

Case Study: Torrent3 Treatment System onsite deployment for excess capacity during wet weather events



District Name and Deployment Location:

Milwaukee Metropolitan Sewerage District (MMSD)
South Shore Water Reclamation Facility (SSWRF) 8500 5th Ave, Oak Creek, WI 53154

Introduction

Rapid Radicals Technology's Torrent3 Treatment System is an advanced, high-rate wastewater treatment platform designed to rapidly remove solids, organics, and pathogens within 30 minutes of total treatment time. Housed within a 45-foot transportable container, the Torrent3 integrates rapid solids removal with a proprietary ozone-based advanced oxidation process. The system provides scalable auxiliary treatment capacity for utilities and for industrial producers seeking reliable, compact treatment solutions.

Building on the success of the BS0405 deployment at a remote lift station in MMSD's sewershed, Rapid Radicals operated the Torrent3 Treatment System at MMSD SSWRF from June 2024 through September 2025 to demonstrate the performance necessary to increase capacity within the fence line. This demonstration focused on long-term operation, automation optimization, and catalyst integration to improve treatment efficiency and reduce energy consumption. The SSWRF site enabled 24/7 operation with continuous wastewater availability, supporting advanced data collection and kinetic modeling.



Deployment Summary

At SSWRF, the Torrent3 pumped primary effluent from the east clarifier wet well and returned treated effluent downstream for full-scale processing. The system operated on both diluted and non-diluted primary effluent, reflecting the range of influent conditions expected during wet weather. Testing evaluated organics removal, pathogen inactivation, ozone efficiency, and total energy consumption under real-world conditions.

System and Operating Specifications

Parameter	Value / Range
Flow Rate	Up to 95 gallons per minute (gpm)
Water Temperature	10–20 °C
Total Treatment Time	18–30 minutes
Influent Type	Primary effluent (diluted/non-diluted)
Ozone Dose	1.4 mg O ₃ /L
Detention Volume	2,000 gallons

Performance Results

Torrent3 achieved consistent effluent quality that met MMSD's Wisconsin Pollutant Discharge Elimination System (WPDES) discharge permit requirements for all tested parameters. Performance was stable across a broad range of wastewater temperatures, demonstrating robust kinetics and effective ozone transfer under field conditions.

Parameter	Influent PE	% Removal	Effluent	Permit Target
COD (mg/L)	450 ± 150	62% (with catalyst)	150 ± 40	Not regulated
BOD (mg/L)	280 ± 100	>80%	<30	30
TSS (mg/L)	67 ± 37	88 ± 3	16 ± 1	30
E. coli (CFU/100 mL)	10 ⁵	99.99%	<126 CFU/100 mL	126 / 410*

*126 CFU/100 mL monthly average; <10% exceedance of 410 CFU/100 mL

Pathogen Inactivation: The City of Milwaukee Health Department (MHD) analyzed samples for viral inactivation. After moving the Torrent3 to SSWRF, Enterococci was also added to MHD's analyses. Enterococci limits are included in many Clean Water Act discharge permits on the East and West coasts due to EPA regulations for marine environments. At 95 gpm the Torrent3 achieved 4.5 + 0.9 and 4.3 + 0.6 log removals of E. coli and Enterococci, respectively.

Key Takeaways

1. Achieved >4-log inactivation of E. coli and Enterococci at 18-minute detention time.
2. 2.8× higher COD removal with catalytic ozonation compared to ozone alone.
3. 23% reduction in energy demand through automation optimization.
4. Demonstrated scalability and performance consistency under continuous municipal operation.
5. Provided the foundation for Torrent3's transition to commercial readiness and integration into MMSD's 2050 Facilities Plan for decentralized high-rate treatment.