Feasibility Studies

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Acknowledge
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Determine Goals of New Manure Management System

- Reduce odors released during land application or at farmstead
- Develop a sustainable source of bedding
- Reduce total farm energy costs
- Expand the opportunities for managing nutrients
- Develop other sources of revenue
Some Important Parameters
(Little Hard Data)

- Manure Production
- Frozen Manure (type of animal housing)
- Hydraulic Retention Time
- Destruction of Volatile Solids
- Gas Production
  - Heating digester
  - Fuel for engine
  - Other uses
Loss of Volatile Solids

Hydraulic Retention Time, days

Loss of Volatile Solids, percent

(fix film)
Parameter, con’t

- **Digester**
  - Length – Width – Depth ratio
  - Percent above grade/below grade – bed rock
  - Presents of a water table
  - Cover
  - Insulation

- **Bedding – composting**
  - Composter type
Parameters con’t

- Engine/Generator
  - Size (kW or kVA) Biogas available
  - On-farm use or sell electricity
  - Type of engine
  - Efficiency vs loading
  - Maintenance costs (actual)
Dairy Manure Production
Dairy Cow Manure Production
Gas Production
### Volatile Solids “Destroyed or Lost” (A Mass Balance)

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
<th>Lbs/day</th>
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</thead>
<tbody>
<tr>
<td><strong>Digester Influent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Solids</td>
<td>4.93</td>
<td>707</td>
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<tr>
<td>Volatile Solids</td>
<td>67.6</td>
<td>478</td>
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<tr>
<td>Fixed Solids</td>
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<td>229</td>
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<tr>
<td><strong>Digester Effluent</strong></td>
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<td></td>
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<tr>
<td>Total Solids</td>
<td>3.92</td>
<td>562</td>
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<tr>
<td>Volatile Solids</td>
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<tr>
<td>Fixed Solids</td>
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<td>204</td>
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<tr>
<td><strong>Solids &quot;Lost&quot;</strong></td>
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<td></td>
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<tr>
<td>Volatile</td>
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<tr>
<td>Fixed Solids (settled)</td>
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<td>25</td>
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<tr>
<td><strong>Volatile Solids &gt;&gt; Biogas</strong></td>
<td>&lt; 120</td>
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</table>
Efficiency of a Generator

16 kW Generator Agway Farm
Fig. 4 Distribution of Biogas, Scenario 1

- Heating influent: 9%
- Space heating: 0%
- Drying bedding: 0%
- Heating composter: 0%
- Water heating: 0%
- Remaining: 0%
- Input to engine: 91%
Fig. 5 Distribution of Water Jacket Energy, Scenario 1

- Heating influent: 10%
- Heating composter: 23%
- Drying bedding: 11%
- Water heating: 4%
- Space heating: 1%
- Remaining: 51%