NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Steel Coal-Loading Silo, 325 Tons, Construction

Reference Flow: 1 piece (pcs) of Steel Coal-Loading Silo, 325 Tons

Brief Description: Based on specifications for a George Third & Son, 325-ton coal silo, used for railcar loading of Illinois No. 6 bituminous coal at the mine site. Assumes silo constructed entirely of steel plate, with negligible amounts of other materials.

Section I: Meta Data

Geographical Coverage: Canada **Region:** British Columbia

Year Data Best Represents: 2006

Process Type: Manufacturing Process (MP)

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:

Tracked Input Flows:

Steel Plate, BF (85% Recovery Rate) [Metals]	*Steel plate from blast furnace (BF) used for the construction of the silo, assumes 85% recycled/recovery rate*

Tracked Output Flows:

Steel Coal-Loading Silo, 325 Tons [Construction]	*Construction of a single, 325–ton, coal-loading silo*

Section II: Process Description

Associated Documentation

This unit process is composed of this documentation and the data sheet (DS) *DS_Stage1_C_Steel_Coal_Loading_Silo_325_Tons_2010.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers the materials required for the construction of a single, 325–ton, steel coal-loading silo, used to load Illinois No. 6 bituminous coal into railcars. The unit process is based on the reference flow of 1 piece of coal-loading silo under Life Cycle (LC) Stage #1, as described below and shown in **Figure 1.** The coal-loading silo is assumed to be constructed entirely of steel; other materials are assumed to be negligible. By default, all steel within this study was assumed to be steel plate, based on available GaBi profiles, unless other steel types were specified per available data, or a higher grade of steel would be required, per NETL engineering judgment. Therefore, all steel considered in this unit process was assumed to be steel plate.

This coal-loading silo construction unit process, along with other construction unit processes for Illinois No. 6 bituminous coal preparation equipment, is combined in a separate assembly process for Illinois No. 6 bituminous coal processing, *DS_Stage1_C_Assembly_I6_Coal_Prep_2010.01.xls.* This assembly unit process quantifies the fraction of each piece of equipment needed under LC Stage #1 to produce 1 kg of Illinois No. 6 bituminous coal ready for transport (LC Stage #2) to the energy conversion facility (LC Stage #3). Underground coal mine operations are modeled in *DS_Stage1_O_CoalMine_I6_2009.01.xls,* which quantifies the extraction and preparation of 1 kg of coal.

Boundary and Description

Construction of the coal-loading silo is based on manufacturer specifications contained in a printed advertisement for a 325–ton, steel coal-loading silo built by George Third & Son for Wolverine Coal Mine, located in British Columbia, Canada. The coal-loading silo is used to load coal into individual rail cars at the Illinois No. 6 bituminous coal mine site.

Figure 1 provides an overview of the boundary of this unit process. Emissions related to the physical assembly of the loading silo (e.g., emitted when putting together the components of the silo, including transport of the components) are not considered in this study. Upstream emission from the production of raw materials used in the construction of the loading silo (e.g., steel plate) are calculated outside the boundary of this process, based on proprietary profiles available within the GaBi model. As shown in Figure 1 and discussed above, the loading silo constructed in this unit process is incorporated into the construction assembly process for LC Stage #1.

The total weight of a loading silo is available, but does not provide a material breakdown of the components of the silo. Therefore, the silo was assumed to be composed solely of steel plate (Steel Plate, BF (85% Recovery Rate) [Metals]).

The dimensions and weight of the silo are provided in **Table 1**. The shape of the silo is a cylinder on top of a cone, to facilitate loading into the railcars. **Table 2** summarizes the modeled input and output flows of the unit process. Additional details regarding input and output flows, including calculation methods, are contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

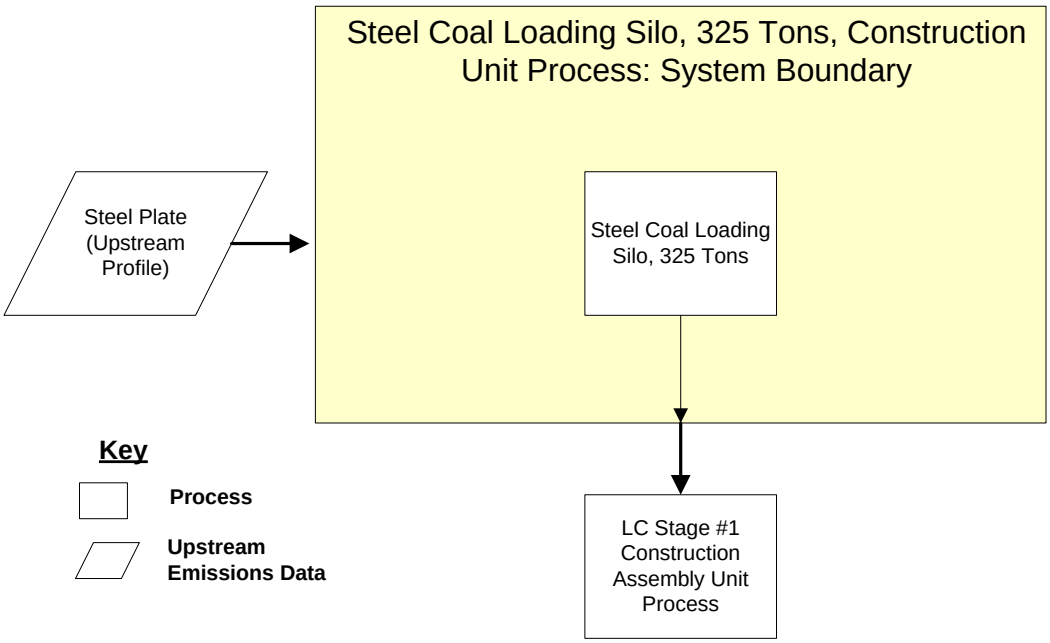

Table 1. Properties of the Steel, Coal-Loading Silo

Property	Value	Reference
Silo Height, m (ft)	24.38 (80)	GTS 2006
Silo Diameter, m (ft)	12.19 (40)	GTS 2006
Silo Weight, Empty, Wolverine Coal Mine, kg (lbs)	294,835 (650,000)	GTS 2006
Steel Plate Required for Silo Construction, kg (lbs)	294,835 (650,000)	NETL Engineering Judgment

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Steel Plate, BF (85% Recovery Rate) [Metals]	**294,835**	**kg**
Outputs		
Steel Coal-Loading Silo, 325 Tons [Construction]	1	piece

* **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.

External References

GTS 2006 George Third & Son. 2006. Advertisement in "First Class Health Care". *Construction Business* 3(6):15. http://www.accesshealthabbotsford.ca/pdf/AHAConstruction_BusinessOct2006.pdf (Accessed December 14, 2009).

Section III: Document Control Information

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