Environmental Regulation of Anaerobic Digestion

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Environmental Regulation

- Air: Emissions
- Water: Discharges
- Land: Contamination
Looking at a Source
Environmentally, you are concerned with:

• Location relative to resources;
• Exposure of potential pollutants to these resources preventing beneficial use of the air, waters of the State (ground and surface), and land.
Major Environmental Laws

- Clean Air Act
- Clean Water Act
- RCRA, CERCLA
- Community Right to Know and Toxic Release Inventory
So, looking at any manure use

- You look at potential:
  - Air emissions;
  - Water discharges; and
  - Land contamination

- Disposition of by-products of the process.
So, What Can Be Done With Manure?

(Source: Promising Manure-to-Energy Technologies for the Chesapeake Bay Watershed – A Technology Summary-September 2011)

• Fertilizer

• Manure to Energy
  – Thermochemical Processes
    • Combustion (ample O2);
    • Gasification (little O2 added);
    • Pyrolysis (no O2 added);
    • Torrefaction (no O2 added);
    • Drying (moisture removal)
Thermochemical Processes

• Pros
  – Concentrates nutrients;
  – Converts nitrogen to N2;
  – Systems more scalable for farm use; and
  – Well-suited to use dry material such as poultry litter.
Thermochemical Processes

• Cons:
  – high capital costs;
  – lack of experience using manure as an energy feedstock; and
  – concerns about pollutants in air emissions)
Thermochemical Processes

• Byproducts
  – Ash
  – Biochar
  – Syngas
  – Liquid Fuel
  – Heat
Manure Disposition 2

• Biological Processes
  – Anaerobic digestion (can produce energy)
  – Composting (no energy production)
Biological Processes

• Pros
  – Well-known with a long history of use to produce methane;
  – Potential to reduce greenhouse gases if methane is converted to CO2;
  – Used by some farms to control odors;
  – Sludge produced retains use as fertilizer;
  – Solids can be recycled as dairy bedding or soil amendment;
  – Well-suited for high-moisture manure slurries.
Biological Processes

• Cons
  – Requires large area for manure containment;
  – Can be very capital intensive;
  – Volume of nutrient-rich byproduct left is large.
Biological Processes

- Byproducts
  - Heat
  - Electricity
  - Liquid
  - Solid
Summarizing Uses of Manure – Organic Fertilizer

• Apply to land instead of chemical fertilizer
• Pros
  – Slower release than chemical fertilizer
  – Not only supplies nutrients, but enhances soil attributes (soil amendment)
  – Contains few contaminants, unlike sewage sludge
• Cons
  – Supplies both nitrogen and phosphorus, when only nitrogen may be needed
  – Bad reputation
Summarizing Uses of Manure – Source of Energy

• Burn or Anaerobically digest to generate methane

• Pros
  – Cheap energy source
  – Reduces volume

• Cons
  – Does not remove nutrients
  – Eliminates source of income for farmers
Anaerobic Digestion

• Usually Anaerobic Digestion is a treatment process used to remove pollutants from industrial wastewater;

• In this case, it IS the industrial process.
Anaerobic Digestion

- Regulated on case-by-case basis;
  - Air: Bill Paul will discuss later;
  - Water: How it’s regulated depends on where it’s built.
  - Land: Proper disposal of byproducts
Old Farmers’ Proverb

“It may be manure to you,

but it’s bread and butter to me!”