

Simulation of a Gas to Liquids GTL Plant

Vijay Kumar V

M.S Ramaiah Institute of Technology

Background & Description:

This dynamic simulation in DWSIM models a Syngas to Liquid Fuels (STLF) process employing Fischer-Tropsch synthesis. The process begins with syngas production in a Plug Flow Reactor (PFR) operating at 730 degrees Celsius, utilizing natural gas as the primary feedstock with steam for steam reforming. Fischer-Tropsch synthesis occurs subsequently in a conversion reactor, with conversions for the reactions informed by pertinent literature data. The simulation also encompasses the final phase of the process: the separation of the product mixture. This separation yields distinct product streams consisting of gases, hydrocarbons, and wastewater.

The DWSIM-based simulation not only provides a comprehensive representation of the STLF process but also offers valuable insights into its feasibility and performance. It serves as a crucial tool for optimizing the sustainable production of liquid fuels from syngas, aligning with the broader goals of energy sustainability and reducing carbon emissions, making it a vital technology in the transition towards a greener and more environmentally responsible future.

Flowsheet:

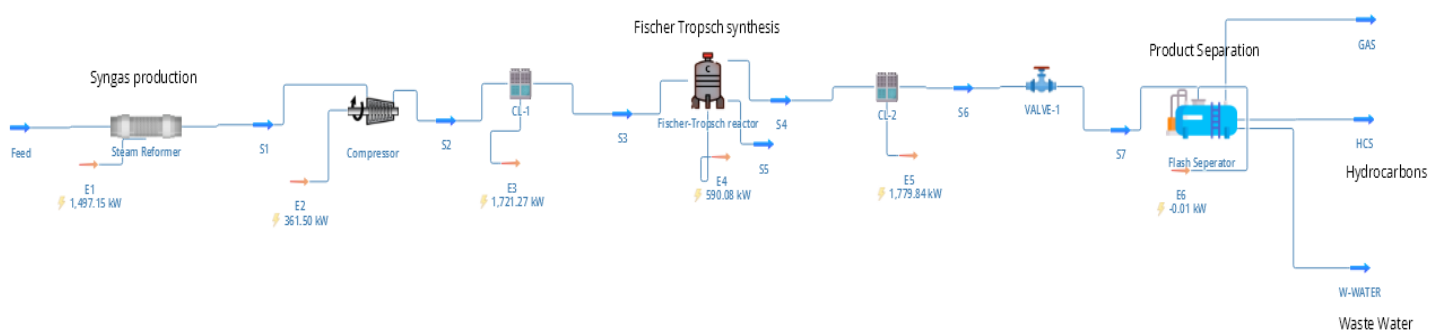


Fig: GTL Flowsheet

Results:

PROPERTIES TABLE			
Feed	Temperature	730	C
Feed	Pressure	40	bar
Feed	Mass Flow	3600	kg/h
Feed	Mass Fraction (Vapor)	1	
S1	Temperature	730	C
S1	Pressure	39.0167	bar
S1	Mass Flow	3600	kg/h
S1	Mass Fraction (Vapor)	1	
S4	Mass Flow	3600	kg/h
S4	Pressure	60	bar
S4	Temperature	300	C
S4	Mass Fraction (Vapor)	1	
GAS	Temperature	12.9438	C
GAS	Pressure	1	bar
GAS	Mass Flow	2006.92	kg/h
GAS	Mass Fraction (Vapor)	1	
HCS	Temperature	12.9438	C
HCS	Pressure	1	bar
HCS	Mass Flow	44.2439	kg/h
HCS	Mass Fraction (Overall Liquid)	1	
W-WATER	Temperature	12.9438	C
W-WATER	Pressure	1	bar
W-WATER	Mass Flow	1548.84	kg/h
W-WATER	Mass Fraction (Overall Liquid)	1	