



NETL Life Cycle Inventory Data

Process Documentation File

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Diesel_Track_Bulldozer_410_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 weight of materials necessary to construct a single, diesel-powered, 410 horsepower (HP) track bulldozer, to be used for the land preparation portion of the production of biomass. The process is based on the reference flow of 1 piece of bulldozer, as described below and shown in **Figure 1**. The bulldozer 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 used during Life Cycle (LC) Stage #1 to assist in the cultivation of biomass feedstocks, specifically switchgrass. It is combined with other cultivation equipment construction unit processes in an individual assembly cultivation unit process for switchgrass, *DS_Stage1_C_Assembly_SG_Cultivate_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 biomass ready for transport (LC Stage #2) to the energy conversion facility (LC Stage #3).

Boundary and Description

Construction of the track bulldozer is based on manufacturer specifications for a Caterpillar Model D9T, 410 HP bulldozer. The cultivation of switchgrass requires a bulldozer, which is fitted with a blade to remove vegetation, large rocks, debris, and other obstructions, and for initial grading.

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

The total weight of the bulldozer was readily available, but reliable data for the material breakdown of bulldozer subcomponents were not. Therefore, the

bulldozer is assumed to be composed entirely of steel plate (Steel plate, BF (85% Recovery Rate) [Metals]).

Table 1 shows relevant properties and assumptions used to calculate the amount of steel plate contained in a single bulldozer. Total weight for one bulldozer is estimated to be approximately 47,899 kg (105,600 lbs) (Caterpillar 2009). Based on the assumption that the bulldozer is constructed entirely out 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

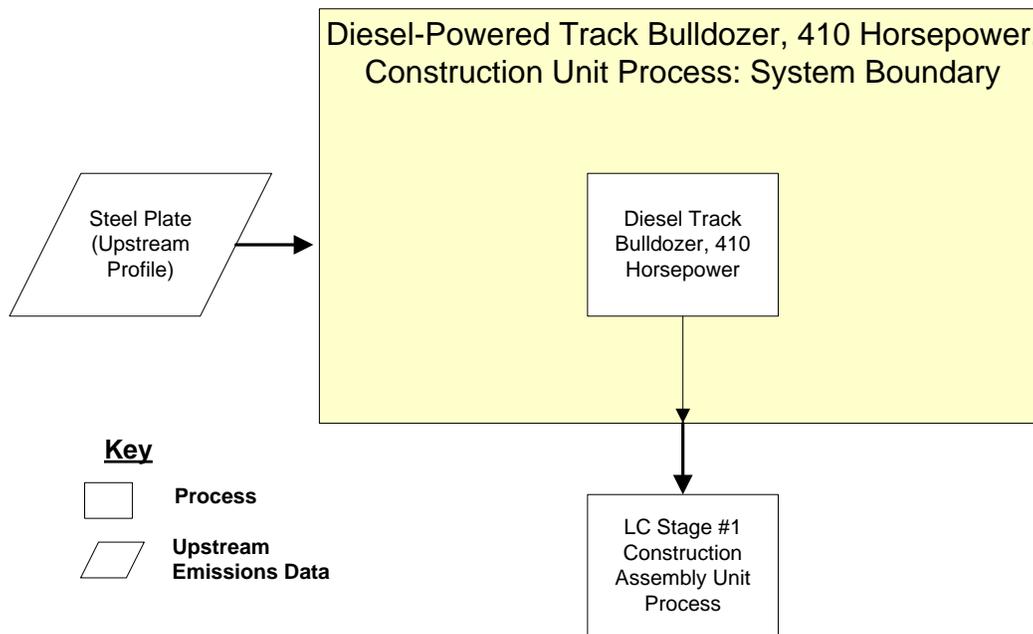


Table 1: Properties of the 410 HP, Diesel Track Bulldozer

Total Weight of Single Bulldozer	Weight	Reference
One Bulldozer Weight, kg (lbs)	47,899 (105,600)	Caterpillar 2009
Total Steel Plate in One Bulldozer, kg (lbs)	47,899 (105,600)	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]	47,899.4	kg
Outputs		
Diesel Track Bulldozer, 410 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

Caterpillar 2009

Caterpillar. 2009. *Caterpillar Products and Applications: D9T Track-Type Tractor*. Caterpillar. <http://www.cat.com/cda/layout?m=308821&x=7> (Accessed May 28, 2009).

Section III: Document Control Information

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