TECHNOLOGY INTEGRATION TO ACHIEVE LOW CAPITAL COST EXPANSION AND "NET-ZERO" ENERGY STATUS FOR WWTPs

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AGENDA

1. Overview of SusGlobal
2. Hamilton Debottleneck of AD Project
3. St. Mary's Heat Treatment of Biosolids Project
4. BioGRID Expansion Project
5. Greenhouse Gas Emission Reductions
6. Conclusion

Overview of SusGlobal

OVERVIEW OF SUSGLOBAL

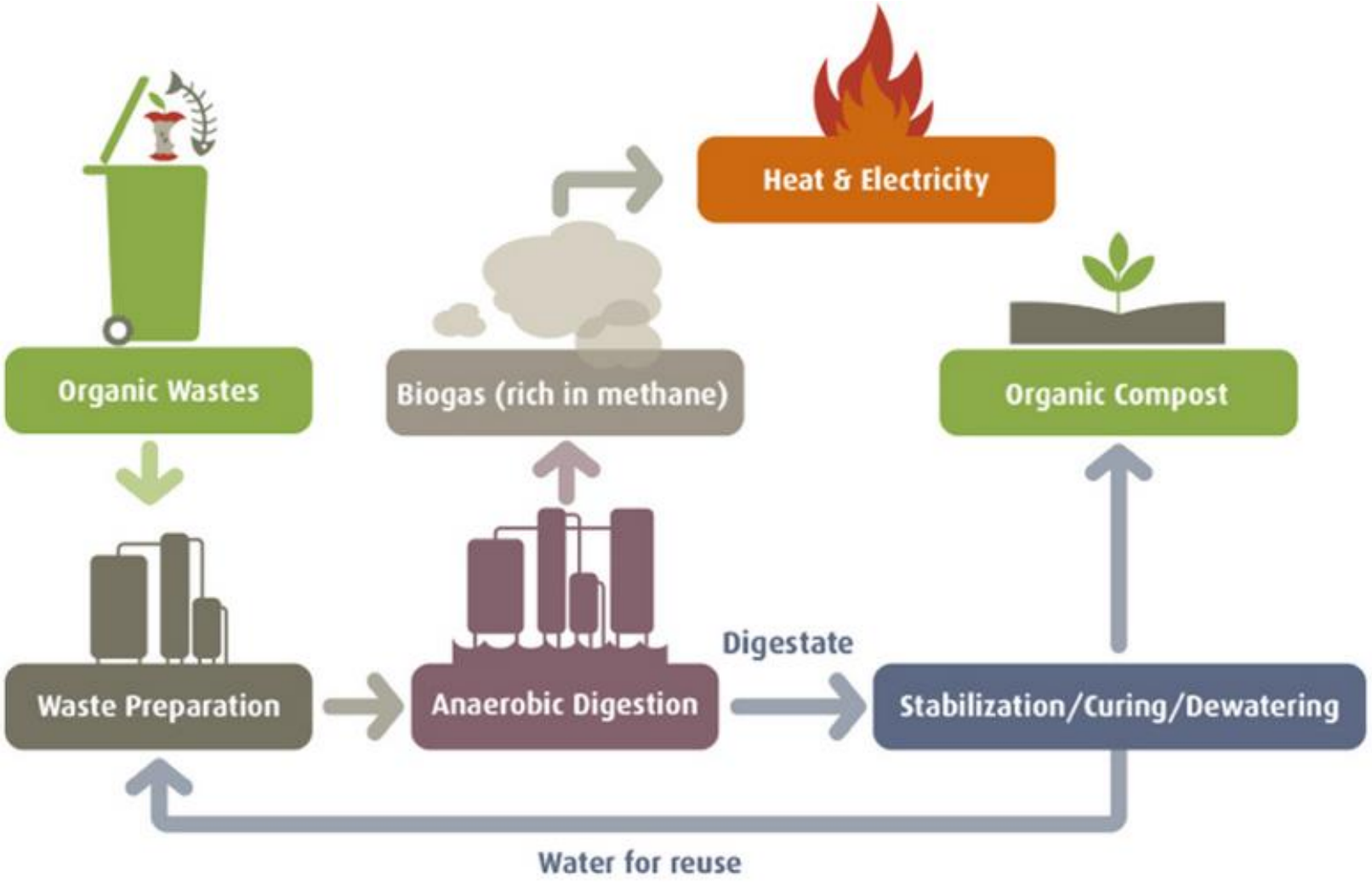
- Founded by Gerald P. Hamaliuk and Marc M. Hazout in Toronto, Ontario, SusGlobal is a renewable energy company focused on acquiring, developing and monetizing a portfolio of proprietary technologies in the waste to energy application globally;
- SusGlobal's mission is to leverage their proprietary technology and wealth of experience to provide a full range of services for the conversion of waste to energy including:
  - facilitating a step-by-step approach to allow clients to evaluate and define waste management strategies;
  - execution of proprietary methods (qualitative or quantitative or a combination of both) to evaluate the potential location, technology, and business model options; and
  - start to finish commissioning, execution and ongoing operation of treatment facilities under various private-public partnership model including design, finance, build, own, operate & transfer;

SUSGLOBAL'S CORPORATE STRATEGY

By leveraging existing relationships in the waste to energy industry including existing patents and both proprietary and intellectual property, SusGlobal seeks to build a large and diversified portfolio of the following technologies with the objective of monetizing them:

1. Process Source Separated Organics ("SSO") in anerobic digestors to divert from landfills and recover biogas. This biogas can be converted to gaseous fuel for industrial processes, electricity to the grid or cleaned for compressed renewable gas;
2. Debottleneck existing anerobic digestors to allow processing of SSO to increase biogas yield;
3. Utilize waste plastics to produce liquid fuels.

SUSGLOBAL'S PROCESS

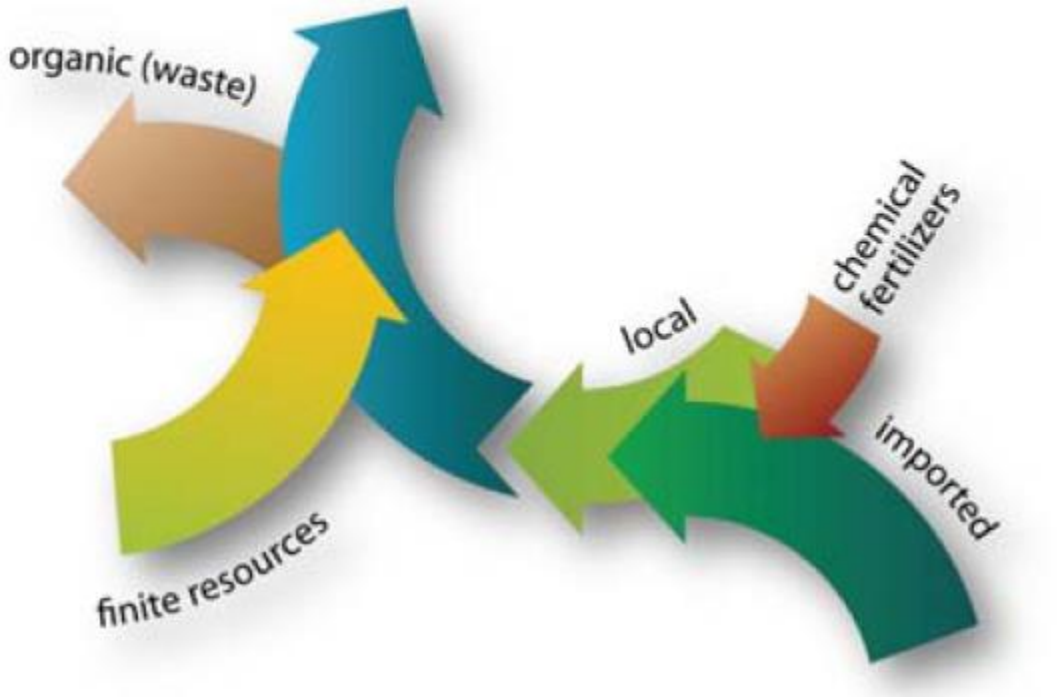


Source: SusGlobal Corporate Website

SUSGLOBAL'S TECHNOLOGY

- Agreement with Syngas Sdn Bhd granting exclusive right to use plastic to diesel ("P2D") technology in North America and on a site agreed basis in any jurisdiction except in Malaysia and Indonesia;
- Technique to more than double anaerobic digestor capacity where traditional conditions are employed;

GROWTH PRESSURES



- Increasing organic "waste" generation
- Increasing management & disposal costs
- Increasing demands on agriculture
- Increasing demands for chemical fertilizers
- Decrease in available farmland & other resources
- Increasing demands for practical, beneficial solutions

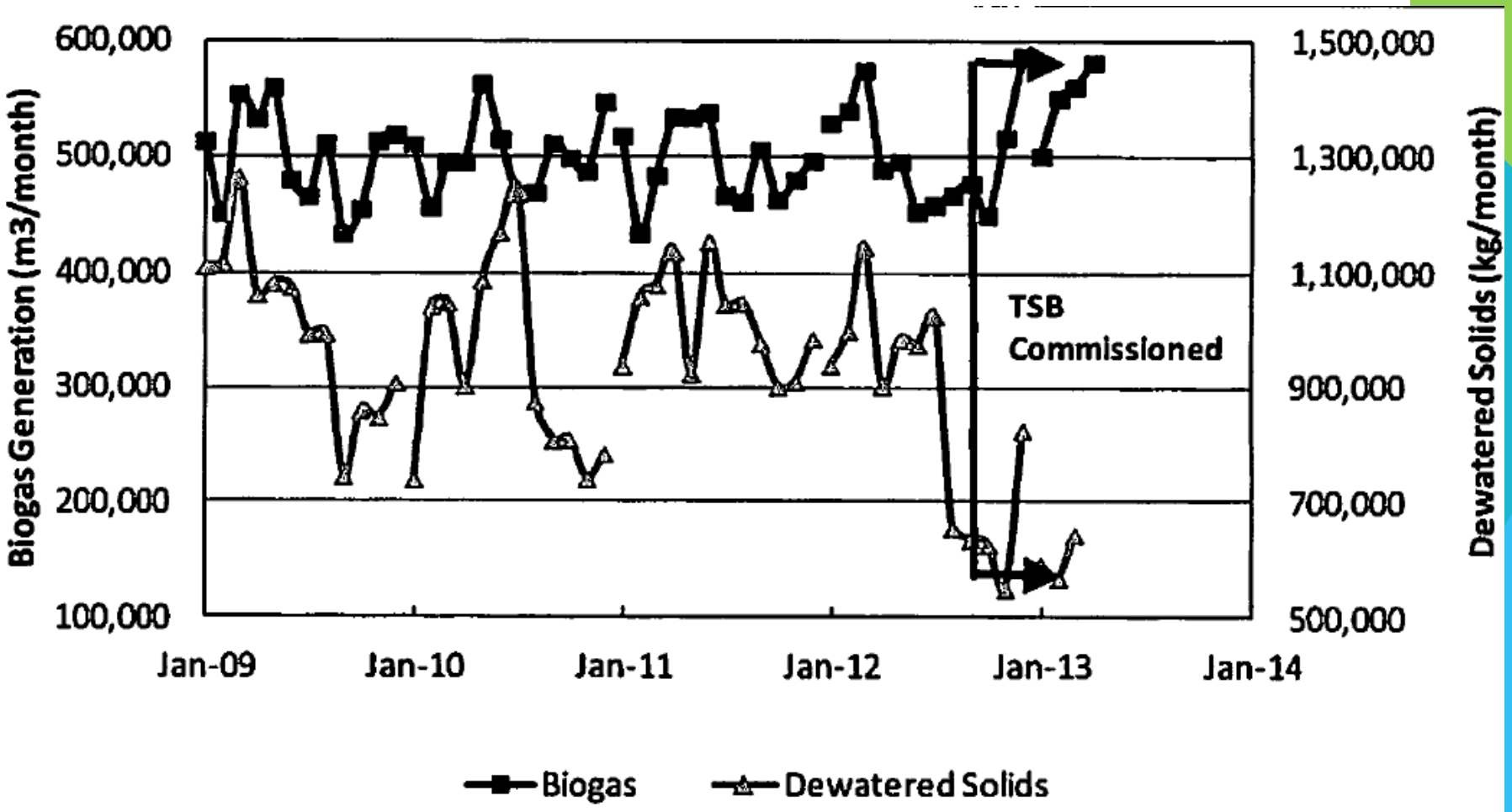
SUSTAINABILITY – CLOSING THE LOOP

Hamilton Debottleneck of AD Project

PROJECT OVERVIEW

PROBLEM	▪ Problem with diverting WWTP influent to Harbor during rain and snowmelt incidents – Capacity 350 mL/d, normal flow 330 mL/d – Determined capacity constraint was the hydraulic loading to the anaerobic digestion system – Existing 8 digestors of 8500 m3 each
SOLUTION	Used polymer addition to decrease hydraulic loading – Improved mixing in digestors – Increased influent capacity to 450 mL/d – Complete June, 2012 – Since mid-2012, never diverted influent wastewater to Harbor – Four of 8 digestors in use with no capacity constraints
OUTCOME	Project changes exceeded expectations – No operational problems, no diversion – Increased biogas purified and sent to natural gas pipeline

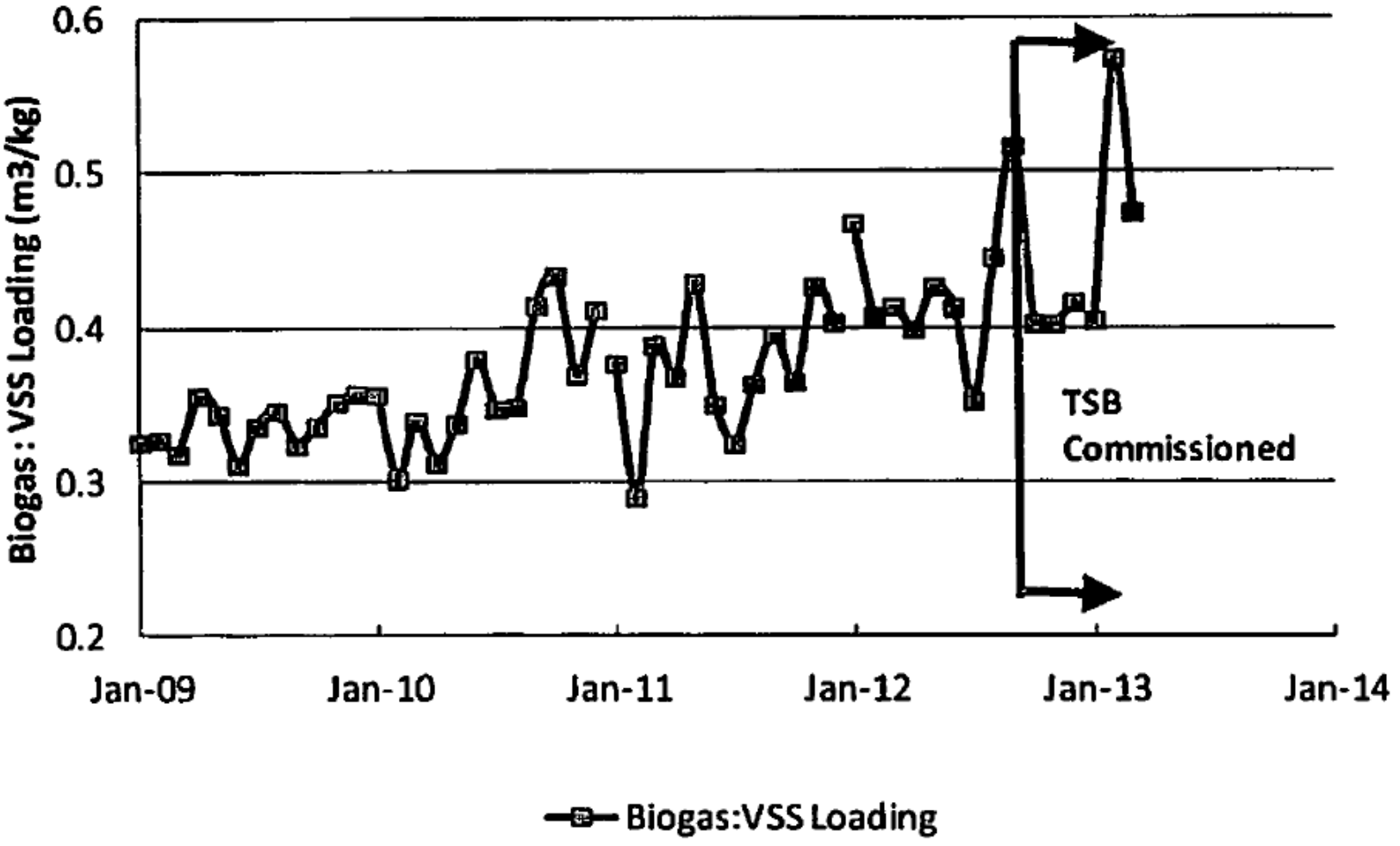
BIOGAS GENERATION AND DEWATER DRY SOLIDS FROM CENTRIFUGES (JAN 2009 TO APR 2013)



PRE- AND POST- TSB COMMISSIONING

Year	Unit	Average Monthly Jan 2009 to July 2012	Average Monthly Sept 2012 to April 2013	Change
Influent Flow	ML/Month	9,313	9,582	3%
Digester VSS	kg/month	1,375,144	1,159,752	-16%
Dewater Solids	kg/month	987,269	635,641	-36%
Biogas: VSS	M3/kg	0.37	0.46	24%

BIOGAS GENERATION PER MASS OF VSS (JAN 2009 TO APR 2013)



Guelph WWTP Heat Treatment of Biosolids Project

HEAT TREATMENT - OVERVIEW

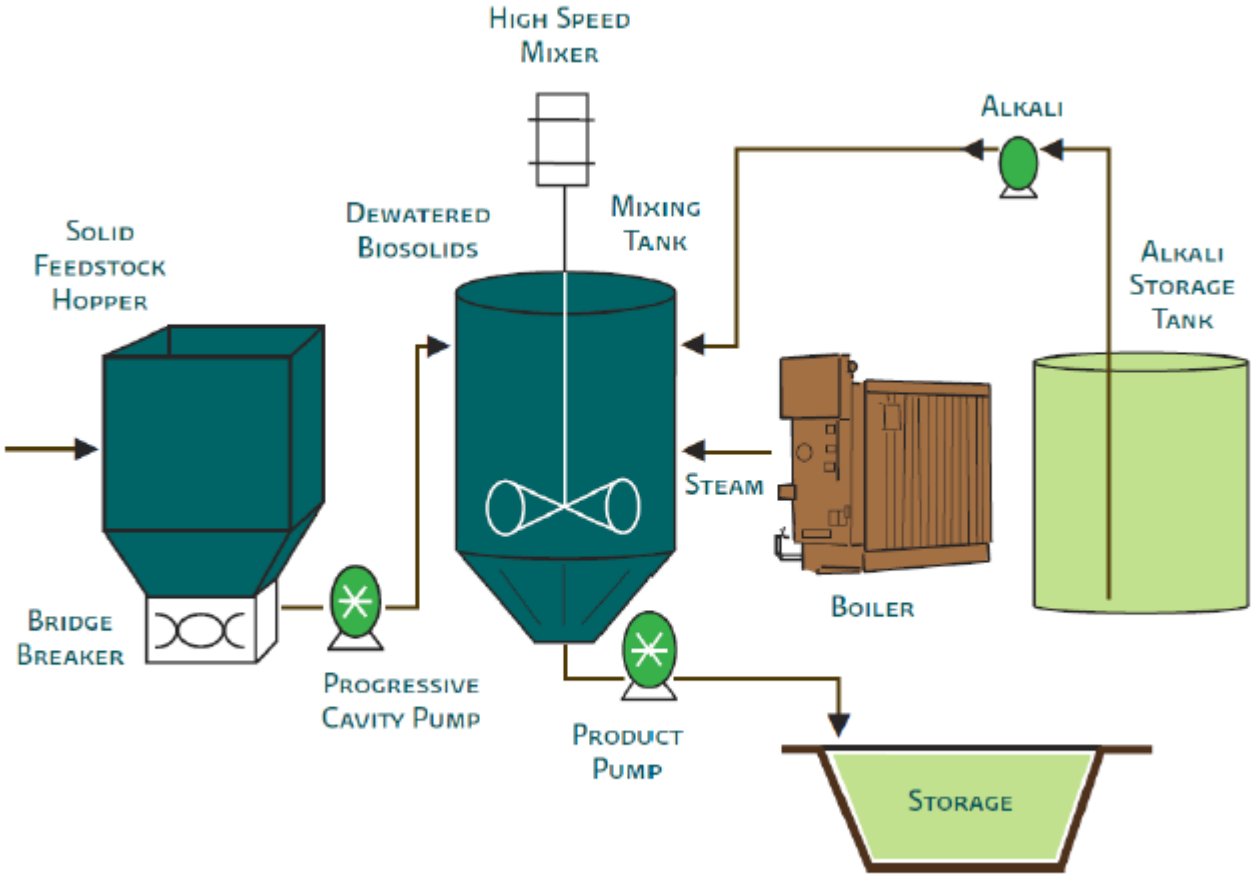
- Low Temperature Physical Chemical Hydrolysis Technology
  - A back-end solution, installed after biosolids dewatering

- Produces a multi-purpose, hydrolyzed product for:
  - Anaerobic Digester Enhancement
    - Improve biogas yields by >30%
    - Reduce biosolids volumes by >20%
  - BNR enhancement – a cost effective, alternative carbon source
  - Liquid fertilizer – Class A EQ (USA) / CFIA registered (Canada) – high organic matter & NPK – huge demand by farmers

TECHNICAL/SCIENTIFIC BASIS

- Cell disintegration & hydrolysis of complex organic molecules into simpler compounds
- Process makes the residual recalcitrant volatile solids in digested biosolids more amenable to further biodegradation when re-fed to anaerobic digester
- Hydrolyzed product provides readily available organics for AD and BNR system + nutrients for soil/plants
- Product contains 10-fold higher VFA as compared to standard, biosolids cake

HEAT TREATMENT – SIMPLE PFD



DIGESTER ENHANCEMENT

- City of Guelph, Ontario – 6-months full-scale study results:
  - >40% extra biogas/>25% solids reduction by re-feeding the Heat Treatment product into the test digesters - compared to control
  - Biodegradability of Heat Treatment product was 65-70%

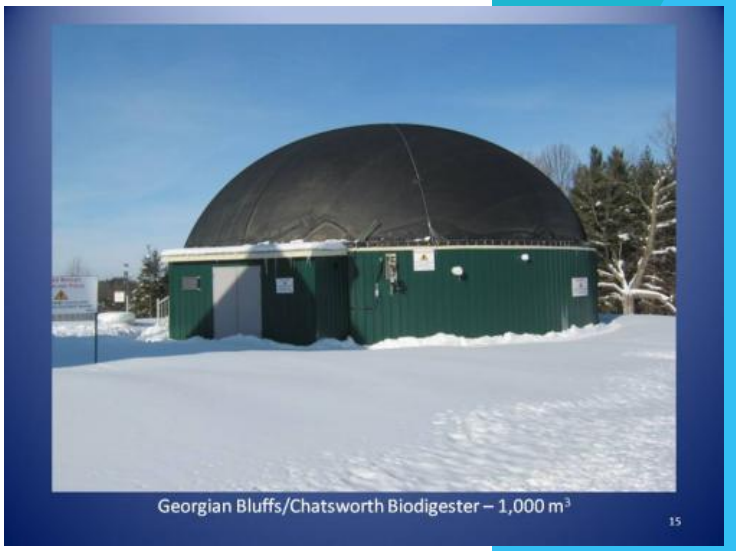
Parameters (average of different feed rates over 6 month study)	Control Digester without Heat Treatment biosolids	Test Digester with Heat Treatment biosolids
Influent VSS primary sludge (kg/d)	2307	2278
Heat Treatment VSS (kg/d)	0	921
Combined Influent VSS (kg/d)	2307	3199
Effluent VSS (kd/d)	1118	1222
VSS Destroyed (%)	51	62
Biogas production (m^3/d)	1189	1977

BioGRID expansion Project

BACKGROUND

The BioGRID Project has been operating since 2011 and currently operates with the following capacity:

- Capacity for Treatment: 40m^3/day of septage plus 5m^3/day of organic waste
- Energy Produced from Methane Gas: 100kW
- Digester Size: 1,000m^3
- Treated Waste Storage: 785m^3

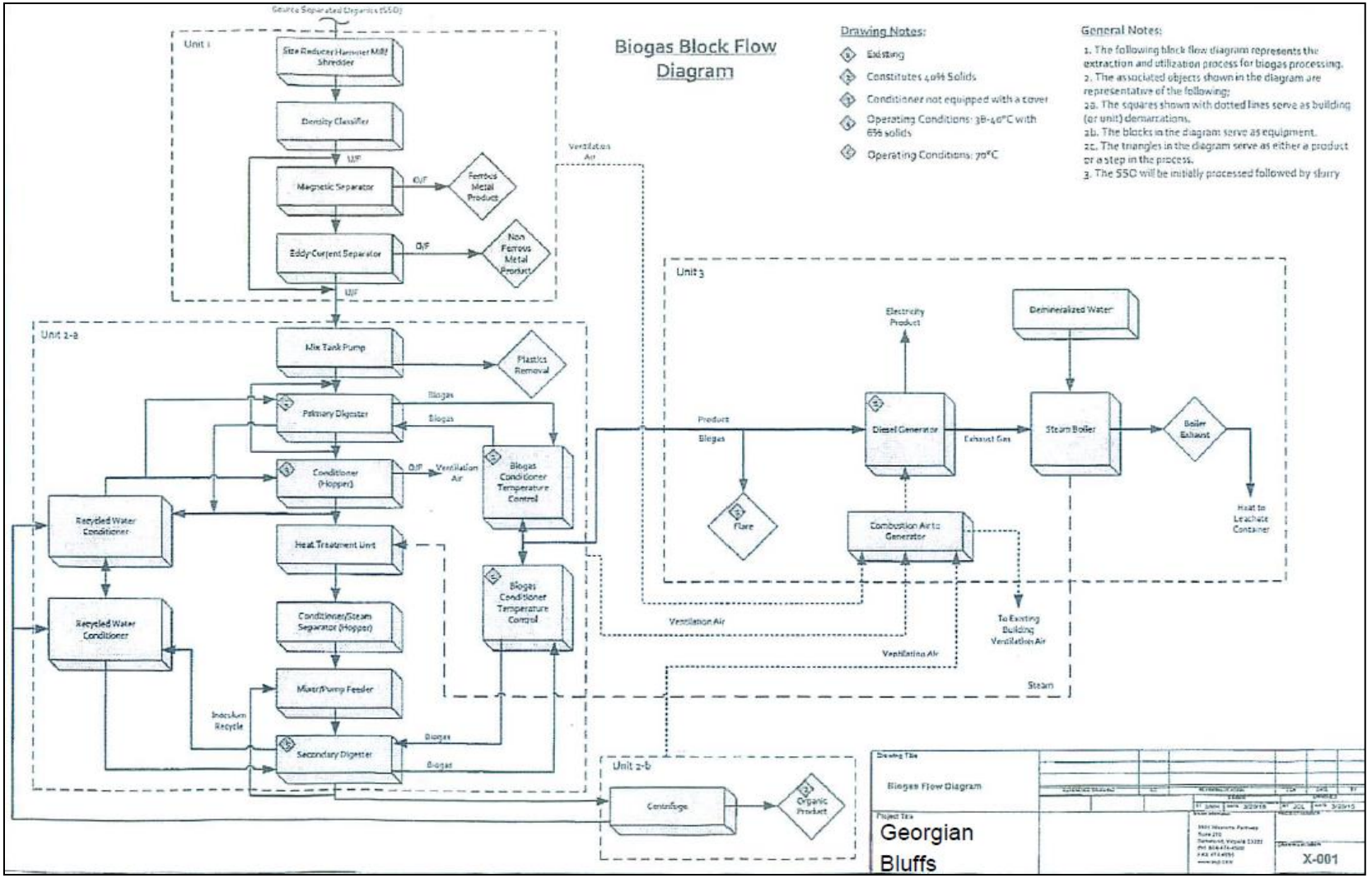


CURRENT STATUS

The facility has a number of operating issues since inception and has unperformed against expectations. Key issues are as follows:

- Current payback period is 15 years against an original estimation of 6 years;
- Current operations fail to optimize revenue generating capacity of existing facilities across all potential streams – power-generation, sewage fees and tipping fees;
- Maintenance & mechanical issues that resulted in less days of in-operation;
- Public opposition due to ongoing complaints of odors and continued expenditures.

PROPOSED SOLUTION



PROPOSED SOLUTION (CONT'D)

To supplement the ongoing initiatives of the Municipalities, SusGlobal proposed the following:

- SSO receiving, debagger, plastic removal and cleaning and send pulped food wastes to holding tank(for 20,000 t/a SSO);
- Modify existing digestor for higher solids digestion;
- Install heat treatment system for digestate from the existing digestor;
- Convert the smaller biosolids holding tank to a secondary digestor operating under thermophilic conditions;
- Install biosolids handling of secondary digestor as Class A fertilizer for hay field applications;
- Connect the secondary digestor to the biogas system and install a 500 kW genset for internal power and heat use and export 300 kW electricity;
- Install heat recovery system from the genset exhausts to generate steam for the heat treating process;

As a Phase 2 to the project, SusGlobal will invest in the technology to convert the waste plastics from the front end SSO debagger to be converted to diesel locally.

Greenhouse Gas (GHG) Emission Reductions

Basic Considerations

Choose offset projects with stringent standards

High standards ensure carbon offset projects meet the minimum requirements to yield real emission reductions:

- **Additional** – a genuine reduction can only be counted if it is in addition to what would have been done in the normal social paradigm, be it for business profit or ongoing improvements.
- **No Leakage** - offset projects in one place should not increase emissions from another source elsewhere.
- **Permanent** - the risk of reversibility (eg, loosing the carbon back to the atmosphere) should be minimal and have mechanisms in place to offer replacement or compensation for any reversal.
- **Verified** - independent and transparent verification of reductions is required.
- **Efficient** - successful projects will yield real emission reductions with competitive costs .

Integrate expenses for offsetting into activities cost

- With limited resources it is better to offset fewer of your emissions but invest in offset projects that are of high quality.

- The new practice of offsetting carbon emissions is a step towards slowing the growth of atmospheric CO_2.

- As there has been little consideration of the atmospheric implications of our fossil fuel use in the past, tying specific offsetting costs to these activities reinforces a causal connection and establishes a direct fiscal responsibility.

Make a Carbon Emissions Inventory

While boundaries determine the edges of a carbon footprint, the inventory defines what is contained inside it.

Basic guidelines for preparing a CO_2 inventory:

- decide what is most relevant to core operations
- undertake a complete audit to justify whether emissions are included
- be consistent so that there can be comparisons over time
- make the process transparent by noting methodologies and important assumptions, using the Ontario Cap & Trade guidelines

Aim for Zero Net Carbon Emissions

We use carbon neutral as shorthand for zero net impact on radiative climate forcing.

The steps involved are:

(i) Identify boundaries for emission responsibility to set a baseline for reporting

(ii) identify opportunities for reductions and implementing them

(iii) choose a methodology to determine the resulting emissions

(iv) select verified offsets to neutralize an agreed amount of emissions.

SusGlobal Technology Integration Achieves:

- Recover additional energy from organic wastes
- Methane Capture if no landfill gas recovery and flaring exists at local sites(near Georgian Bluffs all landfills are small and only vent the landfill gas)
- Activities contribute to GHG reductions to a greater or lesser degree

Conclusion

CONCLUSION

"The greatest challenge in the water and sanitation sector over the next two decades will be the implementation of low cost sewage treatment that will at the same time permit selective reuse of treated effluents for agricultural and industrial purposes." – World Bank

SusGlobal has proven expertise in evaluating WWTP conditions relevant to present and future needs and developing an integrated technological solution that can:

- Make the WWTP "net zero" for energy consumption by increasing energy recovery;
- Expand the AD system as much as 100%, using a low-cost solution;
- Greatly reduce the biosolids mass coming from the WWTP operation by converting the biosolids to biogas energy;
- Generate GHG reductions from each project.

Contact us to learn more!

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Caring for Earth's Journey™

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A Carbon Neutral Company