Anaerobic Digestion

Introduction

Electricity and Heat Production

The production of electricity and heat from biogas is very effective. Using a methane-powered generator, 300 animal units can produce up to 750 kWh/day, enough electricity to power 30 homes; with more than 300,000 Btu/day of heat production. The electricity produced on the farm is fed into the electrical grid. The addition of organic rich substrates can increase biogas production by more than 4 times.

Greenhouse Gas Reductions

Greenhouse gas emissions can be significantly reduced when manure is anaerobically digested. Methane (CH₄) emissions from a farm digesting its manure can be less than half of the emissions from a farm with no digestion system. Reductions in ammonia (NH₃) and nitrous oxide (N₂O) gas emissions are observed after the land application of digested manure when compared with un-digested manure. Field trials comparing gas emissions from the land application of un-digested manure versus digested manure are being conducted at the AAFC-Ottawa site.

Pathogen and Odour Reduction

Anaerobic digestion of manure will typically reduce pathogen numbers in manure by 99% (2 log reduction). The factors affecting pathogen reduction include the operating temperature of the digester (the higher the temperature the greater the reduction in pathogens) and the amount of time the manure stays in the digester.

The digestion process will also significantly reduce odours from manure as odorous compounds, such as volatile fatty acids (VFA’s), are broken down into methane gas. VFA’s have been shown to be reduced by more than 93% in the Fepro Farms digester.

Project Objectives:

Conduct a complete life cycle evaluation of anaerobic digestion at the medium-sized dairy farm, which includes:
- Assessing energy and heat production
- Assessing fate of nutrients and pathogens (plants, soil & water)
- Evaluating greenhouse gas emissions

Project Partners:

- Dairy Farmers of Canada
- Agriculture and Agri-Food Canada (AAFC)
- Thunder Bay Agricultural Research Station (TBARS)
- University of Guelph – Campus d’Alfred
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
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