Fuel Production from Waste Plastic

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Overview

Plastic waste is a growing concern in the B.C. lower mainland, as it continues to accumulate without local treatment facilities available. Additionally, as the depletion of natural resources becomes a growing concern, the demand for an alternative method of fuel production becomes more pressing. This process addresses both issues by transforming consumer waste plastics into various fuel products for commercial use through pyrolysis. Pyrolysis is the decomposition of material at a high temperature in an inert atmosphere. As the population in the lower mainland continues to grow, both the demand for energy and excess of plastic waste will increase, leaving a considerable market for this process.

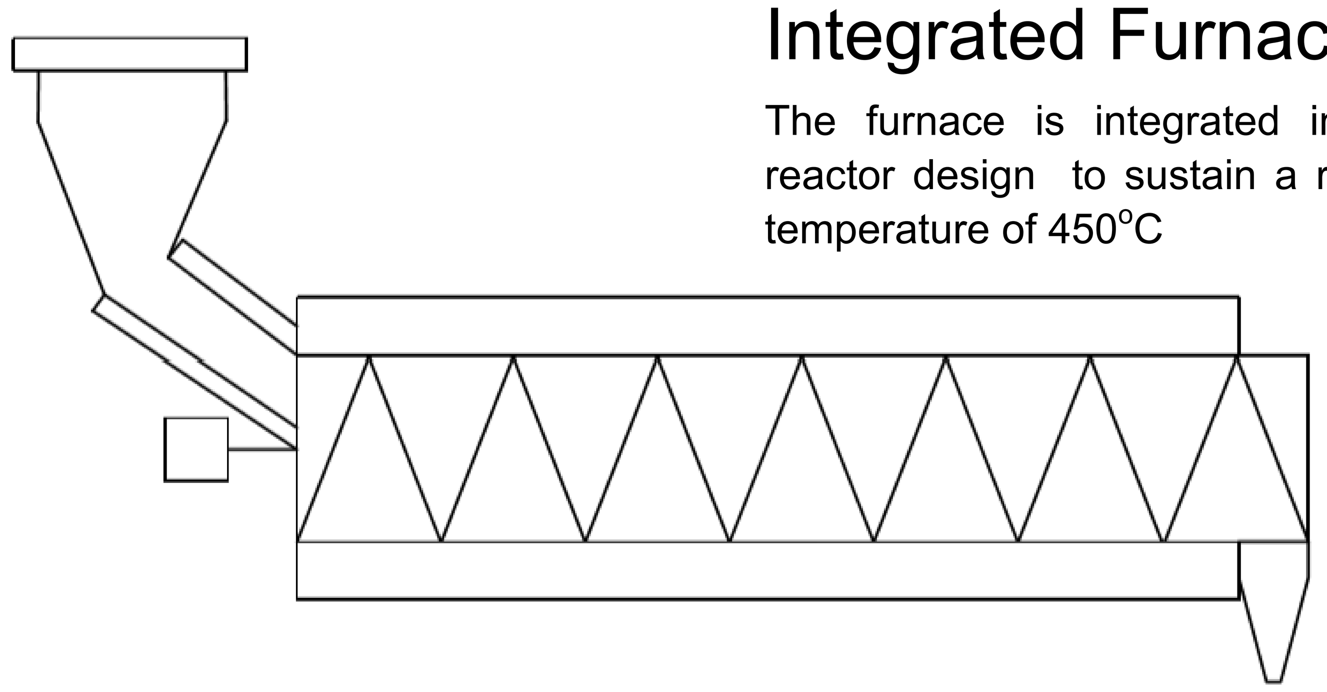
Screw-Kiln Reactor

Feed Hopper

Waste plastic is choke-fed in a hopper to prevent air from entering the reactor. The plastics are pre-heated in the hopper discharge channel

Integrated Furnace

The furnace is integrated into the reactor design to sustain a reaction temperature of 450°C



Motorized Screw

Plastics are driven through the reactor by the motorized screw as they decompose into straight-chain hydrocarbons

Discharge Hopper

The unreacted solids, consisting mainly of carbon, are discharged through a hopper to be collected for disposal

Process Innovations

Continuous Thermal Pyrolysis

Thermal pyrolysis in a jacketed screw-kiln reactor accommodates varying feed composition without repeated start-up and shutdown

Plant Capacity

First large-scale waste-to-fuel facility in Canada

Energy Recovery

The pre-heating of plastic feed with hot air and the combustion of methane and ethane products reduces utility costs

Process Description

8350 tonnes / year of waste plastic diverted from landfills

The plastics are shredded, washed, sorted, and dried

The plastic feed is preheated with hot air using energy recovered from pyrolysis products

The plastics undergo pyrolysis in a screw-kiln reactor where they are broken down into straight-chain hydrocarbons

600 tonnes / year of char

Light gases (methane and ethane) are combined with additional natural gas and fed to the furnace for combustion

The separation of the pyrolysis products into light gases, kerosene, gas oil, and residuum takes place in the fractionation column, with the remaining hydrocarbons sent for further separation

3480 tonnes / year of kerosene

2000 tonnes / year of gas oil

170 tonnes / year of residuum

The separation of naphtha and liquified petroleum gas (LPG) takes place in a stabilizer column

540 tonnes / year of LPG

The separation of heavy naphtha and light naphtha takes place in a splitter column

440 tonnes / year of light naphtha

520 tonnes / year of heavy naphtha

Environment

Plastic Diverted from Landfills
8350 tonnes / year

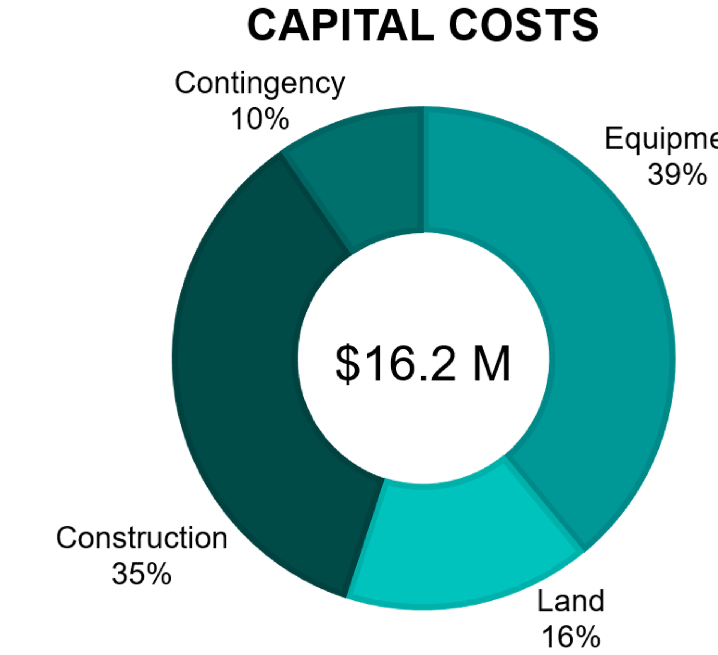
Gas Emissions (CO_2 eq.)
2500 tonnes / year

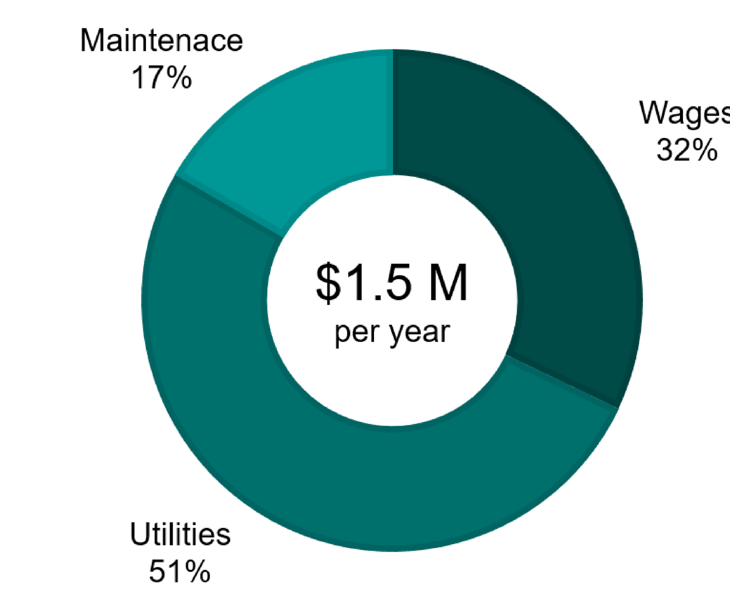
Char
600 tonnes / year

Residuum
170 tonnes / year

Landfill

Economics





Expected Revenue
$3.7 M / year

Expected Present Worth of Project in 10 Years
- $3.2 M

Payback Period
13-15 years

Fuel Savings
$0.3 M / year

	Scenario	Probability	Annual Revenue
Most Likely	100% Capacity	70%	$3.8 M
Optimistic	115% Capacity	5%	$4.3 M
Pessimistic 1	80% Capacity	10%	$3.0 M
Pessimistic 2	-5% Price Volatility	15%	$3.6 M

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