&M costs using sidestream injection vs. fine bubble diffusers.

Operation is also significantly streamlined with SSI at the OUC facilities. At the Conway plant, the sidestream injection system includes 5 injection sidestreams feeding a single PFR. The system provides for turndown during low flow periods while improving efficiency and ozone dosing control for all flows.

Precision, control, efficiency, and outstanding results in achieving targets for odor control and ozone residual, make sidestream injection ozone systems a powerful tool for today's water treatment operations, said Steinke. For more information on sidestream injection ozone systems, visit [www.mazzei.net](http://www.mazzei.net) or call (661) 363-6500.