NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Refueling Station, Diesel, Operation

Reference Flow: 1 kg of Diesel

Brief Description: This unit process includes the emissions from operation of a refueling station for diesel. Emissions from fuel evaporation during storage and tank loading and unloading operations are included.

Section I: Meta Data

Geographical Coverage: US **Region:** Not Applicable

Year Data Best Represents: 2009

Process Type: Basic Process (BP)

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

Allocation Applied: No

Completeness: Individual 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:

Evaporative Loss (Evap_Loss)	*Amount of diesel to evaporate during unloading and refueling operations.*

Tracked Input Flows:

Diesel	*Petroleum Diesel*
Electricity [Electric Power]	*U.S. National Average electricity profile*

Tracked Output Flows:

Diesel	*Reference Flow*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage4_O_Refueling_Station_Diesel_2010.01.xls*, which provides additional details regarding relevant, calculations, data quality, and references.

Goal and Scope

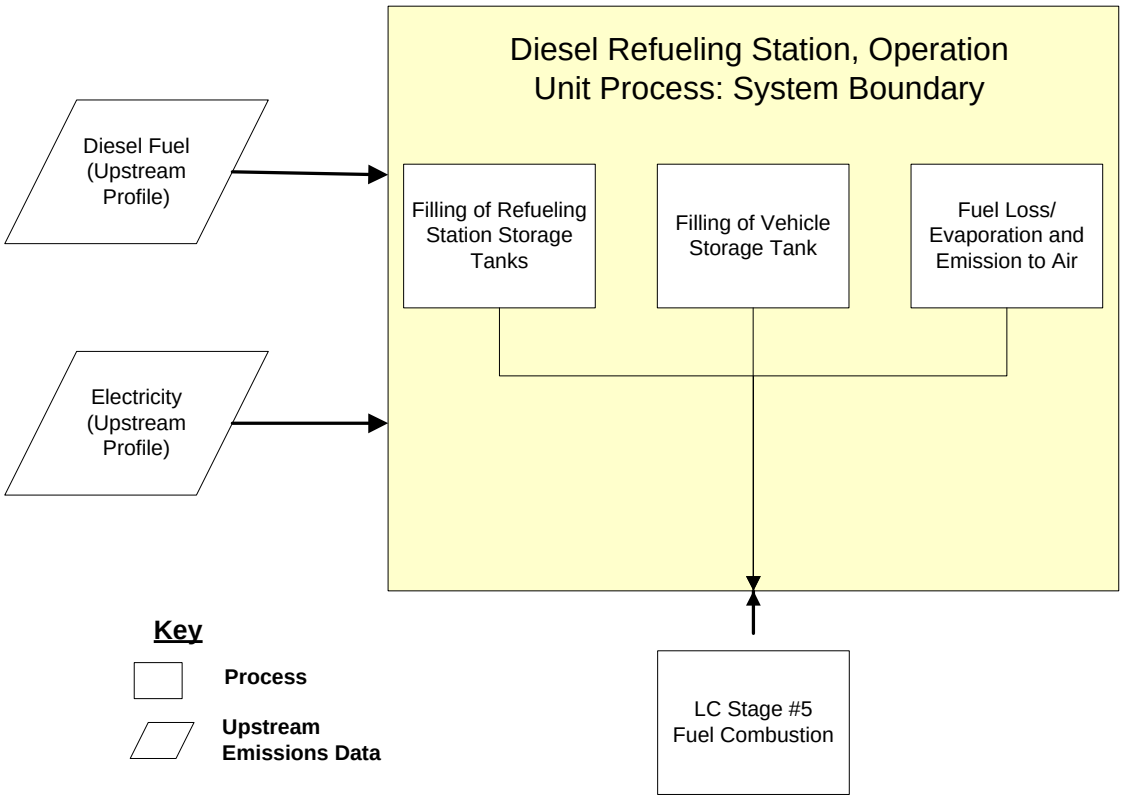
This unit process describes the operation of a refueling station within the distribution stage (Life Cycle (LC) Stage #4) of a fuel lifecycle. Diesel is brought to the station by tanker truck. Truck unloading (filling of refueling station tanks) and vehicle refueling operations are considered in the process, along with evaporative emissions while the diesel is being stored.

Boundary and Description

The boundary of this unit process begins when the tanker truck arrives at the refueling station and ends with fuel contained in a vehicle for the use phase (LC Stage #5). Convenience stores, often operated alongside refueling operations, and other operations such as auxiliary equipment operations, are not included in the boundary.

Figure 1 represents the sub-processes contained within the diesel refueling station operations. Upon arrival to the refueling facility, diesel is pumped from the transport vessel to a storage tank within the facility. Diesel evaporation occurs during unloading. The diesel is later moved from the storage tank to a vehicle for use, causing further evaporation.

Figure 1: Unit Process Inputs, Outputs, and Boundaries



Inputs to the unit process, as shown in **Figure 1**, include electricity and diesel. The electrical consumption for a gasoline dispensing unit was calculated based on assumptions made about the dispensing unit and the amount of fuel it dispensed. The power output for the motor in the dispensing unit is rated at 750 W (CHG 2008). The EPA regulated flow rate of gasoline dispensing units is 10 gal/min or 600 gal/hr. By taking the power and dividing it by the flow rate, the amount of energy consumed by the motor for an hour per gallon is found. Dispensing gasoline into vehicles required 0.00125 kWh per gallon of gasoline dispensed (Skone et al 2008). The electricity consumption per kg of diesel fuel is calculated based on the average density of diesel of 3.21 kg/gal (Skone et al, 2008). Evaporative loss is included in this unit process as an adjustable parameter, and therefore can be updated in the event that updated or more relevant evaporation data are identified.

Table 1 shows diesel properties used for calculation of evaporation of fuel in this unit process. **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 Diesel Stored in the Facility

Property of Petroleum Diesel (U.S. National Average Sold or Distributed in 2005)	Value	Reference
Density kg/m^3 (lb/gal)	847.99 (7.076)	NETL 2008
Lower Heating Value (LHV) MJ/m^3 (Btu/gal)	35,801 (128,450)	NETL 2008

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Diesel	**1.00000638**	**kg**
Electricity	**0.000389410**	**kWh**
Outputs		
Diesel	42.2**	MJ
NMVOC (unspecified) [Group NMVOC to air]	6.38E-06	kg

* **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.

** Output flow shows energy content of 1 kg of diesel output, for consistency with LC Stage #5 modeling flows.

Embedded Unit Processes

None.

References

CHG 2008 — China Hongyoung Group. 2008. *Explosion proof motor product IS: U701-*A. Wenzhou City, China.

NETL 2008 — NETL. 2008. 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

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