NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Fischer-Tropsch and Conventional Jet Fuel Blending, Operation

Reference Flow: 1 kg of Blended Jet Fuel

Brief Description: This unit process provides a summary of blending operations for the 1:1 volumetric mixing of Fischer-Tropsch and conventional jet fuel, based on user-updated density values, and including electricity required.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A

Year Data Best Represents: 2012

Process Type: Basic Process (BP)

Process Scope: Gate-to-Gate Process (GG)

Allocation Applied: No

Completeness: All Relevant Flows Recorded

Flows Aggregated in Data Set:

☒ Process ☐ Energy Use ☐ Energy P&D ☐ Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air:	☐ Greenhouse Gases	☐ Criteria Air Pollutants	☐ Other
Releases to Water:	☐ Inorganic Emissions	☐ Organic Emissions	☐ Other
Water Usage:	☐ Water Consumption	☐ Water Demand (throughput)	
Releases to Soil:	☐ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

F-T jet fuel density	*Density of F-T jet fuel prior to blending, in kg/L*
Conventional jet fuel density	*Density of conventional jet fuel prior to blending, in kg/L*

Tracked Input Flows:

F-T Jet Fuel [Intermediate Product]	*Mass of F-T jet fuel transported from CBTL for blending, in kg*
Conventional Jet Fuel [Intermediate Product]	*Jet fuel for transport from refinery for blending, in kg*
Electricity [Electricity]	*Electricity consumed by fuel blending, in kWh/kg*

Tracked Output Flows:

Blended Jet Fuel [Intermediate Product]	*Blended jet fuel produced for transport*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage4_O_F-T_Conventional_JetFuel_Blending_2012.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers the elements required for the blending of F-T and conventional jet fuel under Life Cycle (LC) Stage #4, at a blending facility over the 30-year study period, as described below and in **Figure 1**. Electricity and the mass of each jet fuel type are the input flows for the operation of the blending process. The total amount of electricity required is based on the number of kilograms of F-T fuel blended over the study period.

Boundary and Description

F-T jet fuel is blended with conventional jet fuel on a 1:1 basis (by volume). However, the upstream environmental flows and emissions associated with conventional crude oil extraction, transport, refining, and conventional jet fuel transport to this point are not considered previously. Therefore, upstream emissions associated with conventional jet fuel production are accounted for here. As a result, emission values considered here are large relative emissions for the other facets of product transport considered in this study. Blended jet fuel, which is the resulting fuel following blending, is tracked through the remainder of the life cycle model.

Upstream emissions from extraction, transport and refining of crude oil are incorporated into the results for product transport. Upstream emissions estimates for the production of petroleum jet fuel were based on prior life cycle modeling completed by NETL (2009), but updated to adhere to the assumptions of this study. Crude oil supply profiles considered within the conventional jet fuel production life cycle were updated for consistency with the 2010 fuel sourcing profile for the U.S. Other data sources and assumptions related to conventional petroleum jet fuel production are documented in detail by NETL (NETL, 2009).

All facilities required for the blending of F-T jet fuel with 50 percent conventional jet fuel are assumed to exist. Therefore, construction material and energy requirements and associated emissions are not considered for the blending station.

Relevant fuel properties used for the calculation of input and output flows for this unit process are shown in **Table 1**. **Table 2** provides a summary of modeled input and output flows. Additional details showing calculation methods for input and output flows, and other relevant information, are contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

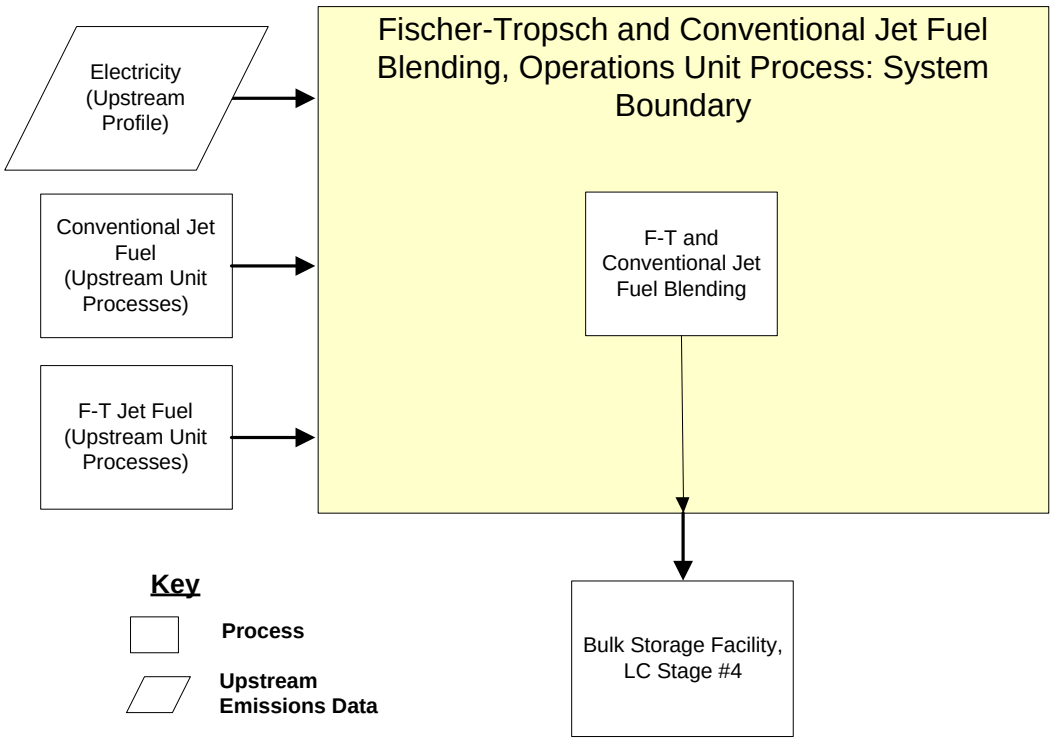

Table 1: Properties of a F-T and Conventional Jet Fuels

Fuel Properties		
Property	**Value**	**Units**
Volumetric fraction of F-T jet fuel in blended mixture	50	percent
Density of unblended F-T jet fuel (default)	7.5998E-01	kg/L
Density of unblended conventional jet fuel (default)	8.05E-01	kg/L
Electricity required for fuel blending, assuming triangular uncertainty distribution	3.50E-04	kWh/kg

Table 2: Unit Process Input and Output Flows F-T and Conventional Jet Fuel Blending

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Electricity [Electricity]	**3.89E-04**	**kWh/kg**
F-T Jet Fuel [Intermediate Product]	**0.49**	**kg**
Conventional Jet Fuel [Intermediate Product]	**0.51**	**Kg**
Outputs		
Blended Jet Fuel [Intermediate Product]	1.0	kg

- **Bold face** clarifies that the value shown *does not* include upstream environmental flows. See also the documentation for embedded unit processes, as shown below.

Embedded Unit Processes

None.

References

NETL 2009 — NETL. 2009. Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels. DOE/NETL-2009/1346. U.S. Department of Energy, National Energy Technology Laboratory, Pittsburgh, PA. November 26, 2008.

Section III: Document Control Information

Date Created: April 12, 2012

Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

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