Applications of Biogas in Chemical Energy Storage and Liquid Fuel Production

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1. Project Road Map

AD for renewable energy production, waste management and greenhouse gas reduction in Northern Ireland

Biogas Reforming - at 1 bar

Fischer Tropsch Synthesis ~ at 20 bars

Liquid Fuel Production (LFP)

*C can we achieve LFP at lower pressures?

Catalyst is key!

Aims:

1. Reduce methane selectivity in FT
2. Achieve high selectivity of C5-C15 at low pressures (thus boosting production of liquid fuels)
3. Ramp up the pressures and study the gradual effect on the production of liquid fuels in terms of selectivity and conversion
4. Minimize FT operating pressure, thereby minimizing compression energy
5. Assess different catalysts for optimal selectivity

II. Experimental - Commercial Catalyst Testing Results using a Mass Spec

II.a Catalyst reduction at 1 bar

II.b FT reaction at 1 bar

Mass 15: CH₃
Mass 43: C₃H₇

Self Preparation: Co Catalyst - 20%Co/Al₂O₃ by wet impregnation

Commercial FT catalyst

A Gas Chromatogram (GC) is more suitable for the analysis

- Signal due to mass 15 (methane) largest of the hydrocarbon signals
- Fragments due to formation of higher hydrocarbons
- C3-C5 detected; C-C coupling products
- Rig is Operational!