Municipal Organic Waste Case Study

City of Edmonton, Alberta to use High-Solids Anaerobic Digestion (also referred to as Dry Fermentation)



Digester Reference

The City of Edmonton, Alberta - along with the University of Alberta and BIOFerm™ Energy Systems - began constructing an anaerobic digester in 2016 to generate energy from organic waste.

BIOFerm's High-Solids anaerobic digester will aid in the City's goals of 90% diversion of residential waste from landfill and greenhouse gas emissions reduction.

By incorporating the anaerobic digester into Edmonton's existing composting operation, this project maximizes value of both digestate and biogas products from organics anaerobic digestion.

Feedstock
Facility is sized to initially process 40,000 tonnes/year high-solids organic waste supplied by the City of Edmonton and the University of Alberta. Facility design, however, can handle 48,000 tonnes/year organics.

Feedstock will primarily include:
- Municipal solid waste
- Source separated organics from industrial, commercial, and institutional waste sectors
- Yard waste

Anticipated Outputs
1.426 MW_{el} combined heat and power (CHP) unit:
- 1.426 MW electrical capacity
- 1.5 MW thermal capacity

Average Annual Energy Production
- 12.5 million kWh electrical
- 45,300 MMBTU thermal

Estimated Energy Could
- Provide electricity to 1,107 homes
- Heat 1,031 homes per year

Emissions Reduced
Methane produced and used is equivalent to the avoided release of:
- 46,000 metric tons CO_2/year

Organic End-Products
- Will produce ~20,000 tonnes/year high-quality compost for sale

Energy Generated Equivalent to Reducing Emissions From
- 10,692 tonns CO_2/year from a conventional bituminous coal facility

Funding
- $10 million in funding has been committed from the Climate Change and Emission Management Corporation

About BIOFerm™

Based in Madison, Wisconsin, BIOFerm™ Energy Systems is a North American provider of turnkey gas processing and anaerobic digestion systems.

We additionally offer a spectrum of biogas services, such as: gas marketing, financing, project development, regulatory and financial oversight, power purchase agreement assistance, and consulting engineering.

Our company has experience from the installation of over 900 PSA systems (including ~90 Carbotech PSA gas processing plants) and over 450 anaerobic digestion facilities worldwide.

BIOFERM™ ENERGY SYSTEMS

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Municipal Organics Management

Community Benefits of Anaerobic Digestion

Food waste and other organics occupy ~30-35% of landfill space, contributing significantly to greenhouse gas emissions, and making organic waste diversion a popular topic for municipalities.

Diverting these organics through anaerobic digestion is an increasingly viable option for cities to create renewable natural gas (RNG), electricity, heat, and sellable byproducts.

However, there are many considerations to be explored before adopting municipal anaerobic digestion, such as selecting the right technology. This can be essential for long-term capital and operating costs.

BIOFerm Dry Fermentation for Municipal Organic Waste Streams
BIOFerm Dry Fermentation digesters are ideal for processing municipal organic waste and can benefit communities through:

- Batch-style process that holds organics stationary, allowing use of contaminated waste streams, and lowering operating cost/susceptibility to damage
- Ability to process a wide range of feedstocks
- Avoiding tipping fee costs to send waste to landfills
- Odor control of organic wastes
- Production of organic compost/sellable organic products
- Potential for faster composting times with digestate, compared to fresh feedstocks
- Renewable energy generation
- Greenhouse gas mitigation
- Opportunity for collaborative private-public relationships

Facility Size and Potential Outputs				
Dry Fermentation Facility Size	**Biogas (scf)**	**Electricity (MWhel)**	**Heat (MMBTU)**	**Gas Gallon Equivalent**
4 chambers	24,000,000	1,800	17,100	115,400
8 chambers	60,000,000	4,400	42,800	288,600
16 chambers	150,000,000	10,800	106,100	721,400
24 chambers	210,000,100	15,200	149,800	1,010,00

The table above illustrates potential energy outputs in the form of biogas, electricity, heat, and fuel for various BIOFerm Dry Fermentation facility sizes. The number of system chambers depends on feedstock amount/type, with a 4 chamber system starting at ~7,000 tons/year.

Food Waste Sources Sorted by Contamination Level			
Food Waste Source	**Examples**	**Contamination Description**	**Contamination Level**
Food & beverage manufacturing	Snacks, baked goods, meat/poultry processing, dairy goods–cheese, ice cream, yogurt.	Attention given to CIP chemicals (clean-in-place) for disinfection purposes as those can sometime be toxic to digestion process	1
Pre-consumer	College or hospital cafeteria prep, restaurant prep, grocery delis, etc.	Gloves, packaging, utensils	2
Post-consum-er	Cafeteria and restaurant waste bins	Utensils, paper goods, some glass/ plastic/cans	3

The above table provides an overview of the levels of contamination typically experienced in various types of organic waste sent to municipal anaerobic digesters. These different food waste sources can influence quality of feedstock, technology choice and project economics.