

# ANAEROBIC DIGESTION

## Performance Evaluation of Seven on-farm Digesters in NYS

### OBJECTIVES

- Monitor baseline performance of 7 digesters in New York State
- Follow the protocol developed by the Association of State Energy Research and Technology Transfer Institutions and USEPA AgSTAR program
- Evaluate economic viability of digester systems
- Investigate optimization opportunities

### DATA COLLECTION AND EVALUATION

Information describing the project farms and systems needs to be put in context, so that farms considering AD can apply this information to their specific situation. This includes:

- Flow diagrams with planned material balances
- Major equipment design parameters and specifications
- Number of animals
- Bedding type, amount and characteristics
- Other amendments: washwater, food waste, feed waste

**Inputs:** In order to size and select the components of a planned system, the characteristics of the influent, the effluent, and the percent change of each of these components needs to be estimated.

- Total Volatile Solids (TVS)
- Total Volatile Acids as Acetic (TVA)
- Total Solids (TS)
- Chemical Oxygen Demand (COD)
- pH

For farms with co-digestion of food waste, components analyzed are:

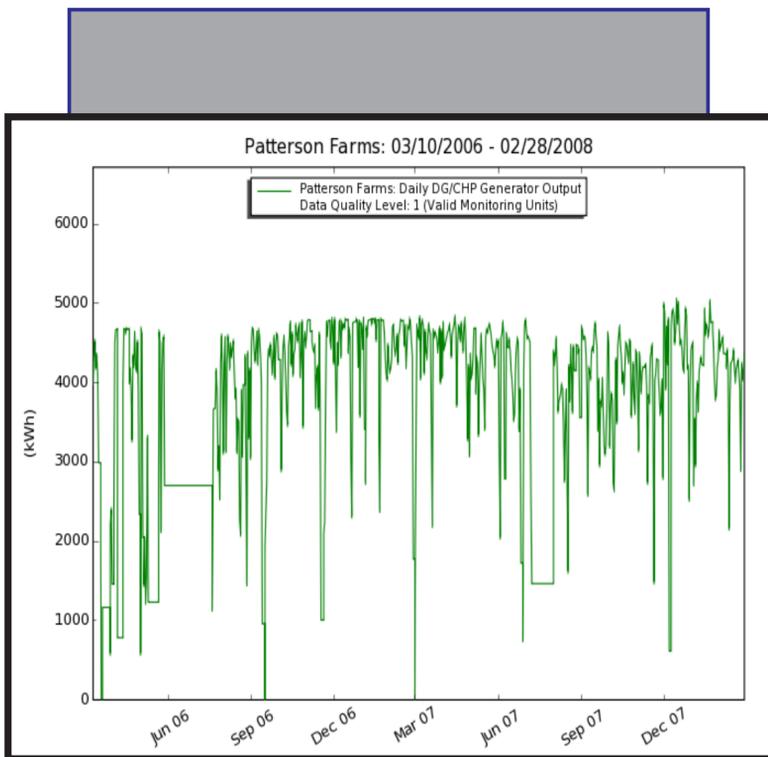
- Ammonia ( $\text{NH}_3\text{-N}$ )
- Total Phosphate (TP)
- Potassium (K)
- Total Kjeldahl Nitrogen (TKN)
- Ortho phosphate

**Outputs:** The expected biogas, power and heat production is needed in order to estimate the size of the gas utilization system information collected includes:

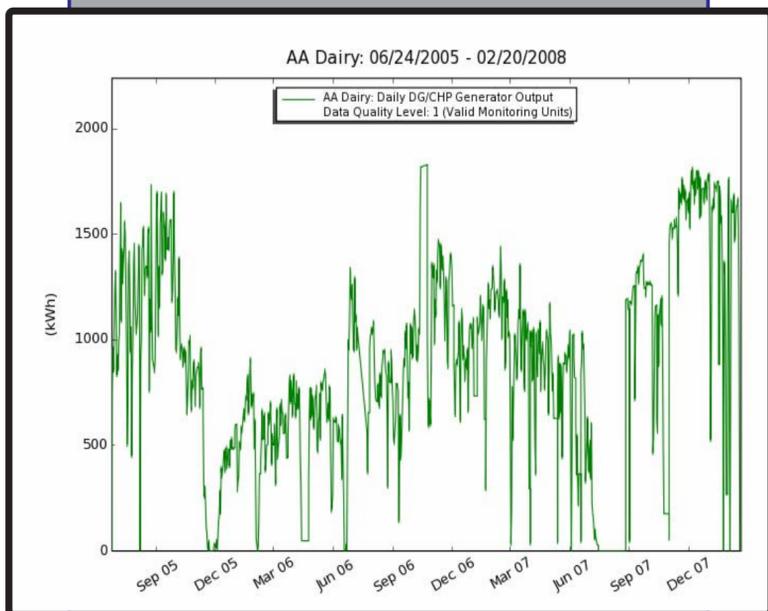
- Energy (Btu) to heat digester
- Biogas concentrations ( $\text{CO}_2$ ,  $\text{H}_2\text{S}$ )
- Energy (kWh) generated
- Thermal energy (Btu) recovered
- Biogas Production (gross)
- Energy offset by production (kWh)

**Economic data** is vital to show the actual capital costs, operating costs, and potential value-added revenue of products such as electricity, gas, heat - all important for projecting profitability. Data collected includes:

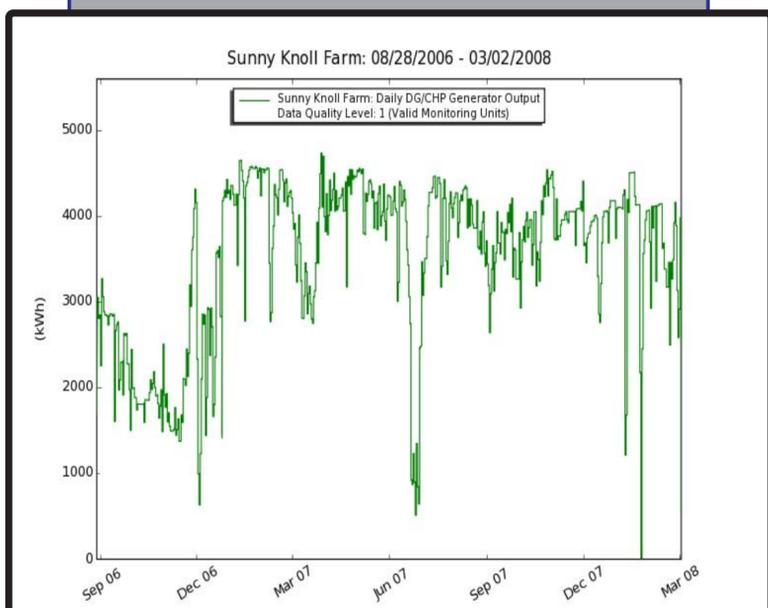
- Capital investment
- Electric cost savings and revenues
- Heating cost savings
- Savings in bedding purchases
- Operating costs (eg. oil changes, repairs)



Patterson Farms engine-generator set output in kWh/day over a 31-month period



Engine generator power output in kWh/day over a 33-month period



Sunny Knoll Farms power output in kWh/day over a 17-month period

