A Standard Protocol for Evaluating the Performance of Anaerobic Digestion Systems Used by Livestock Producers

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Support

• The Association of State Energy Research and Technology Transfer Institutions (ASERTTI)

• The U.S. Environmental Agency’s AgSTAR Program
To provide a standard for evaluating and reporting the performance of manurial biogas systems and including reports in a national database such as the ASERTTTI distributed generation performance database.
Structure of the Protocol

- Prerequisites for performance evaluations
- Specification of required background information
- Requirements for characterizing performance with respect to:
  - Waste stabilization
  - Biogas production and utilization
- Standards for economic analysis
Prerequisites for Performance Evaluations

• Full-scale systems located on commercial livestock operations
• A minimum of 12-months in duration
• Steady-state conditions after completion of start-up
Required Background Information

• Name, location, and type of operation
• Type, age and number of animals
• Type of manure handling system
• Type of digester and design details
• Type of biogas utilization system with design details
• Source(s) of revenue from biogas production
Waste Stabilization

• Parameters:
  – Minimum: TS, TVS, COD, TP, and pH
  – Optional: TVA, TKN, ON, NH$_4$-N, indicator organisms, pathogens

• Sample collection: representative composites of 24-hour flows

• Frequency of sample collection: monthly or semi-monthly?

• Sample preservation and analytical methods
Biogas Production & Utilization

• Measuring production: total and utilized
• Biogas composition: \( \text{CH}_4, \text{CO}_2, \text{H}_2\text{S}, \text{and NH}_3 \)
• Utilization:
  – Generating electricity: kWh generated, thermal conversion efficiency, and waste heat recovered and utilized
  – Boiler fuel: Conventional fuel Btu replaced
• Reporting standards: The per animal day problem with co-digestion
Economic Analysis—Costs

- General approach: an independent enterprise
- Boundary conditions: exclusions and inclusions
- Annual capital cost: cannot exclude recovery with interest of an owner’s investment
- Annual operating and maintenance costs: a better basis for estimation is needed
Economic Analysis—Revenue

• Valuing on-farm energy use: rate structure differences and demand charge impacts need to be included

• Revenue from by-products: what is valid and what is not
Thank-you

Questions?