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Lycoming County Water and Sewer Authority WWTP Mechanical Thickened Aerobic Digester Case Study

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History and Objectives

Lycoming County Water and Authority (LCWSA) Wastewater Treatment Plant (WWTP) in Montoursville, Pennsylvania currently operates an Ovivo thickened Aerobic Digester utilizing a **M**echanical-**T**hickened **A**erobic **D**igester (M-T.A.D.™) system and was commissioned on August 2012.

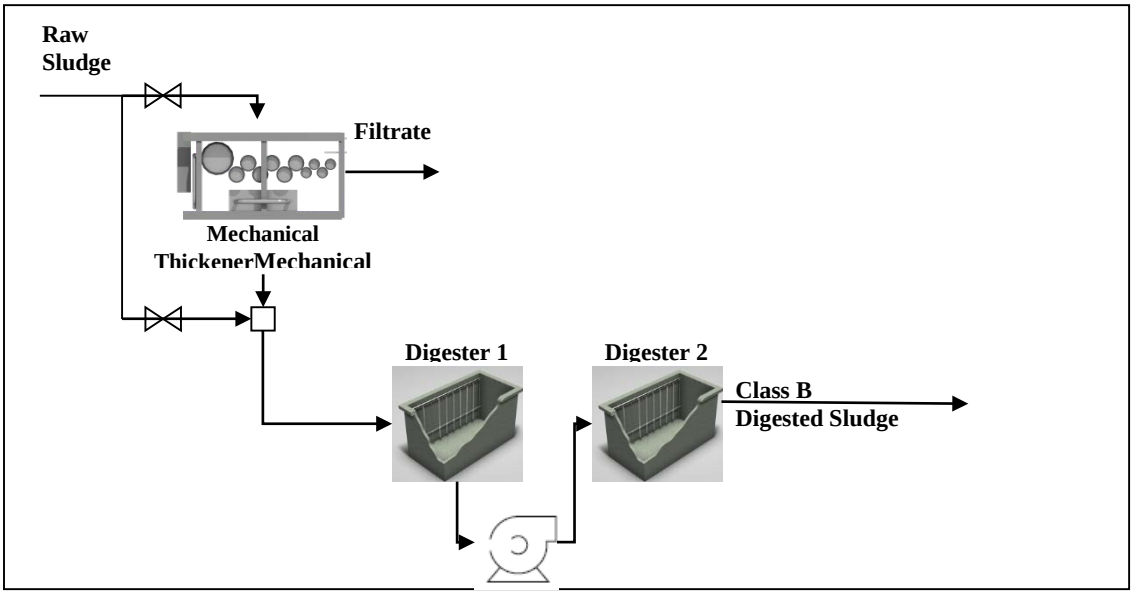
LCWSA was seeking to upgrade and improve their aerobic digestion system. Brinjac Engineering was contracted by LCWSA to design an improved aerobic digestion system that would stabilize the solids to Class B requirements and reduce the amount of solids to be disposed at a landfill.

LCWSA WWTP M-TAD™ System Design

Previously aerobic digestion at the LCWSA WWTP was done through a floor mounted coarse bubble diffuser system in uncovered aerobic digester tanks. This system generally provided poor volatile solids reduction (VSR). From January 2008 to May 2012 this system averaged a volatile solids reduction of 29%, exceeded 30% VSR 21 months out of 53 months (~40%), and exceeded 40% VSR for just three months (~ 6%). Consequently this system was not capable of providing optimum sludge minimization, Class B stabilization which resulted in increased disposal costs.

Brinjac Engineering proposed to retrofit the two existing aerobic digestion tanks with an Ovivo AirBeam™ cover PAD-M system. The M-TAD system at the LCWSA WWTP consists of a gravity belt thickener (GBT) and the two existing aerobic digesters operated in series. Figure 1 below describes the general process flow of the LCWSA PAD-M system.

Figure 1: General M-TAD® System Process Flow Diagram



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By pre-thickened the waste activated sludge (WAS) with a GBT up to 5% solids, the M-TAD® process would provide increase solids retention capacity of the existing aerobic digesters which eliminates additional capital costs to build additional tanks The benefit of increasing solids retention time (SRT) in the existing digesters will result in improved VSR and minimize solids production which decreases disposal costs.

In addition the previous floor mounted diffused aeration system in each aerobic digester was replaced an Ovivo AirBeam cover Aeration System which integrates Ovivo's MS diffusers and shear tubes. The shear tubes allow the diffusers to be submerged several feet above the bottom of the tank floor reducing the blower discharge pressure resulting in lowering energy requirements of the aerobic digestion operations. The AirBeam cover Aeration System provides maximum mixing and aeration efficiency of thickened WAS, minimize odors, and provide optimum temperature control to also improve VSR with pre-thickening. Covering the aerobic digester tanks provides faster kinetic reactions in the system resulting in shorter solids retention time required in the existing tanks to obtain Class B stabilized sludge.

Figure 2: LCWSA WWTP AirBeam™ Cover Aeration System

AirBeam™ Cover Aeration System

Shear Tube Aeration Equipment Under the AirBeam™ Cover

Results of the LCWSA WWTP M-TAD Cover System

Improved VSR and Sludge Minimization Resulting in Reduced Disposal Costs

Solids at this facility were greatly minimized. The WAS is pre-thickened between 3.9% to 4.9% solids prior to entering the aerobic digesters. After the thickened WAS is digested in the M-TAD process it is reduced between 1.5% to 3% solids when transferred out of the second stage digester to be dewatered. The solids reduction ranged between 32% and 67%. The solids reduction is highlighted in Figure 3 below.

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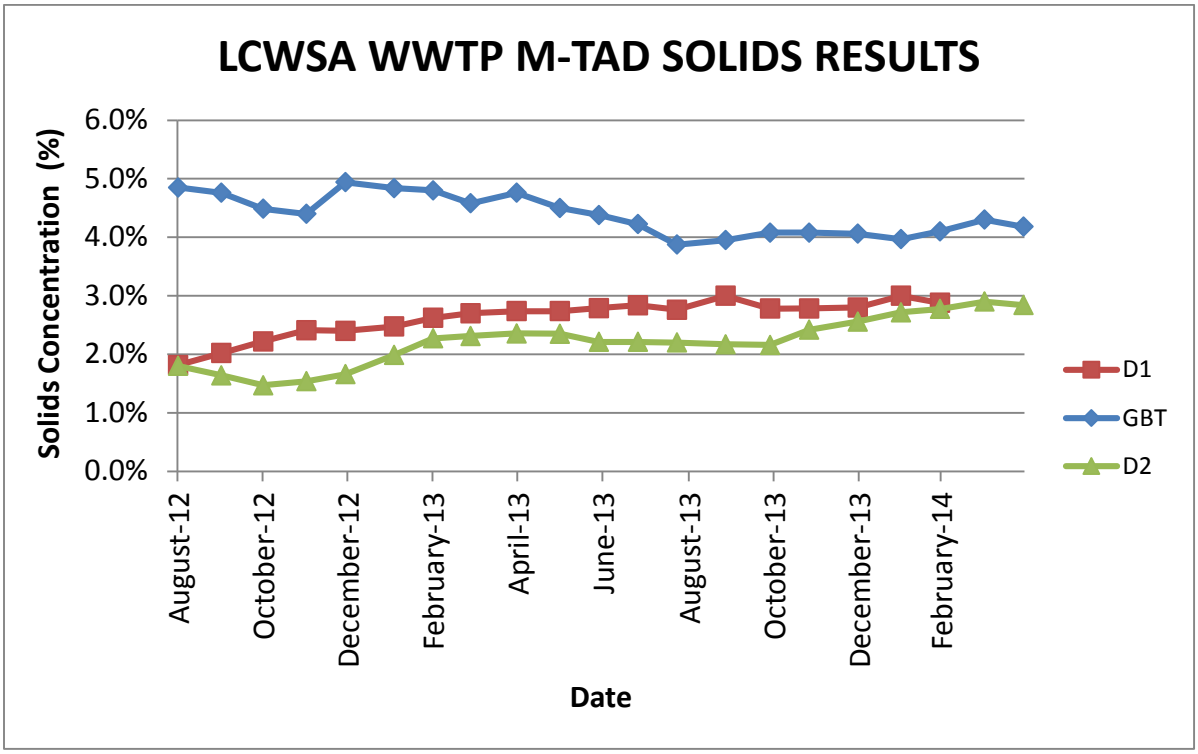
Figure 3: LCWSA M-TAD System Solids Data



In comparison to the prior floor mounted diffuser system M-TAD system provided VSR ranging between 40% and 71% from August 2012 to present day. The VSR results for the M-TAD system and prior to incorporating the PAD-M system are highlighted in Figures 4B and 4A below. Since the M-TAD system generally provided at least two times better VSR then the previous aerobic digestion system, solids production was substantially minimized. Prior to incorporation of the M-TAD system from 2008 to 2011 LCWSA generated 1,588 tons of solids, and after incorporating the M-TAD system this was reduced to an average of 765 tons for 2012 to 2014. This reduced the LCWSA sludge production more than two times. By providing substantial sludge minimization at LCWSA WWTP the M-TAD system reduced disposal costs at this facility. Prior to incorporation of the M-TAD system from 2008 to 2011 LCWSA spent on average $71,445 annually for sludge disposal. After incorporating the M-TAD system LCWSA spent on average $34,403 for sludge disposal. This results in an annual savings of $37,042 per year.

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Figure 4A: VSR Data Prior to M-TAD™ System

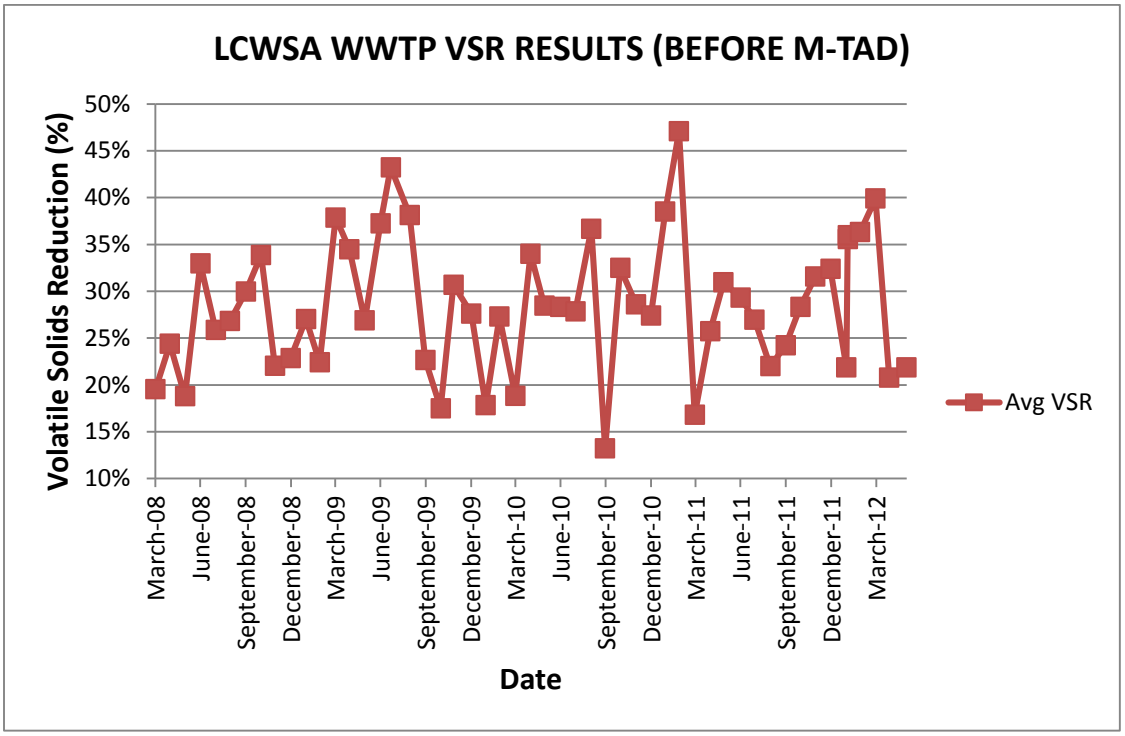
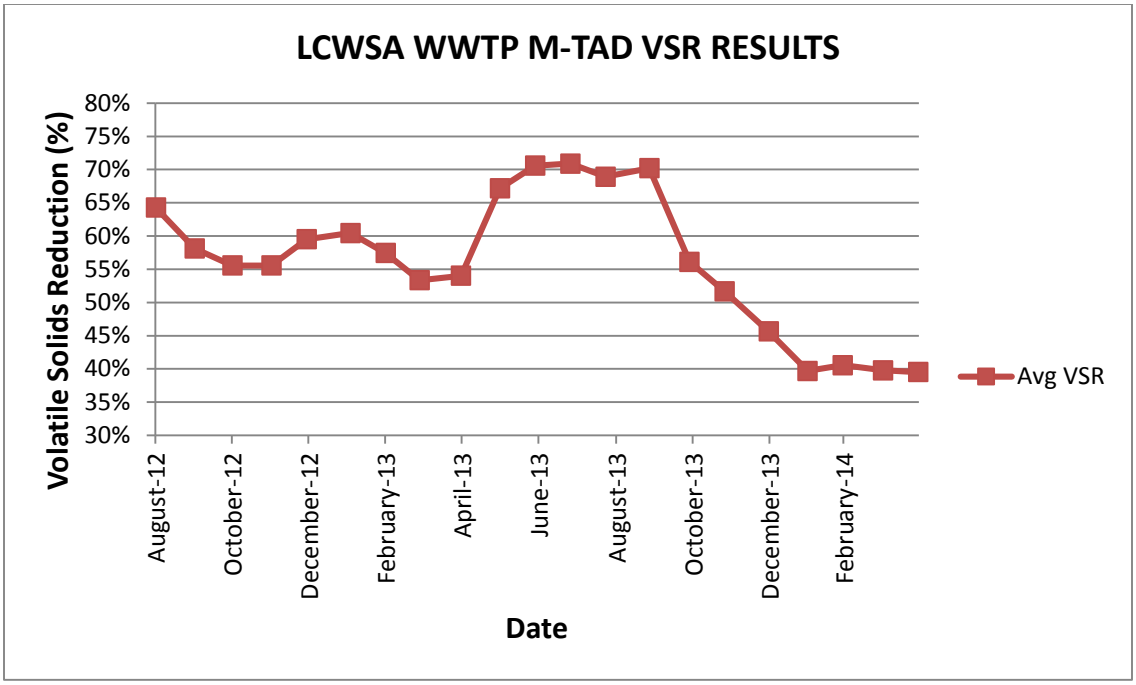


Figure 4B: VSR Data for PAD-M™ System



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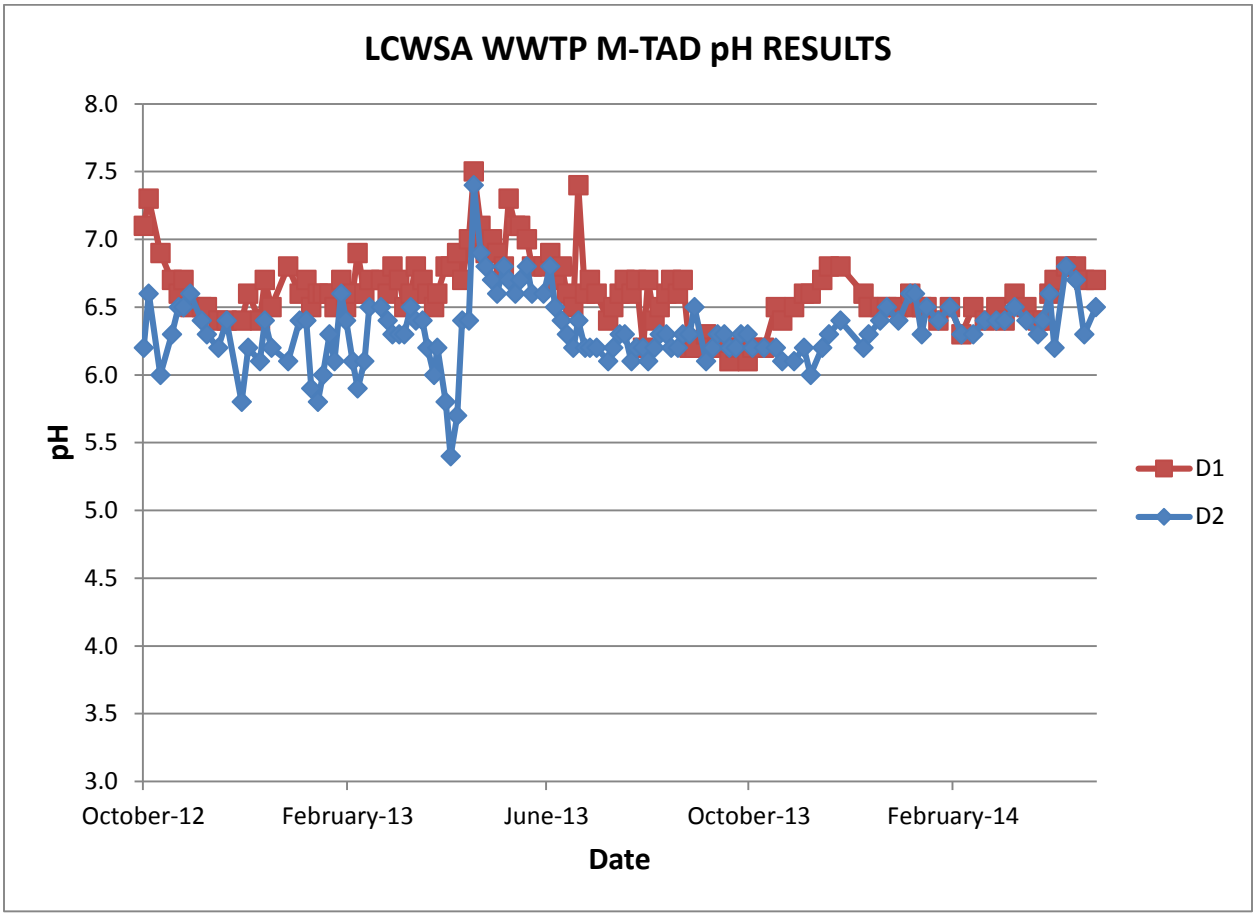
Excellent pH Control

Thickening WAS more than 3% solids causes concerns with adequate oxygen transfer and mixing for an aerobic digestion system. If there is insufficient aeration and mixing in the aerobic digestion system, ammonia a product of the biological process in an aerobic digestion system cannot be oxidized into nitrates and will continue to accumulate. Ammonia accumulation is problematic in an aerobic digestion system because it is toxic to microorganisms and it also creates odor problems. An excellent indicator for ammonia accumulation in an aerobic digestion process is pH. Typically a pH of greater than 7.3 indicates ammonia accumulation in the aerobic digesters.

Excellent pH control is maintained in the aerobic digesters at this facility. As seen in Figure 5 below a pH greater than 7.0 rarely occurs in Digester 1 and has exceeded 7.0 in Digester 2 only once during the entire operations. This indicates adequate oxygen transfer and mixing in the system as well as minimum ammonia accumulation.

Figure 5: pH Data for M-TAD™ System



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Conclusions

The M-TAD system at the LCWSA WWTP has improved VSR performance and substantially reduced sludge production. The system has resulted in at least a two times improved VSR and reduced sludge production more than two times on average. These improvements have resulted in annual savings of more than $37,000 in sludge disposal.