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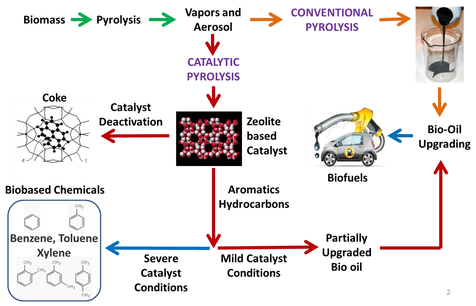
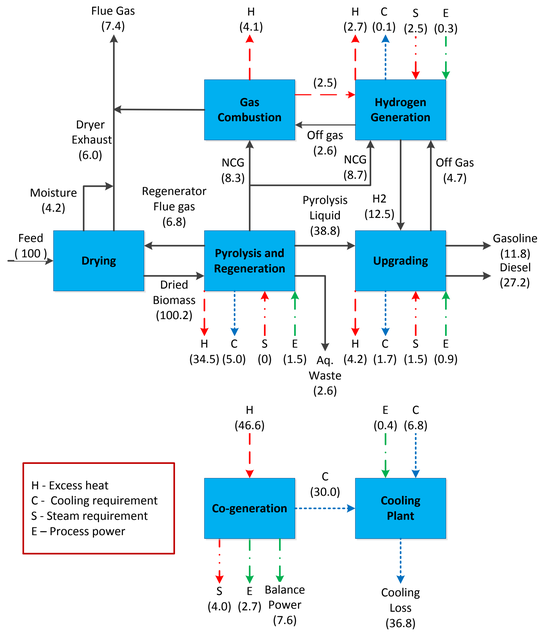
Techno-Economic Analysis of Mild Catalytic Pyrolysis of Biomass for Production of Transportation Fuels

Introduction

Bio-oil produced from fast pyrolysis of biomass is highly oxygenated and has poor stability. Mild catalytic pyrolysis produces a partially deoxygenated oil that is more readily upgraded to transportation fuels. Mild catalytic pyrolysis is being developed commercially, but there is little publically available information on it economics. This technoeconomic analysis estimates the minimum selling price of gasoline and diesel produced by the process.



Energy Flow as a % of Biomass HHV



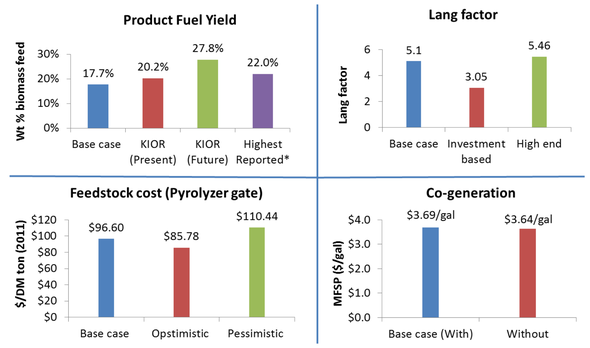
Key Results

Total Purchased equipment cost (TPEC)	100% TPEC	89.7	$ million
Direct installed cost (DIC)	302% TPEC	270.9	$ million
Indirect costs (TIC)	126% TPEC	79.8	$ million
Fixed capital investment (FCI)	428% TPEC	384.2	$ million
Working capital	15% FCI	67.8	$ million
Land	6% FCI	5.4	$ million
Total project investment (TPI)	510% TPEC	457.4	$ million
Annual operating cost		142.1	$ million /year
Fuel Yield		38.5	million gal/year
		58.6	Fuel gal/MT of dry biomass
		17.7	wt% of dry biomass
MFSP		3.69	$/gal fuel

Lang Factor 5.1

Base line $2.92/gal

Uncertainty Analysis of Influential Input



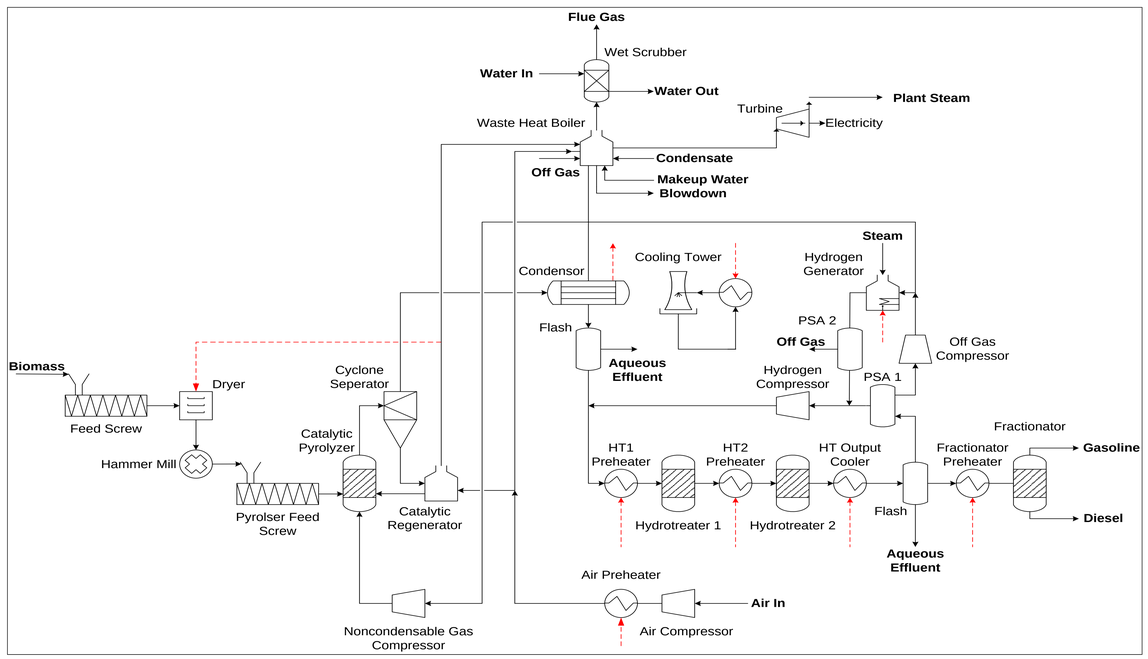
* A. A. Lappas et al, 2012

Contribution by Category for MFSP

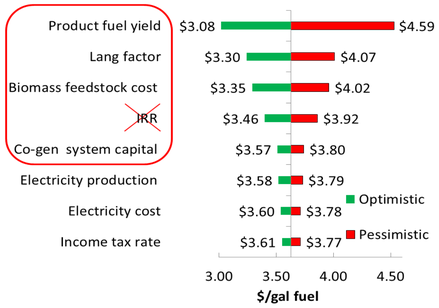
- Feedstock cost contributes to 43% of the MFSP
- Co-generation unit provide a credit to the MFSP

Analysis for Most Probable Fuel Price

Simplified Process Flow Diagram



Sensitivity Analysis for MFSP



- Uncertainty in inputs and assumptions
- Conservative approach for base case to represent the novel process, gives a high end MFSP
- IRR variations are out of scope of this analysis
- Find out the most influential factors for MFSP

Conclusions

The MFSP value for

Base case	Lowest Possible	Worst Case	Most Probable
$3.69/gal	$2.14/gal	$4.07/gal	$3.03/gal

Key References

- A. Zacher, D. Santosa and D. Elliott, Mild Catalytic Fast Pyrolysis of Biomass and Catalytic Hydrotreating to Liquid Transportation Fuels, TC Biomass 2011,Chicago, 2011
- D. C. Dayton, Catalytic Biomass Pyrolysis for Bio-Crude Production, , TC Biomass 2011, Chicago, 2011.

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