



NETL Life Cycle Inventory Data

Process Documentation File

Tracked Output Flows:

None.

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage5_O_Passenger_Vehicle_2012-2042_US_Average_F-T_Diesel_2010.02.xlsx*, which provides additional details regarding relevant, calculations, data quality, and references.

Goal and Scope

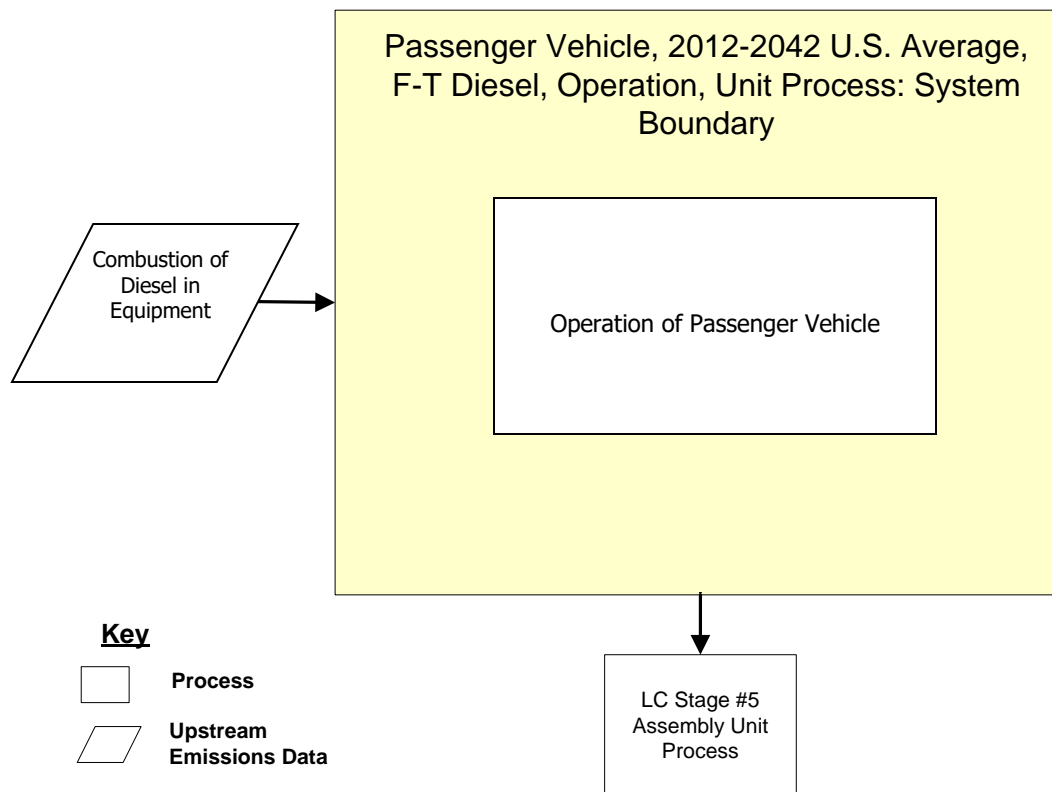
The scope of this unit process covers the consumption of FTD fuel in a passenger vehicle in Life Cycle (LC) Stage #5. The chosen vehicle represents the U.S. average fuel economy for the 30 year study period 2012 to 2042. This unit process is combined with vehicle construction and diesel combusted in equipment unit processes to calculate the total emissions that would result from combustion of FTD in a passenger vehicle.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. Emissions related to the construction and final disposal of the vehicle are considered in another unit process as are the emissions from FTD combustion. The process of refueling the vehicle is contained within LC Stage #4 in a refueling station operations unit process. As shown in Figure 1 and discussed above, the vehicle operated in this unit process is incorporated into the LC Stage #5 assembly process.

The primary source for greenhouse gas emissions from the combustion of FTD is the EPA's proposed rule (May 26, 2009) for *Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program*. However, all data originated from the EPA MOVES model version 6.2.

Figure 1: Unit Process Inputs, Outputs, and Boundaries



Emissions data were reported in terms of mass per vehicle mile traveled. In order to determine the emissions on the basis of FTD energy consumed, average vehicle fuel economy over the study period (2012-2042) was estimated from available resources. Average vehicle fuel economy in 2007 was given as 22.5 mpg by the ORNL 2007 Transportation Energy Data Book. For the years 2020 forward, vehicle fuel economy is required by the 110th Congress to reach 35 mpg. Averaging of these values over the study years was accomplished by assigning 8 years of 2007 efficiency and 22 years of 2020 efficiency. The resulting fuel economy is 31.6 mpg.

Table 1 shows relevant properties of the fuel and vehicle. **Table 2** provides a summary of modeled input and output flows. Additional detail regarding input and output flows, including calculation methods, is contained in the associated DS.

Table 1: Properties of F-T Diesel and Passenger Vehicle

Property	Value	Reference
F-T Diesel Energy Content (LHV) MJ/m ³ (Btu/gal)	27,595 (118905)	NETL 2009
Vehicle Fuel Economy km/m ³ (mpg)	11,210 (31.6)	ORNL 2007, 110 th Congress 2007

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)	DQI
Inputs			
Diesel Combustion, Mobile Sources, Car [Refinery products]	4.83E-01	kg	1,1
Outputs			
Vehicle Travel	1	mile	1,1

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. Upstream environmental flows were added during the modeling process using GaBi modeling software, as shown in Figure 1.

Embedded Unit Processes

None

References

- | | |
|---------------------------------|---|
| 110 th Congress 2007 | 110th Congress. 2007. <i>Energy Independence and Security Act of 2007, Page 121 STAT. 1499. Public Law 110-140.</i> |
| Bandivadekar et al 2008 | Bandivadekar, A. et al. 2008. <i>On the Road in 2035: Reducing Transportation's Petroleum Consumption and GHG Emissions.</i> Massachusetts Institute of Technology, Laboratory for Energy and the Environment. July 2008. |
| Chester 2008 | Chester, M.V. 2008. <i>Life-cycle Environmental Inventory of Passenger Transportation in the United States.</i> Dissertation. University of California, Berkeley, Institute of Transportation Studies. |
| NARA 2009 | National Archives and Records Administration. 2009. "Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Proposed Rule." <i>Federal Register</i> 74(99).
http://www.epa.gov/oms/renewablefuels/rfs2_1-5.pdf (Accessed December 18, 2009). |

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