



Medford Water Commission Robert A. Duff Water Treatment Plant *Ozone Sidestream Injection System*

20-YEAR-OLD SIDESTREAM INJECTION SYSTEM IS READY FOR THE COMING DECADES: The Robert A. Duff Water Treatment Plant (WTP) on the banks of southern Oregon's Rogue River plays a crucial role in the Medford Water District's strategy for keeping up with the summer demands of the growing population of Medford and the surrounding communities. When its ozone generators reached their 20-year lifespan, the district replaced them and positioned its sidestream injection system for the next 20 years—with a pair of new, skid-mounted ozone generators and the capacity to keep up with the plant's ongoing upgrade to 65 million gallons per day (MGD), up from its current design capacity of 45 MGD.

But through all the upgrades, there has been an important constant: the original Mazzei venturi injectors and pipeline with Mass Transfer Multiplier™ (MTM) nozzles are still operating just as effectively as they were when they were installed two decades ago. The only update to the sidestream injection system, says Matt Severloh, water treatment plant supervisor at the Robert A. Duff WTP, is new pumps and meters for the side-by-side, redundant systems.

“Our upgrade for the ozone sidestream injection system was literally the pump and meter—that's it,” says Severloh, who adds that maintenance needs for the system are also negligible. “Maintenance is non-existent. We check the

sidestream pumps for leaks. Maybe we do a little greasing with the valves. There's nothing to clean.”

TASTE AND ODOR

Since its construction in 1962, the Robert A. Duff WTP has augmented the Medford Water District's year-round spring water supply with water from the Rogue River. The crew takes about a month in April to commission the plant and get it running, and the facility supplies as much as 33 MGD from May through September to meet demand for extra water for lawns and gardens, swimming pools, car washing and long showers in the valley's hot, dry summers.

Severloh notes that the district's year-round Big Butte Springs water has won regional and national taste contests and requires no filtration—just disinfection to comply with U.S. Environmental Protection Agency standards. However, seasonally augmenting the spring water with river water introduces a challenge. Water from the Rogue is consistent and clean, with average turbidity at just 2 to 3 NTUs, but the presence of geosmin and MIB (methyl-isoborneol) requires treatment for musty taste and odor (T&O). Severloh points out that when supply chain disruptions delayed the delivery of the new ozone generators in 2022, taste and odor complaint calls started coming in “as soon as we started delivering river water.”

For decades, those complaints had been an annual nuisance for district staff. In 2002, Black & Veatch designed an ozone sidestream injection system for the plant to tackle T&O problems with 0.8 to 1.0 mg/L of ozone injected through Mazzei venturis and mixed into the main flow through the company's pipeline with MTM nozzles.

HIGH EFFICIENCY

The Medford Water District puts a high value on sustainability, Severloh notes. Team members are proud to point out that the 25 to 26 MGD of spring water at the heart of the district's water supply has made the 30.5-mile trip from Big Butte Springs to Medford entirely through a gravity-fed underground pipeline system since 1927. The first pump the spring water encounters is in Medford itself.

Meanwhile, the Robert A. Duff WTP lifts water 87 feet from the Rogue River with 400 horsepower variable frequency drive (VFD) pumps installed with the help of the Energy Trust of Oregon. The incoming water is pH balanced to 8.5 with carbon dioxide dispensed through a SCADA flow-based system.

Inside the plant, small sidestream pumps direct about 10% of the water into the Mazzei venturi injectors, which use the energy of the sidestream flow to create a vacuum that draws in ozone from the ozone generators and mixes it thoroughly into the water. The same energy then mixes the treated sidestream back into the main flow through the pipeline with MTM nozzles.



The Mazzei sidestream ozone injectors at Robert A. Duff Water Treatment Plant are going strong 20 years after installation, with no need to replace them during the recent ozone generator upgrade.

In 15 to 20 minutes traveling through the baffles of a serpentine flow basin, the low dose of ozone fully removes the MIB and geosmin. Excess ozone in the headspace is routed through an ozone destructor where it passes over a catalyst that breaks the O₃ into O₂. Meanwhile, the ozonated water undergoes sedimentation and flocculation, filtration through anthracite coal and sand, and a small residual dose of chlorine from 12.5% sodium hypochlorite.

“We’re as energy efficient as we can be,” Severloh says.

After as little as an hour in the 5-million-gallon on-site covered reservoir, 900 horsepower of pump capacity sends the treated water throughout the Rogue Valley. On average, says Severloh, the process takes four hours from river to town.

UPGRADES NOW

The upgraded plant will feature new sedimentation and flocculation basins, 4 new deep filtration beds, and 9 million gallons of reservoir capacity, says Severloh, as well as a total of 8 high-service pumps.

“That should bring us 50 to 60 years into the future,” he notes.

As earthmovers build up the pads for the expansion, the ozone system is ready for generations to come. Providing clean drinking water to generations of neighbors is something Severloh—the second generation of his family in the water treatment industry—has a unique angle on.

“If you’ve never been exposed to water treatment, you take it for granted,” he says. “But we’re part of this community. We’re part of the planet.”

Mazzei Injector Company continuously works to develop new technologies and improve on their current products and systems. Using computational fluid dynamics multiphase flow modeling, coupled with the vast experience gained throughout the years from Mazzei installations, Mazzei has developed several highly engineered products including the basin nozzle manifold and the Pipeline Flash Reactor™—an improved version of the pipeline with MTM nozzles installed in 2002 at the Robert A. Duff Water Treatment Plant.

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