



Methane to Markets

The Kindersley Centre, Berkshire

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Department for Environment
Food and Rural Affairs



Mixed Waste Opportunities in AD in Canada

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AD in the Past

- From the early 1970's to mid 1980's
 - Annotated bibliography of farm animal wastes, no farm-scale AD
 - Guidelines for AD: Methane gas production from animal wastes & Biogas production from animal manures
 - R&D on the chemistry and microbiology of AD by NRC in labs and pilot plants
 - Federal Government Support Programs:
 - Development and Demonstration of Resource and Energy Conservation Technology to develop full scale operating model - EC
 - Energy Research and Development in Agriculture to support R&D at farms - AAFC

Issues with Early AD Systems

- Inadequate mixing - solids settling, scum formation
- Corrosion of components
- Plugging and freezing of manure and gas lines
- Design deficiencies - accessibility to components difficult, retrofitting was not practical
- Appropriate equipment and expertise not available
- Limited payback

Present Federal Activities in AD

Federal Government
Departments actively promote
the use of AD including:
Natural Resources Canada
(NRCan), Agriculture and
Agri-Food Canada (AAFC),
Environment Canada (EC),
Industry Canada (IC),
National Research Council
(NRC)

Programs which support the
development of AD in Canada:

- Energy Co-Generation of Agricultural and Municipal Wastes (AAFC)
- Environmental Technologies Assessment for Agriculture (AAFC)
- Technology Early Action Measure (NRCan)
- Industrial Research Assistance Program (NRC)
- Sustainable Development Technology Canada
- Green Municipal Fund (FCM)



Present Federal Activities on AD

NRCan actively promotes the use of AD through R&D

- Feedstock recipes for farm scale digesters
- Digestion of source separated organics from MSW
- Opportunities for energy use and production at MWW plants
- Digestion of Pulp and Paper wastes
- Testing of biogas appliances such as micro turbines and stirling engines



Present AD Activities in Ontario

- Government of Ontario Opportunities:
 - Standard Offer Program
(11c/kWh for biomass base power, +3.52 c/kWh for “peak power”)
 - Mixing manures with off-farm co-substrates
(Exempting on-farm AD systems from Certificates of Approval)
 - Limit of 5000 cu.m of waste/year
(resource utilization instead of waste disposal)

Growing the Margins Energy Conference:
www.gtmconf.ca April 11-14, 2007 London, Ontario

Slide 7

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monrealc, 08/11/2006

AD Energy Cogeneration - Pilot Plants

Cattle: 36,000 cattle in feedlot

Manure processed: 105 m³/d

Digester capacity: 1800 m³ x2

Biogas: 8400 m³/d



Energy: 760 kWe, 974 kWt

Emission Reduction: 6.3 kt CO₂e/yr

IMUS AD system

Himark Renewables Inc. - Alberta

- to develop and commercialize an Integrated Manure Utilization System (IMUS) to manage animal manure using **thermophilic** anaerobic digestion technology to generate biogas for electrical and heat energy, and to produce organic fertilizer and reusable water by recovery and concentration of nutrients in the digested beef manure.



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AD Energy Cogeneration - Pilot Plants



Clear Green Inc. - Saskatchewan

- To demonstrate a **mesophilic** anaerobic digester (AD) system for hog manure coupled with a novel nutrient separation and recovery technology
- To produce biogas for energy cogeneration in a micro turbine owned and operated by SaskPower

AD Energy Cogeneration - Pilot Plants

Hogs: 10,000 marketed/yr

Manure processed: 22 m³/d

Digester capacity: 450 m³ x3

Biogas: 550 m³/d



Energy: 60 kWe, 120 kWt

Emission Reduction: 1.4 kt CO₂e/yr

Bio-Terre AD system

Bio-Terre Systems Inc. - Quebec

- To develop a market-ready system for heat and electrical energy cogeneration from hog manure using a **psychrophilic** (23 degrees Celsius) anaerobic digestion for biogas production in a sequencing batch reactor system.

AD Energy Cogeneration - Pilot Plants

Cattle: 142 milking cows

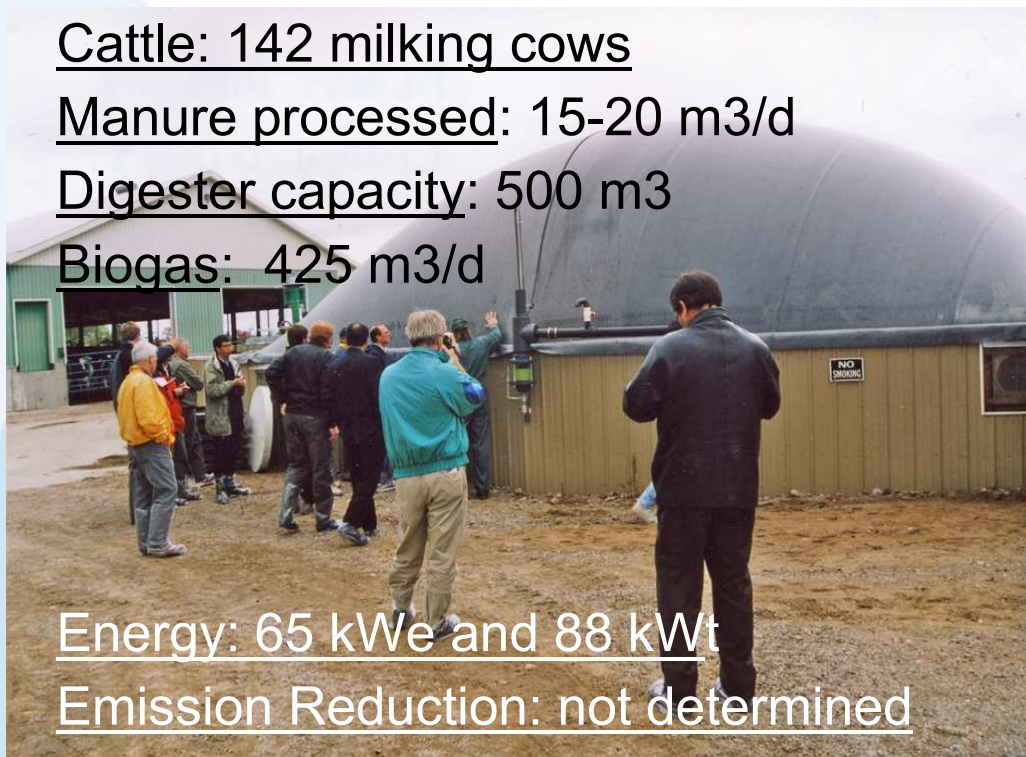
Manure processed: 15-20 m³/d

Digester capacity: 500 m³

Biogas: 425 m³/d

Energy: 65 kWe and 88 kWt

Emission Reduction: not determined



Klaesi Brothers Farm - Ontario

- To demonstrate a **mesophilic** AD system for cow manure
- To produce biogas for energy cogeneration in a 100 Hp Perkins dual diesel/biogas engine capable of generating electrical and thermal energies

Barriers for Adoption of AD

- Technical
 - temperature control, mixing, gas handling & utilization
 - adaptation of AD system components to ILOs
 - utilization of thermal E - (Greenhouses, Ethanol plants)
 - need technology to produce high grade biofertilizer
- Policy/Regulatory/Infrastructure
 - lack of domestic carbon trading system
 - new provincial rules and guidelines
 - insurance, zoning, grid connection
 - transmission limitations (areas with transmission grid limitations)
 - Ontario requires 250 kW minimum production to access power grid

Barriers for Adoption of AD

- Economic
 - high initial capital investment for AD systems
 - find new markets for biofertilizer & new bioproducts
 - economics of pilot plants being determined
 - (price and buyer for electricity exported into power grid)
 - (carbon trading system)
 - (other stimulating policies and programs)

Opportunities for future systems

- Producing renewable energy and biofuels
- Reducing GHG emissions
- Incorporation of off-farm sourced organic residues
- Reducing odours, pathogens and waste volume
- Improve the fertilizer value of livestock manures
- Integration with other technologies to produce other biofuels, bioproducts and new conversion processes

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