

IMPROVED BIOGAS PRODUCTION USING BAE™

ANAEROBIC DIGESTION/ADDITIONAL BIOGAS PRODUCTION CASE STUDY

FACTS

- Average daily flow of 60 MGD
- Secondary treatment process
- Four Digesters
- Cannon style bubble mixers

Reciprocating Natural Gas Engine



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



TREATMENT OVERVIEW

The plant handles an average flow of **60 MGD** of sewerage. The facility has 4 digesters. Each of the four digesters (1.77 million gallons each) employs floating covers to collect and store the gas which is generated in the digestion process. This gas may be consumed in three ways. First, the gas is returned to the digester in order to aid in the digestion process by mixing the tank contents. The digester mixing system consists of ten 30-inch cannon style bubble mixers. Secondly, the gas is consumed as fuel for boilers heating the sludge and various buildings or in the co-generation system for the production of electricity. Finally, excess gas could be consumed by the waste gas burner.

PROJECT INTRODUCTION

The plant installed four co-generation units with a capacity of 800 kW each. The co-generation system came on line in late 2009. The engines are capable of using either methane gas from the digesters or natural gas supplied by public utilities. Power produced by the co-generation system accounts for over 70% (average 1,455,000 kWh/month) of the total power required to operate the entire facility (average 2,066,000 kWh/month).

The addition of the co-generation system became a strong incentive to produce more digester gas. Following pilot testing on one digester (#4) with **Biological Activity Enhancer (BAE™)**, manufactured by **Prodex®**. The plant personnel chose to test BAE™ for the entire digester treatment system. The results were astounding.

RESULTS SUMMARY

Digester gas production increased by 40.9%. This gave the facility a savings of an additional \$68,800 annually due to increased gas production.

There was also a significant electrical energy cost avoidance experienced with the use of BAE™. Each co-generation unit utilizes 250 cubic feet per minute (cfm) of digester gas to produce 800 kW or 19,200 kWh per day. Each co-generation unit consumes 223,200,000 BTU/day. Additional gas produced (30,194,000 BTU per digester) is approximately 14% of the fuel required per day, or 56% when all four digesters are considered. **The cost savings resulting from the additional gas produced equates to \$1,075 per day or \$392,375 annually** (19,200 kWh produced daily or 10,752 x \$0.10/kWh = \$1,075/day or \$392,375 annually).

RESULTS SUMMARY (cont.)

BASELINE PRE-PILOT DATA From 1 digester.	Percent Volatile Solids Reduction	Average Daily Digester Gas	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	48.8%	200,863 ft ³	14.9 ft ³ / #VSD
PILOT DATA From the #3 digester after 1 detention time.	Percent Volatile Solids Reduction	Average Daily Digester Gas	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	54.4% (+13.4%)	216,474 ft ³ (+7.8%)	24.3 (+66.2%)
FULL SCALE OPERATIONAL DOSAGE From all four digesters receiving BAE at a rate of 6.7 GPD each.	The following Pre-Dosage Data is the average of 2 detention times prior to BAE use.		
	Percent Volatile Solids Reduction	Average Daily Digester Gas (each)	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	45.31%	195,234 ft ³	16.78
FULL SCALE RESULTS The effects of BAE on all 4 digesters after 1 detention time over a 6 month period.	Percent Volatile Solids Reduction	Average Daily Digester Gas (each)	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	49.75% (+11.7%)	216,638 ft ³ (+9.2%)	18.36 (+28.0%)
*NOTE: Digester #2 had equipment problems which effected the treatment of the system causing the results to be lower.			
FULL SCALE RESULTS From 3 digesters with solids & BAE redistributed proportionately.	Each digester used 12.5 GPD of BAE for a total of 37.5 GPD.		
	Percent Volatile Solids Reduction	Average Daily Digester Gas (each)	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	51.94%	279,480 ft ³	26.9
FULL SCALE RESULTS	Respective increase over Pre-Dosage results:		
	Percent Volatile Solids Reduction	Average Daily Digester Gas (each)	Cubic Ft. of Digester Gas Produced per Pound of Volatile Solids Destroyed
	+16.6%	+40.9%	+87.6%

