Beginning in 2005, the City of Delphos began a wastewater treatment improvement project that now allows the community to adequately treat its high organic loadings, improve the effluent quality being discharged into Jennings Creek and meet upcoming Total Maximum Daily Loadings (TMDL's) for the Auglaize River Watershed.

Capacity was a critical factor in the design of the new wastewater treatment facility. Although Delphos has a population of approximately 7,000, the wastewater treatment system needed to be capable of handling the wastewater equivalent loadings of a community the size of 70,000 people. In addition to the industrial loadings, the City of Delphos has a combined sewer system which provides for a large peaking factor at the plant. The average dry weather flows experienced by the facility are approximately 1.5 million gallons per day (MGD); however, when it rains, the plant experiences flows in excess of 8 times that. The new facility has a design peak flow rate of 12 MGD. In addition to the new facility, the City of Delphos added on to an existing storm holding pond to increase the storm pond holding capacity for the City to 12 million gallons.

The new (2006) state-of-the-art facility is the largest flat plate membrane bioreactor facility in the world. It is also the only membrane treatment facility in operation with an Autothermal Thermophilic Aerobic Digestion (ATAD) solids handling system.

Following is a step-by-step guide through the wastewater treatment processes of the City of Delphos:

Influent Pump Station

Wastewater from the City enters the influent pump station located at the previous facility site through two lines: a 48 inch and a 12 inch gravity sewer. The wastewater flow is screened to remove large objects that could interfere with downstream pump performance. The pumping arrangement had to accommodate flow variations of less than 1 MGD at night to a peak flow of 12 MGD during a storm event. From the influent pump station wastewater flows through two 18 inch force mains under Jennings Creek and over to the headworks at the new facility.

Headworks

Solids are further removed through 3 millimeter fine screens and an aerated grit and grease removal system. This additional solids removal step is critical to the operations of the membrane system. Large or sharp pieces of debris could puncture or block flow to the membranes. Also located in the Headworks Building is the Septage Receiving Station. Waste from independent septage haulers is screened to remove large materials and processed through the fine screens and then on to the rest of the plant. Software included with the system automatically collects flow data and assists management with the billing statements for the haulers.

Membrane Bioreactor (MBR)

Biological treatment occurs in the anoxic, pre-aeration and aeration tanks of the MBR process. This system houses 130 double stacked membrane units with 52,000 individual membrane plates within five trains.

In a conventional treatment facility organic matter is utilized by bacteria and transformed into inert matter which can then be removed through clarification and/or filtration. During this process, ammonia is converted into nitrate. This treatment method leads to an effluent quality that meets typical NPDES requirements.

Membrane bioreactors, on the other hand, take the place of clarification and filtration typically installed in conventional treatment facilities. Membrane plates handle solids that typically pass through conventional

treatment systems by physically blocking them from passing through to the effluent. The bioreactor also incorporates biological nutrient removal via the anoxic zones allowing for nitrification/de-nitrification processes. Alum is added to the process to assist with phosphorus removal.

During normal flows, solids from the MBR trains are sent to a dedicated membrane thickener (MBT) train. In peak flow events, this fifth train receives influent flow and functions as another MBR train for treatment.

Post-treatment Units

Effluent from the MBR system enters the ultraviolet (UV) disinfection system to inactivate any remaining microorganisms in the effluent stream. Post aeration is also provided to add oxygen to the effluent which helps protect the animals and plants in the Jennings Creek after discharge.

Autothermal Thermophilic Aerobic Digestion (ATAD)

Solids from the membrane thickener (MBT) are pumped to a gravity belt thickener to remove excess water and take the percent solids to approximately 5%. Those solids are then pumped into one of two ATAD reactor tanks. The biological activity in these tanks increases the temperature (approximately 140 degrees Fahrenheit) and the solids are digested by the bacteria resulting in a “Class A” liquid biosolid material. From the reactor tanks, the liquid is moved through a heat exchanger and into a storage tank where the temperature is lowered to less than 95 degrees Fahrenheit.

This material is suitable for land application as a liquid or as a solid. In order to reduce disposal costs, two combination belt thickener/press units were installed and the liquid from the storage tank is run across a belt press unit where the solids content is increased to approximately 22%. This cake material can be more easily handled and utilized within the City parks system or for private use by farmers, landscapers or homeowners in their gardens or flower beds.