PCF reporting principles

of thyssenkrupp Hohenlimburg GmbH

Version 13.03.2024

thyssenkrupp Hohenlimburg GmbH
Oeger Straße 120
+49 2334 910
info.precisionsteel@steeleurope.com

This document is subject to an update cycle
The current version can be found at:

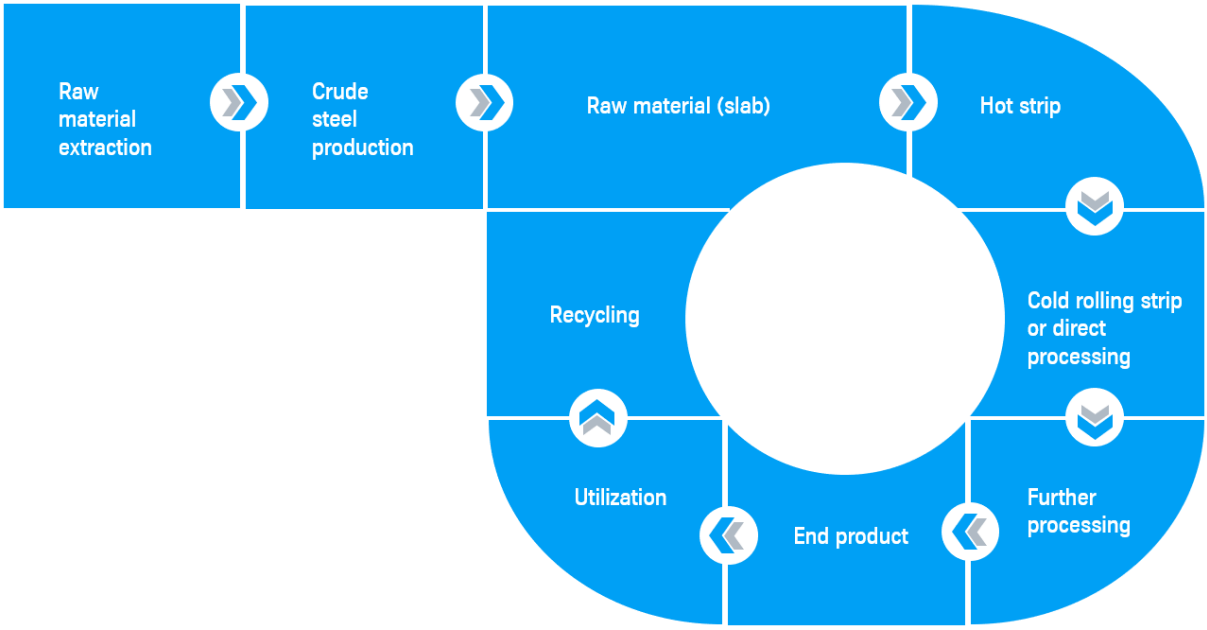
https://www.thyssenkrupp-steel.com/en/company/business-units/precision-steel/certificates/

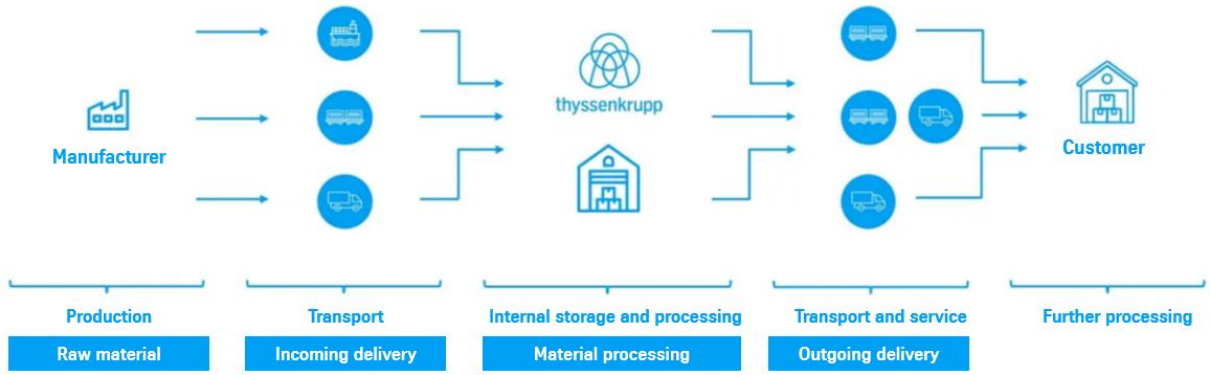
Product Carbon Footprint

Today's manufacturers and customers are increasingly thinking about tomorrow. It is becoming more and more important to think and act sustainably in the value chain and when making purchasing decisions.

In recent years, the issue of greenhouse gas (GHG) emissions associated with a product throughout its entire life cycle has become more and more significant. These emissions can be described with the help of the Product Carbon Footprint (PCF).

The PCF covers the CO_2 balance of greenhouse gas emissions generated by a product throughout its life cycle.



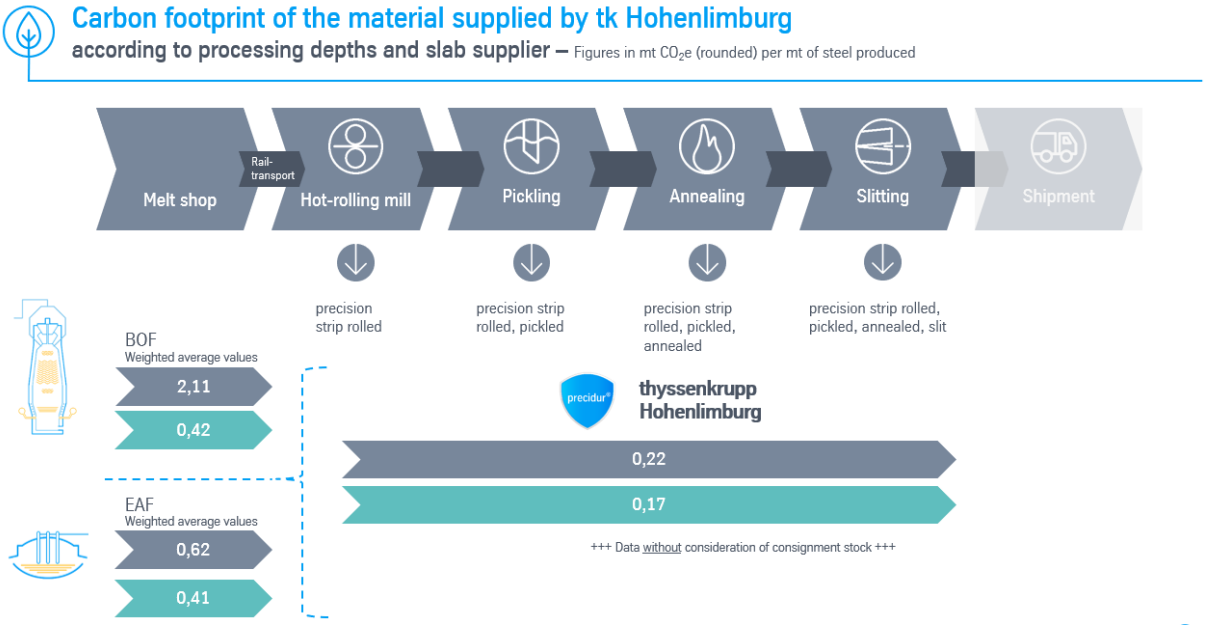


A cradle-to-gate PCF considers all stages of production, from resource extraction to the creation of initial products, transportation, and the final production of the end product, until it is ready to leave the company. This PCF corresponds to the partial Product Carbon Footprint in accordance with ISO 14067.

A PCF that covers the entire life cycle of a product, from cradle to grave, includes emissions from both the use phase and the end of the product's life.

thyssenkrupp Hohenlimburg GmbH (tk Hohenlimburg) is committed to becoming climate-neutral by 2045, and an increasing number of customers are choosing to make environmentally friendly purchases. Hence, tk Hohenlimburg has created a digital solution to calculate the cradle-to-gate PCF for its sales products in compliance with ISO 14067. This enables tk Hohenlimburg to provide PCFs for the entire portfolio. Customers are thus given important information about how much tk Hohenlimburg's products contribute to the carbon footprint of their business activities and end products.

The PCF calculation by tk Hohenlimburg is derived from the greenhouse gas emissions of its own plants, as well as processed data for purchased raw materials and energy.



Options for reducing PCFs

PCFs provide our customers with the information they need to reduce and avoid greenhouse gas emissions. Through the use of alternative manufacturing processes, we are able to provide them with added value right now today. In this way, we help our customers to reduce the carbon footprint of their products as well.

Electricity generated by wind power or photovoltaics, as well as the use of green electricity, are just some examples of sustainable practices in steel production in the upstream electric steel mills.

Another example of the application of the mass balance approach is the bluemint® Steel product. With this, the company is able to provide products with a lower carbon footprint by using a higher percentage of scrap in steel production.

How is the PCF calculated at tk Hohenlimburg?

The partial carbon footprint in accordance with ISO 14067 is calculated using the digital application validated by TÜV SÜD Industrie Service GmbH in accordance with ISO 14064-3, which systematically determines the carbon footprint for each product according to the production route in question. Primary data and secondary data are used for the calculation. Secondary data is, for example, raw material data from commercial databases.

The method for calculating the PCF is based on the ISO 14040, ISO 14044, and ISO 14067 standards. The partial carbon footprint takes into account the greenhouse gas emissions generated during the extraction of the raw materials (cradle) until they leave the tk Hohenlimburg site (factory gate).

The cradle-to-gate consideration is thus a subset of the overall life cycle analysis, which also includes the cradle-to-grave perspective.
The declared unit is 1 metric ton of hot strip delivered by tk Hohenlimburg.

What data is used to calculate the PCF?

Data collected for the 2021 calendar year forms the foundation for modeling the processes.

The hot strip product is allocated all CO_2 emissions generated throughout the value chain. Byproducts such as scrap or scale are not allocated emissions.

Manufacturers of the input stock (slabs) determine the material and production-specific emissions data used for the input stock.
An input stock with a reduced PCF is used for products with a likewise reduced PCF. The CO_2 emissions from manufacturing the slab input stock are determined based on the material losses at tk Hohenlimburg.

If the supplier does not provide specific data, recognized and extensive data records from the Sphera database are used instead. These contain information on other environmentally relevant influences in addition to CO_2 emissions.

The data records from Sphera are utilized to analyze the further environmental impacts of the production process used by the slab manufacturer.

The emissions for generating the electricity used are calculated based on the electricity mix provided by the electricity suppliers. For products with a reduced PCF, 100% of the electricity used is generated from renewable sources.

How high is the PCF of tk Hohenlimburg's products?

The PCF level is determined by a range of factors including the manufacturing process of the slabs, specific emissions from the particular supplier plant, transport emissions from the manufacturer to tk Hohenlimburg's plants, the influence of the alloying elements used, as well as the depth of processing and the type of electricity used during processing at tk Hohenlimburg.

What does Scope 1/2/3 mean in the context of a PCF?

Scope 1 emissions

Scope 1 emissions include all direct emissions that we ourselves cause by burning fuels, heating oil, natural gas, etc. at our locations.
This also encompasses emissions generated during the provision of services by third parties working on behalf of tk Hohenlimburg.

These are, for example

- Burning natural gas and hydrogen for thermoprocessing plants
- Burning natural gas to generate process steam
- Combustion of fuels for transportation within the plant
- Transportation of input stock by rail from the manufacturer to the company
- Transportation by rail and road truck between the company's locations
- Combustion of fuels during transportation of finished materials to consignment warehouses and external service providers
- Burning LPG
- CO_2 emissions resulting from chemical reactions

Scope 2 emissions

Scope 2 emissions are emissions from the generation and provision of purchased energy.

- Generation of electricity
- Provision of natural gas
- Provision of fuels

Scope 3 emissions

Scope 3 emissions are emissions from supplies or further processing outside the scope of tk Hohenlimburg.
A distinction is made here between scope 3 upstream and downstream.

Scope 3 upstream emissions include emissions generated in the production of input stock and auxiliary materials. These emissions are taken into account in the PCF (cradle-to-gate).

Scope 3 downstream emissions include the emissions that occur after leaving the factory gate. These include, for example, emissions from transportation and further processing at the customer's premises. These factors must be considered when determining the customer's PCF.

What is considered in the PCF at tk Hohenlimburg?

- Input stock
  - Manufacture of the slab (cradle to gate)
  - Rail and, if needed, sea transport to ship the input stock from the manufacturer's factory gate to the tk Hohenlimburg factory gate
  - Additional material required as a result of material losses in the factory, including scrap, burn-off, and scale

- Production facilities, infrastructure, and transportation
  - All production plants
  - Multiple processing in our own production stages
  - Reworking at external service providers, incl. emissions from transport
  - Cooling of plant components
  - Cooling of products
  - Generation of compressed air
  - Generation of process steam
  - Preparation of acid
  - Provision of process and cooling water
  - Transportation of material between the company's locations
  - In-plant transportation by rail, road truck, forklift, and crane systems
  - Treatment of wastewater by sewage treatment plants
  - Chemical processes in production plants in which CO_2 is released
  - Oils for lubricating the finished material
  - Air conditioning and temperature control (server and control rooms)

- Power supply
  - Generation and provision of energy including delivery to the company
  - Losses during the transmission of electricity in the public grid

- Ancillaries
  - Manufacture and provision of ancillaries including delivery to the company

- External service providers
  - Transportation of material to consignment warehouses
  - Transportation of material to service providers and back to the company if necessary

What is not considered in the PCF at tk Hohenlimburg?

- Non-production-related activities and resulting waste
- Infrastructure and employees
  - Offices and activities of employees
  - Business trips

    - Company vehicles
    - Catering and canteen
- Maintenance activities
    - Maintenance of systems and replacement/spare parts
    - Storage of spare parts
    - Waste from maintenance activities
    - Oils and greases for machinery operation
- Packaging and the resulting waste
- Processing/reworking of products at the customer's premises
- Transport from/to the customer for contract rolling or other contract processing in the company
- All activities after handover of the product to the customer (gate)
- Use phase of the products
- Recovery, recycling after end of use
- Emissions from land use change have not been taken into account

How can the PCF of the product be reduced?

As part of a sensitivity analysis, tk Hohenlimburg has explored potential strategies for decreasing the PCF.
The type of production of the slab input stock has a significant influence on the PCF. Since the emissions from crude steel production are no longer taken into account, the electric steel mill has a lower PCF than production in the blast furnace. Using green electricity in the electric steel mill allows for a direct reduction in the PCF of the slab used.

While involving significant investments, a direct reduction process using hydrogen has the potential to significantly reduce CO_2 emissions from crude steel production in the long term.

The main emissions at tk Hohenlimburg are Scope 1 emissions from burning natural gas, which can be minimized by switching to biomethane gas or hydrogen. It is not anticipated that the necessary supply infrastructure for hydrogen (electrolysis plants and pipelines) will be in place before 2032. Extensive investments are also needed here to adapt the systems and internal infrastructure.

The use of green electricity for processing at tk Hohenlimburg helps to decrease Scope 2 emissions from the rolling and subsequent processes.

Further potential is offered by the conversion of in-house transportation from diesel-powered trains and forklifts to electric operation. The vehicle manufacturers are currently developing technical solutions for this.

Furthermore, shifting coil transports from road to rail offers potential for reducing CO_2 emissions.

What is a bluemint® precidur® product?

At tk Hohenlimburg, products that have a significantly smaller carbon footprint compared to a reference value are labeled bluemint® precidur® products.

The PCF of tk Hohenlimburg's products is calculated throughout the production process, and can be indicated for each product variant.

bluemint® precidur® products are manufactured using input stock that has already been produced in the steel mill with a reduced PCF, involving electricity from 100% renewable sources.

Life Cycle Assessment (LCA)

Our products' greenhouse gas emissions are made transparent by the PCF. Our overall sustainability approach relies heavily on these components. Products are comprehensively assessed for sustainability, taking into account environmental, social, and corporate governance criteria (ESG).

As part of the study to determine the PCF, the company carried out a holistic life cycle assessment based on detailed modeling of all production processes with regard to further questions on environmentally relevant influences that arise during manufacturing and processing of the hot strip product.

This analysis was undertaken on the basis of the CML method. The CML method aims to map the quantities of all direct material and the energetic exchange relationships between the natural environment and the product system. It thus attempts to take the impact side into account to a greater extent, and includes environmentally relevant influences such as over-acidification, eutrophication, water consumption, greenhouse effect, human toxicity, aquatic ecotoxicity, terrestrial ecotoxicity and photooxidants.

This life cycle assessment (LCA) was also performed within the "cradle to gate" boundaries. The company can thus assess additional environmental factors alongside the PCF, using this data to pinpoint strategies for reducing other environmental impacts like soil acidification, and to develop corresponding measures to increase overall sustainability.

Which international standards and rules have been applied?

The PCFs of tk Hohenlimburg are calculated in accordance with the general standards for life cycle assessments (ISO 14044) and carbon footprints of products (ISO 14067). The validation was conducted in accordance with ISO 14064-3.

This analysis was undertaken on the basis of the CML method. CO_2 emissions from burning biomass (biometric carbon) are taken into account, but are not a relevant influencing factor.

No further product category rules were applied.

For how long is the PCF valid?

The PCF of the hot strip is calculated on an order-specific basis. The basis for calculating this is a model that represents the processes at tk Hohenlimburg, along with data on emissions from input stock manufacturing, the processing depth at tk Hohenlimburg, and the type and quantity of energy and auxiliaries used.

The parameters for calculating the order-specific PCF are updated every two years at the latest, based on a recalculation of the existing model. The calculation depends on the energy combination utilized, and the material-specific PCF of the input material suppliers. If there is a change in the energy mix, new suppliers of input materials, or significant changes in the PCFs

of the input material suppliers, the basis for calculating the order-specific PCF will be updated accordingly.

If influencing variables such as the energy efficiency of the processes change significantly, the model parameters will be adjusted. The model structure will be adapted if the processes of tk Hohenlimburg can no longer be mapped using the existing model.

The TÜV SÜD validation report can be made available on request.