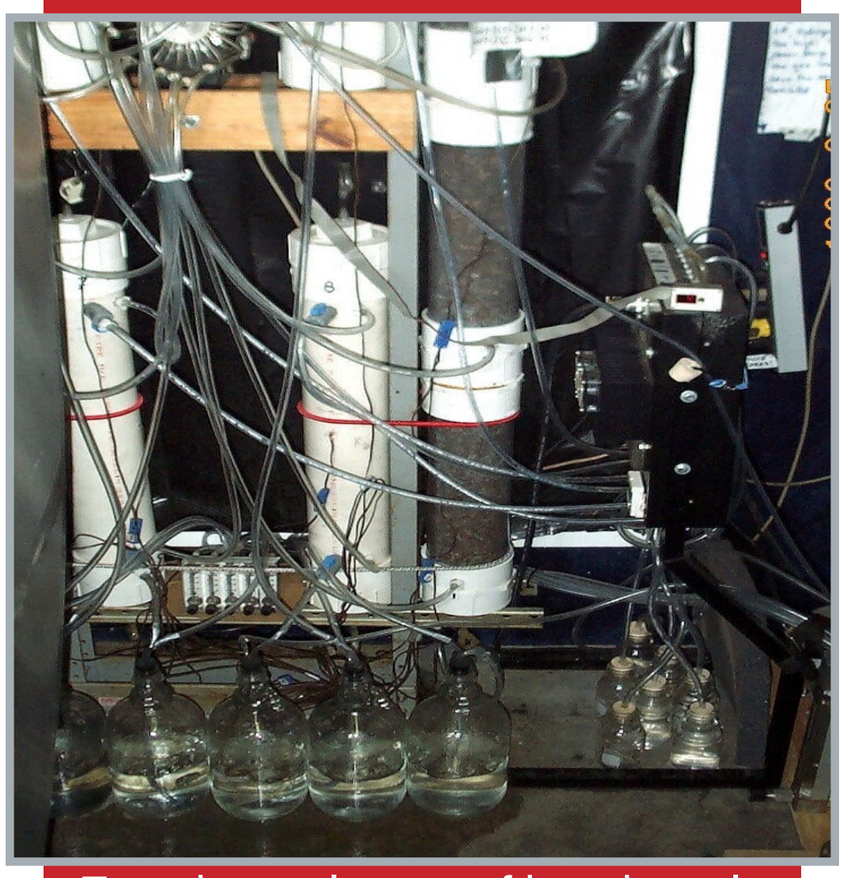
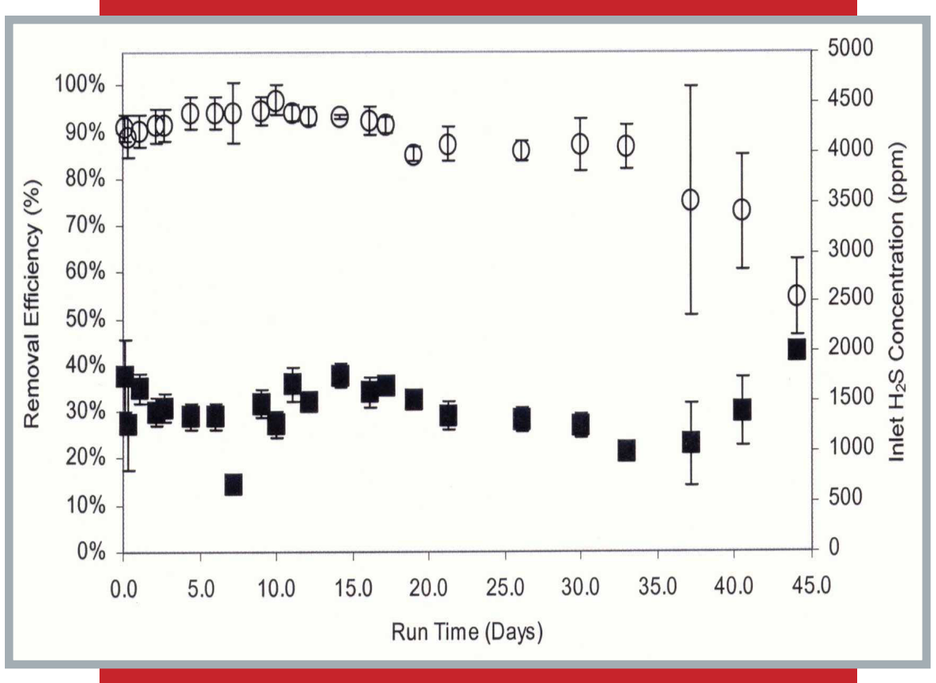


Experimental setup of bench-scale reactors for removal of hydrogen sulfide at Dairy Development International.



Removal efficiencies (○) of hydrogen sulfide from biogas in experimental reactor with manure compost as absorbing media. Inlet biogas concentrations (■).

ANAEROBIC DIGESTION

Hydrogen Sulfide Biofiltration from Biogas Using Cow-Manure Compost

OBJECTIVES

- Evaluate capability of cow-manure compost as a filter medium to remove hydrogen sulfide from biogas produced by anaerobicdigestion.
- Assess the operational characteristics and economics of a farm-scale hydrogen sulfide removal system.

DESCRIPTION OF SYSTEM

Integrated farm energy systems utilize an anaerobic digester (AD) to provide a waste treatment solution, improved nutrient recovery and energy generation potential in the form of biogas. This biogas consists primarily of methane and carbon dioxide plus, smaller amounts of trace gases, particularly hydrogen sulfide (H_2S). H_2S, although present in small quantities (500 – 6000 ppm), is a major problem for internal combustion engines, microturbines and fuel cells. There are numerous chemical, physical and biological methods utilized for removal of H_2S from a gas stream. Many of these methods are expensive, labor intensive and generate a waste stream that poses environmental disposal concerns and risks. Research conducted under NYSERDA Agreement #7250 (collaboration between NYSEG and Cornell) has studied the utilization of cow-manure compost for removal of H_2S from AD biogas using small-scale reactors.

OUTCOME

Slipstreams of AD biogas (approximately 1000- 4000 ppm of H_2S) from an operating system at AA Dairy and Dairy Development International (DDI) were passed through reactor sections of a compost mixture. The mature cow-manure compost (60 days in AA Dairy's outdoor windrow system) was mixed in a 1:1 ratio with dry maple wood chips. Columns have shown over 90% removal efficiency for the early stages of these tests. The removal efficiency (RE) is defined as the difference in inlet and outlet concentrations of H_2S divided by the inlet concentration.

The goal is design of an optimized gas processing technology to decrease operating costs, chemical inputs, and energy use that is associated with gas processing, while possibly providing a use for finished manure compost. Specifically we seek to develope an efficient process which will reduce a technical barrier to the use of AD biogas utilization in operation of IC engine-generator sets, microturbines and fuel cells.

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