

Biogas Processing and Utilization

Cornell University in Collaboration
with NYSEG

NYSERDA Contract No. 7250

Department of Biological & Environmental Engineering

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The Cornell University logo, featuring the word "CORNELL" in white serif font on a red square background.

NYSEG

Bruce Roloson, Project Manager



Project Introduction

- 12 Tasks summarized:
 - Biogas characterization
 - H₂S removal
 - Biological adsorption media
 - Aeration
 - Current technologies
 - Current and innovative biogas process techniques
 - Scale-up experiments

Project Introduction

○ Sampling Sites

- DDI*, AA Dairy, Matlink, Noblehurst Dairy
 - Characterization of:
 - raw manure
 - digester effluent
 - feed
 - water
 - raw biogas

○ On-site Experiments & Analysis

- DDI, BEE Cornell, Dairy One (Cornell)

*Most in-situ experiments conducted at Dairy Development Institute (DDI) in Homer, NY

Primary Testing Location

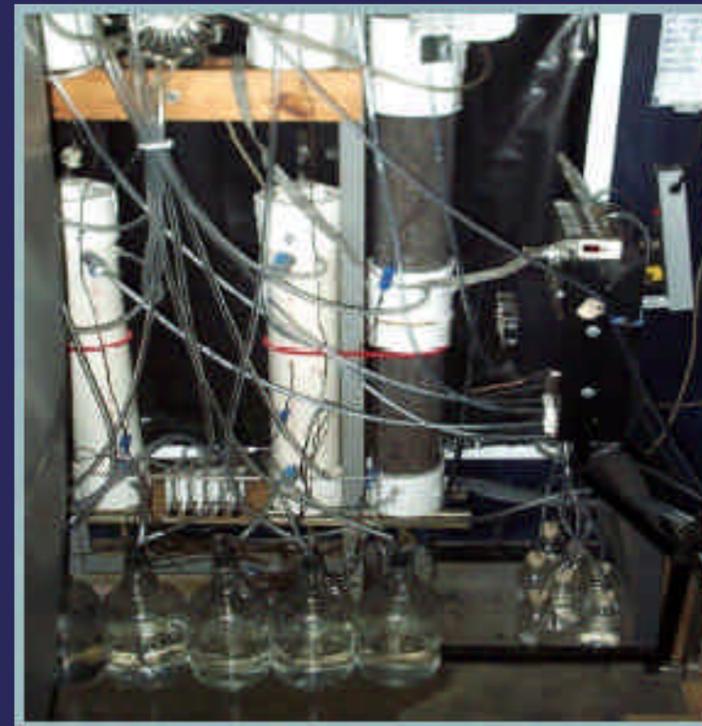
- Dairy Development Institute
- Location of:
 - Cornell experiments
 - NYSEG Gas Chromatograph
 - Microturbines
 - Stirling engine (to be installed)



DDI, Homer, NY

Project Results

- Completion of S.Zicari MS Thesis
- Experimental setup of bench-scale reactors for removal of hydrogen sulfide at DDI
- Recent Paper by Zicari, Hay & Scott "High-Concentration Hydrogen Sulfide Biofiltration from Biogas Using Cow-Manure Compost"



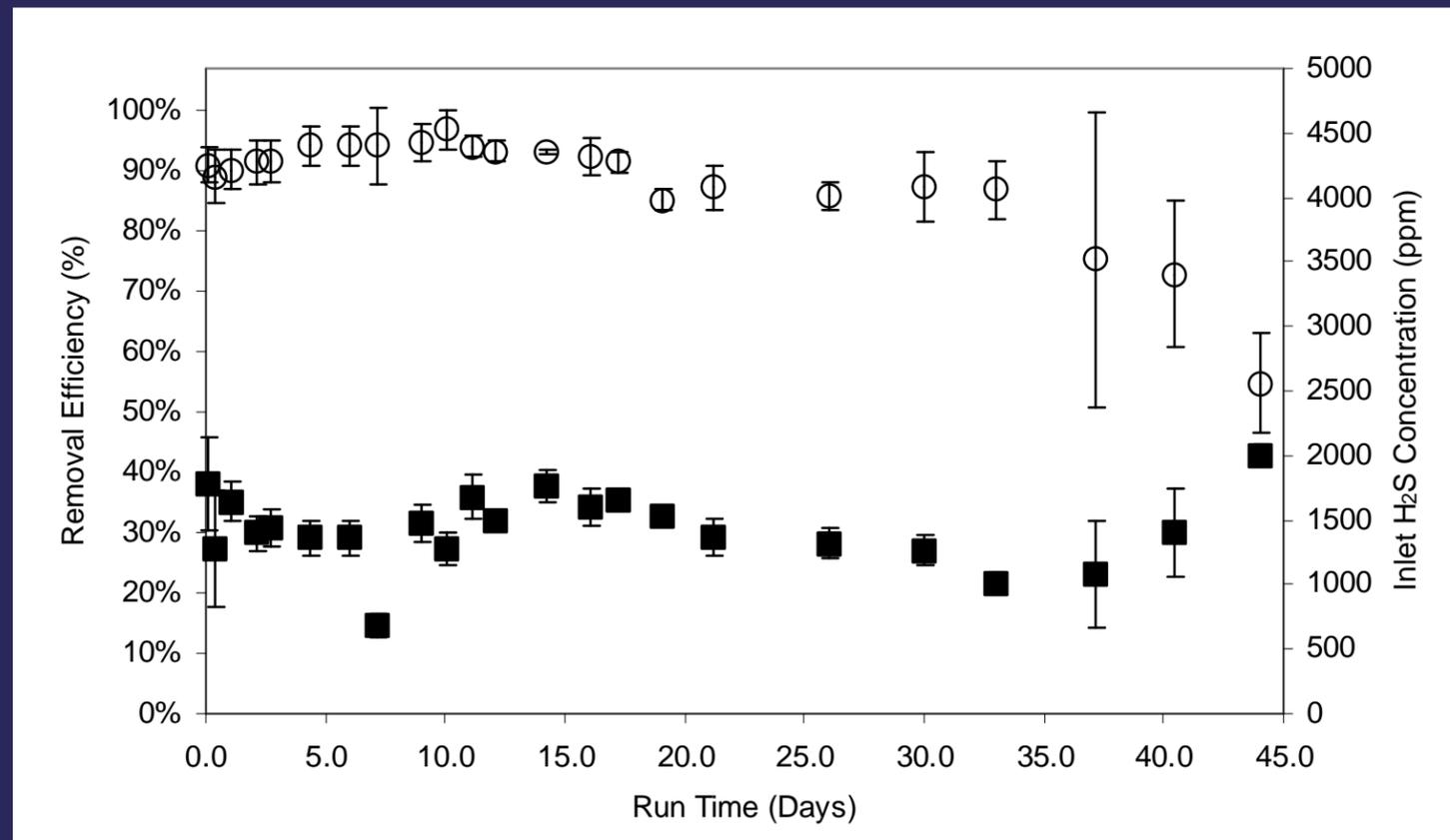
Biogas Properties

Component	Natural Gas (Avg)	Biogas
Methane	95%	50-60%
Carbon Dioxide	1%	38-48%
Trace Components	4%	2%

*Trace Components include hydrogen, hydrogen sulfide, nitrogen, non-methane volatile organic compounds, halocarbons

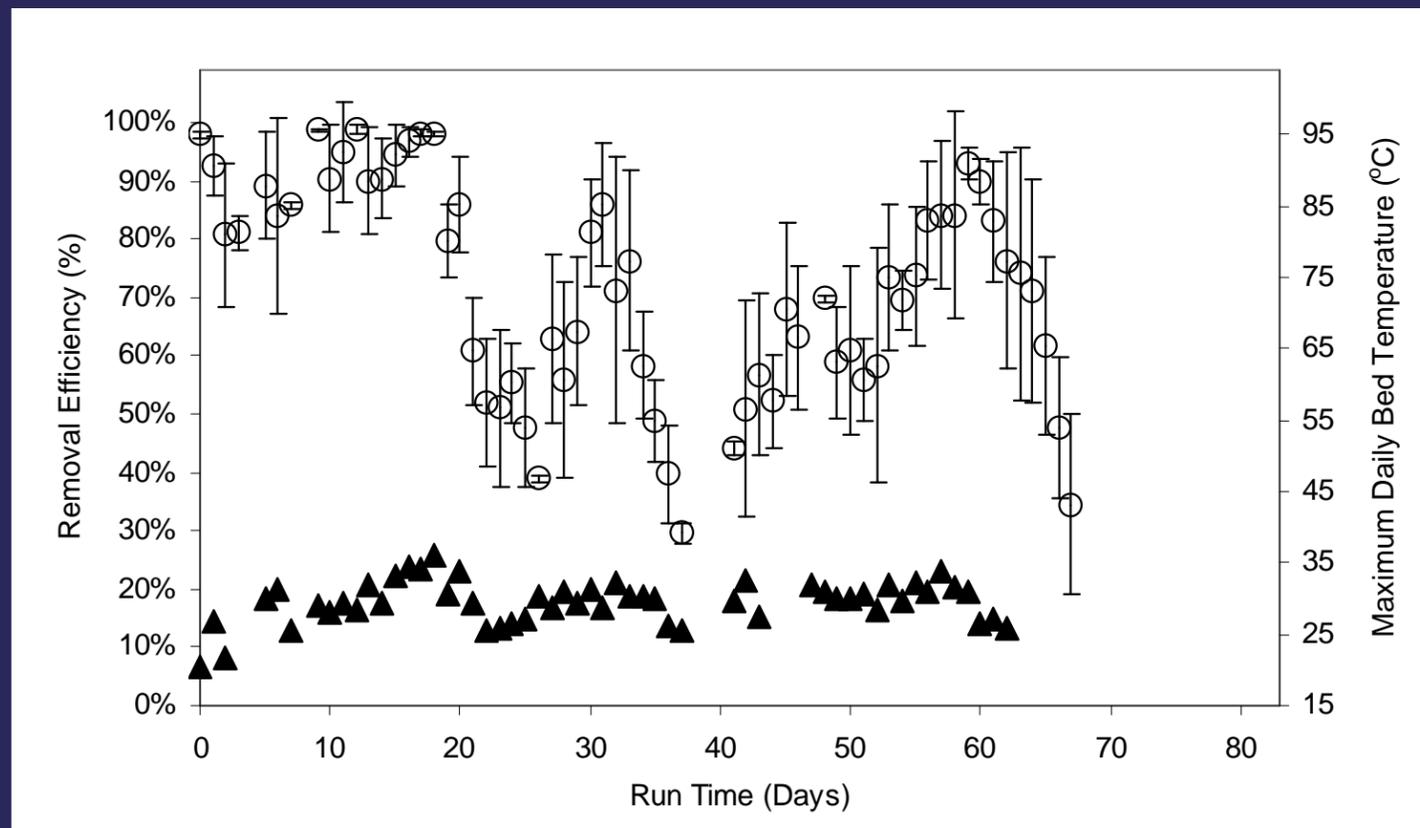
Project Results

Removal Efficiency (O) and Inlet H₂S concentration (■) for Trial A



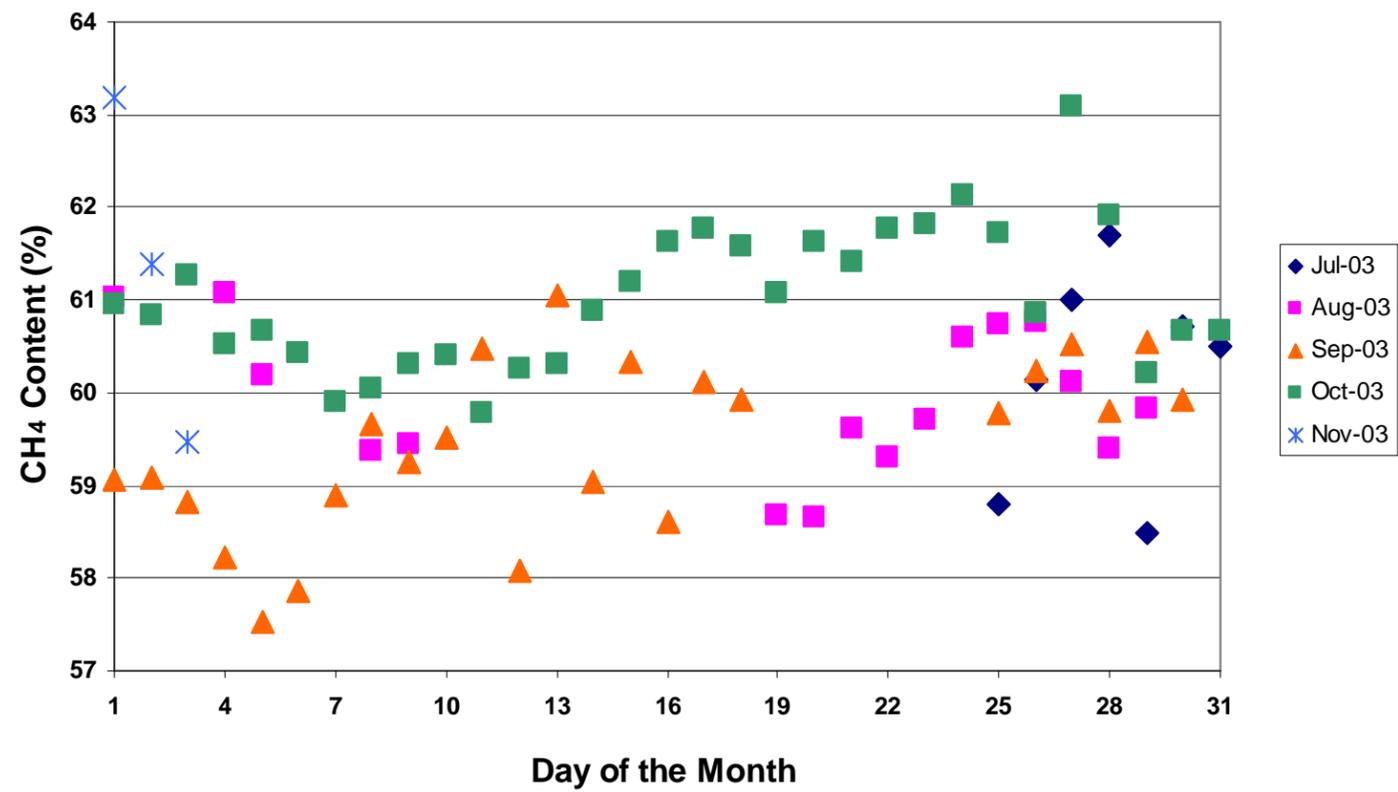
Project Results

Removal efficiency (O) and maximum daily bed temperatures (▲) for trial C



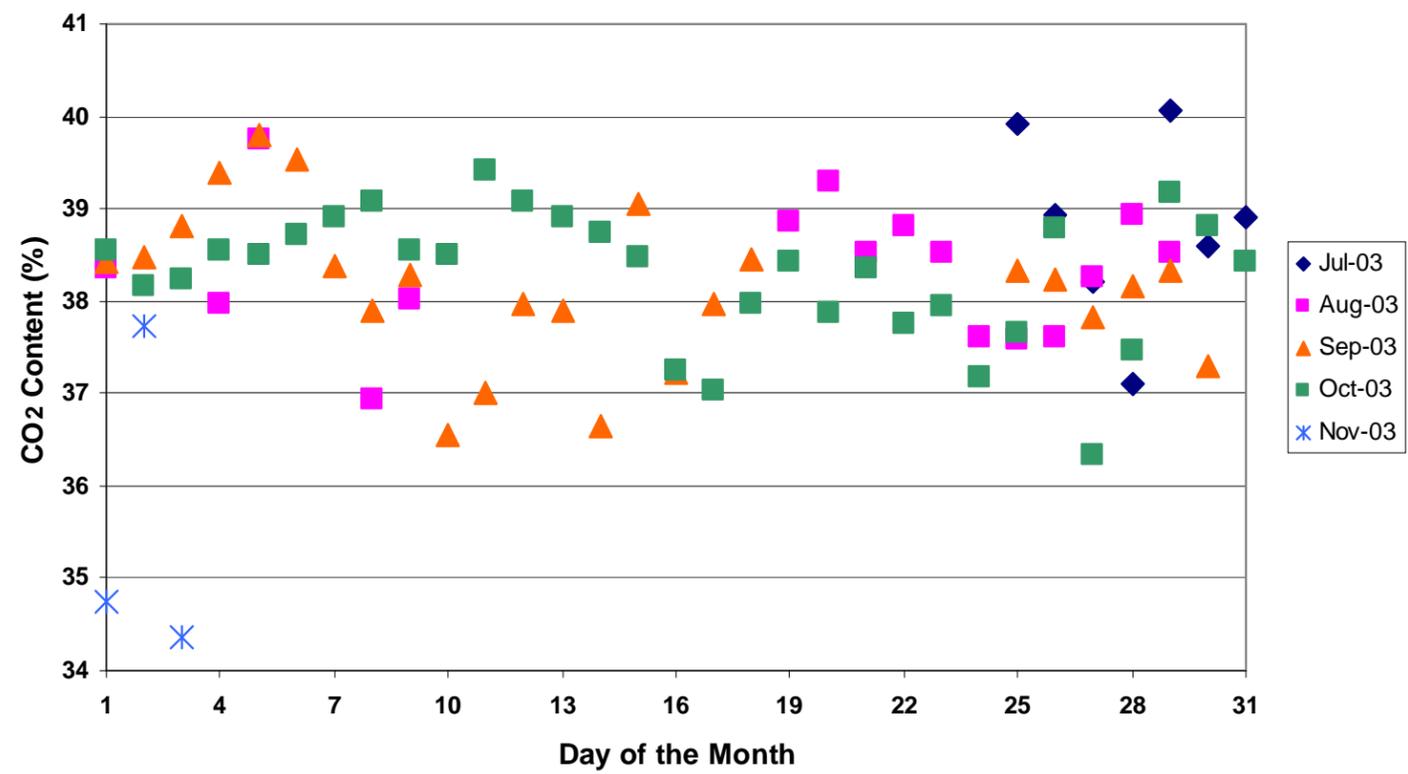
CH₄ Data

Average Daily Methane Content in Raw Biogas (DDI)
July - November 2003



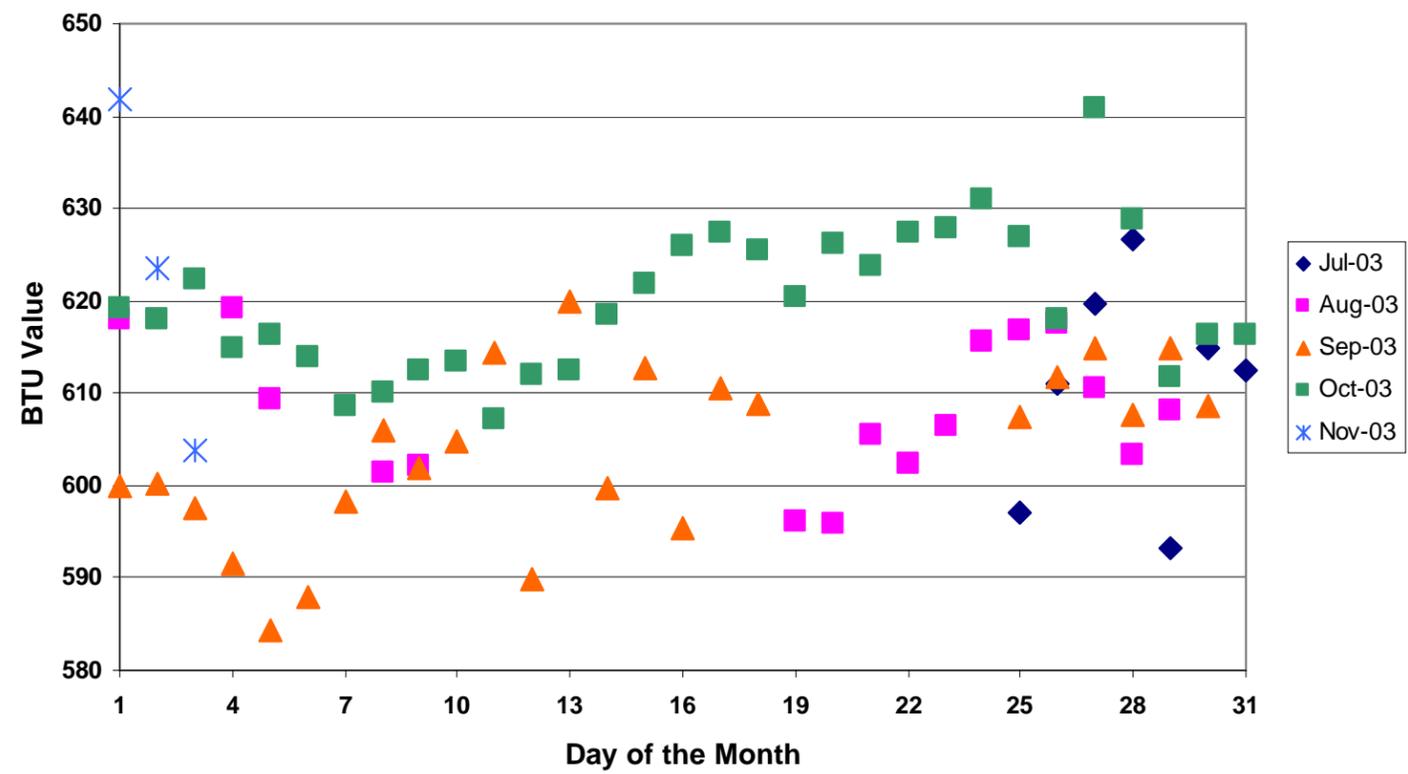
CO₂ Data

Average Daily Carbon Dioxide Content in Raw Biogas (DDI)
July - November 2003

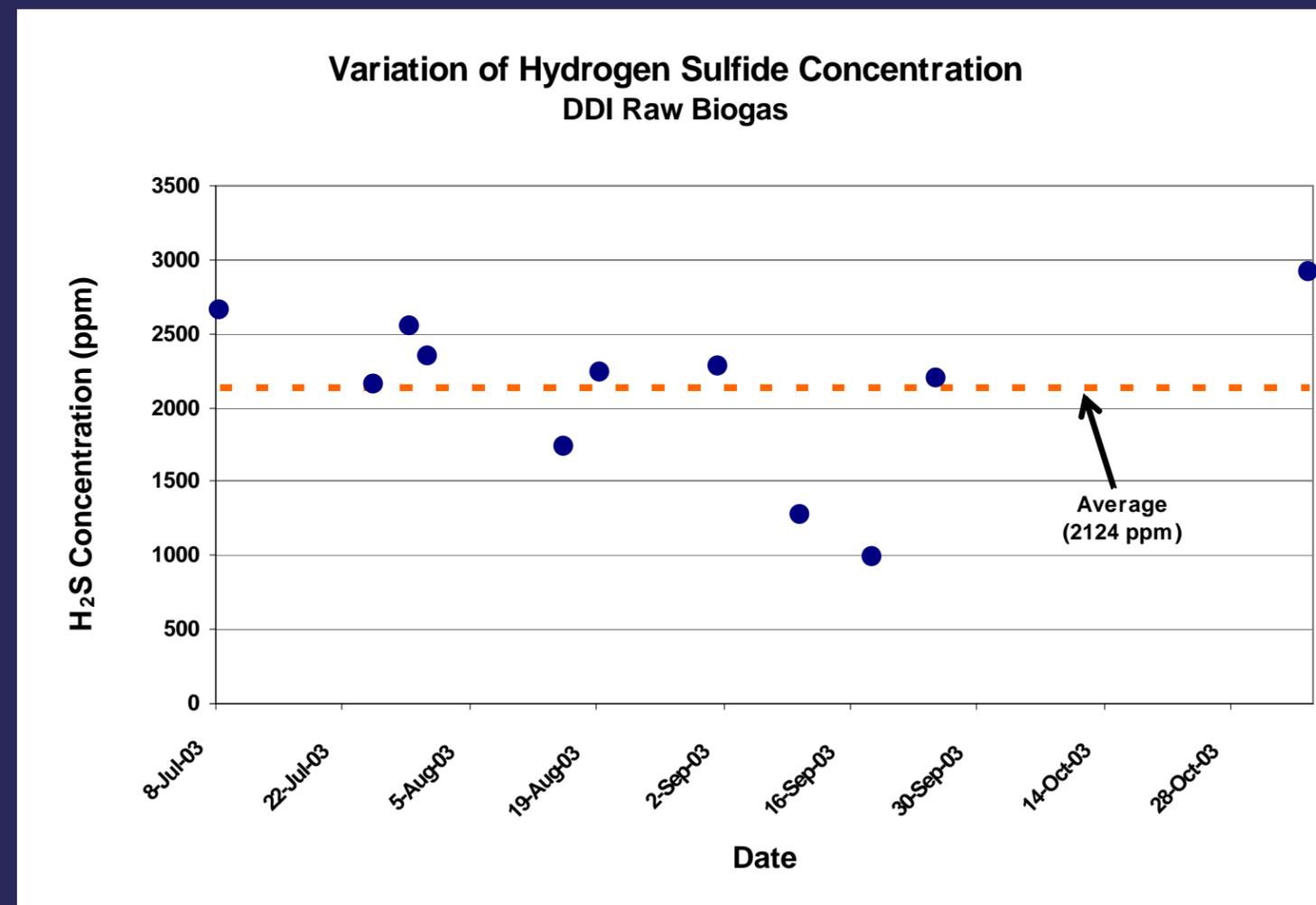


BTU Data

Average Daily BTU in Raw Biogas (DDI)
July - November 2003



H₂S Data



Variation in Raw Biogas Data

Location	Avg H ₂ S (ppm)*
Noblehurst	4628
AA Dairy	2410
Twin Birch	6961
Matlink	580
DDI	2124



AA Dairy, Candor, NY

*More biogas sampling required.

Continued Research

- Perfecting H₂S analysis using Gas Chromatography
 - Tedlar bag studies
- Continued sampling at 4 farms
 - Manure/water/feed characterization
 - Initial results suggest correlation with biogas characteristics
- Scale-up compost reactor to be installed at DDI
 - In co-operation with Triad Technologies, Inc. from Syracuse
- Aeration study
 - 2-phase (in-lab & scale-up at DDI)
- H₂S Adsorption media study
 - Follow-up to Zicari research
 - AC, KIAC, Fe Sponge, Compost

Thank You

