MSW PROJECT OPPORTUNITY
Harvest Energy Garden
Richmond, British Columbia
Harvest Power Inc.

OVERVIEW OF MSW PROJECT:

The Harvest Energy Garden will divert nearly 30,000 metric tons of food and yard waste, generated by the 22 communities of Metro Vancouver, from landfills and instead convert it to biogas. The biogas will be combusted to produce 7 million kWh/year of renewable electricity. In addition to the biomethane production, the residuals from the anaerobic digestion step will be further processed, yielding over 17,000 metric tons/yr of high-quality marketable compost.

TYPE OF PROJECT: Anaerobic Digester for Food and Green Waste Portion of Municipal Solid Waste Stream

PROJECT START DATE: March 2013

ESTIMATED AVERAGE ANNUAL EMISSIONS REDUCTIONS: 173,000 $MTCO_2E$

PROJECT HIGHLIGHTS

The project utilizes an innovative *High-Solids Anaerobic Digestion* (also known as “dry fermentation”) technology, which yields a biogas that contains 70-85% methane, a significant improvement over competing biogas technology. The core technology has been commercially proven by German-based Groβmann Ingenieur Consult GmbH (GICON), who has fully tested and implemented it in Germany. Harvest is the sole and exclusive representative for the GICON technology in North America.

This particular AD technology is transformative due to its ability to accept higher solids content (e.g. yard waste). Other AD systems that cannot do this rely mainly on institutional and commercial food waste. However, effective and efficient residential food waste collection is generally done through co-mingling food and yard waste. Developing an entirely separate collection system for pure food waste is costly and increases traffic and other neighbourhood nuisances. In other words, for densely populated areas to achieve higher levels of waste diversion, High-Solids AD is the clear choice.

The Energy Garden in Richmond includes a Visitor Centre, intended to provide opportunities for community outreach and education around the advantages of organics recycling, composting, anaerobic digestion, and sustainability.

Support has been provided by project partners Natural Resources Canada (Clean Energy Fund), Metro Vancouver, and the British Columbia BioEnergy Network.

Energy Garden Front Entrance & Visitor Centre

Energy Garden, Aerial View

LANDFILL GAS AND ENERGY POTENTIAL

Physical Data

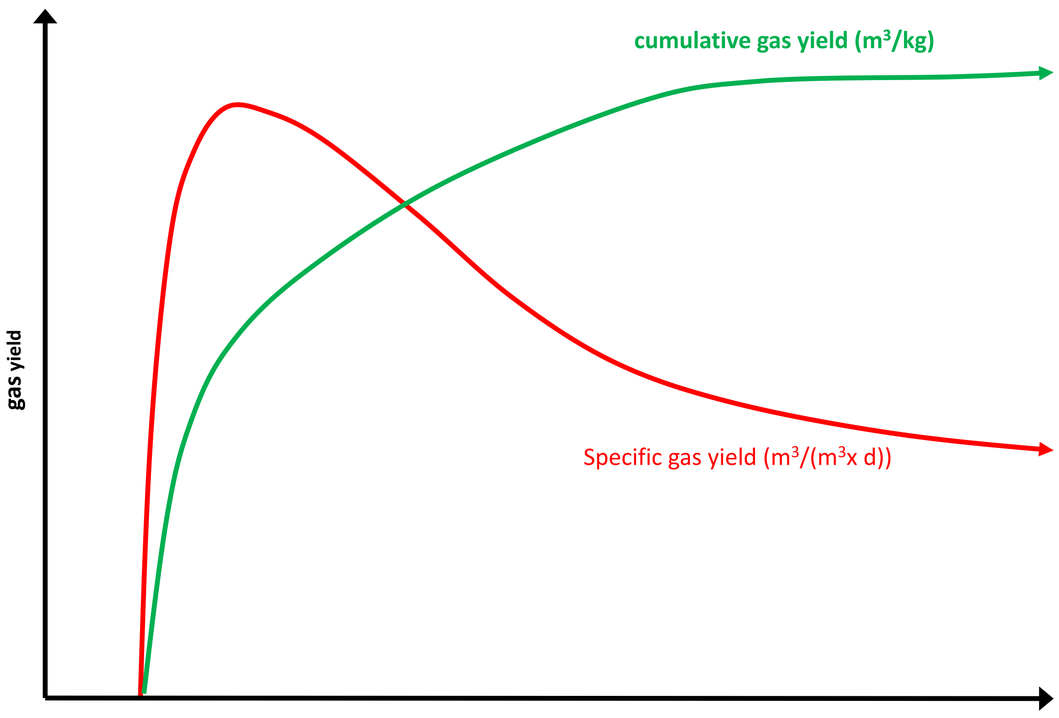
- Temperature range: mesophilic
- Technology type: 2 stage high solids
- Solid content: > 40%
- Quantity of waste accepted annually: 30,000 tonnes
- Average waste residence time in percolate tunnels: 14 days
- Annual quantity of biogas produced: 4,000,000 cbm
- Methane content: > 60%
- Hydrogen sulfide content before desulfurization: < 1,000 ppm
- Hydrogen sulfide content after desulfurization: < 100 ppm
- Average hydraulic residence time: 12 hrs
- Leachate management: minimal, caught in drains and recycled into system
- Digestate after digestions: aerobically processed (composting)
- Quantity of compost after aerobic process: > 17,000 tonnes
- Total electrical energy produced: ~ 7,000 MWh

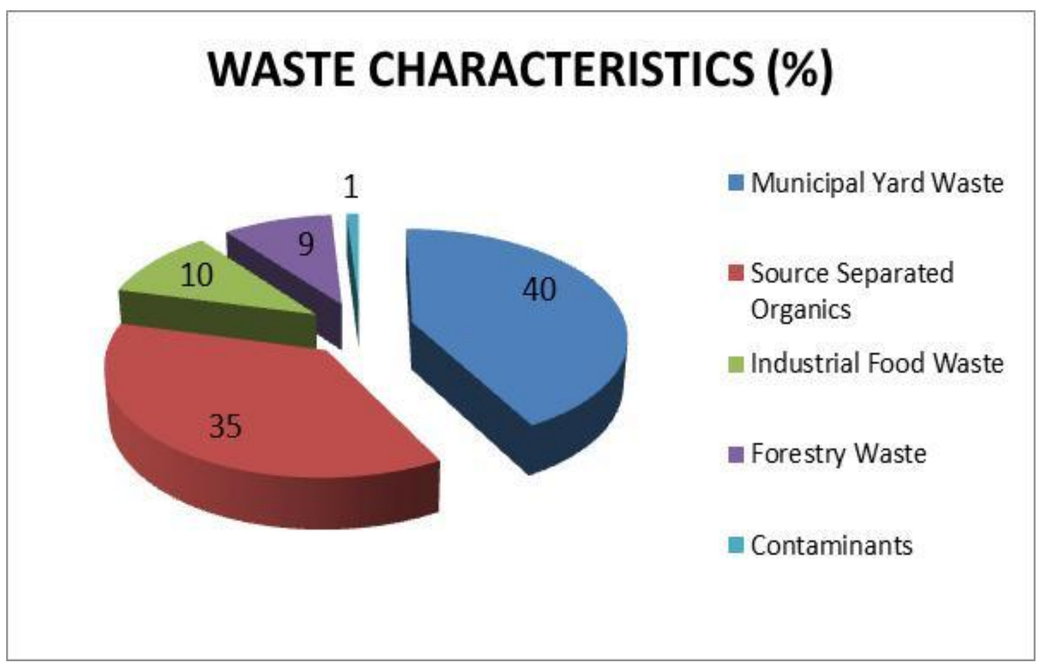
Biogas Modeling Inputs:

- **CH_4 generation potential (Lo): 40,000 m^3**
- **Percent methane: > 60 %**

Percolator Tunnels

Methane Tanks, Interior View





"Instead of burying food and other organics in a landfill and generating methane that escapes into the atmosphere, companies like Harvest Power are turning organics into beneficial products, such as garden soil and bio-fuel,"

–- Malcolm Brodie, Chair of Metro Vancouver's Zero Waste Committee.

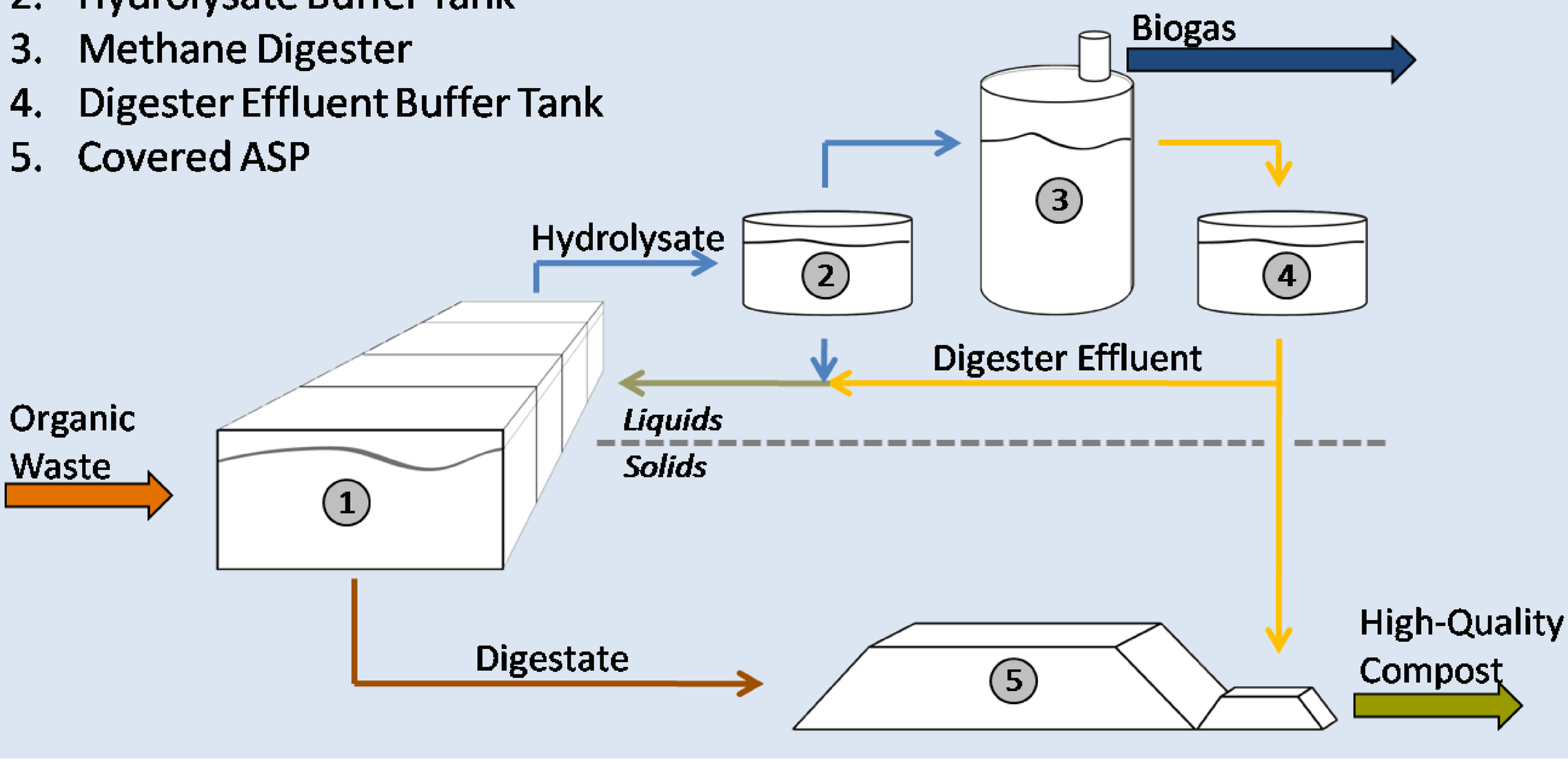
ENVIRONMENTAL BENEFITS

The project will produce 60 cubic meters (m^3) of natural gas (methane) per tonne of organic waste, for an annual total of 1.8 million m^3 of methane or 18 MWh combined heat and power. Diverting this waste from a landfill, where the methane escapes into the atmosphere, results in approximately 23,000 tonnes of CO_2 equivalent avoided in 2013.

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Tonnes CO_2eq from landfill diversion & renewable electricity	23,000	46,000	69,000	92,000	115,000	138,000	151,000	184,000	207,000	235,000	258,000	281,000	304,000	327,000

HSAD SYSTEM

1. Hydrolysis Percolators
2. Hydrolysate Buffer Tank
3. Methane Digester
4. Digester Effluent Buffer Tank
5. Covered ASP



FOR MORE INFORMATION

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