



# KWU WWTP UPGRADES THROUGH THE YEARS

- 1939** **Primary Treatment of Wastewater Began in Kenosha**  
 \$500,000 grant + \$500,000 bond
- 1944** **Methane Biogas**  
 Used to run engines and heating at plant
- 1967** **Secondary Treatment Added**  
 \$750,000 grant + \$1.75M bond
- 1972** **Plate and Frame**  
 Filter presses added for sludge dewatering
- 1981** **Plant Upgrade and Expansion**  
 \$12M grant from state and \$13.5M 1981 revenue bonds
- 1991** **30MG Equalization Basin and Interceptor Sewer Addition**  
 For peak flows exceeding plant capacity
- 1991** **Dewatering Centrifuge**  
 Replaced three plate and frame presses, reduced chemical usage, disposal and operational costs
- 2009** **WAS Thickening Centrifuge**  
 Installed to replace four dissolved air flotation thickening bays, reduced operational costs
- 2011** **Fine Screen Installation**  
 Perforated plates with 6 mm holes replaced 1/2" bar screens
- 2015** **Energy Optimization Equipment Addition**  
 \$10M includes: gas conditioning, combined heat and power units, digester mixers, primary thickening centrifuge, thermo-chemical hydrolysis, sludge dryer
- 2016**

## Sanitary Sewer System

The Kenosha Water Utility maintains the sanitary sewer system consisting of **332 miles of pipe** and **13 lift stations**. The sanitary sewer system is separate from the storm sewer system. However, during heavy rain events, the flow to the plant increases as much as **five times** the average flow. This is due to stormwater entering the sanitary system through illegally connected sump pumps, foundation drains and other methods. If the flow of water to the wastewater treatment plant (WWTP) exceeds the plant capacity, the flow is diverted to a **30 million gallon (MG)** equalization basin to store the additional volume for later treatment.

## Help us to serve you better!

- Do **NOT** flush wipes, paper towels or other non-biodegradable products. These items may cause blockages in pipes and pumping equipment failures.
- Throw **grease** from your kitchen in the **trash**, not down the drain. Grease can clog your sanitary sewer lateral and public mains causing a back-up into your home.
- Disconnect your sump pumps from floor drains/laundry tubs and discharge outside the house. Make sure downspouts are discharged away from your foundation. This reduces unnecessary water from entering the sewer system and WWTP.

## Additional Programs

### Residential Household Hazardous Waste Collection

Regularly scheduled events for Kenosha residents to keep hazardous waste from being disposed down the drain.

### Industrial Wastewater Pretreatment Program

Monitor industrial users to control pollutant discharges that could harm the wastewater system, personnel or Lake Michigan.

### Mercury Minimization Program

Outreach to reduce mercury in the wastewater and environment.



Providing and Protecting Kenosha's Greatest Natural Resource...Water

[www.kenosha.org/departments/water-utility](http://www.kenosha.org/departments/water-utility)  
 WWTP | 7834 3rd Avenue | Kenosha, WI



INCREASED PRODUCTION GENERATING ELECTRICITY UTILIZING HEAT NUTRIENT REUSE CLASS A BIOSOLIDS

## Liquid Processes

**Primary Treatment** = Mechanical processes separating the solid and liquid portions of wastewater for further treatment.

Removes 50% suspended matter and 30% BOD (soluble organic matter)

- A Fine Screening:** Two Enviro-Care perforated plate screens with 6 mm holes remove large debris from incoming wastewater. The material removed includes: wipes, paper towels and other non-biodegradable products. After removal, they are washed, compacted and disposed at a landfill.
- B Grit Chambers:** Tanks allow inorganic material, such as sand, to settle out. The material is disposed of at a landfill.
- C Primary Clarifiers:** Nine tanks with a combined volume of 2.9 million gallons (MG) settle out organic solid material (sludge) from the liquid wastewater. Liquid continues to secondary treatment.

**Secondary Treatment** = Biological processes utilizing microorganisms to remove pollutants from the liquid portion of wastewater.

Removes 90-95% BOD (soluble organic matter)

- D Aeration Tanks:** Six tanks with a combined volume of 5.45 MG where microorganisms breakdown organic matter in the wastewater. Compressed air is added to create aerobic conditions. Biological treatment occurs in the microbial mass called activated sludge. The compressed air is supplied by mechanical blowers through an underground piping system to diffusers in the bottom of the tanks.
- E Final Clarifiers:** Four tanks with the combined volume of 5.5 MG settle out the activated sludge from the liquid wastewater. The liquid overflows weirs for final treatment.
- F Chlorine Contact Tanks:** Three tanks with a series of baffled walls to mix and detain the effluent. Chlorine is added at the entry of the first tank; detention time allows for sufficient disinfection. At the end of the tank, sulfur dioxide is added to remove any chlorine remaining in the effluent.
- G Final Effluent:** The final discharge from the wastewater treatment plant flows through a pipe that extends into Lake Michigan



## Solid Processes

- C Primary Clarifiers:** Settled primary sludge (PS) is pumped to the primary thickening centrifuge.
- E Final Clarifiers:** Settled sludge is pumped to the aeration tanks to be reused or to the thickening centrifuge as waste activated sludge (WAS).

**Anaerobic Digestion** = A two-stage biological process utilizing microorganisms to breakdown and stabilize the solids portion under anaerobic (without air) conditions at a constant temperature of 98°F.

- I PS and WAS Thickening Centrifuges:** Solids concentration is increased in the PS from 3% to 7% and WAS from 1% to 7% by Centrisys centrifuges. A small amount of polymer is injected to increase capture rate. Liquids are removed by the centrifugal motion and returned to liquid processes.
- J Thermo-Chemical Hydrolysis:** Thickened WAS is injected with a low dosage of sodium hydroxide and heated to 150°F causing microorganisms' cells to breakdown in the PONDUS reactor prior to digestion making them easier to digest.
- H Anaerobic Digesters:** Thickening the sludges reduces required digesters from six to three, two for solids digestion and one for final solids and gas storage. All are equipped with Rotamix chopper pumps that circulate and suspend the biomass inside the digesters to evenly distribute the sludge and heat.
- K Dewatering Centrifuge:** Solids concentration of the anaerobically digested biosolids is increased from 3% to 30% by the Centrisys centrifuge. Polymer is injected to increase the efficiency of the separation.
- L Dryer:** Dual belt dryer by Sülzle Klein uses a low heat to evaporate water from 30% dewatered biosolids to a >90% dry solid. Achieves Class A, Exceptional Quality biosolids that can be beneficially reused.
- N Gas Collection and Conditioning:** Methane biogas produced by anaerobic digestion is treated through a Unison gas conditioning system to remove moisture, siloxanes, and particulates that can damage engines.
- M Combined Heat and Power Units (CHP):** Two Kraft engine generators utilize cleaned methane biogas to produce 330 kW electricity and 420 kW thermal energy each. Produced power and heat is used by the new system, with excess utilized elsewhere in the plant.

