MID-ATLANTIC

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

PROJECT PROFILE

W.R. Grace Curtis Bay Facility

5 MW CHP System

Site Description

The W.R. Grace & Co. Curtis Bay Facility is located on an industrialized peninsula in South Baltimore and employs over 550. There are six production facilities on site that manufacture hundreds of products from four general product lines. The four general product lines are 1) fluid catalytic cracking catalysts; 2) hydroprocessing catalysts; 3) polyolefin catalysts; and 4) silicas. These products are used by customers to produce products ranging from toothpaste to gasoline to bottles and cans.

Quick Facts

LOCATION: Baltimore, Maryland
MARKET SECTOR: Chemical
FACILITY PEAK LOAD: 14.7 Megawatts (MW)
EQUIPMENT: 2 x 2,485 kW Recip Engine CHP systems
FUEL: Natural Gas
USE OF THERMAL ENERGY: Process heating
CHP ANNUAL TOTAL EFFICIENCY: 78%
ENVIRONMENTAL BENEFITS: reduces greenhouse gas emissions by 14,415 tons of CO_{2e} per year.
YEARLY ENERGY SAVINGS: $1,200,000 annual operating savings.
CHP IN OPERATION SINCE: 2019

The Curtis Bay Plant uses both electricity and natural gas supplied by Baltimore Gas & Electric which are purchased through third party suppliers. The plant has a 14,739 KW peak demand and uses approximately 94,430,830 kWh/year. The plant uses natural gas to directly supply process load and also supply boilers used for steam and hot water throughout the facility. The plant uses about 17,873,320 therms/year. The natural gas high monthly usage was 1,687,710 therms and the low was 1,180,250 therms. Manufacturing at this location began in 1910 making sulfuric acid, then fabricating munitions during World War 1, silica gel throughout World War 2 as a dehydrating agent to protect shipments from the damaging effects of air and moisture and, today, making catalysts and silicas.

Reasons for CHP

Grace proceeded with this CHP project specifically to lower its operating cost and take advantage of State and utility incentives to improve their return on investment. The site realized following benefits from the CHP plant project:

- $1,200,000 annual operating savings,
- The Maryland Energy Administration CHP Incentive Grant of $500,000,
- BGE CHP Incentive Grant of almost $4,000,000,
- Annual GHG of reduction of 14,415 tons CO_{2e}, and
- Increased reliability.

CHP Equipment and Configuration

Two Caterpillar – 2,485 kW Engine Generators Systems in CHP Plant
SOURCE: W. R. GRACE

The Grace Curtis Bay plant operates 24 x 7 x 365. Electrical demand varies by approximately 15% on a monthly basis and monthly electrical consumption varies by up to 30%. Monthly natural gas usage varies by up to 23% depending on process operation. Grace decided to proceed with the internally funded CHP project and subcontracted the design and construction of the CHP plant. The plant includes two CAT 3520H engine-generators supplied by Carter Caterpillar that are located in a fit for purpose building shown above. Each engine was equipped with an oxidation catalyst and an SCR to meet stringent environmental criteria. The heat recovery system was designed to receive 450 gpm of city water at temperatures varying from 47°F in the winter to 70°F in the summer and deliver the hot water to the process at about 130°F. The "once through" city water flow splits in half with each stream flowing through generator specific heat changers (HXs). The water first flows through the low temperature first stage aftercooler HX and then through the main HX combining jacket water, lube oil cooler, second stage intercooler and exhaust heat. The high electric and thermal loading of the process yields extremely high CHP fuel use efficiency in the 78% range.

Lessons Learned

"Today, the performance of the CHP system more than meets our expectations and we are on track to deliver $1.2 million dollars in annual operation savings. The CHP system is a key tool for our plant to remain competitive, reduce our GHG emissions and improve our long-term sustainability goals."
Richard Martin PE, PMP Capital Project Manager, W.R. Grace & Co. | Curtis Bay

This project was internally funded and developed through the use of contractors. As with many industrial projects, the development took several years. Two particular design choices have required additional attention. The once through hot water system was designed based on summer city water supply temperature of about 70°F with an expected delivery temperature of 150°F. The winter supply temperature of 47°F yields about 120°F supply temperature. This is not a real problem because all the recovered heat is still used. Another concern focuses on the CHP building ventilation system. The design building ventilation system properly enters from the generator side of the building and exhausts on the engine side of the building, but it does not remove enough radiant engine heat which limits summertime power production. This issue is being corrected.

For More Information

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Date produced: 2020