PROJECT PROFILE

Downers Grove Sanitary District

280 kW Biogas CHP System

Site Description and Project Overview

The Downers Grove Sanitary District (DGSD) in Illinois offers service to over 60,000 people and a number of industries, institutions, and commercial facilities for the Village of Downers Grove and portions of the Villages of Westmont, Woodridge, Lisle, Lombard, Oak Brook, and Darien. The facility operates a sewer system with over 245 miles of sewer main and treats an average of 11 million gallons of wastewater per day (MGD) at their wastewater treatment plant (WWTP). Wastewater is treated to a tertiary level of purification and then discharged to the east branch of the DuPage River.

The facility has five anaerobic digesters, three primary and two secondary, to stabilize sludge removed from the wastewater. The digesters were producing approximately 80,000 cubic feet of biogas per day, which is below the gas capture capacity of the system. Restaurant grease trap waste began to be accepted and used within the digester system to increase gas production. In an effort to fully utilize this resource, DGSG decided to install a 280 kW engine with heat recover along with a gas conditioning system.

Quick Facts

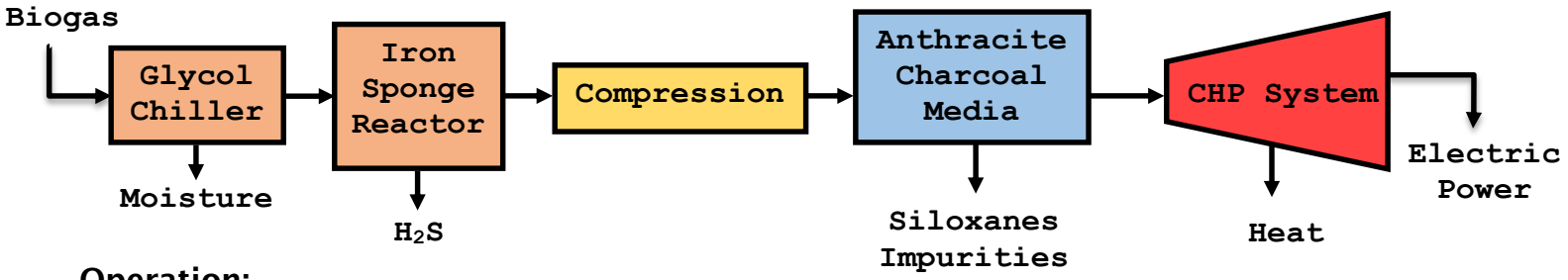
LOCATION: Downers Grove, Illinois
MARKET SECTOR: Waste Water Treatment Plant (WWTP)
FACILITY SIZE: 11 MGD
PRIME MOVER: Internal Combustion Engine
FUEL: Anaerobic Digester Biogas
USE OF THERMAL ENERGY: Heat for anaerobic digester
OPERATION: 24/7
ELECTRIC OUTPUT: 280 kW
THERMAL OUTPUT: 1,556 kBTU/hr
TOTAL PROJECT COST: $2.5 million
BEGAN OPERATION: 2014

Green Benefits – Environmental and Economical

The Downers Grove Sanitary District was interested in CHP because of the numerous economic and environmental benefits that include:

- Ability to use the digester gas productively rather than simply flare it
- Existing sludge heating system that was easy to retrofit to accommodate the new CHP system
- Significant energy savings over a 20-year planning period for electricity
- Supplementing the digester heating with the waste heat from the engine to decrease reliance on four gas-fired boiler units with a total capacity of 3,750 kBtuh
- Ability to receive high strength waste from waste haulers

Equipment and Configuration



Operation:

The CHP system in place uses an internal combustion engine attached to a generator to produce heat and electricity. The 280 kW engine outputs captures heat at 1,556 kBtu/hr. The heat is captured via a hot water system which reduces the reliance on the digester system's boilers. The sludge/water heat exchangers were outfitted to preferentially use hot water from the engine before utilizing the old hot water boilers. The engine generator operates 24 hours a day, 7 days a week unless minor downtime is needed for maintenance. The gas conditioning skid is used as treatment to increase the life of the engine and decrease the amount of maintenance. The siloxane filter system then uses an activated charcoal media to remove the siloxanes while the iron sponge reactor tank removes any hydrogen sulfide gas produced by the digestion process. After conditioning, the biogas is ready for injection into the engine CHP system.

Iron Sponge Reactor

Siloxane Removal Vessels

Lessons and Additional Work

Variability in biogas production and methane concentration prevented maximum engine output from being achieved throughout the day. A cause of this was the batch transfer of sludge between the primary and secondary digesters. Valve actuators have been installed to automate the transfer in order to reduce this issue.

A grease receiving station was installed to accept deliveries throughout the week. Several upgrades have been necessary to control problems inherent with grease receiving and handling. The goal is to make these nuisance type wastes profitable through disposal fees and higher gas production.

The current conditioning system has the capacity to clean and scrub enough gas for two 280kW engines. The District is planning on installing an additional 280kW reciprocating engine in the future.

For More Information

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