Digesting Manure in Dry Climatic Conditions
Perspectives from beef operations digesting feedlot manure

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Feedlot Background

- Founded 1983 – Last expansion occurred in 2001
  - Standing Capacity – 36,000 Hd. (finish 50,000 to 70,000 annually)
  - Open Pen, clay – sand pen base

- Climate – Semi Arid
  - Annual precipitation – 17 in. (rain and snow combined)
  - Temperatures – highs 95 to 100 degrees, lows 40 degrees below 0

- Cattle types – All beef breeds
  - Cattle placed on feed as light as 350 lbs and as heavy as 1000 lbs
  - All cattle are feed to slaughter weighing as heavy as 1500 lbs
Anaerobic Digestion at HFL

Project Background

- In 1995 HFL began investigating alternatives for processing manure
  - The initial driver was environmental regulations
  - Outcome process parameters were set including the following; must lower manure handling costs, must conserve water – nutrients - organic matter, must reduce or eliminate pathogens, must be net energy positive.

- Anaerobic Digestion process was selected
  - In 2000 a world wide technology search concluded that no existing technology was suitable for dry, high solids manure produced at the volumes and conditions in North American style feedlots.
  - In 2001 R&D work began to develop specific technology to overcome these challenges
  - In February 2005 the only Thermophilic AD plant of its kind was up and running at HFL.
IMUS is Born

Integrated Manure Utilization System (2005)

- Processes ~110 tons of high-solids feedlot manure and other waste daily
- Produces up to 1MW of continuous electrical output, biofertilizers, heat and reusable water.
IMUS Today

Integrated bioMass Utilization System (2011)

- Currently Processing ~ 275 tons of manure and other bioMass (slaughter house waste, SSO – source separated organics)
- Produces up to 2.5 MW of continuous electrical output, biofertilizers, heat and reusable water.
With the second 2 million ga. digester completed the plant will consume 550 tons of manure and other bioMass

the AD plant will produce a total of 10MW thermal and 2.5 MW electrical energy required for a 10 mgpy ethanol plant currently under construction.
Feedlot Manure

Feedlot manure can be highly variable in quality

- Muddy Pens yield poor manure quality – volatile solids low as 30%
- Routinely harvested pens yield manure with volatile solids of 75%. Beneficial for the feedlot operation because of improved cattle performance and reduced feedlot maintenance.
How do you feed that much high solids manure?

- The 80 ton capacity bulk feeder handles very dry or wet material.
- The feeding system feeds the digesters around the clock separating out oversized objects - large rocks or pieces of concrete.
What happens to the sand – dirt- small rocks??

- We used to try separate it out in the front end. A dismal failure!
- Highmark Renewables was able to develop a Patented continuous digester cleaning system called Clean Slate™
- Sand and Grit is re-used for pen maintenance or could be re-used for bedding in dairy operations
Can yield be proven with such variable manure?

- Our technology provider had this mobile test unit deployed in Kansas for 4 months doing manure to methane yield determination.
- They have another unit operating in the desert climate of Pakistan.
What are the outputs?

- Pathogen free
- Nutrient rich bio-fertilizer
- Irrigation water
- Electricity and Heat
Challenges? Yes

Nothing 10 years of teeth grinding and butt clinching won’t overcome!

- **Capital cost to high for livestock operations to absorb on their own**
  - Requires partnerships with strategic equity and debt sources or third party
  - Build Own Operate model

- **New types of relationships required**
  - Long term supply and off-take agreements
  - Agriculture and Energy partners need a better understanding of each other’s business

- **It's not as easy as we might think and hope**
  - Don’t lose focus on your core business
  - Find experienced partners and technology providers to work with
  - Know your operations inputs and outputs well
  - Performance guarantees will save your back-side but they aren’t easy to get
Thank You All Very Much

Come see us at Highland in Person or visit our Website

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