

In accordance with ISO 14025 for:

HOT-ROLLED BAR STEEL PRODUCT IN SMEDJEBACKEN & BOXHOLM, OVAKO

Program	The International EPD® System www.environdec.com
Program operator	EPD International AB
EPD registration number	S-P-01136
Publication date	2017-11-28 Version 2020-10-28
Validity date	2025-10-27
Geographical scope	Global. The production site is Smedjebacken and Boxholm, Sweden



General information

Information about the organization

Owner of the EPD: Torbjörn Sörhuus
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Ovako Bar AB
777 80 Smedjebacken, Sweden

Description of the organization: Ovako is a producer of high-performance engineering steel, with sustainability as a core element of its business.

Product-related or management system-related certifications: Certified compliance with ISO 9001, ISO 14001, ISO 50001 and IATF 16949-certificates.

Name and location of production site: Smedjebacken and Boxholm, Sweden

About the company

Ovako is a leading European producer of high-performance engineering steel, with sustainability at the core of all its activities. Ovako serves customers in the bearing, transport and general manufacturing industries. Ovako's customers are found mainly in the European engineering industry and its subcontractors. The steel production is based on scrap, making Ovako the largest recycler in the Nordics. Customers are generally leading manufacturers in their segments, and they place high demands on the performance of their steel.

Ovako belongs to the Nippon Steel Group, together with Sanyo Special Steel. This has formed a strong, world-leading collaboration in specialty steels, with expertise, products and support combined in a global offering. Optimized global production and the joint strength of R&D resources is helping to further accelerate innovation and competitiveness.

Steel melting and casting and modern hot-rolled bar operations are part of the operations at the Smedjeback-

en and Boxholm sites. This includes rolling mills and processing plant in Boxholm and the steel and rolling mill in Smedjebacken. The steel mill in Smedjebacken provides daily deliveries of steel to Boxholm.

The customers are found in many industries, from agriculture and rail to automotive. The majority of the output consists of high wear resistance steel, spring steel and micro-alloyed steel. Flat bar steel is a speciality and accounts for about half of the bar steel manufacturing.

WR-Steel®, the name for wear-resistant steel, is an important product from Smedjebacken and Boxholm. It is designed to provide a wear-resistant advantage when making products exposed to a high degree of wear and where service life is important. The WR-Steel mission is to optimize the wear resistance of end products. But at the manufacturing stage, it also gives customers the flexibility to form, shape and weld the steel to fit precise engineering needs.



Product information

Product name: Hot-rolled bar steel product

Product identification: The product is made from Carbon Steels and Low Alloyed Steels. These steels are in the massive product forms; semi-finished bar products. They are marketed under Ovako's trademarks, attribute brands and EN grade designations, as well as with designations according to various international and national standards.

Product description: The declared unit is 1 tonne (1000 kg) of hot-rolled bar steel product at Ovako's gates from the production sites in Smedjebacken or Boxholm. With respect to alloying content, the product represents an average product from the sites. The average consists of different steel qualities with alloying content varying according to the Content Declaration below.

Ovako hot-rolled bars from Smedjebacken and Boxholm are available in the following profiles and dimensions:

- Round bars: 14-120 mm,
- Flat bars: width 15-300 mm, thickness 5-80 mm
- Special profiles: adapted to customers requirements

The bars are characterized by close tolerances, excellent straightness as well as roundness, good surface finishes and low decarburization.

Process description: As shown in the illustration below, the main inputs to the steel making process are scrap, alloys, coal, lime, electrodes, fuels, oxygen and inbound transportation.

Scrap is melted in the electric arc furnace, alloyed in the ladle furnace and cast into billets in the Smedjebacken steel mill. This site is closely connected by railroad to the rolling operations in Boxholm. Around half of the steel produced in Smedjebacken is rolled on site, while the remainder is shipped each day for rolling at the Ovako facility in Boxholm.

Major additional processes include waste and slag handling and treatment of wastewater. The production units are equipped with filters that reduces emissions to air.

UN CPC code: 412

Geographical scope: Global

LCA information

Functional unit/ declared unit: 1 tonne (1000 kg) of hot-rolled bar steel product.

Reference service life: Not applicable.

Time representativeness: Production data are from 2019.

Database(s) and LCA software used: Ecoinvent 3.6 as applied in SimaPro 9.1.0.11, 2020. For calculation of environmental impacts, the method EPD (2018) Version 1.01 in SimaPro was used.

Description of system boundaries: Cradle-to-gate

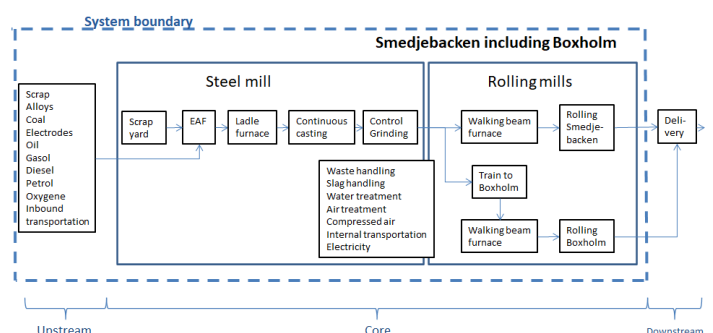
Cut-off criteria: Cut-off allocation of waste burdens and benefits in accordance with the polluter pays principle as stipulated in the PCR. Raw material inflows less than 0.0003% of the output flow were disregarded unless there were reasons to suspect significant environmental impact. Core process data is from site production records and therefore of good quality.

Excluded lifecycle stages: The use and end-of-life stages are excluded since hot-rolled bar steel products can be used in many different applications which also affect end-of-life.

More information: For more information on the product and Ovako steel products, see www.ovako.com/en/

Name and contact information of LCA practitioner: Mats Zackrisson at RISE IVF AB has carried out the underlying LCA study. Mats.Zackrisson@ri.se

Additional information: Vattenfall's unspecified electricity mix (16 gram CO₂eq/kWh) is used for melting and rolling operations. Liquefied petroleum gas (LPG) and oil are used for heating operations.



Content declaration

Products

Materials/Chemical substances	[kg/tonne]	%	Environmental/hazardous properties
Iron	Balance	Balance	
Nickel	0.30-15.7	0.03-1.57	Nickel is classified in EC Directive 67/548/EEC as a suspect carcinogen (category 3 – R40) and as a skin sensitizer (R43).
Chromium	0,4-13,1	0,04-1,31	
Molybdenum	0.1-5.8	0.01-0.58	
Manganese	2,3-16,8	0,23-1,68	
Silicon	0.4-19.7	0.04-1.97	

Standards describing the methods used for chemical composition analysis are: ASTM E 415-17 and ASTM E 1019-18.

Steel products are considered as articles under the European Regulation (EC) 1907/2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). All intentionally added alloying elements in Ovako products with the exception of nickel are not classified as hazardous. Nevertheless, there are certain substances covered by European and national chemical legislation and lists (REACH Annex XIV and XVII, RoHS-directive (2011/65/EC and 2015/863/EU) Annex II and Global Automotive Declarable Substance List ("GADSL")) that cannot physically be measured in steel and others that are difficult to measure due to being present in very low levels. The alloying elements in low alloyed steel are firmly bonded in its chemical matrix. Due to this bonding and to the presence of a protective oxide film the release of any of the constituents is very low and negligible when the steel is used appropriately.

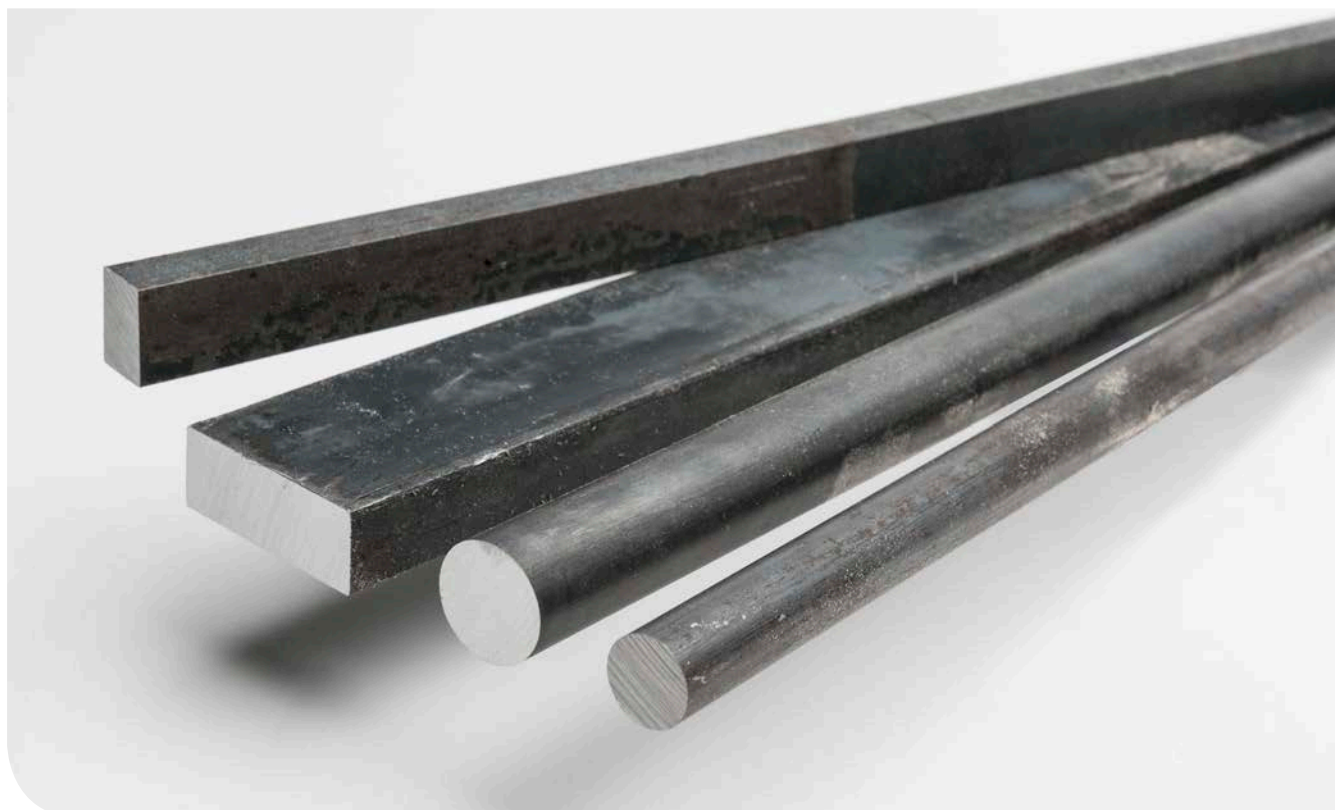
Packaging

Distribution packaging: Not applicable.

Consumer packaging: Not applicable.

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: The hot rolled bar steel product is made from 98% recycled steel and 2% alloying elements.



Environmental performance

Potential environmental impact per 1000 kg hot-rolled bar steel product

Parameter		Unit	Upstream	Core	Downstream	Total
Global warming potential (GWP)	Fossil	kg CO ₂ eq.	177	212	INA	389
	Biogenic	kg CO ₂ eq.	0	0	INA	0
	Land use and land transformation	kg CO ₂ eq.	0	0	INA	0
	Total	kg CO ₂ eq.	177	212	INA	389
Acidification potential (AP)		kg SO ₂ eq.	1.4	0.44	INA	1.8
Eutrophication potential (EP)		kg PO ₄ ³⁻ eq.	0.30	0.082	INA	0.38
Formation potential of tropospheric ozone (POCP)		kg NMVOC	0.92	0.47	INA	1.4
Abiotic depletion potential –elements		g Sb eq.	7.4	0.09	INA	7.5
Abiotic depletion potential – fossil resources		MJ, net calorific value	3980	140	INA	4120
Water scarcity potential		m ³ eq.	1120	62	INA	1182

Use of resources per 1000 kg hot-rolled bar steel product

Parameter		Unit	Upstream	Core	Downstream	Total
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	552	1400	INA	1952
	Use as raw materials	MJ, net calorific value	0	0	INA	0
	Total	MJ, net calorific value	552	1400	INA	1952
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	4540	4748	INA	9288
	Use as raw materials	MJ, net calorific value	0	0	INA	0
	Total	MJ, net calorific value	4540	4748	INA	9288
Secondary material		kg	997	0	INA	997
Renewable secondary fuels		MJ, net calorific value	0	0	INA	0
Non-renewable secondary fuels		MJ, net calorific value	0	0	INA	0
Net use of fresh water		m ³	INA	1.35	INA	1.35

Waste production per 1000 kg hot-rolled bar steel product

Parameter	Unit	Upstream	Core	Downstream	Total
Hazardous waste disposed	kg	INA	19	INA	19
Non-hazardous waste disposed	kg	INA	182	INA	182
Radioactive waste disposed	kg	INA	0	INA	0

Output flows per 1000 kg hot-rolled bar steel product

Parameter	Unit	Upstream	Core	Downstream	Total
Components for reuse	kg	INA	0	INA	0
Material for recycling	kg	INA	158	INA	158
Materials for energy recovery	kg	INA	0	INA	0
Exported energy, electricity	MJ	INA	0	INA	0
Exported energy, thermal	MJ	INA	INA	INA	INA

Influence of alloy content

The results above are presented for an average steel with an average alloy metal content. The influence of the alloy content on the environmental impact of the steels produced in Smedjebacken and Boxholm is shown in the table below. The average (50%) is the same as the declared product; absolute values are presented for the maximum alloy content of 90% of the production and 10% of the production respectively. The values for specific steel products, both value added operations and alloy differences, can easily be provided on request through a "footprint calculator" for the different environmental aspects.

Variance of environmental impact due to alloy content. Impacts per 1000 kg hot rolled bar steel product

Share of production	kg CO ₂ eq	kg SO ₂ eq	kg PO ₄ -eq	kg NMVOC
90%	432	6,7	0,50	1,9
Average; 50%	389	1,9	0,38	1,4
10%	368	1,2	0,30	1,1

Additional information

Information on recycling: Steel is 100% recyclable as a raw material for the production of new steel products.



Programme-related information and verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product

category but from different programs may not be comparable.

Program	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
EPD registration number	S-P-01136
Published	2017-11-28 Version 2020-10-28
Valid until	2025-10-27
Product Category Rules	PCR 2015:03. BASIC IRON OR STEEL PRODUCTS & SPECIAL STEELS, EXCEPT CONSTRUCTION STEEL PRODUCTS. Version 1.01
Product group classification	UN CPC 412
Reference year for data	2019
Geographical scope	Global

Product category rules (PCR): PCR 2015:03. BASIC IRON OR STEEL PRODUCTS & SPECIAL STEELS, EXCEPT CONSTRUCTION STEEL PRODUCTS. Version 2.0

PCR review was conducted by: The Technical Committee of the International EPD® System.
Full list of TC members available on www.environdec.com/TC

Independent third-party verification of the declaration and data, according to ISO 14025:2006:
 EPD process certification EPD verification

Third party verifier: Carl-Otto Nevén, NEVÉN Miljökonsult

In case of accredited certification bodies:
Accredited by: Not applicable

In case of recognized individual verifiers:
Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:
 Yes No

References

General Program Instructions of the International EPD® System. Version 3.0.

PCR 2015:03. Name. PCR 2015:03. BASIC IRON OR STEEL PRODUCTS & SPECIAL STEELS, EXCEPT CONSTRUCTION STEEL PRODUCTS. Version 1.01

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Cradle-to-gate. Understanding CO2 footprint of hot-rolled bar steel products. Ovako Group. 2019.

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SimaPro 8.5.0.0. Pré Consultants. 2019.

Contact information

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