ANAEROBIC DIGESTION – A TOOL FOR RECYCLING ORGANICS

Mike Kopansky, Miller Waste Systems
PRESENTATION OUTLINE

- Evolution of Organics Management
- Feedstock Characteristics
- Basics of Anaerobic Digestion
- Anaerobic Digestion Technologies
- Management of End Products
- Environmental Benefits
- Elements required for success
EVOLUTION OF ORGANICS DIVERSION

- Outdoor Windrow Composting
EVOLUTION OF ORGANICS DIVERSION

- In-vessel Composting
EVOLUTION OF ORGANICS DIVERSION

- Anaerobic Digestion
FEEDSTOCK CHARACTERISTICS

Feedstock for Windrow Aerobic Composting

Feedstock for In-vessel Aerobic Composting

Feedstock for WET & SLURRY Anaerobic Digestion
ANAEROBIC DIGESTION AT A GLANCE

- Digestion of organic matter in the absence of oxygen.
- Completely enclosed – Odour potential substantially less than aerobic composting.
- Reaction pathways are more complex than those of aerobic composting.
TYPES OF ANAEROBIC DIGESTION

- **Thermophilic** - 50-60°C
- **Mesophilic** - 30-40°C

**Primary AD Categories:**
- Wet digestion (typically < 15 % TS)
- Dry digestion (typically > 30 % TS)
- “Slurry” digestion
ANAEROBIC DIGESTION TECHNOLOGIES

- Wet AD (low solids)
ANAEROBIC DIGESTION TECHNOLOGIES

- Dry AD (high solids)
ANAEROBIC DIGESTION TECHNOLOGIES

- Slurry AD (medium solids) – Miller utilizes Yield/FITEC AD technology
FITEC- HIGH SOLIDS WET AD SYSTEMS

- YIELD/FITEC AD Technology - since 1997 and over 14 plants constructed.

- Two Main Strengths:
  - Removes physical contraries before digestion.
  - Self cleaning digester tanks.
WHAT GOES IN MUST COME OUT
DESIGN CRITERIA/KEYS TO SUCCESS

- Understanding feedstock and market conditions

Feedstock generation chart

- Food Waste
- Leaf and Yard Material
DESIGN CRITERIA/KEYS TO SUCCESS

- Digester size
- Pre-treatment techniques
- Material selection
- Water addition
- Temperature control
- pH control
- Micronutrient balance
- Hydrogen sulfide production
MANAGEMENT OF SYSTEM OUTPUTS

- Outputs often greatly influence the economics and viability of a project

- Biogas:
  - 60% CH\(_4\)
  - 40% CO\(_2\)

- Digestate:
  - Nutrient rich digester effluent
Usage of Biogas – Option 1

- Feed In Tariffs (NS COMFIT rate $0.175/kWh)
- High efficiency (~40%) renewable electricity generation.
- Capture and integration of waste heat into process and for other beneficial use.
USAGE OF BIOGAS – OPTION 2

- Production of Renewable Natural Gas (RNG).
- After biogas treatment, high purity RNG can be injected into NG grid.
- RNG can be used as fuel for transit, waste collection & municipal vehicles.
DIGESTATE UTILIZATION

- Digestate can be taken directly from the digester and applied to agricultural lands as an organic fertilizer substitute.
- Alternatively, the digestate can be dewatered, extracting the solids for marketing as a compost product and treating the wastewater for discharge.
ENVIRONMENTAL AND MUNICIPAL BENEFITS

- Generation of renewable energy (electricity/RNG),
- Potential for production of a pathogen free, local source of nutrients for agriculture use,
- Diversion of organics from landfill and opportunity to recycle nutrients back to the soil,
- Reduced greenhouse gas emissions
“A LOT OF THINGS NEED TO GO RIGHT”

- Timing is critical – successful, cost effective programs need;
  - Department of Environment approval – Siting and operating permit (most jurisdictions require environmental permit if receiving off farm waste),
  - Department of Energy - Commitment for FIT and/or RNG premiums,
  - Energy utility must have infrastructure in place to accept electricity or RNG,
  - Department of Agriculture is utilizing digestate onto farmland,
  - Municipal contract or feedstock supply agreement – no feedstock, no tip fee revenue, and no energy revenue,
  - Need reliable technology that matches feedstock characteristics,
  - “Like herding cats”
IN SUMMARY

- Anaerobic digestion can help municipalities increase organics diversion/recycling
- FIT contracts provide significant revenue to offset some of the costs.
- Choose the right technology for the feedstock to be processed – needs to be robust & reliable,
- Need reliable feedstock supply,
- Ensure the production of a consistent and high quality end product to ensure sustainable program.
QUESTIONS?

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