

City of Fond du Lac Wastewater Treatment and Resource Recovery Facility

By Alex Krause, Assistant Superintendent at City of Fond du Lac WTRRF



The City of Fond du Lac WTRRF began to treat wastewater in basic forms beginning in 1913 in central Wisconsin. While the location remains the same, every aspect of this facility has been improved, with major facility upgrades occurring in 1928, 1949, 1964, 1975, and

2008. The facility now receives domestic flow from approximately 65,000 residents including 18 communities surrounding the city, otherwise known as Outside Sewer Groups. Design annual average flows are 9.84 MGD, although flows can range as low as 4 MGD in winter months and upwards of 60 MGD in wet weather events.

Along with residential and clear water flows, Fond du Lac has several industries. Approved in 1984, an industrial pretreatment program was implemented to keep toxic and non-compatible pollutants out of the sewer system. As of 2024, there are 10 industries in the program categorized as significant industrial users.



Collection System

The City of Fond du Lac owns, maintains, and operates 17 sanitary stations and 19 storm stations. Due to an aging collection system and having predominately clay soils, inflow and infiltration (I/I) has been a large concern to the facility. To address these concerns, the city has

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spent a significant amount of time identifying and repairing I/I contributions, including sanitary main and lateral replacements, wet weather televising, dye testing, smoke testing, bagging and flooding, manhole repairs, modeling, public education, and private side inspections/enforcement of existing codes.

Treatment Facility

Preliminary treatment consists of influent pumping, pH monitoring, mechanical fine screens, grit removal, and grit washing. Following preliminary treatment, are two co-thickening primary clarifiers where primary solids and waste activated sludge (WAS) are thickened prior to anaerobic digestion. Secondary treatment consists of three series of aeration basins originally designed to run off dissolved oxygen (DO) control to treat ammonia and biochemical oxygen demand (BOD) biologically and phosphorus chemically.

Since the 2008 upgrade, Fond du Lac has faced changing phosphorus limits, creating a push towards enhanced biological phosphorus removal (EBPR). Process changes include extension of anoxic zones, strategic diffuser grids, supplemental carbon addition, utilizing machine learning with historical data, and implementing OSCAR aeration controls. By adding most-open-valve (MOV) and cascade logics to the control, this low DO system can fine-tune air supply based off oxidation-reduction potential (ORP), ammonia, and DO instrumentation to provide the aeration required at the lowest pressure loss and energy consumption. Currently, over 90% of influent phosphorus is removed biologically. Ortho phosphorus is continuously monitored in the MLSS and effluent. This will control chemical dosing on an as-needed basis. Following aeration includes secondary clarification and UV disinfection prior to the

effluent discharging into Lake Winnebago. Around 2.5 billion gallons of water is treated and discharged annually.

Fond du Lac has four anaerobic digesters running at mesophilic temperatures. Around 50 million gallons of co-thickened primary sludge and high strength waste are treated annually to a Class B biosolid prior to centrifuge dewatering. Fond du Lac produces roughly 11,000 wet tons of biosolids per year to be land applied following the standards put in place by the EPA and WI DNR. In 2018, a side stream deammonification process using Anammox bacteria to remove ammonia from the centrate was put in place. Prior to this addition, this side stream flow accounted for roughly 40% of total ammonia loadings to the facility. This granular biomass provides simultaneous anaerobic ammonium oxidation and denitrification allowing for 90% removal in a relatively small footprint. These efforts were implemented to reduce competition of denitrifying bacteria over phosphorus-accumulating organisms (PAOs) to improve biological phosphorus removal.

Fond du Lac produces roughly 85 million cubic feet of biogas annually through anaerobic digestion. The methane gas is treated for H₂S, siloxane, and moisture removal prior to fueling a boiler and 450 kW combined heat and power methane generator. Energy savings from this generator contribute to over 3 million kW of renewable energy produced, or around 40% of total annual power, lessening the need for utility power.

The Future of FDL WTRRF

To ensure phosphorus compliance in the next permit renewal, Fond du Lac is participating in water quality trading (WQT). This WQT plan identifies and quantifies phosphorus and TSS water quality trades on agricultural property

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owned by the Fond du Lac County Airport. Through modeling and implementation of best management practices (BMPs), the facility will generate credits to offset the pounds of phosphorus discharged from the plant as needed. Work to be done includes permanent grass for conservation cover and grassed/rock-lined waterways to repair severe gully erosion. Construction of these BMPs will begin in late summer/fall of 2024 and is included in the WTRRF WPDES permit renewal in 2025.

With construction beginning in 2025, the WTRRF will be perusing renewable natural gas (RNG) production for pipeline injection. Through a membrane technology, biogas purification will occur removing H₂S, moisture, siloxane/VOC, and CO₂. The gas will then be pressurized, monitored for quality, and injected in the grid. Doing so allows the WTRRF to capture and utilize virtually 100% of methane gas produced while also bringing in revenue.

The WTRRF will also begin construction of a thermal sludge dryer, increasing the percent solids of biosolids from around 23% to over 90%. In this process, Fond du Lac will achieve Class A exceptional quality biosolids, lessening the restrictions of land application and significantly reducing hauling and disposal costs. The organic nitrogen and phosphorus found in the biosolids are used quite efficiently by crops as these plant nutrients are released slowly throughout the growing season.

Facility Mission

The City of Fond du Lac WTRRF has a mission to operate and maintain the regional facility in a cost-effective manner, producing effluent water that achieves and exceeds permit requirements and recovering valuable resources such as energy, biosolids, and nutrients to be used in an environmentally beneficial manner. Commitment to implementation of projects, programs, and processes that promote sustainability and meet the needs and challenges of wastewater treatment and resource recovery is key. The facility looks forward to continuous growth and meeting the needs of all municipal customers. [CS](#)

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