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SPINE LCI dataset: Scalable electric traction motor, permanent magnet (PMSM), for EVs

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Administrative	
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Finished	Y
Date Completed	2016-07-01
Copyright	Anders Nordelöf
Availability	Public

Technical System	
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Name	Scalable electric traction motor, permanent magnet (PMSM), for EVs
Functional Unit	1 piece of electric traction motor, specified by its output in power (20-200 kW) and torque (48-477 Nm)
Functional Unit Explanation	
Process Type	Gate to gate
Site	
Sector	Process
Owner	
Technical system description	The dataset consists of a general and scalable LCI data model for a(n) (internal) permanent magnet synchronous electric motor, (I)PMSM, designed for electric vehicle propulsion. It provides the mass composition and manufacturing data for a typical automotive electrical machine design, as delivered at the factory gate. The model file generates data on motors ranging in power from 20-200 kW and in torque from 48-477 Nm, i.e. from a small electric passenger vehicle up to, for example, an electrically propelled bus. It is a gate-to-gate LCI, with inputs as delivered from various stages of material processing. All input and output flows have recommended matching output and input flows from LCI process datasets or elementary flows included in ecoinvent v 3. The LCI is possible to combine with input data for virgin raw materials as well as recycled materials. Use (operation and maintenance) and end-of-life treatment is NOT included in the dataset. Adjustable model parameters: * Maximum power (kW) * Maximum torque (Nm), allowing for base speeds within 3000-5000 rpm (default: 4000 rpm) * Inclusion/exclusion of electromagentically passive parts: housing (body and endbells on each side), shaft, bearings Input flows: * Products flows, as "product material input" (materials and subparts) and "processing input" (input to production, but not a part of the final product). * Energy use in production Output flows: * Product flow: 1 piece of electric motor * Waste - typically metal scrap, sludge or used process liquids * Emissions to air and water The model has been setup with a regular system boundary and an extended system boundary. The regular boundary encircles the inventoried gate-to-gate system. The latter encircles a set of ecoinvent activities for material transformation and coating included to account for the making of several subparts from their material constituents. These activities are listed separately from the inventory defined by the regular system boundaries, to avoid confusion for the user, see the model report. The model file presents an aggregated inventory list (and an aggregated activity list, see above) on the summary page, as well as all flows in and out of each unit process (including all internal flows of the gate-gate system). Extended system activities are also presented both aggregated (in a list on the summary page) and individually for each related flow. Finally, uncertainty has been quantified for all data on the unit process level (not for aggregated results) by the authors, based on qualitative assessment of data quality according to the ecoinvent pedigree matrix approach, see Appendix A of the model report. For a full description on the methodology, theory and data processing that has led to the inventory details presented in the model file, please read the model report.

System Boundaries

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Nature Boundary	See model report.
Time Boundary	See model report.
Geographical Boundary	See model report.
Other Boundaries	See model report.
Allocations	See model report.
Systems Expansions	See model report.

Flow Data

General Activity QMetadata

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Date Conceived	See model report.
Data Type	Derived, mixed
Represents	See model report.
Method	All flows are calculated using the model file "Scalable PMSM LCI Model.xlsx" http://cpmdatabase.cpm.chalmers.se/DataReferences/Scalable_PMSM_LCI_Model_v1.01.xlsm
Literature Reference	See model report.
Notes	

Flow Table and Specific Meta Data

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QMetadata	Direction	FlowType	Substance	Quantity	Min	Max	SDev	Unit	Environment	Geography
	Output	Product	Electric traction motor, permanent magnet (PMSM), for EVs	1				pce	Technosphere	World

About Inventory

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Publication	Model file: Nordelöf A (2017) Scalable IPMSM LCI Model v1.01.xlsm [Online]. Version 1.01. Gothenburg, Sweden: Environmental Systems Analysis; Chalmers University of Technology. Distributed by The Swedish Life Cycle Center.Available: http://cpmdatabase.cpm.chalmers.se/DataReferences/Scalable_PMSM_LCI_Model_v1.01.xlsm Model report: Nordelöf A, Grunditz E, Tillman A-M, Thiringer T, Alatalo M (2017) A Scalable Life Cycle Inventory of an Electrical Automotive Traction Machine - Technical and Methodological Description, version 1.01. Report No. 2016:4 (1.01). Environmental Systems Analysis & Electric Power Engineering, Chalmers University of Technology, Gothenburg, Sweden. Available: http://cpmdatabase.cpm.chalmers.se/DataReferences/LCI_model_report_PMSM_v1.01.pdf
Intended User	See model report.
General Purpose	See model report.
Detailed Purpose	See model report.
Commissioner	
Practitioner	Anders Nordelöf - Environmental Systems Analysis, Chalmers University of Technology.
Reviewer	
Applicability	See model report.
About Data	See model report.
Notes	