

Five Åkers cast roll LCA study summary

Including a summary of the sensitivity analysis

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Summary of	Life Cycle Assessment of five different cast rolls for metalwork, version 1, 2023-12-11

Background

This is a summary of the results from a life cycle assessment (LCA) study of five cast rolls made by Åkers Sweden AB. The LCA study is conducted in accordance with the ISO 14040 and ISO 14044 standards and focused on five specific roll types produced in 2022: MICRA, ICRA, CRONA, SPECRA, and VICTURA. The full LCA study was conducted from cradle-to-grave and evaluated the environmental performance of five cast rolls in terms of different environmental impact categories. The results were reviewed by a third party. The summary presents the cradle-to-gate results for these five rolls, specifically related to Global Warming Potential (GWP). Also, it presents the results of the performed sensitivity analysis. The summary aims to communicate insights to stakeholders and customers without directly comparing products.

The two functional units considered in this summary report for the assessment are defined as:

one cast roll and one ton of cast roll.

Upstream and core processes are included in the scope of the analysis, as it is a cradle-to-gate LCA. Upstream Processes include raw materials (such as main and auxiliary materials) and transportation of these materials to the Åkers production site. The full LCA study lists the main materials used for each roll (e.g., Graphite, FeSi, FeCr, Ni, etc.). Auxiliary materials are sourced from external suppliers and used during production. Core Processes cover internal transportation, energy use, and waste treatment within the production site.

The data collection is representative of the year 2022. Modelling and environmental impact calculations are performed with the LCA software LCA for Experts (previously known as GaBi) Version 10.7.1.28, using life cycle inventory data from Sphera Professional Database (Sphera Solutions GmbH, 2023) and Ecoinvent v3.9.1, allocation cut-off by classification (Ecoinvent Association, 2023). EN 15804+A2 (based on EF 3.1) has been used as the Life Cycle Impact Assessment (LCIA) method to quantify the Global Warming Potential (GWP).

Methodology differences

The reader should note that there is a difference between the LCA-quantified impacts of specific products and the impacts quantified for the company. There are connections, but these are complex and depend on the size of the product portfolio and the variance within. It is common that the company impact is quantified through the GHG Protocol Corporate Standard. The standard includes, among many other things, the impacts of all purchased materials, energy used during all production, and all waste generated from production within a specific reference year. The cradle-to-gate LCA considers only the specific materials, production energy, waste, and others to produce one product defined by a functional unit with no consideration for other activities within the company.

Results cradle-to-gate

The LCA results are presented in Table 1 (ton GWP per ton cast roll) for the five cast rolls. Table 1 presents the contributions of different processes in the upstream and core to GWP for five cast rolls per cast roll.

Table 1 Global Warming Potential impact [ton CO₂eq./ton cast roll] for all assessed products

GWP - Total	MICRA	ICRA	CRONA	SPECRA	VICTURA
TOTAL	0.53	0.55	0.87	0.76	0.96
Upstream	0.43	0.44	0.74	0.64	0.85
Main materials	0.36	0.37	0.67	0.56	0.77
Auxiliary materials	0.04	0.04	0.03	0.04	0.04
Transport of materials	0.02	0.02	0.04	0.04	0.04
Core	0.11	0.11	0.12	0.13	0.11
Manufacturing process	0.08	0.08	0.09	0.09	0.08
Waste treatment	0.03	0.03	0.03	0.03	0.03
Transport of waste	0.001	0.002	0.002	0.002	0.002

The results show that upstream processes contribute significantly to the total GWP impacts for five cast rolls, particularly raw material extraction and processing.

Setting the results in context

It might be difficult to evaluate the amount of Global Warming Potential per ton of product. Below, in Figure 1, are some examples to assist in setting the impact of the most sold rolls MICRA and ICRA in a context with the help of other metal products. The GWP data for the five general steel¹ and aluminum² products are based on published data.

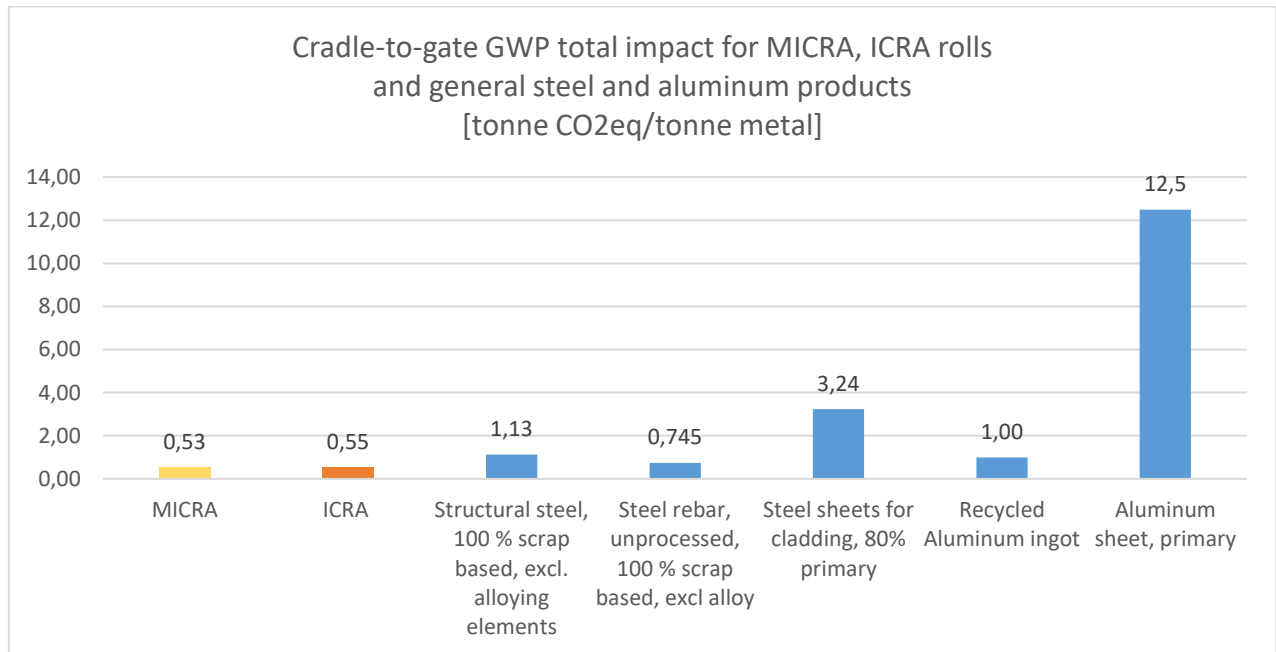


Figure 1 Cradle-to-gate GWP total impact for MICRA, ICRA rolls and general steel and aluminum products.

¹ <https://klimatdatabasen.boverket.se>

² Average of 3 Al Sheet EPDs from www.environdec.com and www.aluminum.org/sites/default/files/2022-01/2022_Semi-Fab_LCA_Report.pdf

Sensitivity analysis

The sensitivity analysis assesses how changes in variables impact the results of the cradle-to-gate LCA. In this case, how changes in the electricity sources in Core processes and changes in recycled material rates in Upstream processes affected the total GWP value. The main LCA study represents the situation in 2022, with 100% hydropower electricity in Core and a high recycling rate of materials in Upstream. One scenario represents a 100% Swedish residual mix used in the Core for manufacturing processes together with a lower rate of recycled material and a higher rate of virgin material content in Upstream processes. This scenario is based on rolls produced between 2015 and 2018 and the used Swedish residual mix from 2016.

It should be noted that the results presented in the scenario are based on a significant assumption regarding the environmental impact of scrap allocation. In the main study, it is assumed that all scrap is post-consumer due to a lack of additional information on pre-consumer scrap. The scenario adopts a worst-case perspective, which, together with the LCA study, indicates the highest possible reductions of potential GWP-total impact. Due to the assumption of scrap allocation, there might be an overestimation of the GWP-total reduction. Thus, the results should be considered an indication of potential reduction, with this uncertainty in mind.

The sensitivity analysis results are presented in Table 2 (ton GWP per ton cast roll) as well as in Figure 2 (ton GWP per ton cast roll).

Table 2 Global Warming Potential impact [ton CO₂eq./ton cast roll] for all assessed products - scenario results.

GWP - Total	MICRA	ICRA	CRONA	SPECRA	VICTURA
TOTAL – LCA study	0.53	0.55	0.87	0.76	0.96
TOTAL - Scenario	1.38	1.21	1.64	1.56	1.73

Considering the scenario as a reference, using a higher share of recycled raw materials in the production of rolls, and switching to renewable electricity sources indicate an improvement in decreasing the cradle-to-gate GWP-total impact. The decrease in impact indicates that the changes in electricity and post-consumer recycled content could potentially reduce the GWP total impact by between 45% and 61%, depending on the roll in a cradle-to-gate assessment.

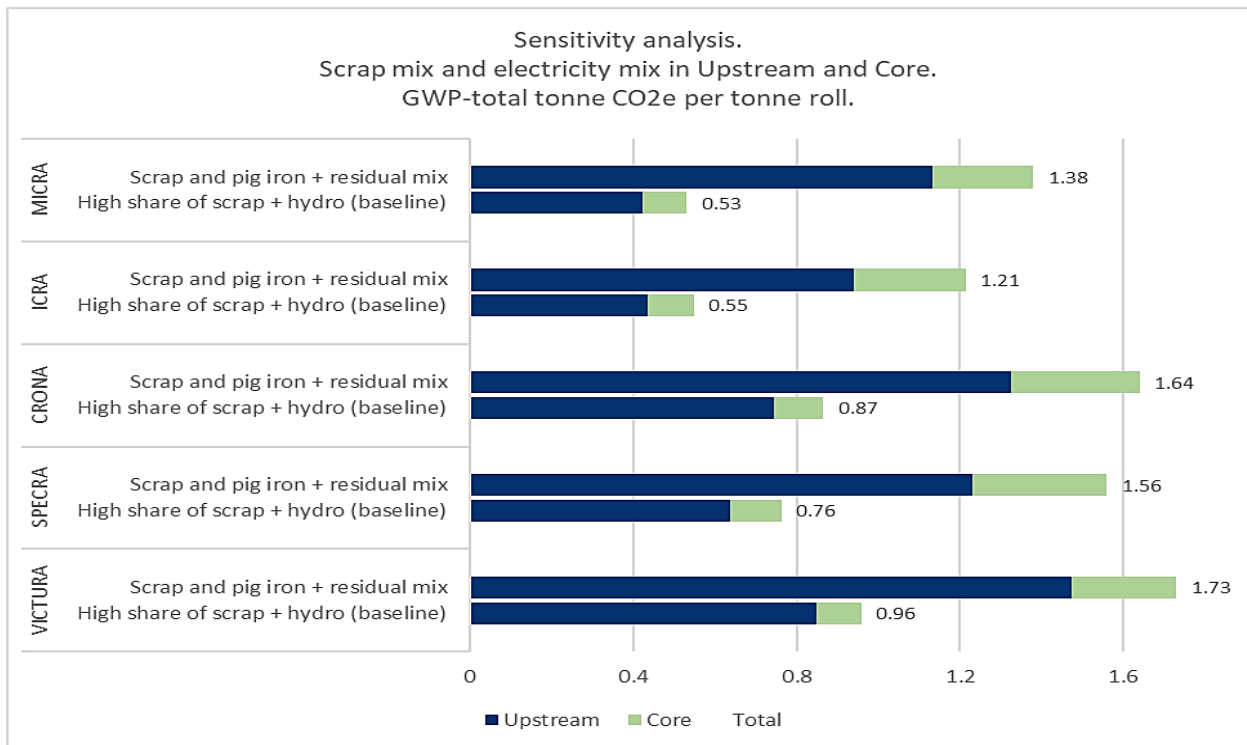


Figure 2 Scenario compared to the baseline, GWP-total ton CO2e/ton roll, cradle-to-gate- The value right of the bar is the total impact.

The main LCA study was conducted with a scope of cradle-to-grave. The Downstream processes contribute between 33% to 46% of the total GWP impact, of which between 18% to 27% is due to transport to customers. Cooperation between Åkers Sweden AB and its customers is necessary to work actively on transportation choices and, thus, potentially on further GWP impact improvements.