

Bioenergy Research Activities at Coastal Plains Soil, Water & Plant Research Center

USDA-ARS
Florence, SC

Sys involved

- ▶ Kyoung S. Ro, Environmental Engineer
- ▶ Keri Cantrell, Agr./Environmental Engineer
- ▶ Phil Bauer, Agronomist
- ▶ Patrick G. Hunt, RL, Soil Scientist
- ▶ Kenneth Stone, Agricultural Engineer
- ▶ Warren Busscher, Soil Scientist
- ▶ Microbiologist

Current Research Projects

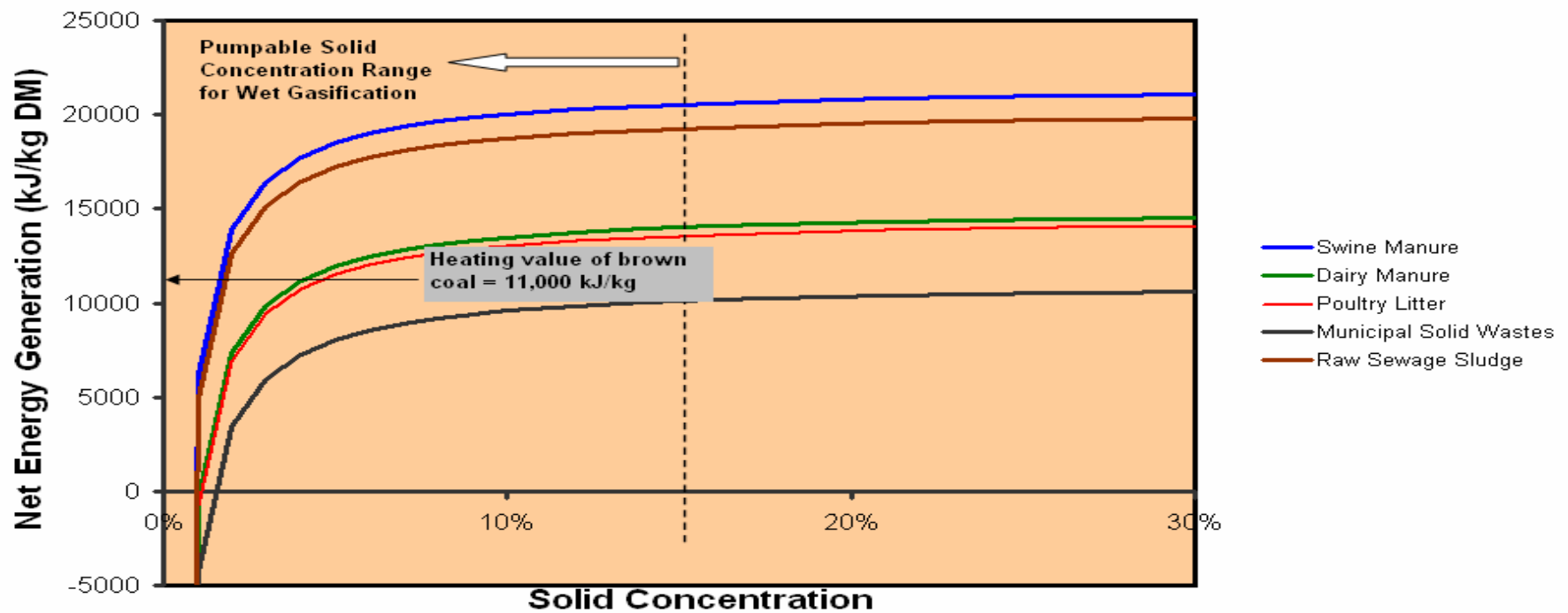


Wet Gasification

- ▶ Paper study to evaluate feasibility of wet gasifying animal wastes
 - D. Elliott of Pacific Northwest National Laboratory
 - Catalytic hydrothermal gasification (350 °C, 20 MPa)
 - Convert animal wastes and biomass into CH₄ and CO₂
 - Produces relatively clean water – livestock drinking water
 - Recover N as NH₃
 - Destroys pathogens, PACs, estrogens



With 90% Efficient Heat Recovery System



Major Findings

- ▶ 4,400 head feeder-to-finishing model swine farm
- ▶ Very high capital, O&M costs (\$375/AU vs. \$85/AU for lagoons)
- ▶ Cost effective and robust catalysts
- ▶ Must remove H₂S, Ca, and P
- ▶ Presented at the 232nd National ACS meeting, San Francisco, Sept. 10-14, 2006
- ▶ Submitted a manuscript to *Industrial Eng. Chem. Research*

Development of 1st generation gasification + conversion system to produce liquid fuel from biomass and animal wastes

- ▶ Evaluate existing dry gasification/pyrolysis systems for synthesis gas production from animal wastes and biomass
- ▶ Effective catalytic process to convert the biomass derived synthesis gas to MeOH or HC
- ▶ Collaboration with Dr. D. Mahajan of Brookhaven National Laboratory – H₂S resistant catalysts
- ▶ Farm-scale demonstration unit

Biohydrogen Production from Animal Wastes

- ▶ D. Mahajan of Brookhaven National Laboratory
- ▶ *Thermatoga neapolitana* – CO free H₂ (about 20% v/v) from glucose + itaconic acid @ 70 °C – can feed directly to PEM fuel cells
- ▶ Evaluate feasibility of using animal manure as C-N source for production of fuel-cell ready H₂

Research Capabilities

- ▶ Separate thermochemical laboratory infrastructure
- ▶ GC, photoacoustic multi-gas analyzer, CN, calorimeter, ICP, HPLC, spectrophotometer, TDLs, autoanalyzers for N species, and other wet chemistry capability
- ▶ Field capabilities to evaluate different biomass species and production practices for bioenergy

Near Future Plan

- ▶ Set up a modular demonstration system to produce liquid fuels from biomass and animal wastes