



AN EXERCISE IN AEROBIC DIGESTION

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Pennsylvania municipality improves sludge digestion & reduces energy use

ARTICLE SUMMARY

Challenge: The Frackville Area Municipal Authority sought to upgrade and improve its aerobic digestion system.

Solution: The engineering firm proposed retrofitting the two existing aerobic digestion tanks with a new aerobic digestion system to minimize operating and capital costs and provide maximum mixing and aeration efficiency of waste-activated sludge.

Conclusion: The new system has improved digestion performance and substantially reduced energy usage without creating a need for additional tank volume.

The Frackville Area Municipal Authority (FAMA) Wastewater Treatment Facility (WWTF) in Frackville, Pa., currently operates an Ovivo Airbeam cover aerobic digestion system that was commissioned in October 2010.

FAMA was seeking to upgrade and improve its aerobic digestion system, so it contacted Entech Eng. to design a new system that would reduce the amount of solids that needed to be disposed for land application.

Aerobic Digestion System Design

Previously, aerobic digestion at the FAMA WWTF was conducted through a floor-mounted coarse-bubble diffuser system in uncovered aerobic digester tanks. Entech proposed to retrofit the two existing aerobic digestion tanks with an Ovivo Airbeam cover aerobic digestion system. This would minimize operating and capital costs and provide maximum mixing and aeration efficiency of waste-activated sludge while using minimum energy requirements, reducing odors and providing optimum temperature control to improve digestion. Covering the aerobic digester tanks provided faster kinetic reactions in the system, resulting in shorter solids retention time in the existing tanks to obtain Class B stabilized sludge, which eliminated the need to construct new tanks.

Each aerobic digester tank was designed with an Airbeam cover integrating Ovivo's Mansel Smith 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.

Reduced Energy

In comparison with the prior floor-mounted diffuser system, the shear tube design is capable of lowering the discharge pressure of the blower system by nearly 1.5 psig, resulting in a reduction of more than a 15% in annual energy usage at the FAMA WWTF since its incorporation of the new aerobic digestion system. The reduced energy usage from this system saves FAMA \$18,000 annually in energy costs.

Pennsylvania Power & Light (PPL) Electric Utilities currently offers financial incentives

under its E-power Program to facilitate the implementation of cost-effective, energy-efficient equipment for commercial, industrial, governmental, institutional and nonprofit customers. The E-power incentive program pays on a per-unit-of-energy-saved (in kilowatt hours) basis. Due to the reduction in energy usage provided by its new aerobic digestion system, FAMA applied for this incentive. It was granted a \$27,503 energy efficiency rebate from PPL in February 2012.

Reduced Sludge Disposal

Enhanced temperature control provided by the new aerobic digestion system greatly improved digestion performance at the FAMA WWTF. After the solids are digested by the aerobic digestion system, they are dewatered with a belt press; then the Class B solids are land applied. Prior to incorporation of the new system, 250 acres were used to land apply the solids. After installation, 172 acres are used, resulting in a reduction of more than 30%.

Prior to the new aerobic digestion system, FAMA disposed of 1,036 wet tons of solids in 2009, costing \$26,000. After installation, it disposed of 444 wet tons of solids in 2011, costing \$11,000. By substantially improving sludge digestion, the new system provides an almost two-and-a-half times reduction in sludge disposal, generating savings of \$15,000 annually in disposal costs.

Improved Digestion Performance

The Airbeam Cover aerobic digestion system at the FAMA WWTF has improved digestion performance and substantially reduced energy usage without having the facility having to build additional tank volume. The improvements have resulted in a 57%-plus reduction in solids disposed and a 15% reduction in annual energy costs. FAMA is able to save a total of \$33,000 annually through reduced energy and disposal costs alone. WWD

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