ReFlow®

DATA-DRIVEN DECARBONIZATION

We make it easy to assess, document and calculate the carbon emissions of your products and company

Jan 2025

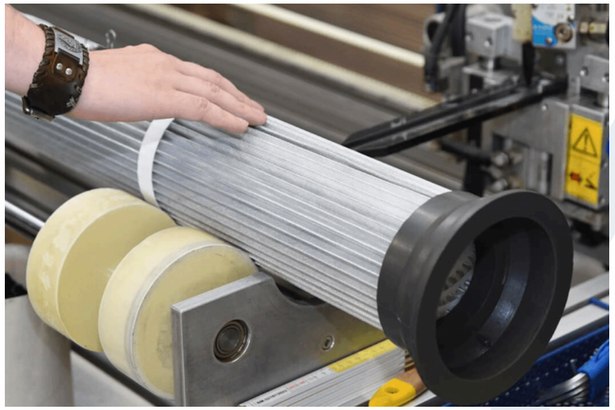
Part of GRIEG

Your Sustainability Partner

Company

- Sustainability reports
- CSRD Readiness
- GHG reports
- Scope 3 calculations
- ESG reporting
- Supply-Chain assessment
- Guidelines & policies
- ISO GHG Certification

Product



- ISO compliant LCA reports
- LCA screening
- Custom material data
- Energy-grid data
- Design evaluation
- Material evaluation
- Green fuel calculation & certification

Inspections & Validations

- End-of-life inspections
- Green claims verification
- ISO GHG Certification
- Factory HSQE inspection
- Report validation

ReFlow®

THE DATA-DRIVEN APPROCH

WHAT COMPANIES DO TODAY

- Ban fossil fuels
- Join initiatives
- Carbon footprint accounting
- Set corporate goals

WHAT SUCCESSFUL COMPANIES DO

- Educate
- Decarbonize the supply chain
- Minimize air transportation
- Reduce waste
- Adapt circular activities
- Set measurable decarbonizations goals
- Understand scope 1, 2 & 3 on company and product level

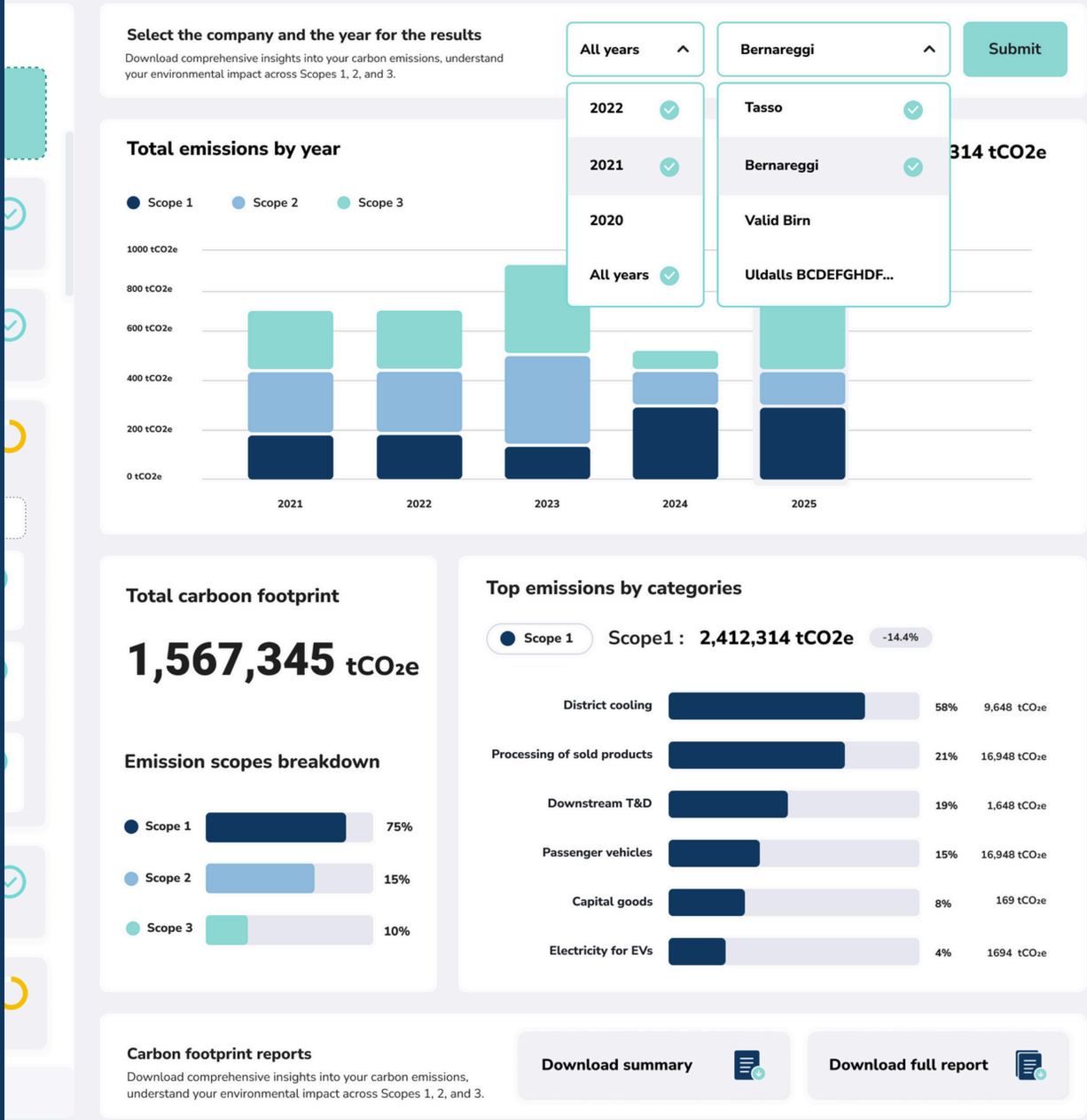
Meet Some Of Our Customers

Since 2021, Viking Life-Saving, a trailblazer in maritime safety equipment, has been leveraging the ReFlow platform to assess and reduce the environmental impact of their products. Committed to sustainability, Viking has successfully utilized ReFlow to calculate the carbon footprint of over 2,000 products, encompassing a wide range of life-saving appliances and safety solutions.

Since partnering with ReFlow, Maersk has revolutionized the sustainability of its shipping operations, particularly through the introduction of methanol-fueled vessels. Utilizing ReFlow's sophisticated LCA approach, Maersk has gained profound insights into the emissions associated with their methanol vessels from cradle to grave.

Wärtsilä, a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets, has harnessed the ReFlow platform since 2024 to calculate the carbon footprint of over 1,500 spare parts. This initiative is part of Wärtsilä's commitment to increasing transparency and supporting their customers in making informed, environmentally-conscious decisions

How you benefit from using ClimateHub™



ReFlow®

ClimateHub™ one-stop climate management

Company-level GHG reporting

- Compliant with GHG protocol
- Calculate scope 1,2 and 3 emissions
- Integrate LCA data & track changes

Environmental Advisory

- Experienced environmental engineers in 5 countries
- Green claims verification
- ISO GHG Certification
- On-site inspections

Product-level emissions

- Lifecycle assessments that are ISO 14040/44 compliant
- Datasets from ecoinvent, supplier data and custom materials
- Automated transparency and quality check
- Ready for future EU regulations

Benefits

Scope of emissions 1-3 for products & companies

Evaluate circular reduction scenarios

Document product & company emissions

Share & Request LCA climate data across the value chain

Compare environmental performance between products (benchmark)

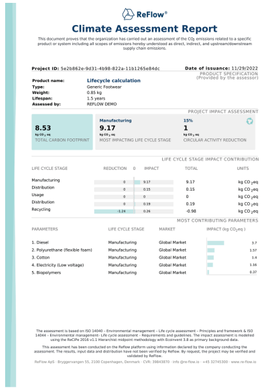
Value-chain emissions using ClimateHub™

A case example

Tier 2

Vald. Birn A/S

Cast-iron foundry



ReFlow®
Climate Assessment Report
This document proves that the organization has carried out an assessment of the CO_2 emissions related to a specific product or system including all scopes of emissions hereby understood as direct, indirect, and upstream/downstream supply chain emissions.

Project ID: 5e2b862e-9d31-4b98-822a-11b1265e84dc — Date of issuance: 11/29/2022 (Provided by the assessor)

Product name: Lifecycle calculation
Type: Generic Footwear
Weight: 0.85 kg
Lifespan: 1.5 years
Assessed by: REFLOW DEMO

PROJECT IMPACT ASSESSMENT

8.53	Manufacturing 9.17	15% 1
kg CO_2e/kg TOTAL CARBON FOOTPRINT	kg CO_2e/kg MOST IMPACTING LIFE CYCLE STAGE	CIRCULAR ACTIVITY REDUCTION

LIFE CYCLE STAGE IMPACT CONTRIBUTION

LIFE CYCLE STAGE	REDUCTION	IMPACT	TOTAL	UNITS
Manufacturing	0	9.17	9.17	kg CO_2e/kg
Distribution	0	0.15	0.15	kg CO_2e/kg
Usage	0	0	0	kg CO_2e/kg
Distribution	0	0.19	0.19	kg CO_2e/kg
Recycling	0.24	0.36	-0.96	kg CO_2e/kg

MOST CONTRIBUTING PARAMETERS

PARAMETERS	LIFE CYCLE STAGE	MARKET	IMPACT (kg CO_2e/kg)
1. Diesel	Manufacturing	Global Market	3.7
2. Polyurethane (flexible foam)	Manufacturing	Global Market	1.57
3. Cotton	Manufacturing	Global Market	1.4
4. Electricity (Low voltage)	Manufacturing	Global Market	1.16
5. Biopolymers	Manufacturing	Global Market	0.37

The assessment is based on ISO 14040 - Environmental management - Life cycle assessment - Principles and framework & ISO 14044 - Environmental management- Life cycle assessment - Requirements and guidelines. The impact assessment is modelled using the ReCiPe 2016 v1.1 Hierarchist midpoint methodology with Ecoinvent 3.8 as primary background data.
This assessment has been conducted on the ReFlow platform using information declared by the company conducting the assessment. The results, input data and distribution have not been verified by ReFlow. By request, the project may be verified and validated by ReFlow.
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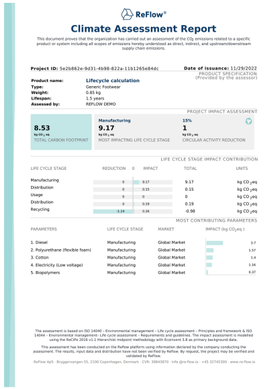
Tier 1

EMERSON™

Shared from ClimateHub™

- Scope 1, 2, 3
- Validated data
- Circularity rating
- Supply-chain emissions
- Comparable data
- Integrated into PLM
- Transparency and QA

Valves



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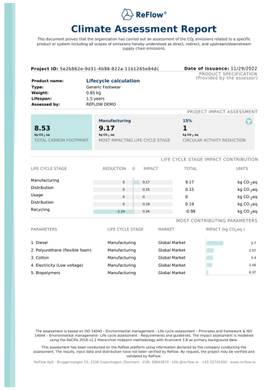
Tier 0

Fred. Olsen Windcarrier

Shared from ClimateHub™

- Scope 1, 2, 3
- Validated data
- Circularity rating
- Supply-chain emissions
- Comparable data
- Including supplier data
- Transparency and QA
- Intergrated proc. systems

Shipowner



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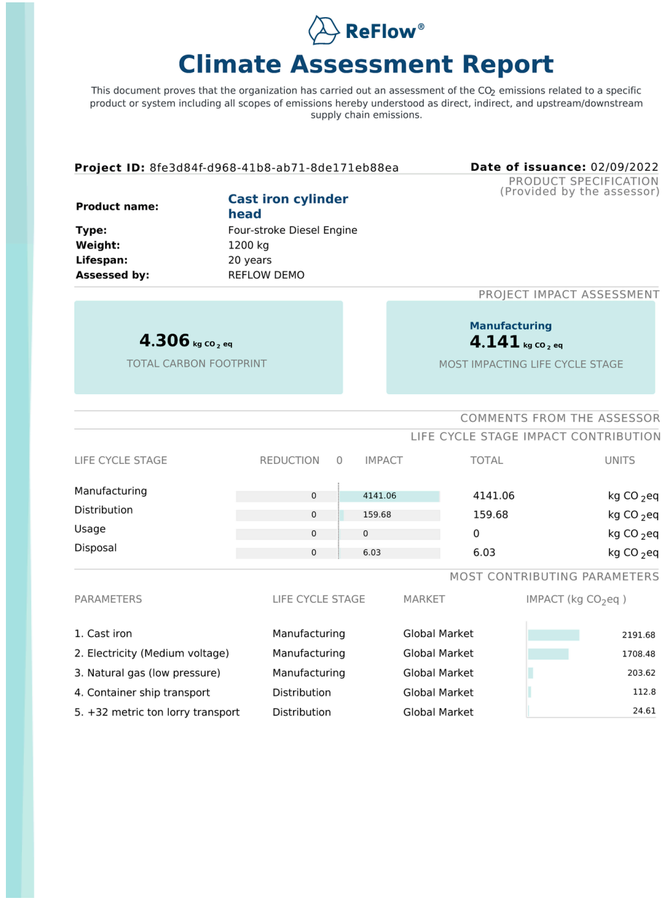
Empowering Customers with Transparent Carbon Footprint Data



ReFlow®

Climate Assessment Report

This document proves that the organization has carried out an assessment of the CO_2 emissions related to a specific product or system including all scopes of emissions hereby understood as direct, indirect, and upstream/downstream supply chain emissions.

Project ID: 8fe3d84f-d968-41b8-ab71-8de171eb88ea **Date of issuance:** 02/09/2022

PRODUCT SPECIFICATION
(Provided by the assessor)

Product name:	**Cast iron cylinder head**
Type:	Four-stroke Diesel Engine
Weight:	1200 kg
Lifespan:	20 years
Assessed by:	REFLOW DEMO

PROJECT IMPACT ASSESSMENT

4.306 kg CO_2 eq
TOTAL CARBON FOOTPRINT

Manufacturing
4.141 kg CO_2 eq
MOST IMPACTING LIFE CYCLE STAGE

COMMENTS FROM THE ASSESSOR

LIFE CYCLE STAGE IMPACT CONTRIBUTION

LIFE CYCLE STAGE	REDUCTION	0	IMPACT	TOTAL	UNITS
Manufacturing	0		4141.06	4141.06	kg CO_2eq
Distribution	0		159.68	159.68	kg CO_2eq
Usage	0		0	0	kg CO_2eq
Disposal	0		6.03	6.03	kg CO_2eq

MOST CONTRIBUTING PARAMETERS

PARAMETERS	LIFE CYCLE STAGE	MARKET	IMPACT (kg CO_2eq)
1. Cast iron	Manufacturing	Global Market	2191.68
2. Electricity (Medium voltage)	Manufacturing	Global Market	1708.48
3. Natural gas (low pressure)	Manufacturing	Global Market	203.62
4. Container ship transport	Distribution	Global Market	112.8
5. +32 metric ton lorry transport	Distribution	Global Market	24.61

- **Transparent Reporting:** Provides customers with clear, accessible reports on product carbon footprints, enhancing brand trust.
- **Detailed Breakdowns:** Offers granular insights into specific emission sources and stages, fostering better customer understanding.
- **Comparative Analysis:** Enables comparisons with industry benchmarks, helping customers make informed choices.
- **Lifecycle Insights:** Shares comprehensive lifecycle carbon impacts, from manufacturing to disposal.
- **Direct Data Sharing:** Enables seamless sharing of carbon footprint data with leading shipowners such as Maersk, Odfjell, and Fred Olsen directly through the platform, facilitating industry-wide transparency and collaboration.

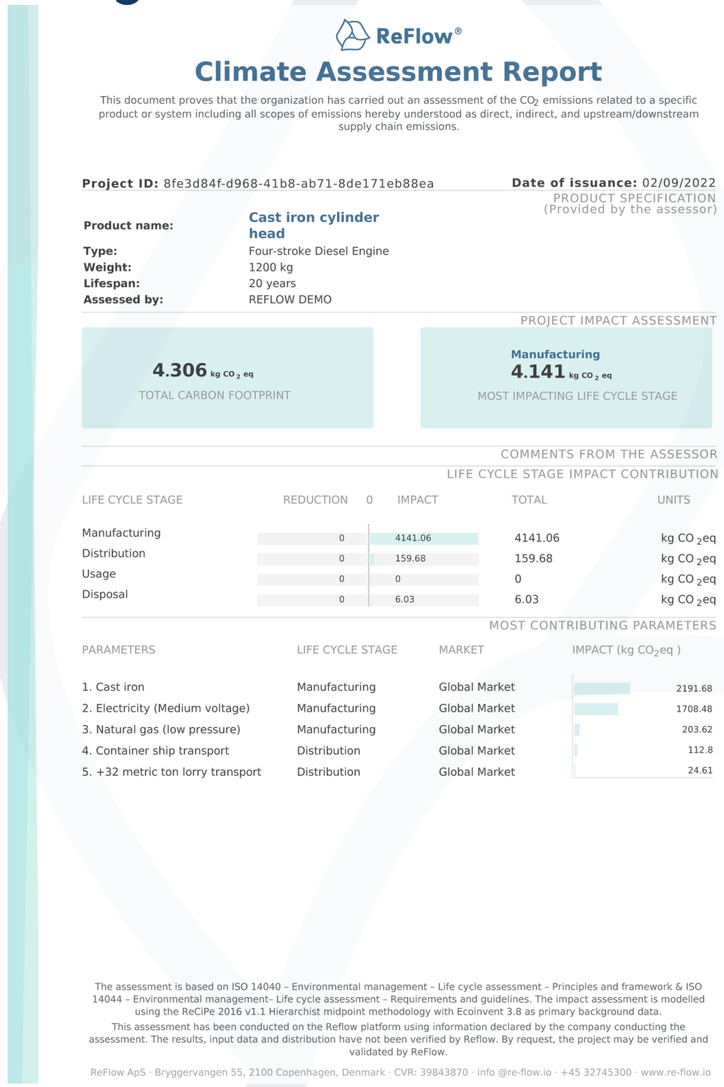
Benefits of using ClimateHub™

ReFlow®

Enhancing Supply Chain Sustainability

- **Standardized Reporting:** Encourages suppliers to use a standardized framework for calculating and reporting GHG emissions, ensuring consistency across the supply chain.
- **Activity-Based Data Collection:** Facilitates detailed, activity-based data collection, enabling precise tracking and management of carbon footprints from various supply chain activities.
- **Data Sharing Platform:** Allows suppliers on the ReFlow platform to seamlessly share their climate data, fostering transparency and collaboration among business partners.
- **Supply Chain Optimization:** Empowers companies to identify high-emission areas within the supply chain and collaborate on targeted reductions with suppliers.
- **Enhanced Compliance:** Supports regulatory compliance and sustainability reporting by providing accurate and verifiable supply chain emissions data.

Benefits of using ClimateHub™



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Project ID: 8fe3d84f-d968-41b8-ab71-8de171eb88ea **Date of issuance:** 02/09/2022

PRODUCT SPECIFICATION
(Provided by the assessor)

Product name: Cast iron cylinder head
Type: Four-stroke Diesel Engine
Weight: 1200 kg
Lifespan: 20 years
Assessed by: REFLOW DEMO

PROJECT IMPACT ASSESSMENT

4.306 kg CO_2 eq
TOTAL CARBON FOOTPRINT

Manufacturing
4.141 kg CO_2 eq
MOST IMPACTING LIFE CYCLE STAGE

COMMENTS FROM THE ASSESSOR

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The assessment is based on ISO 14040 – Environmental management – Life cycle assessment – Principles and framework & ISO 14044 – Environmental management– Life cycle assessment – Requirements and guidelines. The impact assessment is modelled using the ReCiPe 2016 v1.1 Hierarchist midpoint methodology with Ecoinvent 3.8 as primary background data.
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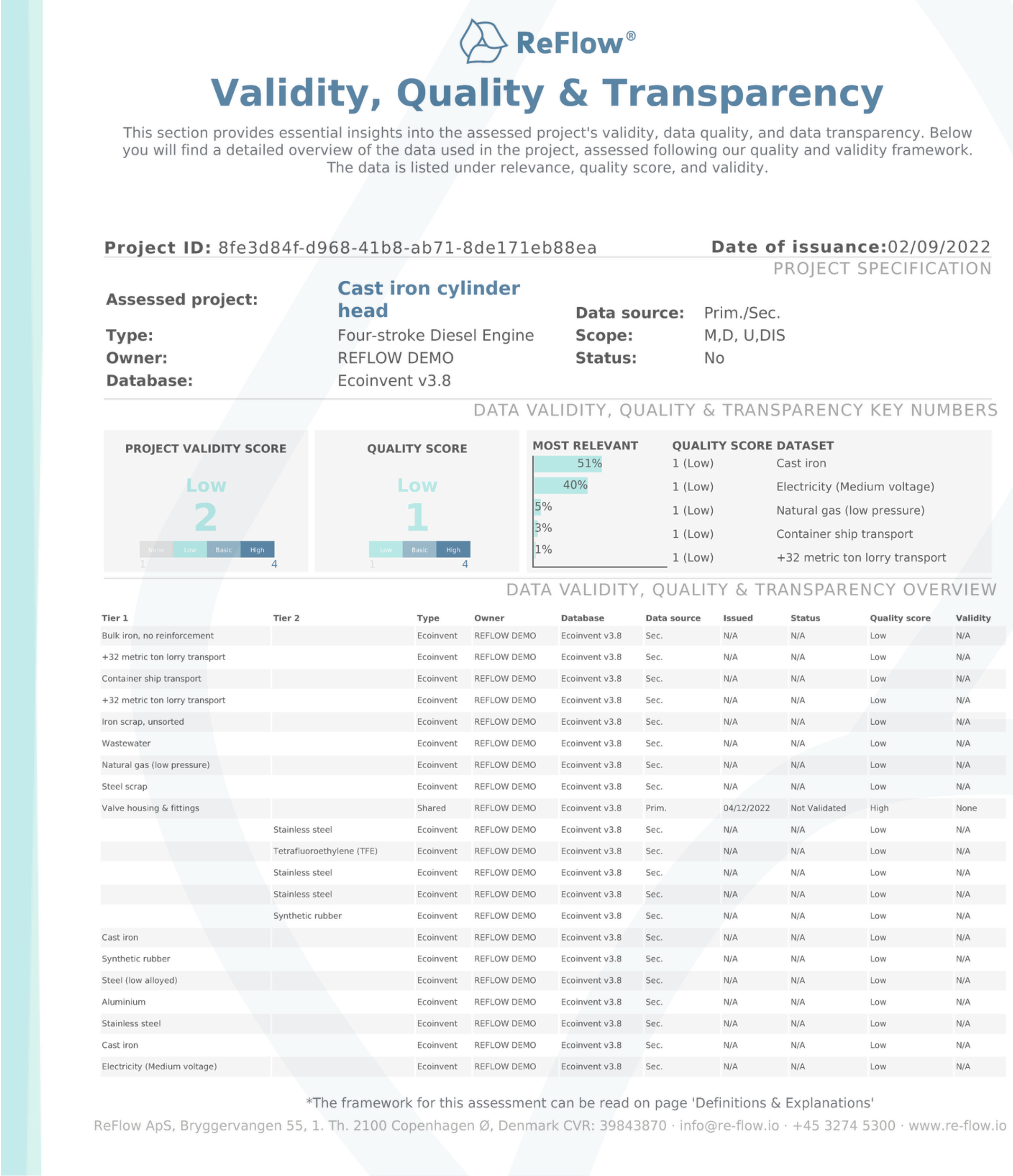
Upholding High Standards in Climate Data Integrity

- **Rigorous Standards Compliance:** Ensures all data complies with international standards such as ISO 14040 and ISO 14044, guaranteeing high-quality and valid results.
- **Transparent Methodologies:** Utilizes clear, well-documented methodologies like the ReCiPe 2016 v1.1 Hierarchist midpoint, enhancing the credibility of environmental assessments.
- **Data Verification Option:** Offers opportunities for third-party verification and validation of project data, reinforcing trust and accuracy.
- **Detailed Data Traceability:** Provides comprehensive traceability from data collection through analysis, ensuring each step is transparent and accountable.
- **Continuous Improvement Feedback:** Supports ongoing data quality improvements with structured feedback mechanisms, maintaining high standards in environmental reporting.



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Validity, Quality & Transparency

This section provides essential insights into the assessed project's validity, data quality, and data transparency. Below you will find a detailed overview of the data used in the project, assessed following our quality and validity framework. The data is listed under relevance, quality score, and validity.

Project ID: 8fe3d84f-d968-41b8-ab71-8de171eb88ea **Date of issuance:**02/09/2022

PROJECT SPECIFICATION

Assessed project: Cast iron cylinder head
Type: Four-stroke Diesel Engine
Owner: REFLOW DEMO
Database: Ecoinvent v3.8
Data source: Prim./Sec.
Scope: M,D, U,DIS
Status: No

DATA VALIDITY, QUALITY & TRANSPARENCY KEY NUMBERS

PROJECT VALIDITY SCORE: Low 2 (None, Low, Basic, High; 1–4)

QUALITY SCORE: Low 1 (Low, Basic, High; 1–4)

MOST RELEVANT	QUALITY SCORE	DATASET
51%	1 (Low)	Cast iron
40%	1 (Low)	Electricity (Medium voltage)
5%	1 (Low)	Natural gas (low pressure)
3%	1 (Low)	Container ship transport
1%	1 (Low)	+32 metric ton lorry transport

DATA VALIDITY, QUALITY & TRANSPARENCY OVERVIEW

Tier 1	Tier 2	Type	Owner	Database	Data source	Issued	Status	Quality score	Validity
Bulk iron, no reinforcement		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
+32 metric ton lorry transport		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Container ship transport		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
+32 metric ton lorry transport		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Iron scrap, unsorted		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Wastewater		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Natural gas (low pressure)		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Steel scrap		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Valve housing & fittings		Shared	REFLOW DEMO	Ecoinvent v3.8	Prim.	04/12/2022	Not Validated	High	None
	Stainless steel	Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
	Tetrafluoroethylene (TFE)	Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
	Stainless steel	Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
	Stainless steel	Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
	Synthetic rubber	Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Cast iron		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Synthetic rubber		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Steel (low alloyed)		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Aluminium		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Stainless steel		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Cast iron		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A
Electricity (Medium voltage)		Ecoinvent	REFLOW DEMO	Ecoinvent v3.8	Sec.	N/A	N/A	Low	N/A

*The framework for this assessment can be read on page 'Definitions & Explanations'

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Climate Assessment of Diesel Engine

The life cycle screening of the diesel engine, quantifies and characterizes the CO2e emissions throughout the entire life cycle of the engine. It specifically focuses on the reductions associated with the remanufacturing process that the engines undergoes at the facilities.

Product description

Product Name:	Diesel Engine
Type:	CAT3516
Weight:	7484 kg
Lifespan:	20 (Initial) years
Assessed by:	ReFlow ApS

Methodology

Methodology:	ReFlow Climate Assessment
Database:	Ecoinvent 3.8
IA Method.:	ReCiPe 2016 v1.1. Midpoint method, H.

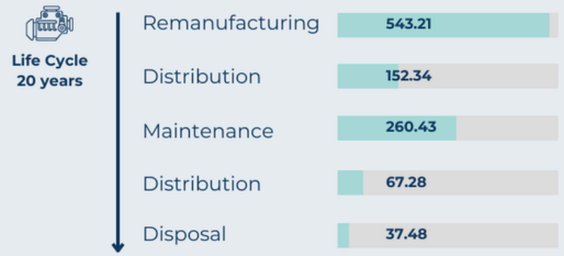
System Boundaries

The **Remanufacturing Scenario** restores a diesel engine to a condition comparable to new, enabling a 20-year service life. This scenario encompasses subsequent life cycle phases, including distribution, maintenance, and end-of-life.

The **Baseline Scenario** involves traditional manufacturing for a 20-year service life. This approach also encompasses distribution, maintenance, and end-of-life phases.

REMANUFACTURING SCENARIO

Life Cycle Stage Impact Contribution



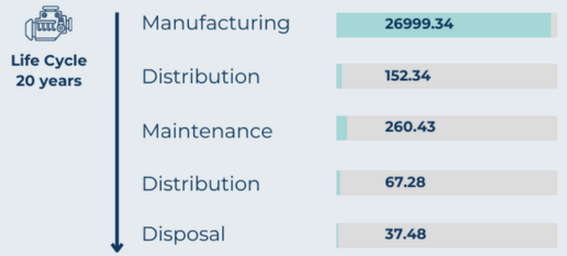
Total Impact Assessment

1.06 t CO2eq

TOTAL CARBON FOOTPRINT

BASELINE SCENARIO

Life Cycle Stage Impact Contribution

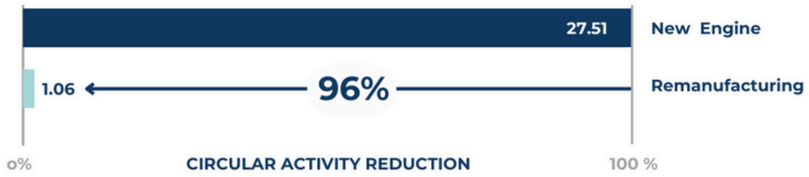


Total Impact Assessment

27.51 t CO2eq

TOTAL CARBON FOOTPRINT

Carbon Footprint Reduction



The **Diesel Engine's remanufacturing** process **reduces CO2eq by 26.54 tonnes**, which is approximately equivalent to saving the production of 30 midsize cars*.

(*) According to data published by ACEA Auto in 2022. https://www.acea.auto/figure/co2-emissions-from-car-production-in-eu/

Benefits of using ClimateHub™

ReFlow®

THANK YOU !

ReFlow®

Environmental performance made easy