ReFlow®

Supplementary Slidedeck

Initial conceptual life cycle calculation of a steel vessel compared with an aluminum vessel in a GHG perspective

Ærøfærgerne | Project: 123218102023-3
November 2023

Overview

Project Overview

Vessel specifications & description

Life Cycle Inventory

Creating the vessel models

Impact Assessment

Conceptual life cycle GHG calculation key numbers

Outline & key findings

Vessel comparison: Reduction potential related to aluminum design

Project Overview

Vessel specifications & description

Steel DE Ferry

Name: DE Ferry: Ærøkøbing-Svendborg

Type: Aeroe Steel DE 70 Construction

Weight: 1 535 000 kg

Lifespan: 25 years

Aluminum DE Ferry

Name: DE Ferry: Ærøkøbing-Svendborg

Type: Aeroe Aluminum DE 70 Construction

Weight: 850 000 kg

Lifespan: 25 years

Function: *To sail between Ærøkøbing-Svendborg both ways, 6 times a day, for 360 days a year, in 25 years*

Life cycle stages: *Manufacturing, Operation, Maintenance, Recycling*

Life Cycle Inventory

Creating the vessel models

Steel DE Ferry

Manufacturing

- Steel: *Primary data*
- Batteries: *Lithium-ion technology*
- Newbuilding processes: *Based on standard vessel data*

Operation

- Electricity: *DK grid mix w. no change over time*

Maintenance

- Battery change: *Assumed10 year lifespan*

Recycling

- Recyclability: *approx. 80% (70%-90% range)*
- Energy: *approx. 1 kWh/kg (0.5-1.5 kWh/kg)*

Aluminum DE Ferry

Manufacturing

- Aluminum: *Primary data*
- Batteries: *Lithium-ion technology*
- Newbuilding processes: *Based on standard vessel data*

Operation

- Electricity: *DK grid mix w. no change over time*

Maintenance

- Battery change: *Assumed10 year lifespan*

Recycling

- Recyclability: *approx. 98%*
- Energy: *approx. 0.5 kWh/kg*

Data Library: *Ecoinvent 3.8, at point of substitution* | ***Calculation Methodology:*** *ReCiPe 2016 v1.1 Midpoint Hierarchist (IPCC Climate Factor)*

Impact Assessment

Conceptual life cycle GHG calculation key numbers

Steel DE Ferry

Total Carbon Footprint: *52 317 tonnes CO2e*

Most Impacting Stage : *49 802 tonnes CO2e (Operation)*

Most Impacting Parameter: *Electricity (DK)*

CO2e Reduction (%): *3.1 % (Recycling)*

CO2e Reduction (t): *1 684 tonnes CO2e (Recycling)*

Aluminum DE Ferry

Total Carbon Footprint: *34 423 tonnes CO2e*

Most Impacting Stage : *32 908 tonnes CO2e (Operation)*

Most Impacting Parameter: *Electricity (DK)*

CO2e Reduction (%): *4.6 % (Recycling)*

CO2e Reduction (t): *1 671 tonnes CO2e (Recycling)*

Outline & key findings

Vessel comparison: Reduction potential related to aluminum design

Comparing the aluminum vessel design to the steel vessel design

Total carbon footprint reduced:	**17 893 *tonnes CO2e***	|	*Percentage reduced:* ***approx. 34 %***
Manufacturing carbon footprint reduced:	**1 034 *tonnes CO2e***	|	*Percentage reduced:* ***approx. 29 %***
Operation carbon footprint reduced:	***16 894 tonnes CO2e***	|	*Percentage reduced:* ***approx. 33 %***
Maintenance outline:	***Only considers battery replacement***		
Recycling outline	***Potential increased recycling potential for aluminum***		

ReFlow®

Supplementary Slidedeck

Initial conceptual life cycle calculation of a steel vessel compared with an aluminum vessel in a GHG perspective

Ærøfærgerne | Project: 123218102023-3
November 2023