Pecos Valley Biomass Cooperative’s Feasibility Study for Dry Lot Dairy Manure to Energy

David Belcher & Gerry Greathouse

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Background

- NM = Dry lot dairies in hot arid conditions
- Traditional digestion has not been successful for this type of dairy production
- Pecos Valley Biomass Coop represents 23 dairies & 60,000 milking cows and was formed to identify suitable technologies
- DOE funding was provided to support completion of a comprehensive technical & economic feasibility study
Typical New Mexico Drylot Dairy

Open Lot Area

Feed Apron
Feasibility Study Sampling

- Three different sample events to collect manure solids from 3 different sources:
  - Daily (feed apron) scrape
  - Weekly (whole corral area) scrape
  - Greenwater (milking parlor flush)
- Aug ‘09 – Mar ’10: 29 WS samples from 6 dairies (avg sample size = 46 tons)
- Aug ‘10 – Sep ‘10: 18 WS and DS samples, 3 dairies (avg size = 40 tons)
- Dec ‘10 – Mar ’11: 20 DS samples, 1 dairy, (avg sample size = 5.7 tons)
Sampling
Sampling
Sample Analysis

- Wet Chemistry (e.g. TS, VS, COD, BOD5, pH, N, P)
- Biomethane Production (BMP) potential
- Combustion (e.g. proximate/ultimate analysis, ash fusion temperature)
Total (Wet) Solids/Cow/Day (weekly scrape)
Average Moisture & Solids Content of NM Dry Lot and Freestall Dairy Manure

- Freestall
  - Moisture: 90%
  - Total Solids: 10%
- Apron (Daily) Scrape
  - Moisture: 80%
  - Total Solids: 20%
- Lot (Weekly) Scrape
  - Moisture: 40%
  - Total Solids: 60%
Sample Biomethane Potential (BMP) Testing Results

Average BMP for Weekly Scrape = 0.18 mL CH$_4$/mg VS loaded
Average BMP for Daily Scrape = 0.28 mL CH$_4$/mg VS loaded
Average BMP for As Excreted Manure = 0.32 mL CH$_4$/mg VS loaded
Ash, Volatile & Fixed Carbon Content of Samples (% dry weight basis)
avg = 41.1% moisture
HHV = 2146 BTU/lb

avg HHV = 3686 BTU/lb at 0% moisture
Summary

• There is variation in quantity and quality of manure solids recovered between drylot dairies (attributed to variations in weather and dairy farm practices)

• The digestion potential of manure decreases over time as solids weather and are scraped/moved around the pen area
Summary – cont.

- Do not attempt to mix and digest all corral scrape solids
- Apron scrape manure solids (collected daily) have good digestion potential
- Corral scrape solids are not suitable for digestion unless inorganic fraction can be removed
- Drylot manure solids have combustion potential
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- NMSU Dairy Extension