Fuel Production from Waste Plastic

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.

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
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
The separation of naphtha and liquefied petroleum gas (LPG) takes place in a stabilizer column
The separation of heavy naphtha and light naphtha takes place in a splitter column

Environment
Plastic Diverted from Landfills
600 tonnes / year of char
3480 tonnes / year of kerosene
2000 tonnes / year of gas oil
170 tonnes / year of residuum
540 tonnes / year of LPG
520 tonnes / year of heavy naphtha
520 tonnes / year of light naphtha
Gas Emissions (CO₂ eq.)
2500 tonnes / year

Economics
Capital Costs:
- Contingency: 10%
- Equipment: 39%
- Maintenance: 17%
- Wages: 32%
- Construction: 15%
- Land: 16%
- Utilities: 51%
- Total: $16.2 M
Operating Costs:
- $1.5 M per year
Expected Revenue:
- $3.7 M / year
Payback Period:
- 13-15 years
Fuel Savings:
- $0.3 M / year

Expected Present Worth of Project in 10 Years:
- Most Likely: $0.3 M
- Optimistic 1: $3.0 M
- Pessimistic 1: $3.6 M
- Pessimistic 2: $3.2 M

Probability
- Most Likely: 70%
- Optimistic 1: 5%
- Pessimistic 1: 10%
- Pessimistic 2: 15%

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