Simulation of a Gas to Liquids GTL Plant

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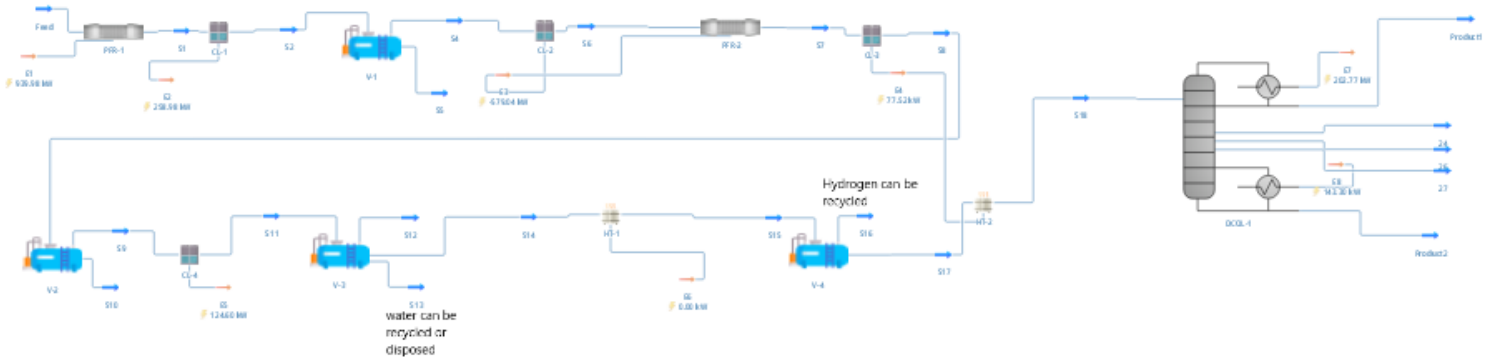
Background & Description: Natural gas is transformed into liquid fuels including gasoline, diesel, and jet fuel using the Gas-to-Liquids (GTL) process. This procedure includes number of phases, including gas pre-treatment, the creation of synthesis gas, and Fischer-Tropsch synthesis.
The following steps are generally included in the GTL process simulation in DWSIM:

1. Defining the feed composition: The natural gas feed composition needs to be defined. This often refers to the natural gas's content in terms of methane, ethane, propane, and other hydrocarbons.
2. Gas pre-treatment: To get rid of pollutants like sulphur, carbon dioxide, and water, the natural gas feed needs to be pre-treated. To avoid catalyst poisoning during the Fischer-Tropsch synthesis, this step is crucial.
3. Synthesis gas production: Natural gas that has already undergone pre-treatment is transformed into syngas, a mixture of hydrogen and carbon monoxide. Usually, steam reforming and shift reactions are combined in this stage.
4. Fischer-Tropsch synthesis: A catalyst is used to transform the syngas into liquid hydrocarbons once it is put into a reactor. The generated hydrocarbons can be further processed to yield various fuels, including gasoline, diesel, and jet fuel.
5. Each phase of the GTL process can be replicated in DWSIM using a variety of unit activities, including reactors, separators, and heat exchangers.

Flowsheet:



Results:

Properties Table						
Object	S7	S1	Product2	Product1	Feed	
Temperature	350	730	16.6078	-211.238	730	C
Pressure	0.846584	0.895123	1.01325	1.01325	1.01325	bar
Mass Flow	720.004	720	0.0640094	222.178	720	kg/h
Mass Flow (Mixture) / Methane	98.0815	98.0815	5.14E-32	79.6163	338.945	kg/h
Mass Flow (Vapor) / Methane	98.0815	98.0815	0	0	338.945	kg/h
Mass Flow (Mixture) / Water	320.124	110.143	1.24E-49	3.98E-24	380.627	kg/h
Mass Flow (Vapor) / Water	320.124	110.143	0	0	380.627	kg/h
Mass Flow (Liquid 1) / Water	0	0	1.24E-49	3.98E-24	0	kg/h
Mass Flow (Mixture) / Hydrogen	34.715	91.2281	1.80E-48	0.0057947	0.428055	kg/h
Mass Flow (Vapor) / Hydrogen	34.715	91.2281	0	0	0.428055	kg/h
Mass Flow (Mixture) / Carbon monoxide	94.0692	420.547	5.35E-39	30.9242	0	kg/h
Mass Flow (Vapor) / Carbon monoxide	94.0692	420.547	0	0	0	kg/h
Mass Flow (Liquid 1) / Carbon monoxide	0	0	5.35E-39	30.9242	0	kg/h
Mass Flow (Mixture) / Ethane	102.97	0	2.61E-17	84.9204	0	kg/h
Mass Flow (Vapor) / Ethane	102.97	0	0	0	0	kg/h
Mass Flow (Liquid 1) / Ethane	0	0	2.61E-17	84.9204	0	kg/h
Mass Flow (Mixture) / Propane	32.3937	0	1.15E-05	26.7104	0	kg/h
Mass Flow (Vapor) / Propane	32.3937	0	0	0	0	kg/h
Mass Flow (Liquid 1) / Propane	0	0	1.15E-05	26.7104	0	kg/h
Mass Flow (Mixture) / N-butane	21.1111	0	0.0345602	0.0005505	0	kg/h
Mass Flow (Vapor) / N-butane	21.1111	0	0	0	0	kg/h
Mass Flow (Liquid 1) / N-butane	0	0	0.0345602	0.0005505	0	kg/h
Mass Flow (Mixture) / N-pentane	8.03338	0	0.0142982	2.18E-07	0	kg/h
Mass Flow (Vapor) / N-pentane	8.03338	0	0	0	0	kg/h
Mass Flow (Liquid 1) / N-pentane	0	0	0.0142982	2.18E-07	0	kg/h
Mass Flow (Mixture) / N-hexane	4.11237	0	0.0073194	5.75E-10	0	kg/h
Mass Flow (Vapor) / N-hexane	4.11237	0	0	0	0	kg/h
Mass Flow (Liquid 1) / N-hexane	0	0	0.0073194	5.75E-10	0	kg/h
Mass Flow (Mixture) / N-heptane	2.47843	0	0.0044112	8.96E-12	0	kg/h
Mass Flow (Vapor) / N-heptane	2.47843	0	0	0	0	kg/h
Mass Flow (Liquid 1) / N-heptane	0	0	0.0044112	8.96E-12	0	kg/h
Mass Flow (Mixture) / N-octane	1.91526	0	0.0034089	1.05E-13	0	kg/h
Mass Flow (Vapor) / N-octane	1.91526	0	0	0	0	kg/h
Mass Flow (Liquid 1) / N-octane	0	0	0.0034089	1.05E-13	0	kg/h