NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Continuous Miner, 755 Horsepower, Construction

Reference Flow: 1 piece (pcs) of Continuous Miner, 755 Horsepower

Brief Description: Based on manufacturer (Bucyrus) specifications for a 25M Series model, 755-horsepower (HP), underground continuous miner. Assumes continuous miner constructed entirely of steel plate with negligible amounts of other materials.

Section I: Meta Data

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

Year Data Best Represents: 2008

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 to construct continuous miner, assumes 85% recycled/recovery rate*

Tracked Output Flows:

Continuous Miner, 755 Horsepower [Construction]	*Construction of a single, 755-HP, Bucyrus continuous miner, 25M Series.*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Continuous_Miner_755_HP_2010.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process encompasses the materials and weights of those materials necessary to construct a single, Bucyrus 25M Series, 755 Horsepower (HP), underground continuous miner to be used during extraction of Illinois No. 6 bituminous coal from an underground mine. The process is based on the reference flow of 1 piece of continuous miner, 755 HP, as described below and shown in **Figure 1.** The continuous miner 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 unit process is combined with other coal mine equipment construction unit processes in an assembly unit process for Illinois No. 6 bituminous coal, DS_Stage1_C_Assembly_I6_Coal_Underground_Mine_2010.01.xls. The assembly unit process quantifies the fraction of each piece of equipment needed under Life Cycle (LC) Stage #1 to produce 1 kg of Illinois No. 6 bituminous coal ready for transport (LC Stage #2).

Boundary and Description

Construction of the continuous miner is based on manufacturer specifications for a Bucyrus 25M Series model, 755 HP, underground continuous miner. Extraction of coal from the Illinois No. 6 bituminous underground coal mine requires continuous miners, which are used to cut into the coalbed and remove coal during the mining process. The continuous miner removes coal from the coal face using a large rotating steel drum equipped with tungsten carbide teeth, which scrape coal from the seam. The indicated model was chosen based on the coal mine seam thickness, which is assumed to be 2.13 - 2.74 m (84 - 108 in.) thick (Illinois 2006). The 25M Series continuous miner is designed for seam heights ranging from 1.12 - 2.90 m (44 - 114 in.) with a load rate of 23 metric tonnes (25.4 short tons) per minute. From the continuous miner, coal is loaded onto a conveyor for transport to the surface, where it is cleaned, stored, and loaded onto a train under LC Stage #1, for transport under LC Stage #2.

Figure 1 provides an overview of the boundary of this unit process. Emissions related to the physical assembly of the continuous miner (e.g., that are emitted while putting

together the components of a continuous miner, including transport of those components) are not included in this study boundary. As shown in Figure 1, the continuous miner constructed in this unit process is incorporated into the underground coal mine construction assembly processes for LC Stage #1 for coal.

The total weight of a continuous miner was readily available, but reliable data for the material breakdown of continuous miner subcomponents were not. Therefore, the continuous miner was assumed to be composed entirely of steel plate (Steel plate, BF (85% Recovery Rate) [Metals]). Upstream emissions from the production of raw materials used for the construction of the continuous miner (e.g., steel plate) are calculated outside the boundary of this unit process, based on proprietary profiles available within the LCI databases.

Table 1 shows relevant properties and assumptions used to calculate the amount of steel plate contained in a single continuous miner. Based on assumptions made, the total weight for one continuous miner is estimated to be approximately 56,700 kg (125,000 lbs) (Bucyrus 2008a & 2008b). Assuming that the continuous miner is constructed entirely of steel plate, the total weight is assigned to this material. **Table 2** provides a summary of modeled input and output flows. Additional details regarding input and output flows, including calculation methods, are contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

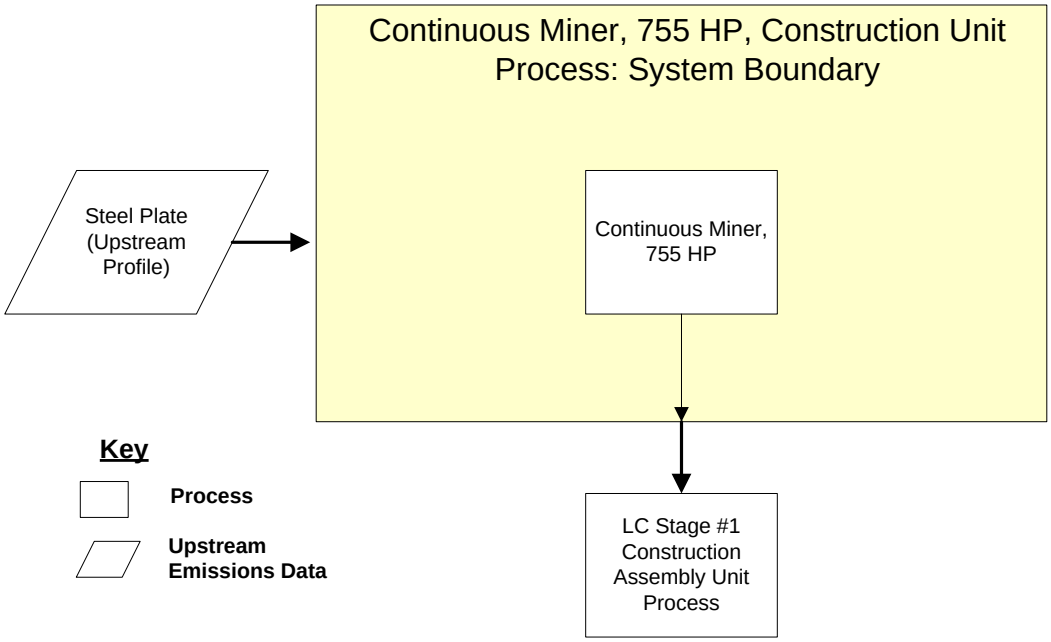

Table 1: Properties of the 755 HP Continuous Miner, 25M Series

Total Weight of Single Continuous Miner	Value	Reference
Coal seam thickness, m (ft)	2.13-2.74 (6.98-8.99)	Illinois, 2006
One Continuous Miner Weight, kg (lb)	56,700 (125,000)	Bucyrus, 2008a & 2008b
Total Steel Plate in One Continuous Miner, kg (lb)	56,700 (125,000)	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]	**56,700.00**	**kg**
Outputs		
Continuous Miner, 755 Horsepower [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.

References

Bucyrus 2008a — Bucyrus International. 2008. *Continuous Miners: The Range*. Bucyrus International. http://www.bucyrus.com/pdf/underground/Continuous%20Miners.pdf (Accessed January 12, 2010).

Bucyrus 2008b — Bucyrus International. 2008. *Continuous Miner Specifications*. Bucryrus International. http://www.bucyrus.com/cmspecs.htm (Accessed January 12, 2010).

Illinois 2006 — Illinois Department of Natural Resources. 2006. *Annual Statistical Report, 2006*. Illinois Department of Natural Resources. http://dnr.state.il.us/mines/public/asr2006.pdf (Accessed January 12, 2010).

Section III: Document Control Information

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