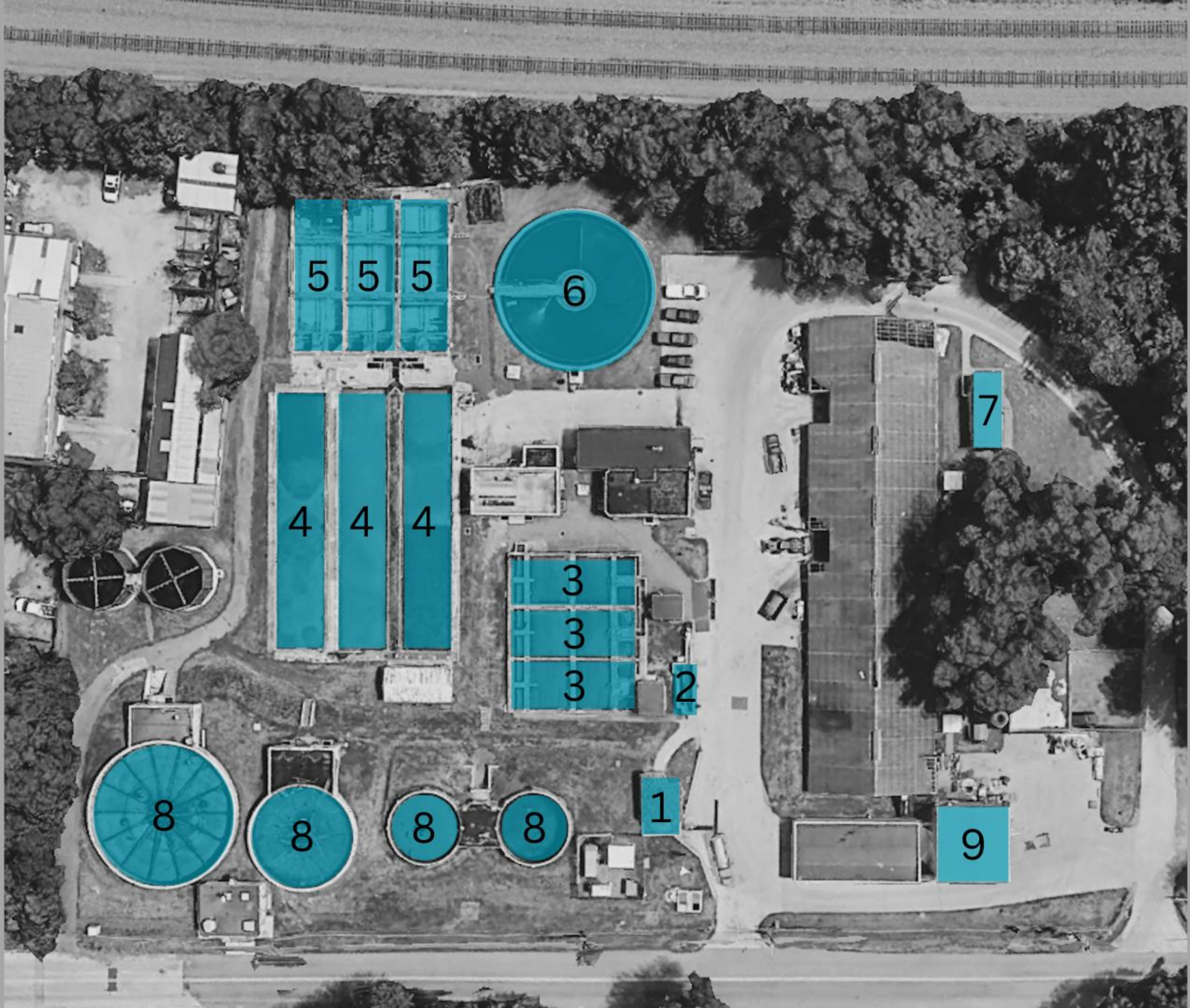
PXVNEO

PHOENIXVILLE **NEW ENERGY OPTIMIZATION**

BOROUGH OF PHOENIXVILLE

INCORPORATED 1849

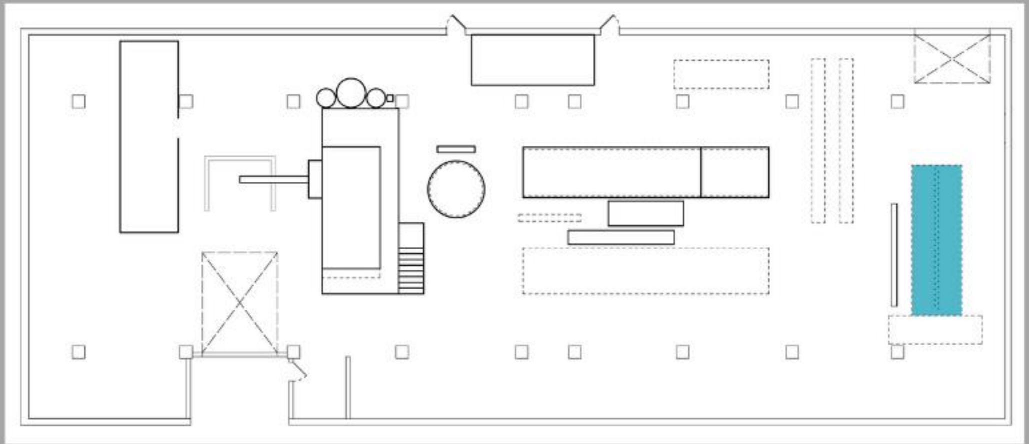


Existing WWTP

1. Headworks
2. Grit Collector
3. Primary Clarifiers
4. Aeration Tanks
5. Secondary Clarifiers (old)
6. Secondary Clarifiers (new)
7. UV Disinfection
8. Anaerobic Digestors
9. Centrifuge

HTC

1. Headworks
2. Grit Collector
3. Centrifuge
4. UV Disinfection
5. Anaerobic Digestors
6. HTC



HOPPER

Stores BioSolids and ensures the proper amount is continuously fed into the system.

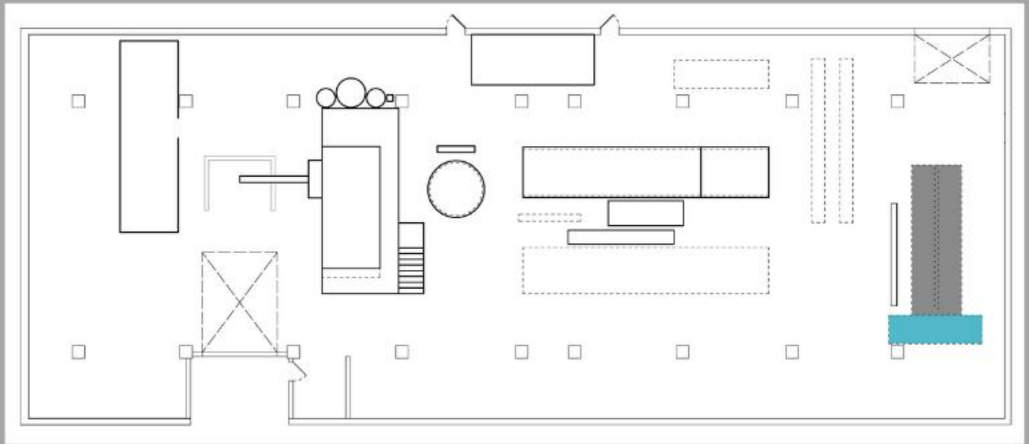
WHY IS THIS IMPORTANT

Since sewage is very thick and sticky, the system has components that keep the materials flowing to prevent them from binding-up or clogging.

The system can operate continuously, without the need for crews to work overnight or between shifts.

KEY STATISTICS

- 60 cubic yards of storage capacity
- 1 day of storage capacity



PISTON PUMP

Alternating pistons that push the material through two miles of piping.

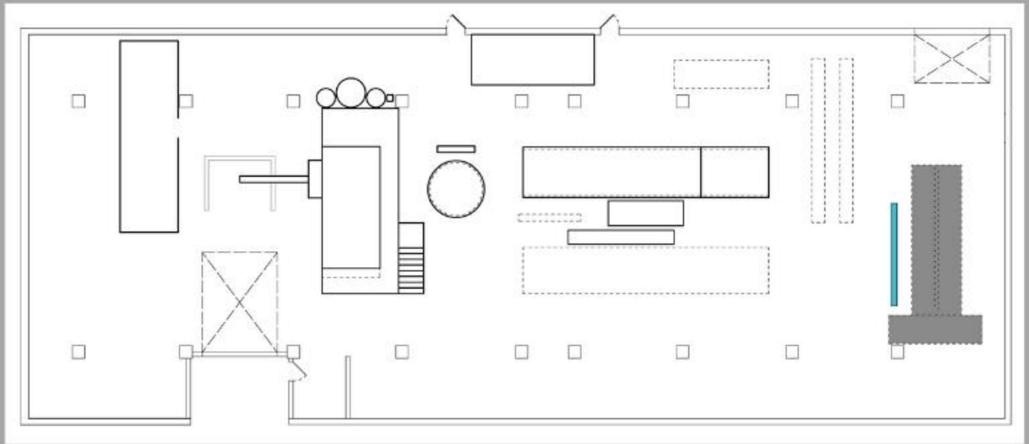
WHY IS THIS IMPORTANT

The pump generates the pressure throughout the system.

This pump controls flow rate throughout the system.

KEY STATISTICS

- The flowrate is 7 - 10 Gallons Per Minute (GPM)



ACCUMULATOR

Regulates the pressure in the system; the water column prevents clogging.

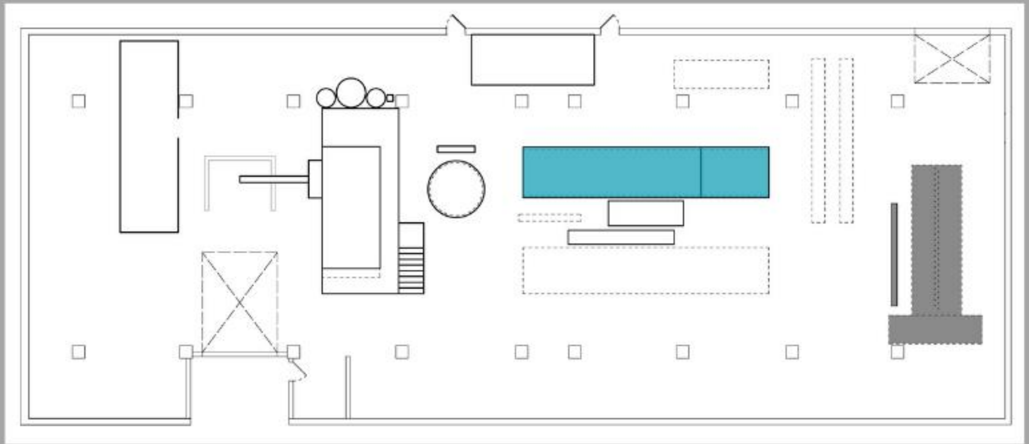
WHY IS THIS IMPORTANT

As the piston pump forces BioSolids into the system, the accumulator regulates the pressure swings.

By property regulating pressure in the initial run of pipe, the accumulator is the first line of defense in the pressure safety system.

KEY STATISTICS

- Between 20 - 30 Bar Pressure (290 - 435 psi)



HEAT EXCHANGER

Uses water to exchange thermal energy.

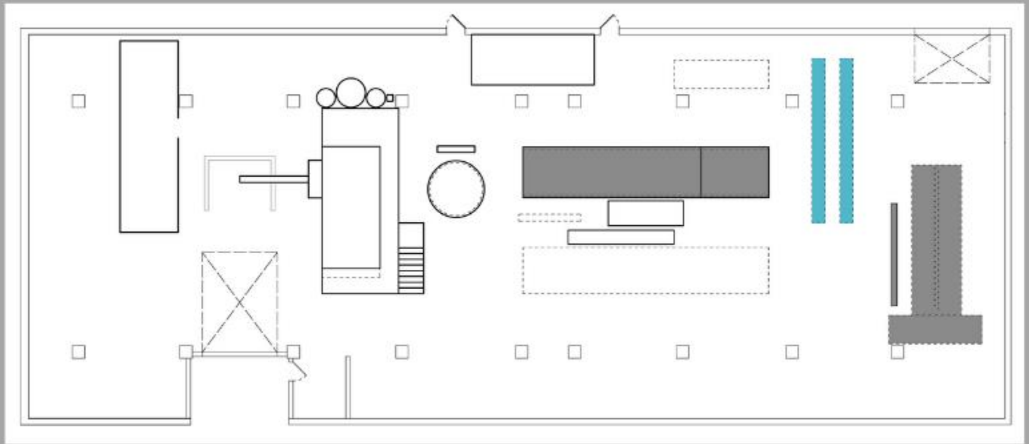
WHY IS THIS IMPORTANT

It warms up incoming BioSolids and cools down the hydrochar slurry for increased thermal and energy efficiency.

This yields financial savings due to the lower energy requirements needed to run the system.

KEY STATISTICS

- BioSolids come in at room temperature
- Resulting output material is 150C/302F
- 0.565 miles of pipe



HEATER SKID

Fed by thermal oil at 260C/500F to bring the BioSolids up to reaction temperature.

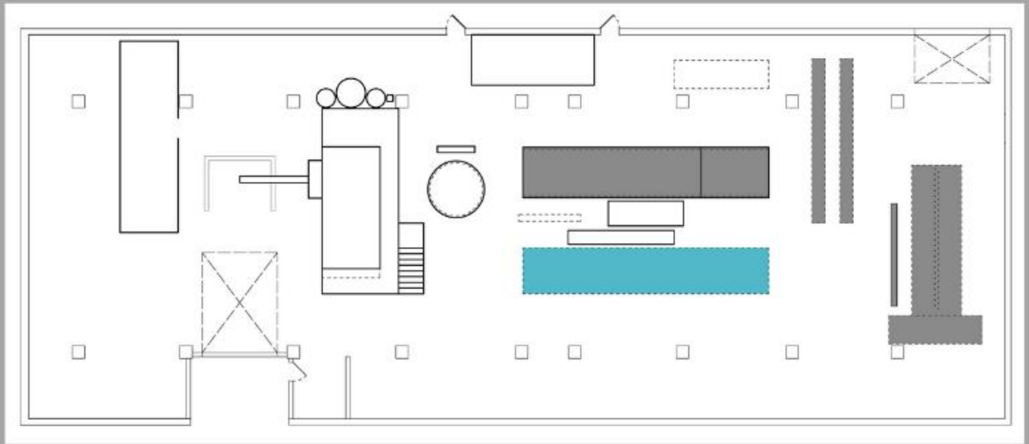
WHY IS THIS IMPORTANT

The temperature and pressure drive the chemical reactions in HTC. The heater skid has proprietary anti-fouling technology to prevent clogs in the system.

If the temperature is too low, the material won't carbonize.

KEY STATISTICS

- Incoming temperature = 150C/302F
- HTC reaction occurs between 180C/356F and 220C/428F



HTC REACTOR

Monitors temperature and pressure.

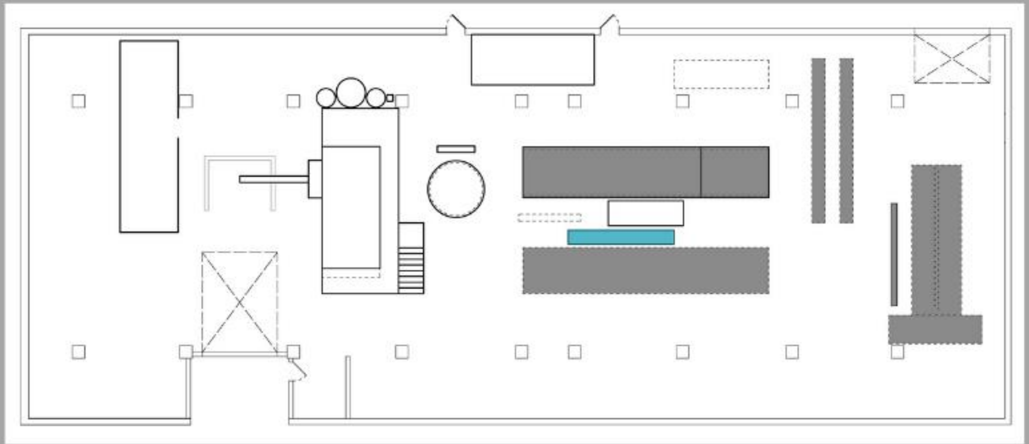
WHY IS THIS IMPORTANT

Reaction temperature is maintained for three (3) hours without requiring additional energy.

The process optimizes carbonization/hydrochar production and ensures energy efficiency.

KEY STATISTICS

- No moving parts and no active heating
- 1.404 miles of pipe



DEPRESSURIZATION PUMP

Reduces pressure prior to the buffer tank.

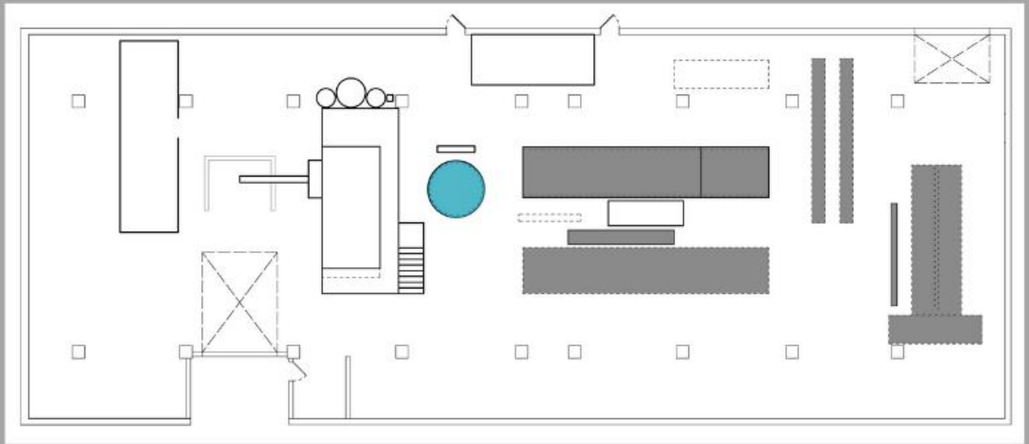
WHY IS THIS IMPORTANT

Depressurizing via pump is a better option than using a series of valves due to lower maintenance and increased uptime.

The depressurization pump works in tandem with the piston pump to regulate flow and pressure in the system.

KEY STATISTICS

- Pressure is reduced from 20 Bar/290 psi to 2 Bar/29 psi



BUFFER TANK

Mixes the hydrochar slurry and communicates directly with the dewatering press to begin and end the cycle.

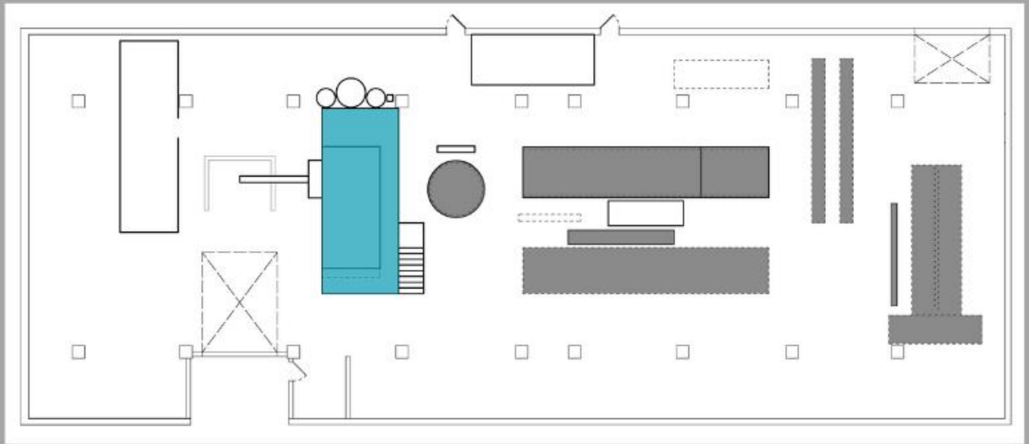
WHY IS THIS IMPORTANT

This combines the continuous process with the batch process, creating a buffer to store more material.

The tank is insulated to reduce heat loss. Via ancillary heaters, heat can be added to the system to increase dewatering efficiency.

KEY STATISTICS

- Holds up to ~30% of the daily flow of the HTC system
- Temperature maintained at 37C/120F



HYDRAULIC PRESS

Separates the hydrochar from water.

WHY IS THIS IMPORTANT

The hydrochar needs to be separated from the water so the water can be recovered and re-used at the end of its cycle.

The hydrochar drops to the bottom and all the water returns to the headworks (the WWTP entrance point), then the treatment process starts all over.

KEY STATISTICS

- 99% of solids are captured and separated from the water
- The hydrochar is now 60% dry matter (industry standard is 25 - 30% dry matter)

Borough of Phoenixville, PA

First Municipality in Pennsylvania to pledge 100% Clean and Renewable Energy Goal by 2035

Borough of Phoenixville WWTP

Population:	~17,000
Rated Cap.:	4 MGD
Ave. Flow:	1.75 MGD
Product:	Class B Biosolid
Method:	AD
Volume: (2022)	966 tons @ 22.7% TS
Disposal Cost:	$46.90/ton

Phoenixville HTC Project Timeline

- April 2019 – HTC Engineering and Design
- May 2021 – Present – Greenhouse Slab Upgrades
- June – August 2021 – Equipment Purchasing
- 2022 – Equipment Arrival and Construction
- Q1 2023 – HTC Process Commissioning
- 2023 – Prove and Permit Beneficial Use Cases & Apply for a PA General Permit
- 2024/2025 – Phase 2 – Combine Food Waste as a feedstock and include Gasification for Carbon Neutral Electricity Generation

Benefits of HTC at the Borough

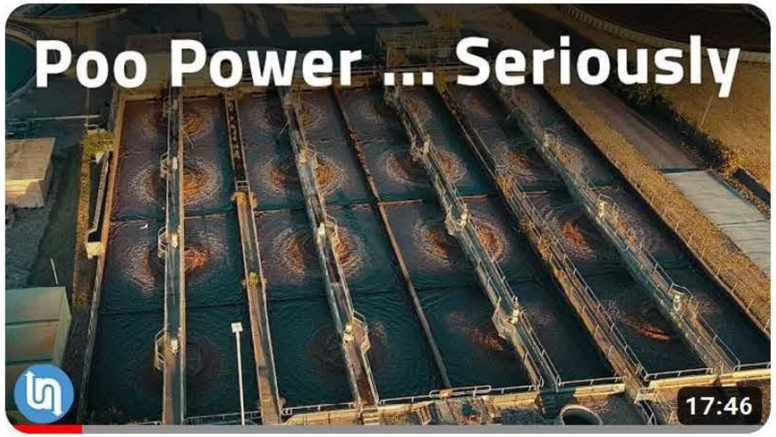
- Regulatory Risk Reduction
  - No longer land applying
- Turning a Liability into an Asset
  - Creating a sellable product from organic waste
- Meet Sustainability Goals
  - Reduce carbon footprint by generating renewable energy
- Additional Solids Processing Capacity
  - Increased revenue from hauled waste and organics
- Up to 40% project cost coverage with new tax credits in the IRA (if creating energy)
  - New transferable tax credits for non-tax paying entities

HTC vs. Standard Organic Waste Solutions

Process	Carbon Efficiency	Process Duration	Final Product
Landfill	0%*	Months-Years	Landfill Gas, Leachate
Composting	10%	12 Weeks	Soil Amendment
Anaerobic Digestion	50%	15-40 Days	Biogas – 60:40 CH_4:CO_2 Digestate
Hydrothermal Carbonization	**Up to 90%**	**30 Minutes – 4 Hours**	**Hydrochar** **Process Water**

For More Information

- Website: www.PXVNEO.com
- Website: www.SomaxHTC.com
- YouTube: Undecided with Matt Ferrell
  - Turning Human Waste into Renewable Energy?



- Podcast: Nexus PMG – Bigger than Us Podcast
  - Episode #209 Dan Spracklin CEO and Founder of SoMax

@BoroughofPhoenixvillePA

Thank you!