The Role of Manure Digesters

in Dane County Manure Management

Dave Merritt
Director of Policy & Program Development
Dane County Department of Administration

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What is a Manure Digester?

Basic Anaerobic Digester System Flow Diagram

Digester Inputs
(manure, organic substrates)

Anaerobic Digester → Biogas
Conditioning to remove H₂O & H₂S

Processing to remove CO₂

Supplemental Heat for Digester

Medium-BTU Biogas (600-700 Btu/scf)
Boiler, heater, chiller, etc.

Recaptured Heat

Electricity
Internal combustion engine
(early stage: microturbines, fuel cells)

Biomethane
(900-1000 Btu/scf)
Natural gas pipeline quality, vehicle fuel (CNG/LNG), feedstock

Energy Company
Electric utility, natural gas pipeline, vehicle fueling station

Farm or Neighbor Use
Building heating, greenhouse, food storage, adjacent commercial/industrial needs, etc.

Lagoon/Liquid Storage
Advanced Treatment

Fiber-based Products
Fertilizer (NPK)

Compost
Soil Amendment
Bedding

Discharge
Reuse

Fertilizer for field or greenhouse crops, flush water
Manure Digester Locations

- 1. Clean Fuel Partners (formerly Clear Horizons) near Waunakee

- 2. GL Dairy Biogas – Gundersen Health System near Middleton

- Yahara CLEAN recommends 5 total
Myth – Digesters “Remove” Phosphorus

- **FACT** – a Dane County Manure Digester is a **SYSTEM**, that consists of multiple components, including:
  - manure collection and digestion
  - fiber separation from digestate
  - fiber (phosphorus) export out of the watershed
  - centrate application to fields to meet crop needs according to a land spreading plan

Photo from Gundersen Health System
Two Manure Discharge Events in 2005

1. Lake Mendota
2. Sugar River Fish Kill
Manure Task Force

- Formed by County Executive Falk in 2005, includes the following members:
  - 3 livestock farmers
  - 2 environmental and water quality experts
  - 4 county board supervisors representing urban, rural interests along with the Land Conservation Committee and Lakes & Watershed Commission

- 6 Meetings
Short-term Recommendations

1. Require a permit and winter spreading plan for spreading manure on snow-covered or frozen ground

2. Encourage professional waste haulers to join a professional nutrient applicators association

3. Provide county funding for technical assistance and to expand manure storage facility capacity

4. Require an emergency response plan for permit holders (spreading and storage permits)
Long-term Recommendations

- 1. Regional Manure Facility
  (anaerobic digesters to process manure)
  - Generates methane for renewable energy
  - Separates fiber
  (export biosolids with phosphorus out of watershed)
  - Provides emergency storage
Long-term Recommendations (cont.)

2. Explore Municipal Treatment of Manure

3. Match Manure Supply with Demand (brokering between livestock producers and cash grain operations)

4. Conduct a Feasibility Study on Anaerobic Manure Digesters
Community Manure Feasibility Study

- Study (2006 – 2008) evaluated options that would meet county’s nutrient management goal.
Factors Evaluated

- Size (individual vs. community)
- Technologies (advanced solids separation, advanced phosphorus separation and recovery, anaerobic digester and methane recovery)
- Economics (current manure handling costs, alternative systems analyses, challenges, costs)
- Financial assistance
- Alternative business structures (individual farm operation, cooperative ownership, third-party technology, power utility and investment company, cooperative or government ownership)
- Non-monetary impacts
Anaerobic Digestion

- Increases availability of plant-available nutrients
- Reduces odors and pathogens
- Produces a renewable fuel
- Provides a consistent product for post secondary processing of nutrients
Non-monetary Impacts

1. Phosphorus Reduction
2. Water Quality Impacts
3. Air Quality Impacts
4. Maintaining Green Space/Water Quantity
5. Maintaining Working Farmland/Culture
6. Nutrient Transportability
7. Greenhouse Gases and Potential Credits
8. Production of Renewable Energy
9. Aesthetics/Nuisances
10. Safety Issues - Farm/Commuter Traffic
11. Impact on Roads/Truck Traffic
12. Animal Disease Control
13. Status of Technology; Reliability
14. Ease of Operation
15. Expandability
16. Ability to Treat Other Feedstocks
17. Regulatory and Permitting Issues
The Dane County farming community is interested in developing manure management strategies.

Currently many Dane County farms have long hauling distances and need to rent land for land application of the manure.

Water quality impacts from land application of manure have been shown to be significant, and manure is a major source of phosphorus loading (and other nutrient loading) within the Upper Lake Mendota Watershed.
Cluster manure management strategies appear to offer significant economies of scale with respect to capital costs compared to the individual farm systems.

Several of the cluster management strategies have significantly lower annual O&M cost projections than the existing annual O&M costs at the farms especially energy recovery alternative.
Current

- Two Manure Digester Projects
- Community Manure Storage Cost Share Program
  - UW-Madison BSE Manure Management Study
- Nutrient Concentration System

Photo from M. Kakuska
Questions