INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION

Quantifying the improvement in the environmental impact of the production of high carbon ferrochromium (HC FeCr)

High Carbon Ferrochromium Life Cycle Assessment (LCA) Summary

High carbon ferrochromium (HC FeCr) is an intermediate product used in the production of stainless steel.

Production of stainless steel with a chromium content of 10 to 20%, is the main end-use of high carbon ferrochrome. In fact, **over 80% of the world's ferrochrome** is used in the production of stainless steel.

Adding chromium to carbon steel in sufficient quantities is what makes steel stainless:

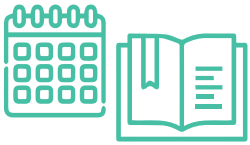
corrosion resistant | **mechanically strong** | **heat resistant** | **hard wearing** | **100% recyclable**

These unique properties make stainless steel ideal for a host of everyday and essential uses from architecture to energy production, medical equipment, food processing, and homeware.

The International Chromium Development Association (ICDA) has completed a fourth LCA of HC FeCr sector to quantify its environmental impacts, benchmark it with the results of the previous LCAs, and identify areas of improvement. The results of this LCA also offer a baseline to develop a roadmap to decarbonise HC FeCr production.

Scope of the LCA

Cradle-to-gate production of HC FeCr including mining, beneficiation, pelletising and smelting.



A comparison between the study published in 2015 (2012 data) and the study published in 2020 (2018 data).

Companies that participated in the study account for **45.3% of global HC FeCr production**. Despite being the largest FeCr producer, China did not participate in the study due to restrictions on the LCA data they were able to provide.

Standards adhered to

The LCA is a scientific approach, recognised as the best tool for assessing and comparing the environmental performance of products. This assessment was undertaken by Sphera (formerly thinkstep) and conducted following ISO 14010 and ISO 14044 standards.

Results at a glance

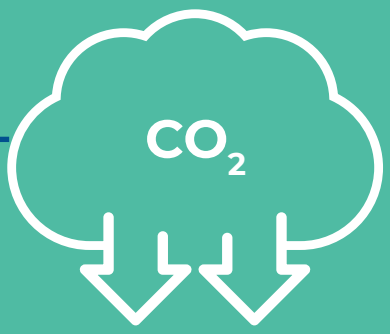
The environmental impacts of producing HC FeCr are mainly associated with local electricity consumption:

- Smelting causes approximately 82% of the overall contribution to global warming potential because it requires high amounts of energy which is still fossil-fuel based in several producing countries.
- Coal-based electricity grid mix remains a significant driver for global warming potential.
- The average total global warming potential is 10 kg CO_2 equivalent per kg of Cr in ferrochromium (result based on companies participating in the study).

Percentage change in major indicators between 2012 and 2018

9%	16%	10.7%	10.3%	3.5%
Global Warming Potential	**Acidification Potential**	**Eutrophication Potential**	**Photochemical Ozone Creation Potential**	**Primary Energy Demand**

Continued improvement



The improvement in major environmental indicators is due to research and development investment as well as independent renewable energy initiatives by HC FeCr producers. This trend should continue in future. However, focused support from governments to encourage the development of low carbon energy sources is needed to accelerate future improvements and achieve the chromium industry's goal of limiting any impact on climate change.

Benefits for users

Efficiency
The LCA can be used by the stainless steel industry to calculate the overall footprint of their final products and develop targets for its main alloying elements.

Environment
The LCA helps HC FeCr producers to monitor progress and improve their processes in order to minimise the environmental impact as far as possible.

The future
This LCA is a critical tool for governments and regulators, particularly those in countries still highly reliant on high carbon sources of power, to encourage them to accelerate the development of low carbon energy sources.

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