Welcome to the City of Shelby's Wastewater Treatment Plant (WWTP)

History

From 1889 to 1900, the City of Shelby's first sewage treatment plant and sanitary sewage system were designed and constructed. Due to Shelby's growth, the sewage treatment plant was remodeled and expanded in 1913.

In 1934, the Works Progress Administration (WPA) built a new interceptor sewer and remodeled and upgraded the treatment plant.

Modern and more efficient methods of treatment were developed over the upcoming years, so once again the plant was upgraded and again remodeled to handle the increase of population and industrial growth. In 1953, Friebel & Hartman, Inc. was awarded this contract at a cost of $529,273.

In 1988, the Ohio EPA required the City to eliminate the sanitary bypass at the plant as well as upgrade its facility. A 1.8 million gallon retention pond was added to the property, and Cedar Bay Construction was awarded the facility expansion for about $3.5 million.

In 2005, the more stringent Ohio EPA regulations concerning bypass/storm water brought on the next upgrade to the facility; a second retention pond of 18-million gallon and grinder building were constructed. Simonson Construction completed both projects at the cost of about $1.5 million.

At present time, the City of Shelby's WWTP processes an average of 1.9-million gallons per day. On average 57-million gallons are treated every month, with a total yearly average of 690 million gallons.

Typically, a total of five operators work three eight-hours shifts at the WWTP 24 hours, 365 days a year. Collectively, our operators equal 52 years of experience. Operator certifications range from Class1 to Class 3, with Class 3 being the highest. To achieve basic licensing, operators are required 12 months of experience prior to a 15-week class, followed by an examination. Class work includes technical lab operation and the treatment process.

The Shelby WWTP is currently classified as a Class 2 facility; this is defined in the NPDES permit as a facility that treats a population of 10,000 people or less. On July 31, 2012, the Shelby WWTP will be upgraded to a Class 3 facility, due to the implementation of the industrial pretreatment program.

What is wastewater?

Wastewater is made up of human wastes, food wastes and chemicals from residential homes, farms, hospitals and businesses. Waste includes residential and street debris, waste oils, pesticides and fertilizers. Wastewater is generally comprised of organic materials (ie, human waste and food) with a small percentage of inorganic materials (ie, wood, rocks, plastics, petroleum, etc).

Why do we treat wastewater?

- To remove organic and inorganic matter that could cause pollution to the environment.
- To remove pathogenic (disease-causing) organisms to protect public health.

According to the "World Health News"

- More than a billion people of the world's population have no basic sanitation.
- The water & sanitation crisis claims more lives through disease then any war.
- Every 20 seconds, a child dies from a water-related disease.

Some related diseases caused by wastewater include:

- Hepatitis A
- Dysentery
- Cholera
- E-coli and gastroenteritis

The Shelby WWTP carries a strong responsibility to our community and to the environment around us.

What is wastewater management?

Wastewater management is the treating of household and industrial sewage to remove contaminants, both chemical and biological, and then return the clean water back into the environment. The City of Shelby WWTP releases treated water to the Black Fork River, the principal tributary of the Mohican River. The treated water is in many ways cleaner and healthier than what flows in the river.

Wastewater management is generally defined into 4 separate categories.

- Generation – residential or industrial wastewater is produced
- Collection – sanitary sewer system
- Treatment – wastewater treatment facility
- Disposal – approved EPA fields and landfills

The production of wastewater begins at homes, business and streets throughout Shelby. The sanitary sewer collection system transports the wastewater to the beginning of the Shelby WWTP.

Wastewater requirements and standards

The City of Shelby's WWTP is regulated by the Ohio EPA through the National Pollutant Discharge Elimination System (NPDES) permit. The Ohio EPA determines acceptable levels and standards of discharges for the facility to operate. The NPDES permit outlines the required testing. Water samples are taken daily, weekly, monthly and annually. Through testing, the WWTP can determine what pollutants are coming to the treatment plant through the collection system and treat accordingly to ensure a high quality standard for the water that leaves the facility.

Biologic treatment process

The City of Shelby's wastewater treatment plant is an activated sludge process. This process is named for the activated mass of micro-organisms that are in the presence of oxygen (aerobic), thus stabilizing the organic matter.

The treatment is a pure biologic process, which uses micro-organisms (bugs) to break down solids (organic material). The micro-organisms accelerate decomposition. Oxygen is the key factor for this process to work properly. The activated sludge consists of bacteria, fungi, protozoa, and other microbiologic life.

The micro-organisms are mixed with the wastewater from the collection system in the aeration tank. The aeration tank uses air to agitate thereby allowing individual microbes to flocculate (come together) and form masses called activated sludge.

The activated sludge has a brownish appearance and consists of organic materials that air an earthy odor. At this time, the bacterial organisms are eating (absorbing) the organic materials as a food source. The micro-organisms are also reproducing as the older generation dies. The bacteria convert their food source into an insoluble solid. The insoluble solids are the surplus of the activated sludge process and are removed from the treatment process for land application.

After this process, chlorine and bi-sulfite are added for final treatment. The chlorine kills the pathogenic (disease-causing) organisms before the final product is delivered to the Black Fork River. The bi-sulfite is added to remove residual chlorine to protect aquatic life in the Black Fork.

Note: Following the Ohio EPA guidelines, chlorine gas is used as a disinfectant from May to October. Shelby's ratio is 4,438 pounds to 343,351,000 gallons treated (.00206 ounces of chlorine per gallon).

Recycle opportunities. The activated sludge process produces two beneficial by-products — methane gas and sludge.

Methane gas, which is the main component of natural gas, is recycled as a fuel to provide the heat necessary to maintain the anaerobic temperature for the micro-organisms to live. In 2007, the WWTP doubled the size of its boiler to utilize more methane, thereby saving thousands of dollars a year on purchasing of propane gas.

The second beneficial product is the production of sludge, also called bio-solids. These bio-solids are the end product of the activated sludge process and contain nitrogen, phosphorus and other materials, which make an excellent fertilizer and soil amendment. The Shelby WWTP operates a recycling program or land application program for the bio-solids. This material is applied to local Ohio EPA-approved farmland to replace the need of fertilizer for crop growth. (Note: A listing is kept on file at the WWTP.)

Stages of plant process

Pretreatment. Grinders or (comminutors) chew up all foreign matter, such as rags, woods, plastics and rubber products. Comminutors are mechanical devices with revolving cutting bars that cut and grind material for easer handling. The material is removed to avoid the plugging of pumps and lines. Unusual materials found include dolls, clothing, 2x4 lumber, etc.

Retention basins. The Shelby WWTP averages a daily flow of 1.9-million gallons per day but is designed to handle a maximum flow of 5 million gallons per day. The flow from the collection system is at its maximum capacity when inflow and infiltration occurs. When rainwater and runoff collect in the sanitary sewer system, the extra volume comes to the WWTP and is pumped into the two lagoons or retention basins. (The retention ponds hold up to 20 million gallons of storm water.) The water is pumped back through the treatment plant along with the daily flow of processing. It takes 19 to 23 days to empty the full lagoons. The retention basins assist in the prevention of back-ups, which could cause flooding at the facility as well as low-lying areas of the city.

Wet-well. Gravity works to flow the wastewater into the wet-well (flow equalization tank). Wastewater seldom flows into the plant at the same rate throughout each day, but the tank is design to keep the volume of flow to the plant at a constant level for the raw pumps to function properly.

Raw pumps. The four Gorman Rupp eight-inch pumps are each designed to pump an average of 1,000 gallons per-minute. The flow is then pumped into the plant where the process begins.

Grit aeration tank. The grit tank removes inorganic material (ie, sand, broken glass, silt, and pebbles) that settle to the bottom of the tank through the aeration of the wastewater. The aeration also removes volatile gas and allows the organic solids to be mixed thoroughly. Removal of the inorganic material prevents damage to pumps and

other mechanical devices as well as increases flow capacity. Fine material tends to settle in corners and bends, thus reducing flow capacity and eventually clogging pipes and channels.

Primary treatment. Gravity in the primary tanks remove organic solids suspended in the wastewater. The material that settles to the bottom of the tank is called sludge. Some sludge is sent to the digester for the start of the anaerobic digestion process. The remaining sludge is sent to the aeration tank for aerobic digestion. The sludge is a food source for the micro-organisms as a natural breakdown of the solid waste.

Aeration tank. The aeration tank continuously injects air into the wastewater to mix the activated sludge to stimulate the growth and reproduction of the microbes. The oxygen-rich environment naturally breaks down the organic pollutants to make "mixed liquor" (eg, wastewater and activated sludge).

Secondary clarifiers. The micro-organisms settle and are returned to the aeration tank to maintain a high population of microbes to further break down the organics that makes flow in from the primary tanks. When the mixed liquor leaves this stage, the water product is essentially free of dissolved and suspended organic matter.

Contact tank. This step disinfects the water product. Chlorine is injected as it flows into the final tank. The chlorine needs a reaction (or contact) time of 15 minutes to kill any remaining pathogenic (disease-causing) organisms.

Final tank. Since chlorine can be harmful to aquatic life, the chlorine agent is removed. Sodium bi-sulfite is a de-chlorination agent that strips or breaks down all remaining chlorine in the water. The contact time for this chemical is 10 to 20 seconds.