WASTE TO FUEL
Gasification using High Temperature Steam

Evaluation and Thermochemical Modeling of High Temperature Steam Gasification of Municipal Solid Waste (MSW)

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Biomass and MSW Steam Gasification System

Hydrogen Separation

F-T Reaction
Municipal Solid Waste (MSW)

Landfilled waste: 53.8% (2012, EPA)

- Discarded: 53.8%
- Recovery: 34.5%
- Combustion with Energy Recovery: 11.7%

Per capita generation (lbs/person/day)

Year | Total MSW generation (million tons) | Per capita generation (lbs/person/day)
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1960 | 88 | 2.68
1970 | 121 | 3.25
1980 | 152 | 3.66
1990 | 208 | 4.57
2000 | 243 | 4.74
2010 | 254 | 4.69
2010 | 252 | 4.55
2010 | 251 | 4.38
Gasification

Energy conversion process

- a process that converts organic or fossil based carbonaceous materials

High temperature
- achieved by reacting the material at high temperatures
- with a controlled amount of oxygen and/or steam

Syngas
- hydrogen, carbon monoxide and methane

Hydrogen Membrane Separator
- Fischer-Tropsch Reactor
- Gas turbine or IC engine

Generator

Electricity
- pure Hydrogen
- Biodiesel
- Mechanical work

Syngas (H₂, CO, CH₄)
Why Steam?

Steam works as a source of H2. The element is limited in feedstock, so expected higher H2 concentration. This increase in syngas heating value can be achieved by separating and recirculatingcondensed water. It can also be reused.