NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Steel-Cord Conveyor System, 72", Construction

Reference Flow: 1 pc of Steel Cord Conveyor System, 72”

Brief Description: Based on manufacturer's specifications, a conveyor system, 72” width, from Sandvik to transport coal from prep facility to loading silo at a Powder River Basin coal mine. Materials include cold-rolled steel, hot-dip galvanized steel, and rubber.

Section I: Meta Data

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

Year Data Best Represents: 2003

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 cold rolled (St) [Metals]	*Cold rolled-steel needed for the construction of the conveyor system*
Hot-dip Galvanized Steel [Metals]	*Hot-dip galvanized steel needed for the construction of the conveyor system*

Styrene-butadiene-rubber (SBR) [Plastics]	*Rubber needed for the construction of the conveyor system*

Tracked Output Flows:

Steel-Cord Conveyor System, 72” [Construction]	*Construction of a single steel-cord conveyor system with a width of 72”*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Steel_Cord_Conveyor_72in_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 conveyor system with steel cords needed to transport Powder River Basin sub-bituminous coal from the preparation facility to the loading silo, where the coal is loaded into railcars and transported to the energy conversion facility. The process is based on the reference flow of 1 piece (pcs) of steel-cord conveyor system, as described below and shown in **Figure 1.** The steel-cord conveyor system is assumed to be constructed of cold-rolled steel, hot-dip galvanized steel, and rubber; quantities of other material types are assumed to be negligible.

This construction unit process for the steel-cord conveyor system is combined with other pieces of equipment used during coal preparation on site, under Life Cycle (LC) Stage #1, in an individual assembly unit process, DF_Stage1_C_Assembly_PRB_Coal_Surface_Mine_2010.01.doc. This assembly unit process quantifies the fraction of each piece of equipment needed under LC Stage #1 to produce 1 kg of Powder River Basin coal ready for transport (LC Stage #2) to the energy conversion facility (LC Stage #3).

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process. Emissions related to the physical assembly of the steel-cord conveyor system (e.g., emitted while putting together the components of the conveyor system, including transport of those components) are not considered in this study. Upstream emission from the production of raw materials used for the construction of the steel-cord conveyor system (e.g., steels) are calculated outside the boundary of this unit process, based on proprietary profiles available in the GaBi model. As

shown in **Figure 1** and discussed above, the steel-cord conveyor system constructed in this unit process is incorporated into the construction assembly for LC Stage #1.

The total weight of a steel-cord conveyor system was readily available, but reliable data for the material breakdown of steel-cord conveyor system were not. The steel-cord conveyor system is designed such that it transports the sized coal from the preparation facility to the loading silo. The specifications found for the conveyor system included information for the cold-rolled steel (Steel cold rolled (St) [Metals]), hot-dip galvanized steel (Hot-dip Galvanized Steel [Metals]), and rubber (Styrene-butadiene-rubber (SBR) [Plastics]).

Table 1 shows relevant properties and assumptions used to calculate the amount of steel plate contained in a single steel-cord conveyor system. Total weight for one steel-cord conveyor system was calculated to be approximately 1,064,007 kg (1,172 short tons). **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.

Figure 1: Unit Process Scope and Boundary

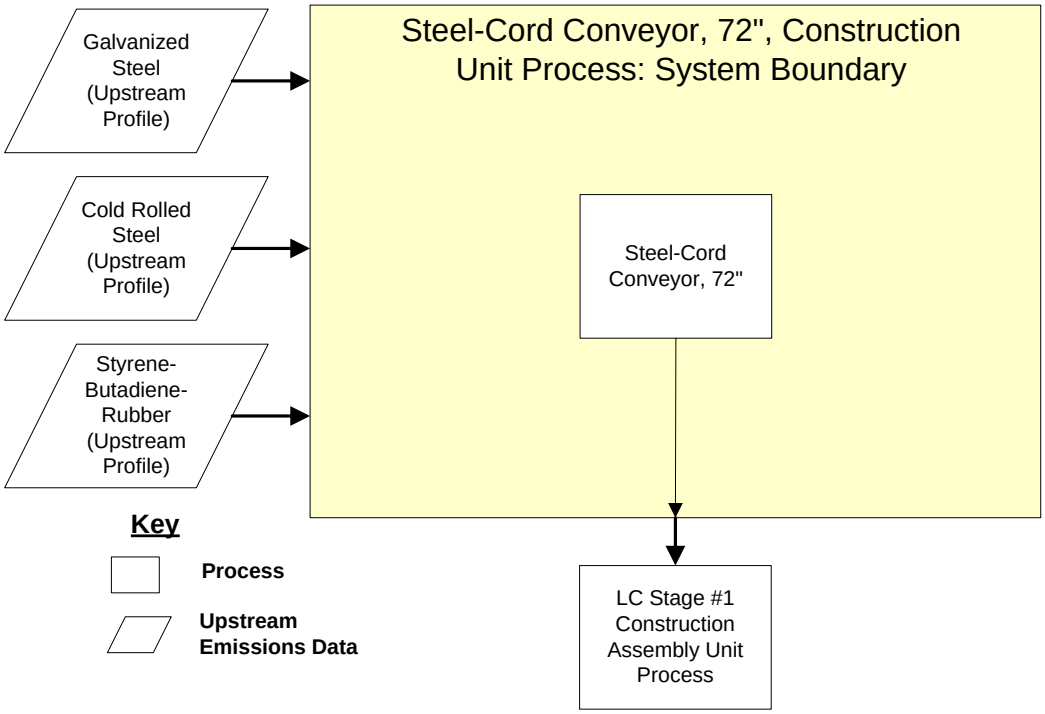

Table 1: General Properties

Property	Weight	Reference
Belt Length, m (ft)	7,132 (23,400)	ENI 2009
Belt Width, m (in)	1.83 (72)	ENI 2009
Hot-Dip Galvanized Steel, kg/m	**83.6 (56.2)**	**NETL Engineering Calculation**
Steel Cord, kg/m (lb/ft)	14.8 (9.9)	Goodyear 2008, Lexco 2006
Idler	61 (41.0)	Sandvik 2004
Return Idler	7.8 (5.2)	Sandvik 2003
Total Hot-Dip Galvanized Steel, kg (lb)	**595,995 (1,313,930)**	**NETL Engineering Calculation**
Rubber Weight, kg/m (lb/ft)	**25.7**	**ENI 2009**
Total Rubber, kg (lb)	**182,972 (402,983)**	**NETL Engineering Calculation**
Cold-Rolled Steel, kg/m	**39.2 (26.3)**	**NETL Engineering Calculation**
Idler	29.7 (20.0)	Sandvik 2004
Return Idler	9.5 (6.4)	Sandvik 2003
Drive Pulley	3,927 (8,658)	Sandvik 2003 ENI 2009
Tail Pulley	1,288 (1,288)	Sandvik 2003 ENI 2009
Total Cold-Rolled Steel, kg (lb)	**285,040 (628,399)**	**NETL Engineering Calculation**

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Steel cold rolled (St) [Metals]	**285,040**	**kg**
Hot-dip Galvanized Steel [Metals]	**595,995**	**kg**
Styrene-butadiene-rubber (SBR) [Plastics]	**182,972**	**kg**
Outputs		
Steel Cord Conveyor System, 72” [Construction]	1.00	pcs

* **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

ENI 2009 — Elgin National Industries. 2009. Thunder Basin. Elgin National Industries, Inc. http://www.elginindustries.com/sitecore/content/Engineering%20and%20Construction/Roberts%20and%20Schaefer/Projects/Arch%20Coal%20-%20Black%20Thunder%20Mine.aspx?industry={070935F2-5A79-4993-B01F-1EA0E295F207} (Accessed December 18, 2009).

Goodyear 2008 — Goodyear Engineered Products. 2008. Flexsteel Conveyor Belt. Veyance Technologies. http://www.goodyearep.com/uploadedFiles/Product_Categories/Conveyor_Belt_-_Heavyweight/Products/HW%20-%20Flexsteel®.pdf (Accessed December 18, 2009).

Lexco 2006 — Lexco Cable. 2006. Custom Cable Assemblies: 7x7 GAC (Galvanized Aircraft Cable). Lexco Cable. http://www.lexcocable.com/7x7_aircraft_cable.html#gac (Accessed December 18, 2009).

Sandvik 2003 — Sandvik. 2003. Sandvik Conveyor Components: Conveyor Pulley. Sandvik Mining and Construction. http://www.miningandconstruction.sandvik.com/sandvik/0120/Internet/global/S003713.nsf/Alldocs/Products*5CConveyors*and*conveyor*components*5CPulleys*and*take*2Dup*devices*2AMedium*duty*locking*element*pulleys/$file/DK-BK-eng.pdf (Accessed December 18, 2009).

Sandvik 2004 — Sandvik. 2004. Pulleys, Idlers and Materials Handling Systems: Catalogue Medium to Heavy Duty Idler. Sandvik Mining and Construction. http://www.miningandconstruction.sandvik.com/sandvik/0120/Internet/global/S003713.nsf/Alldocs/Products*5CConveyors*and*conveyor*components*5CIdlers*2AMedium*Duty*Idlers/$file/Idlers%20-%20Medium%20to%20Heavy%20Duty.pdf (Accessed December 18, 2009).

Section III: Document Control Information

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