BIO-FUEL CAN'T MELT STEEL POSTERS

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Design Statement

Produce 9,780 bbl/day of grade A commercial jet fuel from a renewable corn stover feedstock via gasification and F-T Synthesis.

Process Design

Gasification

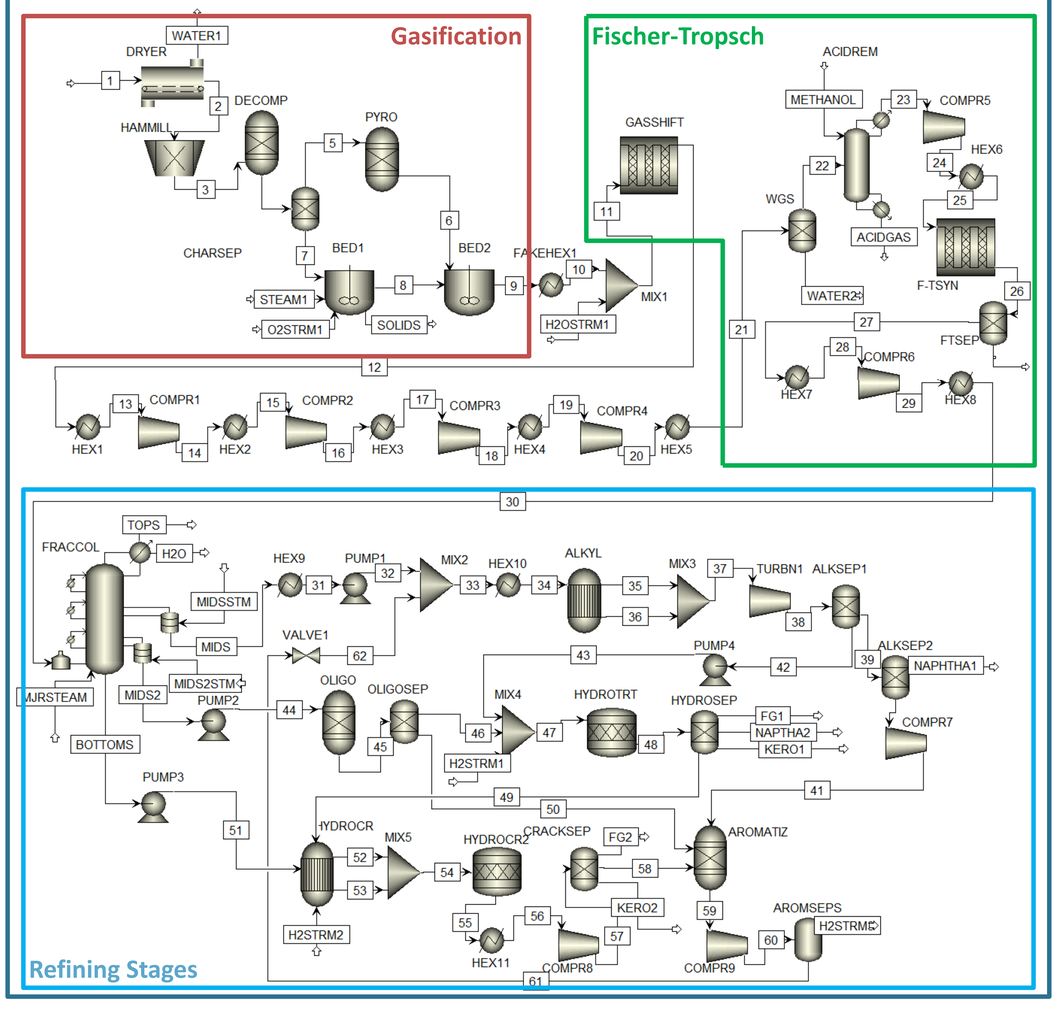
- Dried corn stover was converted to conventional Aspen components based on its elemental composition
- Solid carbon and sulfur are gasified with oxygen and steam according to a kinetic model in a CSTR
- Volatile component reactions are simulated in an RGibbs before reacting with gasification products in a CSTR

Fischer-Tropsch Synthesis

- Gasification products undergo a water gas shift to achieve a H_2:CO ratio of ~2.1:1
- Sulfur compounds and CO_2 are removed by methanol absorption in the Rectisol process
- In Fischer-Tropsch Synthesis H_2 and CO are converted to hydrocarbons. Modeled by a PFR based on a kinetic model for CO conversion and theoretical product distributions

Refining Steps

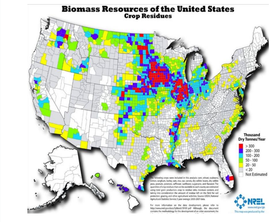
- A rigorous crude fractionation column separates FT products for refining
- C11+ products are sent to the hydrocracker for isomerization and conversion to lower carbon numbers
- A fraction of these products are converted to aromatic compounds to meet ASTM fuel standards
- C6-C10 products are oligomerized to longer hydrocarbons
- C3-C5 are alkylated to the aromatics to reduce freezing point according to ASTM standards



Project Scoping

Feedstock: Corn stover due to low cost and abundance in the United States
Plant location: Fulton, Illinois based on abundance and proximity to consumers
Consumer: Chicago O'Hare International Airport – 3rd largest airport in the U.S.

Upstream: Feedstock		Refining		Downstream: Distribution	
Plantation	Transport	Milling	Conversion to Jet Fuel	Jet Fuel Distribution	Jet Fuel Consumption
Corn Stover sourced in Iowa from local growers	Shipped to facility via freight train	Ground up before later processing steps	Gasification & Fischer-Tropsch Synthesis	Shipped via freight train to Chicago O'Hare	Sold to airlines such as American, United & Delta



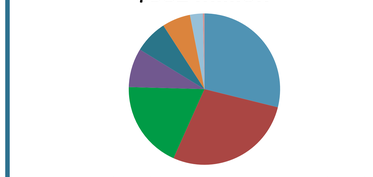
Economics

Our initial plant design was not economically feasible

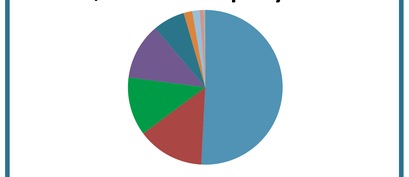
- High capitals costs led us to redesign the plant to eliminate electrical generation and an air separation unit
- A sensitivity analysis was performed, which found that the economic feasibility is most sensitive to capital costs, followed by product sale price and jet fuel production rate

We subsequently increased the plant throughput by a factor of 25 to take advantage of the flattening capital cost curve
Total Fixed Capital Costs of $1.2 Billion
Total Corn Stover Feedstock: 3.3 million tonnes/year

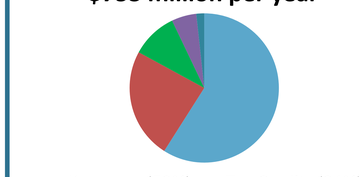
Total ISBL Cost: $582 million

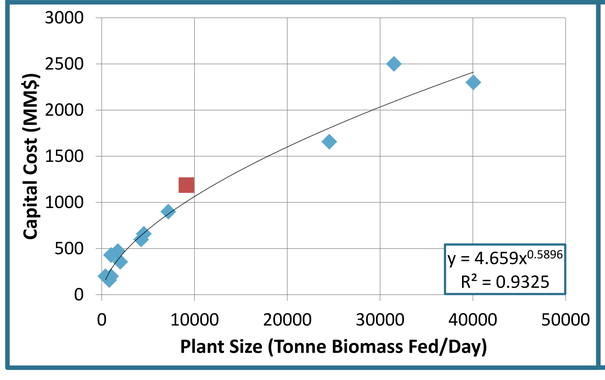


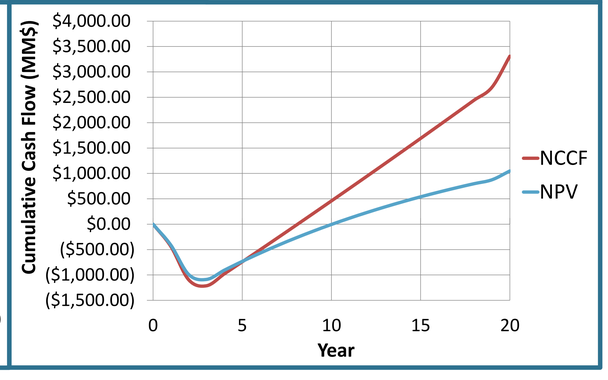
Total Operating Cost: $358 million per year



Total Revenue: $753 million per year







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