Plant Profile – City of Medford, WI Wastewater Treatment Facility

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Occupying a footprint of about four acres along the Black River in the heart of the city's industrial area, the City of Medford, WI Wastewater Treatment Facility is small but mighty.

Medford is an employment hub for the region, which causes the permanent population of about 4,800 to double during the workday. A major food processor in town further boosts the waste strength due to the production of frozen pizzas. In addition, the plant serves as a major treatment area for the septic haulers from around the surrounding region.

The facility is rated to treat up to 1.45 million gallons of waste per day. Due to successful infiltration and inflow reductions, average flows are about 600,000 gallons per day.

The current postage-stamp-sized site has been revised a few times in the past 80+ years, making excavation ever more interesting than greenfield construction. The original plant, built in 1938 was sophisticated for the era with primary clarifiers, activated sludge, and anaerobic digestion. However, as the sewers started to fail, I&I became a peak flow problem and required changes. The facility was rebuilt in 1983 and in 1991. Since 1991, upgrades focused on ways to improve efficiencies of reduce staff needs. There has been a continual focus to be proactive in addressing regulatory changes putting the plant years ahead of peer communities in such things as biological, low-level phosphorus removal, and ultraviolet disinfection.

Because of its compact size and lack of opportunity to expand, plant operators and engineers have had to be creative in making the space they do have work for their needs both now and into the future.

Left to right: Joe Harris, City Coordinator; Alex Zenner, Wastewater Superintendent; Brooke Klingbeil, Laboratory Director; and Mike Schaaf, Operator.

Subsequent growth in residential, commercial, and industrial areas around the facility have also impacted plant operations over the years.

The plant is staffed by three full-time employees. Alex Zenner is the plant superintendent, Brooke Klingbeil is laboratory director, and Mike Schaaf is the newest utility employee. Like many utilities, employee retention is a concern but the utility has had success recruiting from their public works department for new operators. By working in cooperation with the city's DPW staff, the wastewater treatment facility can keep its staffing levels low. The DPW takes care of routine maintenance of the collection system while the plant staff maintain three lift stations throughout the city.

Advancements in construction equipment and practices has enabled the city to eliminate the need for a lift station, especially when a deeper interceptor sewer could be installed. Aside from the longer asset life with no operational or maintenance cost, a deep sewer also provides more capacity and connections for development. Medford has constructed miles of sewer interceptors and eliminated two large lift stations with these interceptors freeing up time and expense for other projects.

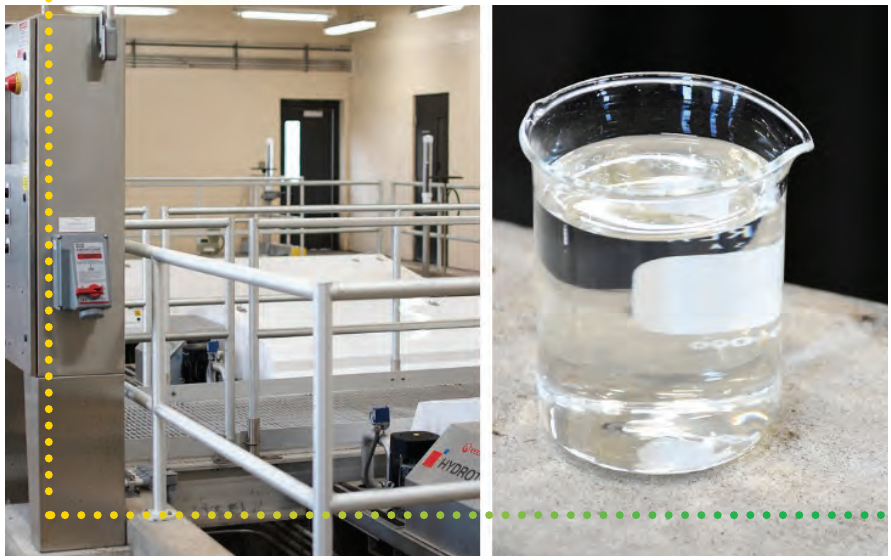
The city also has a jetter truck which is used by DPW staff to do routine cleaning of the collection system. Under the jetter program, one-half of the collection system is cleaned out every other year. Zenner said they are fortunate to be able to keep to this schedule because it prevents minor issues from becoming major headaches. He noted that many smaller utilities do not have access to jetter trucks and that larger communities may not be able to get their entire systems cleaned on a regular basis.

In 2019, Medford was able to achieve an ultra-low level phosphorus designation. The plant selected the Kruger Hydrotech Disc filters from Veolia and worked with engineering firm Donohue and Associates to become the first in the CSWEA region, and among only a few facilities in the county, to use the technology this way. They were able to take out existing tertiary sand filters and retrofitting the new 10-micron filters into the existing building. The elevation of the new system was meticulously positioned to flow through the rapid mix, coagulation, flocculation, and filters and onward to disinfection without the need for the existing tertiary pumps. Zenner noted the sand filters had required additional labor on the part of the staff to keep operational and one of their ongoing goals was to ensure the plant can be managed with a small staff.

Zenner also noted that while someone is always available to respond if there is a situation, they average less than 20 hours a year of call-in time. The plant staff is able to achieve this by staying up with preventative and maintenance work. This is done almost entirely by the facility staff or with the help of the city DPW staff. The plant rarely needs to hire outside subcontractors. Zenner said they are fortunate to have such a good working relationship with the other city departments, this allows them the ability to tackle projects like aeration diffuser replacements without needing to hire additional staff.

In addition to the normal wastewater, the facility takes in about two million gallons of trucked in waste per month (the equivalent of 20-30 trucks per weekday). Included in this is leachate, trucked in from a local paper mill, as well as other concentrated waste. To accommodate these loads, the plant refurbished high strength receiving tanks. The waste is delivered to the tanks and then slowly introduced to the plant. Klingbeil stated that this helps balance the diurnal flows and allows the plant to operate at higher efficiency by maintaining a consistent loading. Zenner estimated 50% of the chemical oxygen demand for the plant is from trucked in waste. The high-carbon loading of the trucked-in waste encourages the deep anaerobic conditions necessary for the biological phosphorus removal processes. Zenner explained that the "bugs" that make the system work well like the high strength waste and that they actively look for loads which are relatively high in volatile acids. The plant regularly receives loads from Price, Marathon, and Lincoln counties in addition to loads from Taylor County. In many cases, Medford is the closest plant that is able and willing to take these higher strength loads. This is a win for haulers by not having to travel large distances, while also being a win for city rate payers and other utility customers by gaining additional revenue to keep rates low and meeting good phosphorus removal. Typical secondary effluent prior to filtration is 0.25 mg/L TP from biological removal only, with the new filter system knocking it down below 0.075 mg/L TP.

The main disadvantage of a large-hauled waste receiving system is keeping up with biosolids handling. The plant recently completed upgrades to its solids handling. As with the other projects, the team creatively repurposed unused space to thicken waste activated sludge in a



Results of the Kruger Hydrotech Disc filters from Veolia.

The Huber S-Disc thickener from Energetics, which provides 4% TS to the aerobic/anoxic digester.

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Huber S-Disc thickener. This device has been working very well and provides 4% TS to the aerobic/anoxic digester. After digestion, solids are dewatered on a belt filter press, stored, and land-applied.

With its location on the Black River, water quality of effluent is of primary importance to support recreation and aquatic life. Effluent from the plant during low flow times accounts for 72% of the downriver flow of the Black River south of Medford. Through long-term studies of water quality of the upstream river water and the effluent, staff note that water discharged into the river is significantly cleaner than the water in the river itself.

One of the things that sets Medford apart from other facilities is the hands-on involvement staff has in working with outside engineering firms in planning and implementing facility upgrades. This level of hands-on interest has helped the facility develop processes that help improve workflow and efficiency and reduces engineering fees. The routine construction observation during recent projects was performed by the city.

In addition to being proactive in water treatment processes, Medford has also been aggressive in upholding its laboratory staff, testing processes, and methods. Having a highly skilled lab in-house is priceless to provide instant feedback on any process adjustments. The Medford facility operates as a certified commercial laboratory and municipal laboratory able to test water samples for private companies such as well-drillers and contractors as well as providing testing services for five other municipal wastewater treatment plants in addition to their own daily wastewater sampling needs. Klingbeil said they recently took over the Taylor County Health Department's drinking water testing program. This has been a major benefit for area residents who are able to drop water samples off to the plant to be tested rather than sending them to labs outside the area where there may be delays in getting the results back or having the tests done without exceeding the required hold times. The nearest lab to Medford is over an hour drive away. Klingbeil noted this saves the city money by being able to do its testing internally as well as bringing in outside revenue from the other municipalities and private contractors. As the utility is not for profit, the testing services provide a valuable community service to the region.

Brooke Klingbeil working in City of Medford WTF's lab.

Klingbeil stated that with the city having the equipment and certifications in place for their own testing, expanding to offering it to others made sense since doing the actual testing does not take a significant amount of additional time.

With a small staff and a facility that operates 365 days a year, cross-training is essential to its continued smooth operation. "Everybody is capable of doing everyone's job," Klingbeil said, noting that everyone is cross-trained in doing all the lab work or checking on the processes. Zenner stated there are a lot of treatment facilities smaller than Medford that have much larger staff, but through their integrated leadership and cooperation that are able to keep things running smoothly. He explained that each team member normally serves a core area of operations, but they all work together to achieve their goals. Zenner took over as superintendent in winter of 2022 and has already found a few ways to streamline the mundane tasks without disrupting a well-run facility.

"We have handled [leadership] changes and kept working together," Zenner said. One thing that observers note is the relatively young age of all the facility staff, all of whom are under 40 years old. Zenner noted that compared to the stereotypical image of plant operators "there are a bunch of kids operating this plant." Despite being young, the staff hold training and certifications in high regard and encourage other young operators to step into new opportunities when able.

"It is a really rewarding career," Klingbeil said. "At the end of the day you can say you did something good for the community and for the good of the environment." CS