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## **Mem-T.A.D.™ Case Study: Union Rome Wastewater Treatment Plant, Union Rome, Ohio**

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### **History and Objectives**

Union Rome Wastewater Treatment Plant (WWTP) in Union Rome, Ohio currently operates a Membrane Bioreactor (MBR) activated sludge system followed by an Ovivo **Mem**brane **T**hickening **A**erobic **D**igestion (Mem-TAD™) process using a flat plate membrane thickener which was commissioned on December 2009.

CT Consultants which was contracted by Union Rome Sewer Authority to design a wastewater treatment facility to handle its municipal wastewater. The main objective of the Union Rome WWTP design was to minimize the footprint of the facility so that the entire operations could be constructed into one building (see Figure 1 below). Minimizing the footprint of the facility provided a substantial savings in building costs. Ovivo recommended the Mem-TAD process to CT Consultants. Many traditional aerobic digestion systems rely on decanting which typically provides very unreliable thickening performance resulting in larger process tank footprints. Membrane thickening provides reliable thickening of waste activated sludge (WAS) solids without the use of polymers and is independent of sludge settling characteristics which provides significant footprint reduction of process tanks. The Mem-TAD equipment provided the smallest footprint out of all the aerobic digestion options the Union Rome Sewer Authority considered.

**Figure 1. Union Rome WWTP**



## Union Rome WWTP Mem-T.A.D.™ Design

The Union Rome WWTP Mem-TAD™ process design consists of a membrane thickening tank operating in-loop with an anoxic and aerobic digester tanks. Sludge at the Union Rome WWTP is thickened up to 5% solids (4.15% solids on average) with the membranes by introducing a pressure gradient created by the rising bubbles from a coarse air diffuser located on the bottom of the membrane unit. This pressure gradient induces an upward cross-flow of mixed liquor over the membranes, allowing for wastewater (permeate) to be filtered from the sludge.

The aerobic digester tank was designed with Ovivo's MS diffusers and shear tubes to provide maximum mixing and aeration efficiency of thickened solids. During digestion, the aerobic zones (the membrane thickener and digester) provide nitrification with the anoxic basin provides built-in time for denitrification and stabilizes the pH. This continuous nitrification and denitrification sequencing eliminates nitrate and ammonia in the permeate which is critical in allowing the facility to comply with their ammonia effluent discharge limit of 1.0 mg/L and 0.3 mg/L for summer and winter operations respectively.

**Figure 2. Union Rome WWTP Mem-T.A.D.™ Facility**

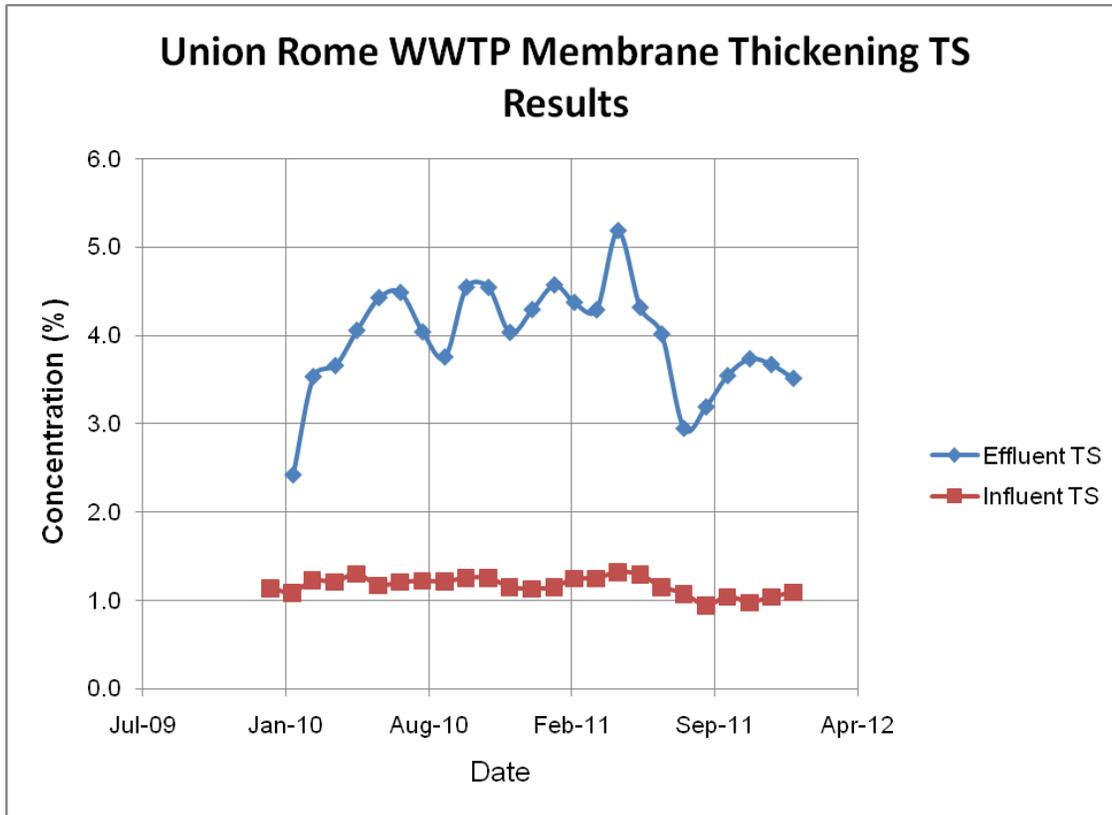


**(Membrane Thickening Tank shown on the left, Aerobic Digester shown on the right)**

## Thickening Results

After implementation of the Ovivo Mem-TAD process at the Union Rome wastewater facility, superior thickening performance was achieved without the use of polymers. As shown in Figure 3 below, thickening of WAS up to 5% solids was achieved and consistently more than triple the concentration of the influent total solids wasted from the MBR biological process.

**Figure 3. Union Rome WWTP Thickening Performance**



**Permeate Quality Results**

Permeate produced from the Mem-TAD process at the Union Rome facility is combined with the MBR effluent which is sent directly to disinfection. As shown in Table 1 below the permeate from the Mem-TAD process contains less than 0.1 mg/L of ammonia which is well below the facility’s effluent discharge limit mentioned above.

**Table 1. Union Rome WWTP Permeate Results (February to January 2012)**

Parameter	Result (mg/L)
BOD	< 1.0
TSS	< 1.0
Total Phosphorus	< 5.0*
NH3-N	< 0.1

\*No biological phosphorus removal in MBR process upstream

**Figure 4. Union Rome WWTP Mem-T.A.D.™ Permeate Sample**



### **Reduced Dewatering Operations**

After the WAS is processed in Mem-TAD process it is sent directly to a belt filter press for sludge dewatering for disposal to a sanitary landfill. Prior to incorporation of the PAD-K system the Union Rome facility operated their belt press five days a week (260 days per year). Improved thickening achieved with the Mem-TAD process as described above substantially increases the capacity of the Union Rome facility, resulting in reduced belt filter press operations and decreasing the frequency of the sludge to be dewatered. The Mem-TAD process reduces the belt filter press operations at the Union Rome WWTP to three days every two and a half months (15 days per year). Since operating the Mem-TAD process the Union Rome facility has increased their belt press efficiency by using 40% less polymer to dewater the same amount of solids as the previous sludge handling process and reduces the quantity of sludge hauled to the landfill by more than 50%. This results in savings over \$58,000 in hauling costs and over \$3,000 in polymer costs annually since operating the Mem-TAD process.