Camden County Municipal Utilities Authority

Anaerobic Digestion, Food Waste, and Carbon Footprint

April 2024

CCMUA and the Resource Recovery Facility

- The CCMUA operates the County's wastewater treatment plant
- Design Flow - 80MGD
- Average Flow - 58 MGD
- Secondary, Pure Oxygen, Activated Sludge Treatment
- A 1.9MW Solar PV system and a 3.8MW CHP plant supply approx.
- 65% of the plant's load annually and can supply up to 100% of total load on sunny days.

Digester & CHP - What

There are four anaerobic digesters at the plant. The biogas produced in this process is captured, processed and stored for fuel supply to the CHP plant.

The cogen system consists of two (2) 1,900 kW Jenbacher Engine Driven Generators, model JGS 612 GS-B.L. Both engines operate when possible to minimize the dependency on electricity from the grid. Waste heat is used to preheat water used in the digester process.

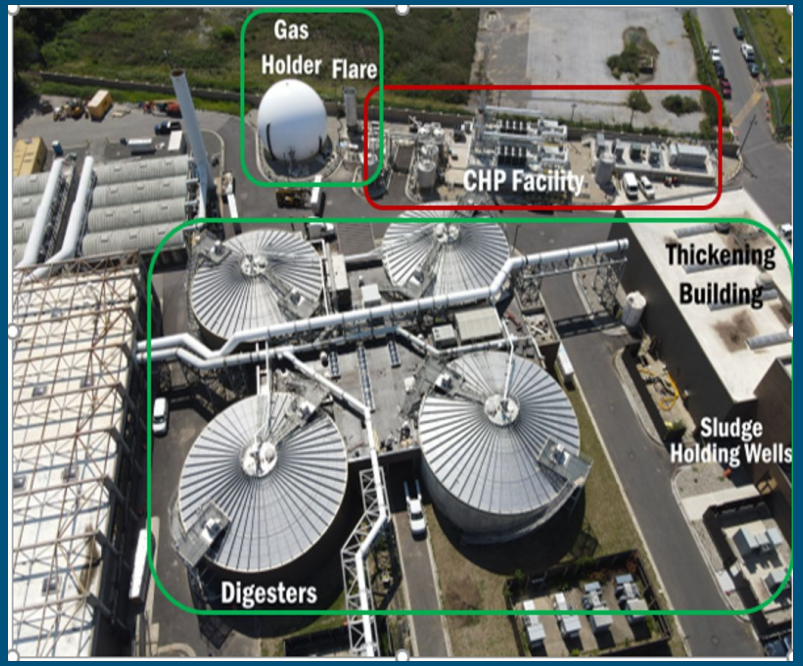
Digester & CHP - Why

In 2021, CCMUA built the digesters to process sludge, reducing sludge by 50% (which resulted in decreased GHG emissions from sludge processing and disposal in landfill)

CCMUA also commenced the collection of biogas, a methane-rich byproduct of the digestion process.

CCMUA uses this fuel to supply the CHP plant.

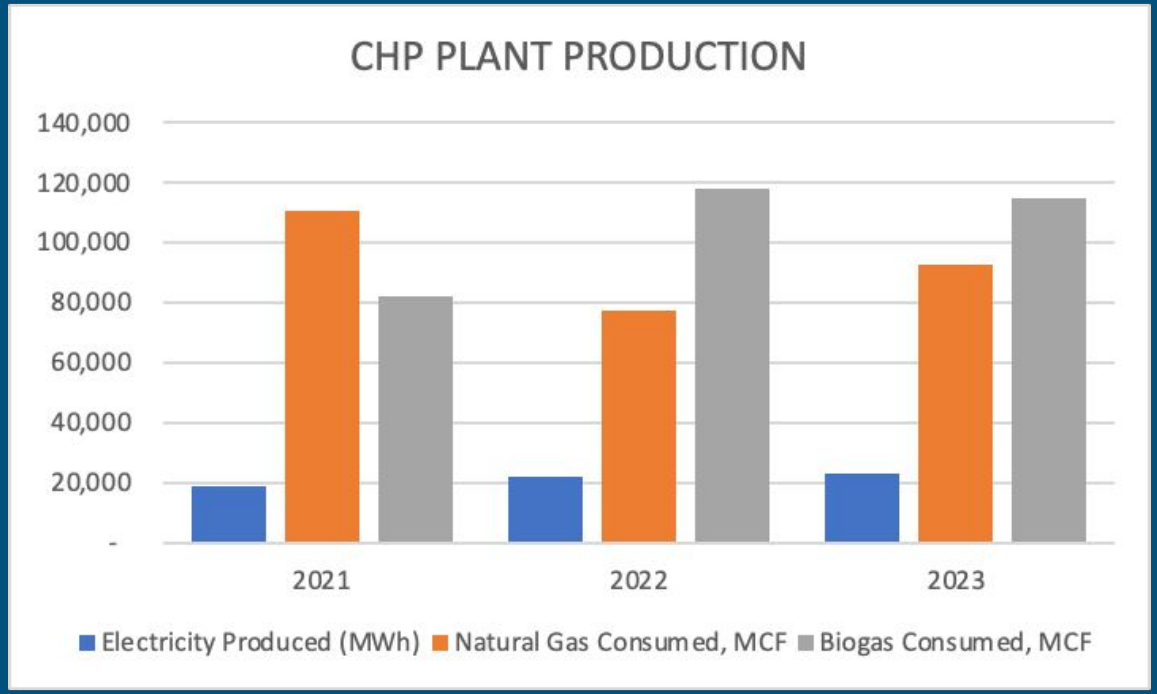
The CHP plant uses the renewable biogas fuel to produce electricity used onsite, thereby reducing the natural gas consumed.



Baseline Energy Production

Biogas fuel operations started in May 2021 at the CCMUA plant.

The biogas was used onsite at the CHP plant to produce electricity from this renewable energy resource.



Environmental & Financial Benefits

-GHG Avoided (Sludge) - CCMUA reduced its sludge disposal by 50%; it is difficult to determine the resulting reduction in CO_2e, but based on a NJDEP website reference "The US EPA calculated that on average, approximately 1.67 metric tons of carbon dioxide equivalents (CO_2e) are avoided for every ton of municipal solid waste" - which calculates as 12,191 tons of CO_2e per year for the CCMUA's 20 tons of sludge reduction per day

-Avoided energy losses and T&D costs resulting from the onsite production of electricity typically reduce electricity costs by 30-60%

-Savings on energy costs from the use of biofuel vs natural gas

- at 100% natural gas at $5.37/DT produces- electricity equivalent to $0.045/kWh

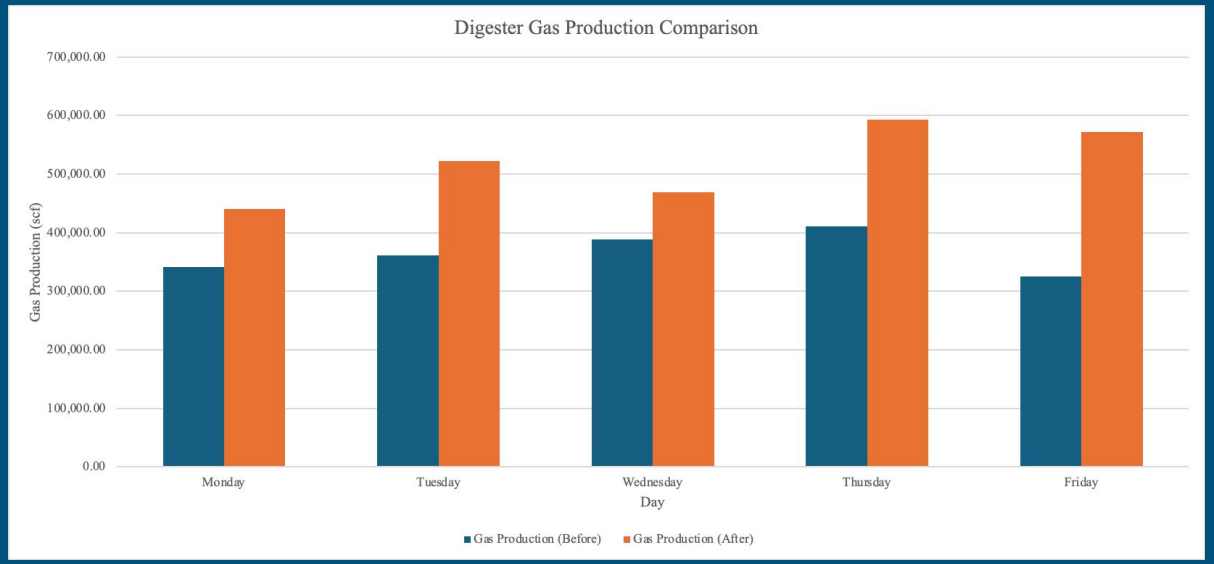
- In 2021, with an average natural gas cost of $5.46/DT the plant ran with 39% biofuel with an electricity rate equivalent of $0.0329/kWh; in one month, the fuel mix was 80% biogas/20% natural gas and the equivalent electricity rate was $0.019/kWh.

NJDEP Site reference: https://www.nj.gov/dep/focus/depfocus_feature_recycle.htm

Introduction of Food Waste

A short term Food Waste Pilot Project was completed by CCMUA with a local waste management company.

The results show a **42%** increase in biogas production with the introduction of food waste.



CCMUA received 2 loads @ 5,000 gal of food waste slurry per day

Environmental & Financial Benefits

-Avoids GHG emissions from decomposition of organic waste in landfills

- Landfills have limited capacity - diverting large amounts of food waste from landfills will increase longevity of existing landfills

-Capturing and using biofuel from anaerobic digesters is a renewable energy resource;

- Adding food waste increases the production of biofuel at the plant with minimal increased costs

- Biofuel directly offsets the expense of natural gas as a fuel source for onsite power production - reducing energy costs and increasing resiliency for wastewater treatment plant critical infrastructure

- Tipping fees may be provided to wastewater treatment plants for accepting food waste at lower rate than landfill tipping fees - “Win-Win”

- Leverages existing infrastructure and expertise at local wastewater plants

Potential Benefits for Camden County

-Environmental Benefits

- Diverting food waste from trash stream to landfills and/or incinerator

-Societal Benefits (Regulations)

-Financial Benefits

- Lower cost option for waste disposal

Plant Expansion - Future Energy Needs

REGULATORY REQUIREMENTS:

Nutrient removal will increase electricity use by 50%

PFAS requirements will also increase electricity and natural gas usage

Storm water increased flows related to climate change will require additional capacity and increases pumping and related energy costs

Recommended Actions

1. Require food waste streams to be pre-processed to remove trash and non-volatile solids before introducing to WW plants
2. Prioritize liquid waste recycling to wastewater treatment plant digesters - slurries from beverage and food processing
3. Provide incentives for studies and pilot programs
4. Provide funding for incremental cost of capital investment for WW plant digester expansion, biogas operations expansion (storage) and CHP plant expansions to support introduction of food waste stream
5. Accelerate permitting processes
6. Support export of excess capacity - biofuel and/or electricity production

Conclusion

Food waste recycling reduces landfill waste and the associated methane (greenhouse gas) produced from the decomposition of the organic material.

Wastewater treatment plants are uniquely positioned to be an offtaker of this food waste as significant capital investment has already been made in the systems and processes for treatment and conversion to biofuel.

Regulations to require mandatory liquid food waste recycling from the beverage industry and pre-processing to remove solids from food processing facilities will increase the availability of these liquid food waste streams.

As waste management is a significant source of GHG emissions, additional studies into the GHG emissions of landfills and for wastewater treatment plants including strategies to their reduction would benefit the industry and residents of NJ.