NEW MARKETABLE PRODUCTS FROM ANIMAL WASTE

POTENTIALS FOR ENERGY FROM ANIMAL MANURE DIGESTERS

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President
Haubenschild Farm, Inc.
Haubenschild Farm

Producing many deliverables in an environmentally safe manner
Haubenschild Farm History

- Established 1952
- Started w/ 128 acres
- 100 year old house and farm buildings
- No electricity
- 2 cows
- $6,000

- 1990s became a 3 Generation Family operation
- 1000 acres
- Modern facilities
- 825 cows
- producing 53,000 + lbs of milk each day
Farm Objectives

- environment-friendly farm management
- Milk production
- Electricity production
- Heat recovery
- Minimized odors
- Soil preservation
- Effective feed program
- Recycled newspapers
- Recycled water
- Improved nutrients
- Family-oriented
- Fair profit
- Fun
Milk Production-Today

- 850 cows in production
- 100 in dry lot
- milking 3X per day
- 59,500 pounds per day
- or 7000 gallons
Milk Production

- no human handling
- closed sterile system
- minimal agitation

98F to 36F instantly

2 - 6,000 gallon tankers
Feed Management

- Once a day feeding
- Recovery of unused portion
- Cost effective program
- Computer generated TMR
- Minimal shrinkage
Manure Digester

Methane production via anaerobic decay

- 130'LX30'WX14'D
- 1/2 million gallons
- 20,000 gallons each day
- constant 100F degrees
- 1,800' of piping

- 72500 cf of biogas per day
- 51 cf/min
- 23 cf/kWh
Methane Facts

- Naturally occurring gas
- Produced by many sources (swamps, rice cultivation, animal husbandry, waste management)
- Captured and used as a commodity
- The conversion of wastes into value-added products represents the positive solution to pollution problems that are often caused by the accumulation of underutilized byproducts.
Manure Digester

- Capturing methane
- Reduced odors after processing

3.5 million gallon lagoon

gas pipes
Methane Powered Co-gen Electricity Production

- Started project June 1999
- Fully operational Oct 1999
- 150Kw generator
- Waste heat recovery for digester operation and building heat
Methane Powered Co-gen Electricity Production
Electrical Transfer

connection to power company
Heat Recovery

heat exhaust recovery

hot water storage - 180°F

heat exchanger

boiler & pump
Soil Preservation

- Increased nutrient value of the processed manure
- More readily available to crops
- Estimated $40,000 savings in fertilizer
- Manure is a commodity
- Digestate is a soil amendment
Recycled Water

- Reused many ways
- Milk cooling water goes to cow drinking water
- Milk equipment wash water goes for floor washing
- Floor wash water goes to digestor/lagoon
Recycled Newspaper for Cow Bedding

- 4 tons per week
- Minimal costs

- Optimal bedding
- Excellent anaerobic breakdown
<table>
<thead>
<tr>
<th>Component</th>
<th>Projected $</th>
<th>Actual $</th>
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<tbody>
<tr>
<td><strong>Mix Tank/ Manure Collection</strong></td>
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<tr>
<td>Excavation/grading</td>
<td>3,400</td>
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<td>Cement work</td>
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<td>Manure pump</td>
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<td>Other (piping, installing)</td>
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<td><strong>Subtotal</strong></td>
<td>25,900</td>
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<td><strong>Digester</strong></td>
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<td>Excavation/grading</td>
<td>10,600</td>
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<td>Digester tank</td>
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<td>Heating</td>
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<td>Cover</td>
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<td>Start-up</td>
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<td><strong>Energy Conversion</strong></td>
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<td>Building</td>
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<td>Engine-generator/hot water recovery</td>
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<td>Components and installation</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>COST/COW (assuming 1000 cows)</strong></td>
<td>$307</td>
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*Costs for these items are embedded in other items for which costs are shown.
Advantages

- Reduce Odor
- Generation of Electricity
- Thermal Energy Production
- Increase in Fertilizer Value
- Pathogen Reduction
- Weed Seed Reduction
- Greenhouse Gas Reduction - Carbon Credit Value
SUMMARY

"Even if you are on the right track, you will get run over if you just sit there..."

Will Rogers