

# InFact

## Solid Waste Gasification – Project Overview

Published by the Edmonton Waste Management Centre of Excellence

### Many potential benefits to gasification research

In another example of leadership in sustainable waste management, research through the Edmonton Waste Management Centre of Excellence has shown that gasification can be used to further reduce the amount of municipal waste the City of Edmonton sends to landfill.

With funding assistance from the Alberta Energy Research Institute, Natural Resources Canada and the Federation of Canadian Municipalities (Green Fund), the Gasification/Co-generation Project investigated using the leftover material, called residuals, that remains following solid waste composting and recycling to produce refuse-derived fuel.

“Even with our successful composting and recycling programs, there is still some material like small bits of mixed plastics and paper left in the residual streams, and it’s



*Enerkem Technologies Inc. operates a gasifier in Spain that processes industrial plastic waste. Edmonton’s gasifier would process residuals from the composting and recycling facilities*

impractical to recycle them in any other way,” says Jim Schubert, Project Manager, Capital Projects, Edmonton Waste Management Branch. “But from a different viewpoint, these residuals do have a lot of heating value. And that is what we are looking at.”

The City of Edmonton, a Centre member, collects about 260,000 tonnes of residential waste and recyclables annually. About 60 per cent is recovered through recycling and composting programs. What remains

ends up in the landfill. Gasification can recover value from that remainder, and reduce the total amount of residential waste going to landfill to 10 – 15 per cent of what is currently produced.

The study involved producing fuel fluff and fuel pellets by processing residuals through a series of screening, air classification, sorting and sizing equipment.

A gasification system is used to transform this combination of mixed plastics and papers, wood and other combustible waste into synthetic gas. Thermal gasification is a process that



*Pellets produced from residual wastes from the City’s composting and recycling facilities*

heats the solid fuel in an oxygen-restricted reaction and produces hot, unburned fuel gases, called “syngas.” This syngas can run engines or boilers, or be used as a chemical building block for many industrial applications, such as production of methanol or hydrogen.

The project verified that the technology could be scaled up to achieve a commercial processing rate of about 100,000 tonnes per year, and has paved the way for a full-scale facility to handle the City’s residual waste. This will be the first gasification facility for residential waste in North America.



*Vincent Chornet*

“We’re looking forward to having a gasification system developed in Edmonton,” says Vincent Chornet, executive vice-president of Enerkem,

a partner in the project. He notes that the Centre of Excellence approach and facilities have been an excellent fit with his firm’s goals, and demonstrate global leadership in waste management practices.



### Edmonton Waste Management Centre of Excellence

The Edmonton Waste Management Centre of Excellence is a not-for-profit joint venture between public, private and academic members. The Centre promotes research, development and training to enhance scientific and applied knowledge in all areas of waste management and facilitates transfer of knowledge to contribute to the protection of public health, the sustainable use of environmental resources and the quality of life locally and globally.

The Centre’s members are: the City of Edmonton, the University of Alberta, the Alberta Research Council, AMEC Earth and Environmental Ltd., Northern Alberta Institute of Technology and EPCOR Water Services Inc.

# A Closer Look

## Scope

The Gasification/Cogeneration Project focused on finding a better way to deal with residuals, the material left over after recycling and composting of municipal solid waste. Gasification technology has the potential to provide a cost-effective method of converting residuals into syngas, a clean alternative energy source. The City of Edmonton's residual wastes are now sent to the municipal landfill. They represent 30 per cent to 40 per cent of the 260,000 tonnes of municipal solid waste the City of Edmonton currently collects per year. This residual waste stream is estimated to be capable of producing approximately 12 megawatts of electricity annually. A full-scale gasification facility must process the residual waste stream at a rate of 12 tonnes an hour to be cost-effective. This second phase of study determined that commercial scale-up is feasible, while also addressing several technical questions.

## Project Leaders



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City of Edmonton  
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Dr. Esteban Chornet  
Chief Technical Officer  
Enerkem Technologies Inc.  
Sherbrooke, Quebec



Dr. Richard Johnson  
Research Scientist  
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## Partners

- City of Edmonton
- Alberta Research Council
- Enerkem Technologies Inc.
- Edmonton Waste Management Centre of Excellence
- Weatherford Canada Inc.

### Funding assistance

- Alberta Energy Research Institute
- Natural Resources Canada
- Federation of Canadian Municipalities

## Goals

- To verify that Edmonton's solid-waste residuals can be cost-effectively converted into refuse-derived fuel (RDF) fluff and RDF pellet form
- To develop a mechanism to feed fluff fuel into the gasifier and confirm that the fluff-fed system performs as well as the already-proven pellet-fed system

- To confirm that air emissions from the system meet required standards
- To develop preliminary cost estimates and business case analyses to determine if commercial scale-up is financially viable.

## Time Frame

- Phase 1: a bench-scale study determined residuals could be processed into RDF pellets, which could be fed into gasification technology developed by Enerkem — 2003/2004.
- Phase 2: evaluation of scale-up requirements and final technical and financial analysis — March 2005 to July 2006.
- Objective of ground breaking for full-scale project by 2009.

## Potential Benefits & Applications

- Development of a clean new renewable fuel source (syngas from biomass) to displace fossil fuels
- Development of a process that can recover value from residual waste and contribute to achieving nearly 100 per cent diversion of residential solid waste from landfill
- Potential to link this technology with other energy conservation objectives such as distributed energy, district heating, and other waste heat applications
- Potential to further develop the technology to produce important industrial chemicals including methanol and hydrogen
- Potential wider application to biomass conversion, including the agriculture and forestry industries.

## Status

- Testing of commercial-scale processing equipment to produce RDF fluff has been completed.
- RDF fluff and pellets were produced and used in trials to ensure that gasification technology would accept both the pellets and the fluff, and that emissions from the process met requirements. The fluff was of key interest because it is the lower-cost option.

## Equipment Specifications

Waste Processing: Vecoplan shredder; General Kinematics air classification de-stoner; Elrus overhead belt magnet; Eriez eddy current separator for non-ferrous metal; Baghouse for dust control. Pelletization and Gasification: California pellet mill (contract service); Enerkem "Biosyn" (Trademark) pilot gasifier, Sherbrooke, Quebec.

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