Life Cycle Assessment of Fischer Tropsch Fuels

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Further Work

A total LCA analysis of the FT process and comparison with refinery needs to be done under the following scope.

The geographic context should be Australia.

The acidification potential and Photochemical Smog formation is much lower for FT fuel compared to Petroleum fuel. This should be considered under Australian context.

The research outcome will answer the potentiality of commercializing the FT process in Australia.

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References

(Wang and Huang 1999; Marano and Ciferno 2001; COOPER 2003; COOPER 2006; Jaramillo, Griffin et al. 2008)


Jaramillo, P., W. M. Griffin, et al. (2008). "Comparative Analysis of the Production Costs and Life-Cycle GHG Emissions of FT Liquid Fuels from Coal and Natural Gas."

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Graphical Representation of Fischer Tropsch Process

Life Cycle Approach For Environmental Impact Assessment of FT Fuel and Petroleum Based Fuel

Need For LCA on FT

The FT fuel is relatively clean during combustion. On the contrary the thermal efficiency of the FT process is approximately 30% lower than refinery. So the actual production of FT fuel has higher GHG emission compared to the refinery.

Existing life cycle assessment for GHG impact are contrary to each other because of boundary and geographical issues.

Contradictory Result showing High & Low GHG impact of FT Fuel

According to the US context FT process shows higher GHG emission compared to refinery except for the case of biomass feedstock. Biomass feedstock is favourable because the process consists of planting trees which consume CO₂ from the environment.

Fischer Tropsch Description

Step 1: Syngas Production: Coal, natural gas or biomass is combusted in a controlled manner to generate syngas.

Step 2: FT Process: synthesis gas or syngas is converted into liquid hydrocarbons by reacting with the catalyst. The FT process can be described by the following chemical equation:

\[(2n+1)H_2 + nCO → C_{2n+2}H_{4n+2} + nH_2O\]

where 'n' is a positive integer

Natural Environment
Extraction/Production
Transport to Refinery/Plant
Conversion & Product Upgrade
Transportation/Distribution
End Use Fuel Combustion

GHG comparison between FT Fuel and Petroleum Fuel

GHG Comparison Between Refinery And FT Process

Using a marketedor in Western Europe and a FT plant in Qatar Shell conducted a LCA of FT process. The result showed 7% higher GHG emission for the refinery case. The feedstock is natural gas in this case.