



MGI MULTIGEN
INTERNATIONAL
Changing the world to zero waste

***Bioenergy 2015: Opportunities in a Changing Energy
Landscape
Renewable Natural Gas - Developer Perspective***

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Your Economic Onsite Energy Solution

Overview

- MultiGen International
- Biogas
- Anaerobic Digestion
- Biogas Upgrade Technologies
- Development Risk
- Recommendations

MultiGen International, LLC

MultiGen International (MGI) – is a project development company focused on solving waste issues using **commercial** technologies

Established three legs of the stool

- **Expertise**
- **Capital**
- **Partner with Commercial Technology Providers**
 - ▣ **Anaerobic digester**
 - Food Waste
 - Animal Waste
 - Sludge
 - ▣ **Gasification**
 - Municipal Solid Waste (MSW)
 - Medical Waste
 - Tires

Biogas

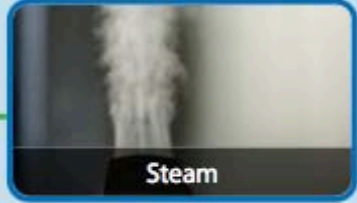
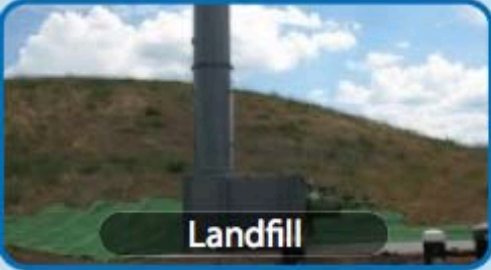
Biogas is produced from the anaerobic decomposition of organic material

- Mixture of CH_4 (Methane) and CO_2
 - ▣ Can contain small amounts of Siloxanes and H_2S

Main Producers of Biogas

- ▣ Landfill - 50-60% Methane
- ▣ Anaerobic Digesters (Wastewater Treatment)– 55-70% Methane

Biogas Generation and Utilization



Biogas Cleanup Technologies

There are multiple technologies on the market that are commercial

- Pressure Swing Absorption
- Membrane
- Water Scrubbing

These technologies scrub the gas of CO₂, Siloxanes and H₂S which results in gas spec similar to:

CH₄: >96%

CO₂: ~1%

O₂: <0.4%

Total inerts: <4% H₂S: <1 ppm

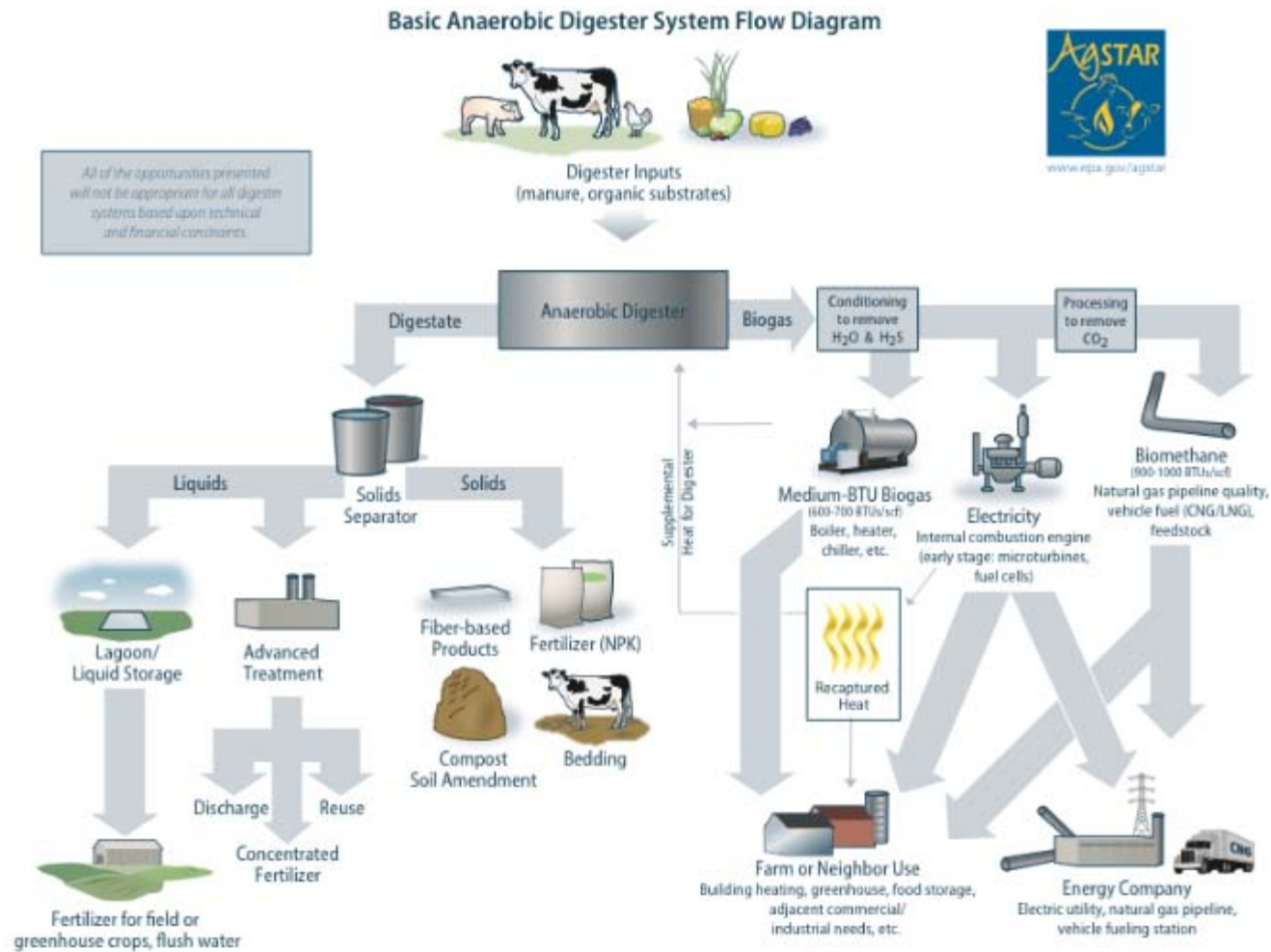
H₂O: <1 ppm Siloxanes: <1 pp

Anaerobic Digesters - Byproducts

- ▣ Clean biogas can be converted to:
 - Renewable Electricity – Renewable Power
 - Renewable Natural Gas
 - Renewable Compressed Natural Gas - Transportation Fuel
 - Renewable Hydrogen Production
 - Other Renewable byproducts
- ▣ Biosolids - used for animal bedding, soil enhancement and a high quality fertilizer
- ▣ Liquid Effluent – nutrient rich liquid purified and separated from the solids



Anaerobic Digestion Process Flow



Anaerobic Digester – Key Facts

- AD Systems are Commercial
- Financeable
- Solve very serious and problematic waste issues

Solid Waste Permitting

- Permitting a manure based digester project is pretty straight forward
- Once you start adding food waste you are restricted by the amount of food waste you can add based upon local or State requirements for a Solid Waste Permit.
- Food waste increases the production of gas
- A solid waste permit is very costly and time consuming
- A National Standardized process for AD systems to add food waste without going through the entire Solid Waste permitting process

National Renewable Natural Gas Specification

- Currently each Natural Gas pipe owner has different Natural Gas specifications relative to
 - O_2
 - N_2
- Stringency of pipe specifications can make or break a projects economics
- Can cost millions of dollars in added equipment to meet specification

Renewable Natural Gas Production

Priority

- Currently any producer of Natural Gas can be “shut in” for any reason
- Being a small producer of Natural Gas and having an expected production capacity in the economics – being “shut in” can be very costly
- Renewable Natural Gas is
 - ▣ Renewable
 - ▣ Solves current waste issues

Navigating National Agencies

- Currently – An AD project can potentially work across many agencies
 - ▣ US DOE – Transportation Fuel, PPA
 - ▣ US EPA – Emissions, Nutrient recovery
 - ▣ USDA – Agricultural waste and recovery
 - ▣ US DOT – RCNG retrofit kits, fuel quality, fueling stations
 - ▣ Department of Homeland security – Avian Flu and Swine Flu
- Compound that with State and Local Agencies the education process and coordination efforts become immense
- Multiple agencies to work through a project, coordination needed from policy perspective

Recommendations

- Cross coordination of Key Stakeholders – Round Table
- Create a National Renewable Natural Gas Pipeline Quality Specs
- Create a National Renewable Natural Gas Pipeline Interconnection standards
- Create a National Standardized process for AD systems to add food waste without going through the entire Solid Waste permitting process
- Move from a Grant to policy focus on wet waste

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Thank You

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