NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Grapple Skidder, 172 HP, Construction

Reference Flow: 1 piece (pcs) of Grapple Skidder, 172 HP

Brief Description: This unit process quantifies the materials required for the construction of a single grapple skidder, used for dragging cut trees from the harvester to the on-site chipper at the harvesting site.

Section I: Meta Data

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

Year Data Best Represents: 2011

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:

N/A

Tracked Input Flows:

Steel Plate, BF (85% Recovery Rate) [Metals]	*Steel plate from blast furnace used to construct skidder, assumes 85% recycled/recovery rate*

Tracked Output Flows:

Grapple Skidder, 172 HP [Construction]	*Construction of a single John Deere 172 HP Grapple Skidder*

Section II: Process Description

Associated Documentation

This unit process is comprised of this document, as well as the data sheet (DS) *DS_Stage1_C_Grapple_Skidder_172HP_2012.01.xlsx*, which provides additional details regarding calculations, data quality, and references as relevant.

Goal and Scope

The scope of this process encompasses the materials and weights of those materials necessary to construct a single 32,271 lb, 172 HP grapple skidder, to be used in the harvesting of short rotation woody crop (SRWC) biomass. The process is based on the reference flow of 1 piece of grapple skidder, 32,271 lbs, 172 HP, as described below, and as shown in **Figure 1.** The skidder 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 process is used during LC Stage #1 to assist in the harvesting of short rotation woody crop (SRWC) biomass feedstocks. It is combined with other cultivation equipment construction unit processes in individual assembly cultivation unit processes for SRWC biomass, DS_Stage1_C_Land_Use_Direct_Indirect_2012.01.xlsx, DS_Stage1_C_Standard_Drum_Wood_Chipper_630HP_2012.01.xlsx, DS_Stage1_C_Tree_Harvester_241HP_2012.01.xlsx, and DS_Stage1_C_Disc_Wood_Micro-Chipper_765HP_2012.01.xlsx. These assembly unit processes quantify 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 skidder is based on manufacturer specifications for a John Deere model 648H, 32,271 lb 172 HP grapple skidder. The skidder is used to collect short rotation woody crop (SRWC) biomass.

Figure 1 provides an overview of the boundary of this unit process. Emissions related to the physical assembly of the skidder (e.g., that are emitted while putting together the components of a skidder, 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 skidder (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 skidder constructed in this unit process is incorporated into the cultivation assembly processes for LC Stage #1 for SRWC biomass.

The total weight of a skidder was readily available but reliable data for the material breakdown of skidder subcomponents was not. Therefore, the skidder was 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 skidder. Total weight for one skidder is estimated to be approximately 14,638 kg (32,624 lbs) (John Deere 2011). Based on the assumption that the skidder is constructed entirely out of carbon steel, the total weight is assigned to this material. **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 sheet.

Figure 1: Unit Process Scope and Boundary

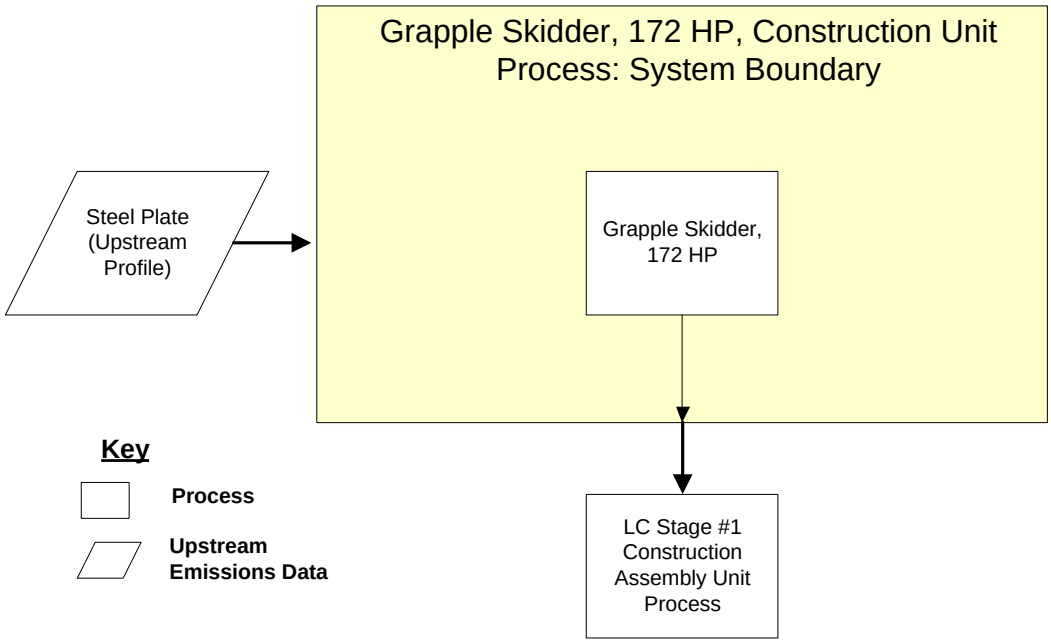

Table 1: Properties of the 172 HP Grapple Skidder

Total Weight of Single Harvester	Weight	Reference
One Skidder Weight, kg (lbs)	14,638 (32,271)	John Deere 2011
Total Steel Plate in One Skidder, kg (lbs)	14,638 (32,271)	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]	**14,638**	**kg**
Outputs		
Grapple Skidder, 172 HP [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

John Deere 2011 — John Deere, 2011. Skidders 548G-III/648H/748H/848H Grapple. Available at: http://www.deere.com/en_US/cfd/forestry/deere_forestry/media/pdfs/skidders/grapple/DKBGRPLSKDR.pdf (Accessed February 9, 2012).

Section III: Document Control Information

Date Created: May 3, 2012

Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

Revision History:

Original/no revisions

How to Cite This Document: This document should be cited as:

NETL (2012). *NETL Life Cycle Inventory Data – Unit Process: Grapple Skidder, 172 HP, Construction*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: May 2012 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

Section IV: Disclaimer

Neither the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) nor any person acting on behalf of these organizations:

A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe on privately owned rights; or

B. Assumes any liability with this report as to its use, or damages resulting from the use of any information, apparatus, method, or process disclosed in this document.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by NETL. The views and opinions of the authors expressed herein do not necessarily state or reflect those of NETL.