

LANDIS SEWERAGE AUTHORITY

VINELAND, NEW JERSEY

ANAEROBIC DIGESTION/CHP CASE STUDY

JUNE, 2011

LANDIS SEWERAGE AUTHORITY

- 8.2 MGD design, daily flow at 6.0 MGD, two 1 MGD equalization basins
- Activated sludge process complete with six, 500,000 gallon Denitrification basins and eight 800,000 gallon aeration basins
- Two 980,000 anaerobic digesters along with two 1,900,000 gallon digested sludge storage tanks
- Plant effluent is applied by spray irrigation on 180 acres of LSA land and also retained in 115 acres of rapid infiltration basins
- Biosolids are land applied at the 380 acre LSA farm by soil injection vehicles

GENERATOR FACTS

- 185 KW Generator supplied by Schmitt-Enertec
- Engine is a 6-cylinder turbo diesel design, equipped with machined heads and spark plugs for methane gas combustion

2010 EPA CHP ENERGY STAR AWARD WINNER



MAXIMIZING ANEROBIC DIGESTER AND COMBINED HEAT & POWER (CHP) PERFORMANCE

LANDIS SA

The Landis Sewerage Authority (LSA) is an 8.2 MGD designed activated sludge plant with biological nutrient removal and mechanical aeration. The average daily flow is 6.1 MGD with a BOD of 350 mg/l, of which the majority comes from food manufacturing. Effluent is spray irrigated over 180 acres of LSA forestland, and the remaining effluent is diverted to an additional 115 acres of LSA land with rapid infiltration basins for additional effluent disposal. Seven days per week primary sludge is time controlled to pump directly to the digester. Monday through Friday waste activated sludge (WAS) is thickened and pumped to the digester; on weekends and holidays waste activated sludge is not thickened. All digested sludge from the digester is dewatered and sprayed with plant effluent, removing any excess nitrogen in order to maintain nitrogen limits required of them by NJDEP for biosolids land application.



185 KW Schmitt-Enertec Generator Supplied by Kraft Power and Designed by CET Engineering

INCREASING DIGESTER PERFORMANCE

LSA uses Biological Activity Enhancer (**BAE**[®]) from Prodex[®] in their digester, a low cost revolutionary organic peat extract scientifically proven to improve biological efficiency — increasing anaerobic digester performance and methane production. Since implementing the use of **BAE**[®] in the digester, LSA has vastly improved not only digester performance, but also increased the efficiency of the CHP system. The EPA recognized the results of this outstanding performance and awarded LSA with the **EPA 2010 ENERGY STAR Award**. The core properties of **BAE**[®] are well documented and proven to control many entities known to inhibit anaerobic microorganisms. **BAE**[®] is multifunctional, proving to remove organic and inorganic contaminants from both activated & nonactivated environments.

PROJECT OVERVIEW

LSA took control of their energy project in March of 2008 and for the following ten months the operating efficiency averaged 85%. During weekends & holidays, operation of the generator was typically reduced because the WAS thickening process is not in operation during those times, resulting in low methane productivity & low gas pressure. Prodex[®] proposed to LSA the addition of **BAE**[®] at a rate of twenty gallons per week into the digester. It

was noted that during certain times of the year, the digester would experience foaming issues. To reduce any possibility of foaming, the decision was made to reduce the rate to 10 gallons per week.

Treatment of **BAE**[®] to the 980,000 gallon digester began on December 21st, and it should be noted that weather conditions
... continued on reverse side

LANDIS SEWERAGE AUTHORITY

VINELAND, NEW JERSEY

ANAEROBIC DIGESTION/CHP CASE STUDY

JUNE, 2011

GAS ANALYSIS

- Methane **63 - 70%**
- CO2 **25 - 34%**
- H2S **200 - 300%**
- Mercaptans **3.6 ppm**
- Gross BTU..... **650 - 740 ft³**
Heat Value
- Net BTU **575**
Heat Value

SILOXANES

- Octamethylcyclotrisiloxane
14 ppb
- Decamethylcyclopentasiloxane
600 - 800 ppb

ELECTRICAL & THERMAL SYSTEM EFFICIENCY

- System Efficiency Prior to the addition of **BAE®** **85%**
- System efficiency with the addition of **BAE®** **100%**

FINANCIAL BENEFITS FROM BAE®

- The anticipated pay back of the construction loan was estimated at 6.3 years with the current electric rate of 12¢ per KWH with no increase to the rate during the life of the loan.
- Yearly energy increase from generated electric ..**221,664 KWH**
- Yearly reduction in gallons of Fuel Oil**8,700 Gallons**
- Reduction in the life of the construction loan.....**5.3 months**



From the Earth...for the Earth®
A JSH international™ Company

during the months of December, January, and February were the coldest that had been recorded for many years.

The digester has a floating roof, and in order for the generator to run at full speed, the cover must be at a nine foot height to maintain enough gas pressure.

Upon returning from the New Year Holiday, it was discovered that the roof had surpassed the nine foot height and reached its maximum designed height of thirteen feet.

The generator was now operating at full load capacity of 170KW, and as the month progressed, gas pressure continued to increase. By mid January, there was enough daily gas pressure available to operate both the 1,000,000 BTU boiler and the generator full time, maximizing its designed efficiency of 98%.

As Winter progressed, ambient temperatures were still below seasonal averages, and in spite of the colder conditions, gas production continued to remain at historical levels. Both the boiler and generator continued to operate at full capacity, and the flare burner began to burn excess gas.

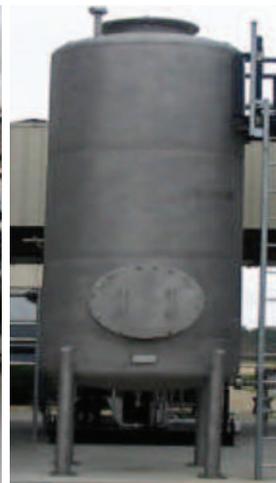


Gas Piping for Digester, Chiller Glycol Heat Exchanger, Flame Arrestor, Gas Meter, and Gas Pressure Booster

SYSTEM COMPONENTS & ADDITIONAL BENEFITS



Air Cooled Chiller System for Gas Conditioning



H2S & Siloxane Scrubbers



Heat Exchanger Capturing Heat from Generator for Boiler



Air Cooled Condensers for Engine Cooling

An ongoing challenge LSA faced was the continued interruption of the boiler when gas pressure was diverted to operate the digester mixers. The digester is equipped with cannon mixers that operate on methane, and it is not uncommon during the digestion process to have sludge stratify in the digester. This requires increasing the gas pressure pumped to the mixers, which then provides the necessary pressure required to mix the stratified sludge. Once the mixing requirements are satisfied, gas pressure then begins to increase and system operation is restored.

To overcome digester sludge stratification, additional **BAE®** is now added to the digester. This creates enough gas pressure for the cannon mixers to mix the stratified sludge and enable the system to operate at its maximum design efficiency of 98% with no interruption to the boiler.

LSA continues to add **BAE®** to their digester and as a result, continues to increase energy production and receive a very substantial return on their investment.

Prodex® | 856.234.4540 | Mt. Laurel N.J. | www.prodexproducts.com