



**MDE Maryland Department of the Environment**

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# Environmental Regulation of Anaerobic Digestion

**Presented by**

**Gary F. Kelman, Chief, AFO Division**

**Maryland Department of the Environment**

**Agriculture and Environmental Law Conference**

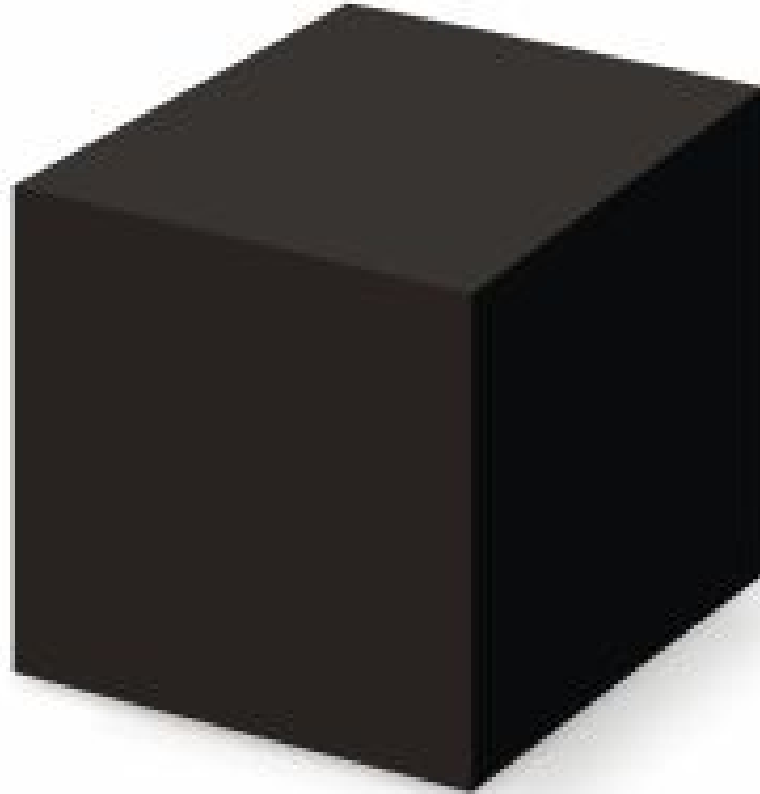
**November 20, 2015**



# 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 O<sub>2</sub>);
    - Gasification (little O<sub>2</sub> added);
    - Pyrolysis (no O<sub>2</sub> added);
    - Torrefaction (no O<sub>2</sub> added);
    - Drying (moisture removal)



# Thermochemical Processes

- Pros
  - Concentrates nutrients;
  - Converts nitrogen to  $N_2$ ;
  - 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 CO<sub>2</sub>;
  - 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!”



# **Maryland Department of the Environment**

## **Land Management Administration Resource Management Program Animal Feeding Operation (AFO) Division**

**Gary F. Kelman, MS, CEP  
Chief, AFO Division**

**410-537-4423    [gary.kelman@maryland.gov](mailto:gary.kelman@maryland.gov)**

