

INVESTIGATION OF MOST VIABLE TECHNOLOGY FOR ANAEROBIC DIGESTION OF SOURCE SEPARATED ORGANIC WASTES

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Anaerobic digestion (AD) is the process by which biodegradable material is decomposed in absence of oxygen in presence of anaerobic microorganisms.

*part of the integrated waste management that reduces amount of waste disposed and decreases emission of greenhouse gases from the landfills into the atmosphere.

*renewable energy process because biogas (55-60% methane) and fertilizer are the final products of the process.

AD can be generally divided in two phases:

1st phase- complex organic molecules are broken down into monomers further converted to simple organic acids, carbon dioxide and hydrogen, in presence of fermentative and acidogenic bacteria strains.

2nd phase- methane is produced by methanogenic bacteria using the outputs from the previous phase.

Reported biogas yield of different MSW feedstock in AD facilities in EU.

Input	Biogas m ³ /t
Food waste + garden waste	80-90
Food waste+ low level of cardboard	104-112
Food waste+ cardboard+ garden waste	104-112
Food waste+ cardboard	112-136
MSW	112-144

Scope:

1. Investigation of operating AD facilities
2. Experimental work on laboratory-scale AD reactor to identify the biodegradation potential of different constituents of the food waste.

Research methodology:

1. Investigation of industrial-scale AD technologies:
 - Site visits
 - Critical review of literature
2. Identification of the biodegradation potential of different constituents of the food waste:
 - Design and construction of laboratory- scale AD reactor
 - Performing AD treatment on different food waste constituents in laboratory- scale reactor
 - Continuous monitoring of the system performances
 - Analysis of data collected

Dufferin Organics Processing Facility, Toronto, Ontario (DOPF)

General information of the most prominent AD facility in North America:

- Started operation in 2002.
- Source Separated Organic material from Toronto's residential Green Bin and the commercial Yellow bag collection programs.
- Design capacity of 25,000 metric tons, but as of May 2008 was operating at about 190% (187 metric tons per day).
- Capital cost: \$ 10 million.
- Operating cost: \$ 190 per metric ton of feedstock treated.
- Biogas generation- 110 m³ /metric ton of food waste

Technology used: The BTA patented process

- Wet pretreatment system
- Single stage, mesophilic anaerobic digester



DOPF Anaerobic Digester

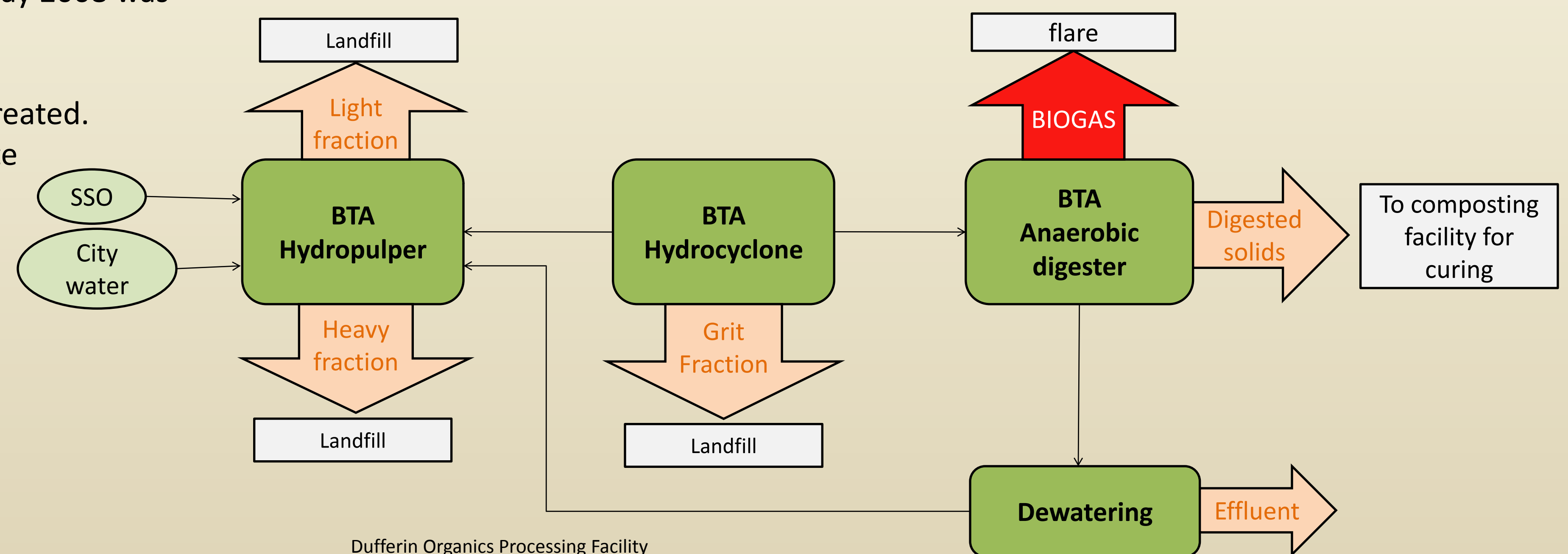


DOPF receiving and processing buildings



DOPF Grid Fraction Residue;

DOPF Digested Solid;



Dufferin Organics Processing Facility

Weaknesses :

- High operating costs
- No revenues from power generation because all biogas produced is combusted in an open flare
- No revenues from carbon credits and sales of finished compost products
- No air emissions monitoring

Future plans:

The City of Toronto has approved the establishment of two new organic processing facilities , each of them with processing capacity of 55,000 metric tons of organic material. Total investment costs of \$70 million (\$ 636.36 per annual ton of capacity)