NEW ENGLAND CHP Technical Assistance Partnerships

PROJECT PROFILE

Lewiston-Auburn Water Pollution Control Authority

Biogas-Powered 460 kW CHP System

Site Description

The Lewiston-Auburn Water Pollution Control Authority (LAWPCA), located in Lewiston, Maine, began operation in 1973 and is now the third largest treatment plant in Maine designed to optimally treat 14.2 million gallons per day (MGPD) of sanitary sewage wastewater. Currently, LAWPCA treats an average of 12 MGPD, but on days of heavy rainfall treats nearly 20-25 MGPD due to the combination of sanitary and storm sewers that are piped to the plant for treatment. In 2013, LAWPCA became the first municipal wastewater treatment facility in Maine to process solids through two 690,000-gallon anaerobic digesters. Included in the "anaerobic complex" project are two 230 kilowatt (kW) biogas-fueled combined heat and power (CHP) systems to utilize the produced biogas.

Quick Facts

LOCATION: Lewiston, ME
MARKET SECTOR: Waste Treatment Plant
FACILITY SIZE: Average 12 MGPD
FUEL: Biogas (Methane)
EQUIPMENT: Two 230 kW generators
CHP OPERATION: 24/7
SYSTEM CAPACITY: 1,970 MWh annually
PEAK LOAD: 500 kW
USE OF THERMAL ENERGY: Process heat for digesters, building heat
ENVIRONMENTAL BENEFITS: Reduced odor, and CO_2 emissions by 80%
PROJECT COST: $15.5 million
ANNUAL SAVINGS: $960,000
BEGAN CHP OPERATION: 2013

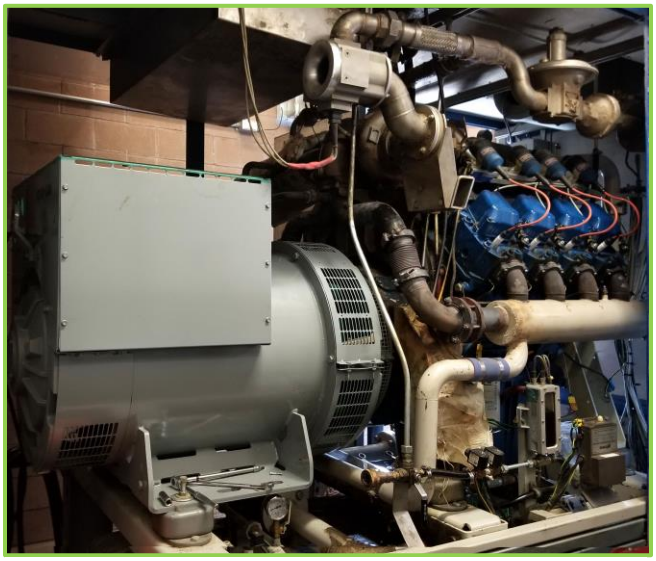
Reasons for Installing CHP

Prior to installing the anaerobic complex, LAWPCA treated solid waste to Federal Class B Standards, which requires biosolids to meet land application pollutant limits. For these limits to be met, LAWPCA shipped lime from Ohio to the facility for treatment purposes. Once the waste was properly treated it was distributed to permitted agricultural fields, occasionally even shipped to Canada. This process proved to be very costly and produced excessive amounts of carbon dioxide (CO_2). In 2013, two anaerobic digesters were installed to handle the excess of biosolids, decreasing the facility's dry solid waste production by 40-60%. The digesters created biogas that was initially flared. The installation of two 230 kW CHP engines allowed LAWPCA to utilize the gas produced from the anaerobic digestion process, while supplying the necessary heat and power for the digestion process. Since the installation of CHP, LAWPCA has been able to cut energy consumption by roughly 50% for the entire facility and save an approximate $960,000 annually.

Wastewater treatment facility. The right side of the image shows the anaerobic complex where the CHP system is located.

PHOTO COURTESY OF nebiosolids.org

Equipment and Operation



230 kW 8-cylinder Liebherr engine
PHOTO COURTESY OF NECHP Team

The CHP system was designed by CDM, manufactured by Tech3 Solutions, and installed by Methuen Construction. The project was completed under budget and five months ahead of schedule. The equipment consists of two 8-cylinder internal combustion Liebherr engines attached to generators producing 230 kW of electricity and 280 kW_{th} of heat per engine. The engines are fueled utilizing the generated biogas from the anaerobic digestion process, or natural gas if a situation arises where the system is unable to run on the biogas. The exhaust heat is routed to two anaerobic digesters through shell and tube heat exchangers to keep the digesters at an ideal constant temperature of 97-98°F. Also, heat is routed to buildings in the anaerobic complex for space heating purposes during Maine's colder months. Two 1748 Million Btu per hour boilers provide thermal resiliency to the facility when the CHP is shut down or not producing enough heat for the process. LAWPCA also installed a switchgear to provide "island-mode" capabilities (electrical resiliency) when the local power grid has an outage. If excess heat is produced, it is expelled into a dump radiator; excess gas is flared. The facility maintains 90% of its operation in-house, but requires assistance in maintaining the CHP system. The facility has a 600 kW back-up diesel generator to take over necessary power needs when the CHP system and local grid are not available.

Awards and Honors

LAWPCA received many awards and recognition towards the CHP and digester project including:

- 2014 Governor's Award for Environmental Excellence for going beyond regulatory requirements for innovation in environmental sustainability, reducing the facility's CO_2 emissions by approximately 80%.
- 2015 American Council of Engineering Companies (ACEC) Engineering Excellence Award (EEA) for innovating and impactful engineering achievements.
- 2016 Clayton "Mac" Richardson, superintendent of the LAWPCA, was awarded the New England Water Environment Association (NEWEA) Biosolids Management Achievement Award for his focus on the best possible environmental, social, and economic outcomes for the projects completed under his management. Biosolids management costs have been reduced by 35% since the installation of the digesters and CHP.

Lessons to Share

- Gas must be properly treated and quality tested between the digestion process and usage. Moisture, hydrogen sulfide (H_2S), and siloxanes must be removed in the treatment process to reduce maintenance costs and increase the life expectancy of an engine. Since installation, both engines have been shut down and repaired due to siloxane corrosion.
- REC prices vary by state; LAWPCA sells its RECs in Massachusetts instead of Maine at a higher price.
- Modernizing to computer operation allows the facility to reduce staffing from 24 hours to just 10 hours per day.

> ***"Smooth consistent loading is crucial to the success of a waste treatment facility. CHP allows for this to happen."***
>
> ***- Clayton 'Mac' Richardson***
> ***LAWPCA Superintendent***

For More Information

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More CHP Project Profiles:
http:/www.nechptap.org