Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for

Ferrochrome

from

Outokumpu Chrome Oy

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Content

Figure 1 Lumpy ferrochrome

1. Outokumpu in brief

Outokumpu is a global company producing stainless steel and ferrochrome. Stainless steel is durable and designed to last forever. Our customers use it to create civilization's basic structures and its most famous landmarks as well as products for households and various industries.

Outokumpu employs approximately 8,500 professionals in close to 30 countries, with headquarters in Helsinki, Finland and shares listed on Nasdaq Helsinki.

2. Outokumpu Chrome Oy in brief

Outokumpu is the owner of the largest known chromite reserves in Europe. We have the unique access to an essential raw material in the production of stainless steel. Ferrochrome is an integral part of Outokumpu's operations and supported by our Kemi mine.

The primary product for the Ferrochrome business area is the charge grade of ferrochrome. Our Ferrochrome business area runs the chrome mine in Kemi and ferrochrome smelter in nearby Tornio, Finland.

Figure 2 FeCr furnaces in Tornio

3. Sustainability at Outokumpu

Sustainability at Outokumpu is founded on good governance and on three pillars: environmental, economic, and social, all of which need to be in balance.

3.1. Environment

3.1.1. Environmental certifications

All Outokumpu's production sites are certified according to quality ISO 9001 and environment ISO 14001 management systems, including energy efficiency targets. The functioning of the systems is monitored by both internal and external audits. These management systems are used to implement sustainability issues on the local level.

3.1.2. Climate and emissions

Outokumpu has been a member of the Science Based Targets initiative since 2016. We are committed to limiting global warming to below 1.5°C. By working closely with our customers, we help them to develop solutions that further decrease their carbon footprint and reduce the burden on climate. We are determined to make our operations more energy efficient by maximizing the use of electricity with a low carbon footprint in our operations. In 2022, over 85% of our electricity sources came from low-carbon (renewable and nuclear) sources.

Long committed to sustainability, Outokumpu has even devised a way to use carbon monoxide generated in ferrochrome furnaces through Tornio operations to replace propane as a primary energy source, cutting costs and CO_2 emissions.

3.1.3. Environmental protection

Protecting the environment in the locations where we operate is our highest priority and a part of our license to operate. We have made significant investments in environmental protection over the past years, and we will continue to develop our processes even further. We aim to have a minimal impact on nature and biodiversity. This means also minimizing waste to landfill and for example FeCr slag is used mainly in road and earth construction.

3.1.4. Sustainable mining

Our ferrochrome originates from our own chrome mine located in Kemi, Finland. We are a member of the Finnish Network for Sustainable Mining, and Kemi mine is committed to the Finnish sustainability standard for mining. The minerals are in oxide form and very stable with only a minimal amount of sulphur compounds. Chemicals are not used in the beneficiation process, which is based on gravity separation. The

Kemi mine is almost self-sufficient with water as it recycles water on site and collects rainwater.

3.2. Social and economic

The most important policies guiding Outokumpu's sustainability management are the Group's Code of Conduct and the Corporate Responsibility Policy. We expect our business partners and suppliers to follow similar standards. All of our policies are available at outokumpu.com.

Outokumpu complies with international, national, and local laws and regulations, and respects international agreements concerning human and labor rights, such as the International Bill of Human Rights, the UN Global Compact and the ILO Declaration on Fundamental Principles and Rights at Work. Outokumpu also implements the UN Guiding Principles on Business and Human Rights in its corporate policies.

3.2.1. Impact on society

Outokumpu exists through employees, the communities where we operate in, business partners, investors and other stakeholders. Our operations have considerable social and economic impacts both on personal, local, national, and global community levels. We therefore take responsibility concerning people and societies from many different aspects.

We contribute to community level well-being by direct and indirect employment, as well as by numerous ways of community involvement. Even though Outokumpu operates in a global market, our production sites are often located in small cities or towns, where we may be one of the few private sector employers in the area. We recognize that our decisions may carry major impacts both our personnel, communities, and the local service providers and suppliers.

At Outokumpu, we value diversity and want to create a work environment that allows all team members to develop and grow. We are operating in an increasingly global environment with a diverse organization in terms of e.g., age, culture, ethnicity, gender, religion, sexual orientation. It is important that everyone feels welcome and can contribute equally to our joint journey. Our ambition towards 2025 is that we aim for our workforce and leadership to represent the societies we operate in and serve.

3.2.2. Safety and employees

We believe that strong safety performance correlates with improved quality and operational efficiency. This way we are also taking responsibility for our people and surrounding societies. Outokumpu aims to be among the industry leaders in safety with the vision of zero accidents. We focus on building a strong safety culture by

establishing common safety principles, sharing good practices and learning from past incidents to create increased awareness.

We see measuring and managing our organizational health in a consistent and comprehensive manner as essential. We are also committed to supporting the development of our people by training programs and performance management. Outokumpu regularly conducts an Organizational Health Index survey to assess its organizational strengths and improvement areas, as well as to initiate new development programs.

3.2.3. Supply chain and governance

Outokumpu is a part of a global supply chain by producing stainless steel for leading brands and demanding industries around the globe. Our customers expect us to provide a traceable supply chain and, therefore, we have in place stringent requirements on our suppliers, too.

Figure 3 Ferrochrome is an integral part of Outokumpu's operations, and supported by our Kemi mine.

4. Product information

The primary product is the charge grade of ferrochrome, product information is given in table 1. Ferrochrome can be used as raw material for the manufacture of various grades of stainless steel, high chromium casting, and specialty steel.

Table 1. Product information of ferrochrome

	Description
Product name:	Ferrochrome
Product identification:	Ferrochrome (FeCr), Ferrochromium, High Carbon Ferrochrome, Charge Chrome. CAS No 11114-46-8
Product description:	This product is used as raw material for the manufacture of various grades of stainless steel, high chromium casting, and specialty steel. No uses advised against.
UN CPC code:	Group 411 – 41113 Ferrochromium
Geographical scope:	Finland

Figure 4 Lumpy ferrochrome

5. LCA information

The scope of the declaration is for 1 tonne of ferrochrome from cradle to gate.

Table 2. Scope and data used in life cycle assessment.

	Description
Functional unit / declared unit:	1 tonne (1 000 kg) of ferrochrome at the manufacturer gate.
Reference service life:	N/A
Time representativeness:	The data is collected from year 2022. The database data are from 2022. Environmental product declarations used as background data for modelling are published less than five years ago.
Database(s) and LCA software used:	SimaPro (release 9.4.0.2) and database ecoinvent 3.8.
Description of system boundaries:	Cradle to gate
Cut-off:	In the LCA inventory of the input flows, a 1 % cut-off rule was applied regarding mass and energy flows. However, the flows that have known significant environmental impacts are included even in low amounts. Excluded processes from the LCA: - transport of explosives, flocculant, ferrosilicon, grinding balls, bentonite, calcite, electrode paste, ethylene glycol, sodium hydroxide, nitrogen, oxygen, and magnesium hydroxide - transport of waste to treatment (A1, A3) - processing infrastructure
Allocations:	No allocations were done. All environmental impact were allocated to ferrochrome.
Assumptions:	For the transportation distance, information was used as provided by the commissioner. For certain longer distances, rougher estimates were used. Nevertheless, it was assumed that these distances are sufficient for a representative impact assessment.

5.1. System diagram

At Outokumpu's Kemi Mine, located just 20 kilometres from Outokumpu's Tornio Works, all mining operations take place underground. The mine is the source of chromite ore that is concentrated into upgraded lumpy ore and fine concentrate at the surface. No chemicals are used in the concentration process at the Kemi Mine. Both concentrates are then transported to the Tornio Ferrochrome Works for processing. Total ore reserves amount to 50 million tonnes.

Using Best Available Technologies (BAT), Tornio ferrochrome operations consist of sintering, smelting, crushing and screening. Tornio Ferrochrome doubled its capacity of ferrochrome production in 2013 to a total capacity of 530,000 tonnes per annum. The plant is one of the largest in the world and is dedicated to meeting customer requirements for high quality and the strictest safety standards.

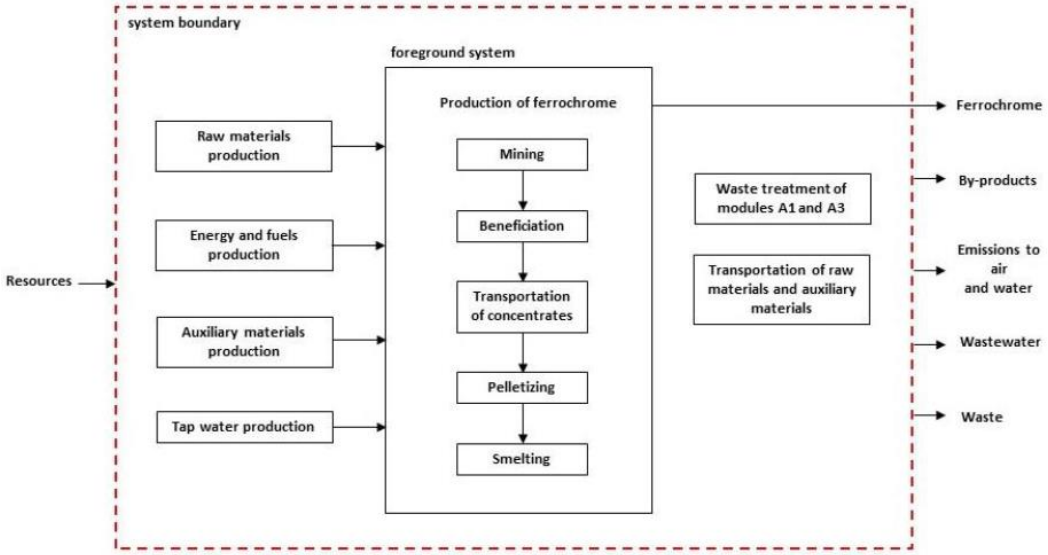

Figure 5. Flow diagram describing the system boundaries.

5.2. Content information

Table 3. Typical composition of ferrochrome

Product components	Weight, kg	Weight-%	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Carbon	70,0	7,00 %	0 %	0 %
Chromium	525,0	52,50 %	0 %	0 %
Iron	340,0	34,00 %	0 %	0 %
Nickel	< 2,00	< 0,20 %	0 %	0 %
Phosphorus	0,2	0,02 %	0 %	0 %
Silicon	47,0	4,70 %	0 %	0 %
Sulfur	< 0,5	< 0,05 %	0 %	0 %
Others	1,53	1,53 %	0 %	0 %
TOTAL	1 000,0	100 %	0 %	0 %

5.3. Systems specifications

The scope of the declaration is for 1 tonne of ferrochrome from cradle to gate. Cradle to gate option is chosen ferrochrome a raw material of stainless steel so after further manufacturing it can no longer be separated from steel at the end of life. Ferrochrome is no longer identifiable at the end of life as a results of manufacturing processes. In addition, it does not contain biogenic carbon.

Table 4 shows modules declared (A1-A3) and geographical scope for this life cycle assessment. Modules A4-A5, B1-B7, C1-C4 and D have not been included to calculation.

Table 4. Module declaration.

	Product stage			**Construction process stage**		**Use stage**							**End of life stage**				**Resource recovery stage**
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	EU 27	EU 27	FI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data used	> 90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0 %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0 %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

6. Results of the environmental performance indicators

The scope of the declaration is for 1 tonne of ferrochrome from cradle to gate. Results from life cycle assessment are presented in tables 5-9.

Primary reason for producing ferrochrome (FeCr) is to obtain chromium (Cr). The chrome component in ferrochrome is essential because it imparts corrosion resistance, heat resistance, strength, and hardness to the alloy. These properties make ferrochrome valuable in stainless steel production and other industries where durable and high-performance materials are required.

For every 1 tonne of Outokumpu FeCr produced 1,75 tonnes of total CO_2-eq is released. There is 52,5% chromium in 1 tonne of FeCr, thus it can be said that the carbon footprint for chromium from Outokumpu FeCr is 3,34 tonnes of CO_2-eq per tonne of chromium.

6.1. Mandatory impact category indicators according to EN 15804

Table 5. Mandatory impact category indicators

Results per declared unit			
Indicator		**Unit**	**A1-A3**
Global warming potential	**Fossil**	kg CO_2 eq.	1,74E+03
	Biogenic	kg CO_2 eq.	9,51E+00
	Land use & land use change	kg CO_2 eq.	3,29E-01
Global warming potential – Total		kg CO_2 eq.	1,75E+03
Ozone layer depletion potential		kg CFC 11 eq.	3,47E-04
Acidification potential		mol H^+ eq.	5,52E+00
Eutrophication potential	**Freshwater**	kg P eq.	1,34E-01
	Marine	kg N eq.	1,16E+00
	Terrestrial	mol N eq.	1,23E+01
Photochemical ozone formation		kg NMVOC eq.	3,52E+00
Abiotic depletion potential	**Minerals & metals ***	kg Sb eq.	1,72E-03
	Fossil *	MJ	5,11E+04
Water deprivation potential *		m^3	3,87E+03

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

6.2. Additional mandatory and voluntary impact category indicators

Table 6. Mandatory and voluntary impact category indicators. Human toxicity and ecotoxicity are voluntary impact categories.

Results per declared unit		
Indicator	**Unit**	**A1-A3**
GWP-GHG[1]	kg CO_2 eq.	1,75E+03
Human toxicity Cancer[2]	CTUh	8,26E-07
Human toxicity Non-Cancer[2]	CTUh	2,76E-04
Ecotoxicity, freshwater[2]	CTUe	5,44E+04

1 This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.
2 The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Table 7. Resource use indicators

Results per declared unit			
Indicator		**Unit**	**A1-A3**
Primary energy resources - Renewable	**Used as energy carrier**	MJ	2,53E+03
	Used as raw material	MJ	0
	Total	MJ	2,53E+03
Primary energy resources – Non-renewable	**Used as energy carrier**	MJ	5,10E+04
	Used as raw material	MJ	0
	Total	MJ	5,10E+04
Secondary materials		kg	0,00E+00
Renewable secondary fuels		MJ	0,00E+00
Non-renewable secondary fuels		MJ	0,00E+00
Net use fresh water		m^3	8,83E+01

Table 8. Output flow indicators

Results per declared unit		
Indicator	**Unit**	**A1-A3**
Components for re-use	kg	0,00E+00
Material for recycling	kg	6,03E+00
Materials for energy recovery	kg	1,05E-03
Exported energy, electricity	MJ	0,00E+00
Exported energy, thermal	MJ	0,00E+00

Table 9. Waste indicators

Results per declared unit		
Indicator	**Unit**	**A1-A3**
Hazardous waste disposed	kg	2,83E-01
Non-hazardous waste disposed	kg	1,37E+02
Radioactive waste disposed	kg	5,82E-01

7. General information

7.1. Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com
EPD registration number:	S-P-09583

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): Construction products, 2019:04, version 1.2.5, UN CPC code: Group 411 – 41113 Ferrochromium
PCR review was conducted by: The Technical Committee of the International EPD® System. Chair of the PCR review: Claudia A. Peña. The review panel may be contacted via info@environdec.com.
Life Cycle Assessment (LCA)
LCA accountability: Ecobio Oy, info@ecobio.fi
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier **Third-party verifier:**      Viktor Hakkarainen, VästLCA AB **Approved by:** The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

8. Company information

Company information
Outokumpu Oyj
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Tel +358 (0) 9 4211 Fax +358 (0) 9 421 5555 Mail sustainability@outokumpu.com Web www.outokumpu.com

Product-related or management system-related certifications
All of Outokumpu's production sites are certified according to quality ISO 9001 and environment ISO 14001 management systems, including energy efficiency targets. The functioning of the systems is monitored by both internal and external audits. These management systems are used to implement sustainability issues on the local level.

Name and location of production sites
Kemi Mine, Outokumpu Chrome Oy, Elijärventie 645, 94600 Kemi Finland
Ferrochrome Works, Outokumpu Chrome Oy Terästie, 95490 Tornio Finland

9. References

General Programme Instructions of the International EPD® System. Version 4.0.

Ecobio. LCA Report - Ferrochrome. Outokumpu Chrome Oy. 2023

PCR 2019:14. Construction products. Version 1.2.5.

Figure 6 Outokumpu operates a chrome mine in Kemi, Finland. We are a member of The Finnish Network for Sustainable Mining, and Kemi mine is committed to the Finnish sustainability standard for mining.