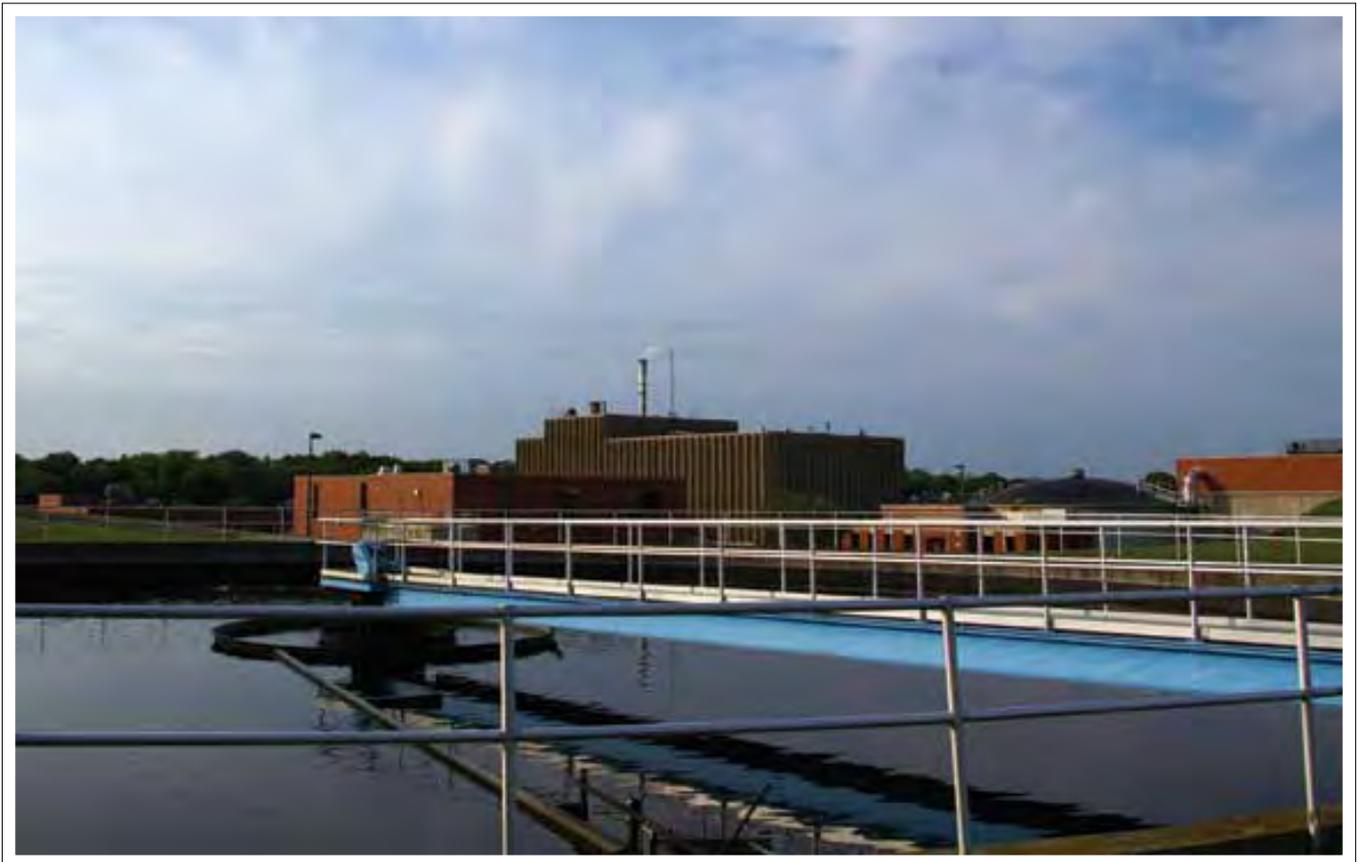


Green Bay MSD

Dave LeFebvre and the operating staff of the Green Bay MSD received CSWEA's Operations Award for Wisconsin at the 83rd Annual Meeting.



The Green Bay Metropolitan Sewerage District (GBMSD) owns and operates two wastewater treatment facilities in Green Bay and De Pere, WI. Combined, the facilities on average treat 39 million gallons per day (mgd), 30 mgd at the Green Bay facility and nine mgd at the De Pere facility. GBMSD provides service to over 219,000 people over a 285 square mile area. The service area includes the cities of Green Bay and De Pere; the villages of Allouez, Ashwaubenon, Bellevue, Hobart, Howard, Luxemburg, Pulaski, and Suamico; the towns of Green Bay, Humboldt, Lawrence, Ledgeview, Pittsfield, Red River, and Scott; and contract customer Procter & Gamble Paper Products Company.



Both facilities are modern, well-maintained sewage treatment plants. The Green Bay facility is designed for 49 mgd and operates two multiple hearth incinerators. The De Pere facility is designed for 14.2 mgd and solids are sent to the Green Bay facility for processing. GBMSD has 85 miles of interceptor pipes. GBMSD has net assets of \$158 million and an annual operating budget of \$26 million. GBMSD currently employs 87 full-time employees.

Green Bay and De Pere facility profiles

Pump Station – both facilities

Municipal wastewater arrives at the Green Bay facility's pump station through a 108" interceptor. The objects in the wastewater are removed with 2 1/8" size bar screens. From this first screening point, one of four large pumps lifts the wastewater to the next step in the treatment process. Separately, wastewater flows in from Proctor & Gamble through a 42" inceptor. The mill wastewater is pumped to the next step in the treatment process and is combined with the municipal wastewater.

As the wastewater enters the De Pere facility, it passes through 1/4" fine screening devices. The material collected is washed, compacted, and sent to a landfill for disposal. Large centrifugal pumps convey the wastewater to the Preliminary Treatment Units for further processing.

Preliminary treatment units (PTU) – De Pere

As wastewater flows through the PTUs, the flow speed is slowed to one foot per second, allowing sand and other coarse material to settle to the bottom. The settled material is removed, washed, and disposed of in a landfill. The oil and grease that rises to the surface is skimmed off the top of the tank for further processing.

Headworks – Green Bay

Headworks are often considered the beginning of the treatment process at the Green Bay facility. Within, step screens provide preliminary treatment, and degritting equipment separates and removes inorganic material from the waste streams. Incoming wastewater passes through four fine step screens,

“The Green Bay facility has four primary clarifiers that hold about one million gallons each.”



which trap the debris. Once trapped, the solid objects are removed, washed, compacted, and sent to a landfill.

Primary clarifiers – Green Bay

From Headworks, the wastewater flows into the primary clarifiers. The Green Bay facility has four primary clarifiers that hold about one million gallons each. In the primary clarifier, the wastewater is slowed which allows the solids in the water to settle out. The floating material is collected by an arm skimmer and sent on for further processing. Nearly 60% of the solids are removed in this process before the wastewater moves on to the aeration basins.

Aeration basins – both facilities

Wastewater flows to the aeration basins where air is supplied by a compressor through fine bubble diffusers that lay at the bottom of each basin. The aeration

systems utilize the activated sludge process, which is single stage nitrification/denitrification with biological phosphorus removal. For successful treatment, the operators must insure there are sufficient numbers of microorganisms present to completely breakdown the influent waste, ammonia, and phosphorus.

Final clarifiers – both facilities

After the wastewater leaves the aeration basins, it enters the final clarifiers where any solid material is again settled out to the bottom of the basins. The solids either are sent back to the aeration basins as return activated sludge or are wasted to the gravity belt thickeners. The water that flows over the weirs is sent to the disinfection process.

Disinfection – both facilities

As the wastewater prepares to leave the Green Bay facility, sodium hypochlorite

is injected into the water through a mixer at the very beginning of the disinfection chamber. The mixer is used to help distribute the chemical evenly in the water. Next, the water flows through a series channels to make sure that there has been sufficient time and contact to kill bacteria. At the end of the last pass, sodium bisulfite is added to remove any residual chlorine.

The effluent chlorine residual is monitored and controlled through a computer control system. This system measures the residual chlorine just prior to the injection of sodium bisulfite and controls the amount of sodium bisulfite used. The operators conduct tests to verify that the residual chlorine has been removed from the effluent.

As the wastewater prepares to leave the De Pere facility, it goes through a disinfection process to kill remaining bacteria. The De Pere facility uses an ultraviolet light disinfection system that is capable of treating 15 mgd. The liquid chlorine treatment process is still retained and used during periods of high flow.

Solids processing

Connected by a pipeline, the De Pere facility sends its solids to the Green Bay facility for processing.

Gravity thickening

There are four gravity thickener basins. The basins receive sludge and scum flow from the four primary clarifiers along with the scum from the ten final clarifiers.

The gravity thickeners provide a quiescent condition to thicken the sludge prior to pumping to the sludge holding tanks (SHT) in the solids processing building. The quiescent condition in the gravity thickeners also allows the scum and grease to float to the surface of the basin.

A rotating collector mechanism scrapes the bottom sludge toward a center sump for removal and skims the floating material into a scum manhole. Scum pumps transfer the scum from the manholes to the scum concentrator in the solids building. This scum is then further thickened and pumped to the incinerator as a fuel source.

Gravity belt thickeners

The gravity belt thickeners (GBT) thicken the waste activated sludge from the final clarifiers. To aid in de-watering the sludge, polymer is added to the sludge at the front of the GBT. Flocculation occurs



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when the solids start to separate from the liquid. The filtrate drains to a pan below the belt and is pumped back to the beginning of the treatment process. The sludge on the belt is turned continuously by chicanes. The chicanes move the sludge back and forth allowing the water to fall through the belt to the drain. Near the end of the belt, a ramp contacts the belt at its leading edge causing the sludge to roll back on itself. The ramp is adjustable to enhance further the thickening of the sludge. The thickened sludge is sent to the sludge holding tanks to mix with the primary sludge and next to the belt filter presses.

Belt filter presses

Thickened primary and waste activated sludges are dewatered and thickened prior to incineration. The sludges are combined in sludge holding tanks and mixed to keep them well blended. The blended sludges are conditioned with polymer before being fed onto the belt filter presses (BFP).

The sludge moves along the BFPs on a porous cloth belt, which allows the water to drain. The solids on top of the belt,

quickly concentrate as the water drains away. The belts move through a series of rollers applying more than 500 pounds of pressure, to squeeze out as much water as possible. The solids coming off the BFPs are conveyed to the incinerators.

Incineration

The dewatered BFP sludge is burned to an ash within two multiple hearth incinerators. Burning the sludge reduces the weight and volume, resulting in less expensive landfill tipping and hauling fees. Incineration at the Green Bay facility takes place on a continuous basis. Operators control and monitor the incineration process 24/7 from the solids control room. 



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