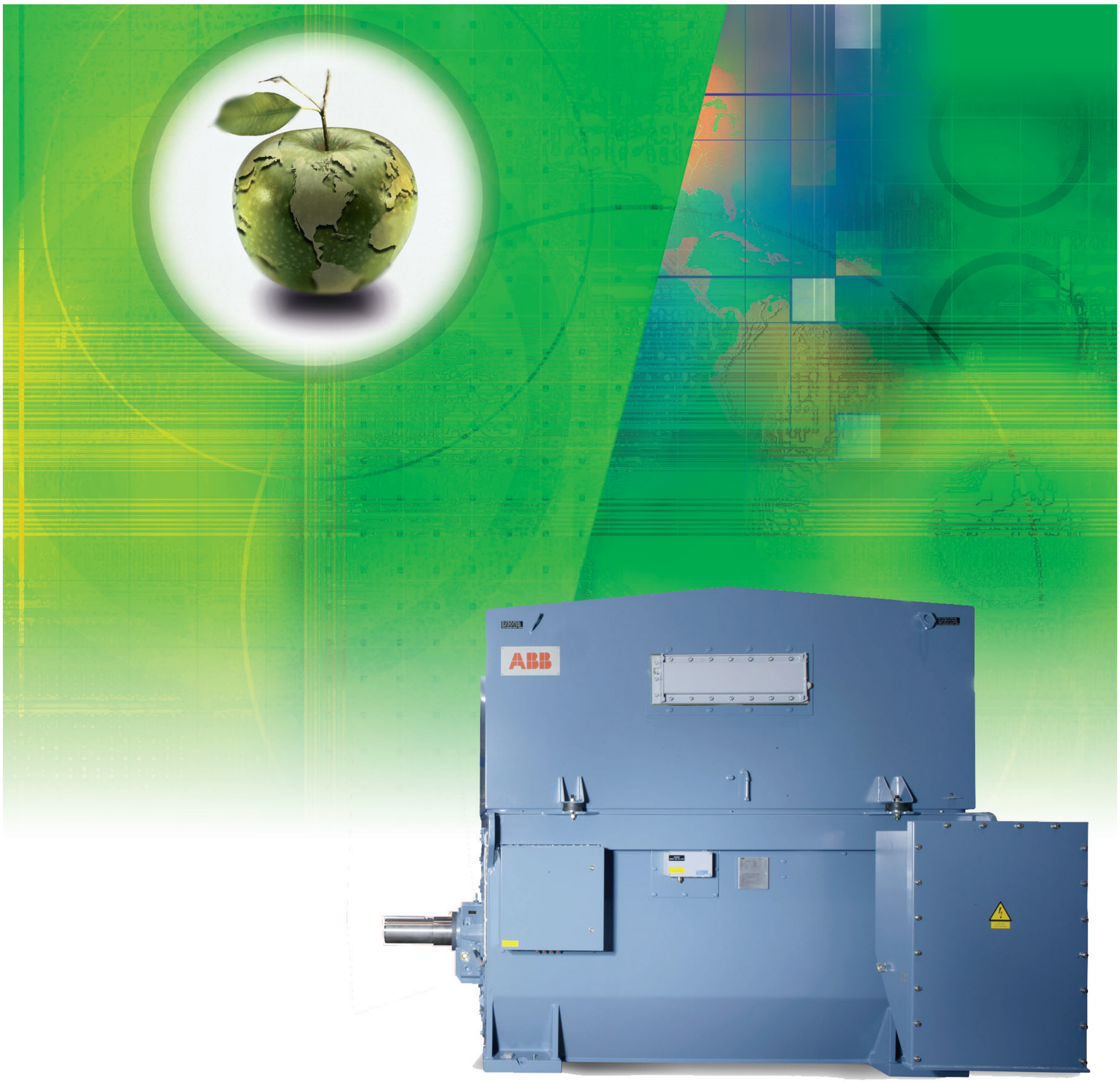
Environmental Product Declaration

AC machine type AMI 710



Organizational framework

Manufacturer

ABB AB
LBU Machines
S-721 70 Västerås, Sweden
tel: +46/21/32 96 86
fax: +46/21/32 95 10
Contact person EPD: Johanna Sandvall

LBU Machines belongs to the Business Unit Machines, with sites located in different countries in the world.

Environmental management
The ISO 14001 international environmental management standard has been implemented at Machines. The AMI induction motors are manufactured both in Västerås, Sweden and in Finland. Both the sites have been certified to ISO 14001 since 1997. Life cycle assessment is applied continuously to all product development.

Product description
ABB's line of machines –motors and generators- consists of several families. The AMI-family, high voltage machines, was introduced in 2005. The AMI has been developed to fulfil the highly variable needs of many different applications, such as:

- Compressor motors
- Refiner motors
- Thrusters/propulsion motors
- Fan motors
- Blower motors
- Extruders
- Pump motors

This EPD is for the AMI 710 with an output power of 9 400kW. For all AMI machines manufactured in the same factory the EPDs are conducted in the same way, which make it possible to compare the environmental performance of the different machines.
The plant in Västerås that manufactures these motors has been certified according to ISO 9001 quality management standard since 1993.

Raw materials	kg/ product	kg/kW
Electrical steel	14 092	1.499
Hot rolled steel	4 644	0.494
Copper	2 767	0.294
Hot rolled steel bar	2 782	0.296
Cast iron	460	0.049
Insulation material (Fibre glass)	385	0.041
Impregnation resin	6	0.0006
Paint	20	0.002
Solvents	7	0.0007
Paper	29	0.003
Oil	12	0.001
Sawed timber	1 513	0.161

Environmental performance

The data and calculations are in accordance with the Product Specific Requirements (PSR) for Rotating Electrical Machines dated April 2000, which specify the following baselines for the LCA calculation.

Functional unit
The functional unit for the LCA is 1 kW of rated output power.

System boundaries
The life cycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly of the machine, transportation and use of the product, dismantling, fragmentation and disposal and recycling of scrap after end of life. It includes consumption of material and energy resources as well as emissions and waste generation.

Calculations are based upon an estimated lifetime of 25 years when operating 6 500 hours per year. A Swedish mix of energy has been used for calculating energy consumption during manufacturing and a European mix of energy for calculating energy consumption during use and disposal. The Swedish energy mix is defined as: 4 % Biomass, 3 % Coal, 0,4 % Gas, 39 % Hydro, 50 % Nuclear, 3 % Oil, 0,2 % Wind. The European energy mix is defined as: 2 % Biomass, 27 % Coal, 19 % Gas, 15 % Hydro, 30 % Nuclear, 5 % Oil, 0,4 % Wind.

Within the centre height 710 there are different options for output power and efficiency factor.
The model studied in this EPD has 9 400 kW in output power.

Allocation unit
The factor for allocation of common environmental aspects during manufacturing is calculated as the rated output power of the product in relation to the total annual production volume in kW.

Resource utilization during life cycle

	Manufacturing phase	Usage phase	Disposal phase
Non-renewable resources (kg/kW)			
Aluminium in ore	0.002	0.000	-0.001
Coper in ore	0.120	0.045	-0.211
Iron in ore	2.812	6.201	-1.986
Lead in ore	0.000	0.002	0.000
Manganese in ore	0.000	0.006	0.003
Zinc in ore	0.001	0.001	0.000
Crude oil	0.258	70.602	0.063
Hard coal	2.221	768.021	-2.033
Natural gas	0.267	118.526	-0.063
Uranium in ore	0.000	0.036	0.000
Renewable resourses (kg/kW)			
Water	81.114	69 887.440	-8.020
Wood	0.130	57.780	-0.025

Energy consumption and losses

Total energy consumption and losses	kWh/ product	kWh/kW
Manufacturing phase		
Electricity used in the factory	17 900	1.90
District heating used in the factory	8 300	0.88
Usage phase		
Energy losses	38 524 195	4 098.32
Disposal phase		
Energy for granulation	1 014	0.11

Waste

Waste from manufacturing (kg)	kg/ product	kg/kW
Steel for recycling	2 333	0.248
Copper for recycling	103	0.011
Non hazardous waste	214	0.023
Hazardous waste	212	0.023

The non hazardous waste from the manufacturing site is mainly combustible and will be used for heat generation. An absolute minimum of the waste goes to landfill.

The classification data for emissions

Category of impact	Equivalent unit/kW	Manufacturing	Usage phase	Total life cycle
Global warming, GWP	kg CO_2/kW	7.37	2 096.74	2 104.11
Acidification, AP	kmol H+/kW	2.93	279.76	282.69
Ozone depletion, ODP	kg CFC/kW	0.00	0.00	0.00
Photochemical oxidants, POCP	kg ethylene/kW	0.00	0.39	0.39
Eutrophication	kg O_2/kW	0.12	24.67	24.78

Additional qualifying factors

Recycling and disposal

The main parts of the product can be recycled. Some parts need to be fragmented to separate different types of material. A list of parts and components that can be fragmented and recycled can be obtained from the manufacturer. See references.

Usage phase in relation to the total

It is to be observed that the environmental impact during the usage phase is the most important. As an example, GWP for the usage phase is approximately 400 times larger than GWP for the manufacturing phase.

Category of impact	Usage phase in % of total
Global warming, GWP	99.65
Acidification, AP	98.96
Ozone Depletion, ODP	99.87
Photochemical oxidants, POCP	99.74
Eutrophication, NP	99.53

Maintenance

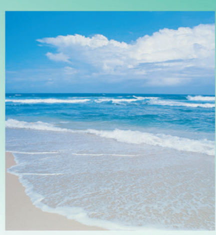
Maintenance of the product is necessary to assure the best possible operation condition and efficiency of the machine. Cleaning of a water cooler is an example of a maintenance task which may reduce the temperature inside of the motor with consequential decrease in resistive losses and hence increase the efficiency of the machine. Maintenance is also of great importance in order to avoid unwanted down time which may lead to waste of production material and an increase in the environmental impact. By always struggle to have the best possible feeding to the machine any additional losses will also be limited.

You find ABB:s suggested maintenance and inspection plan in your Installation & Service manual or contact your local ABB office.

References

- LCA report: LCA for AMI 710, AMI 800 and AMI 900
- PSR for rotating electrical machines
- Recycling and disposal 3BSE 017 435
- Risk assessment 3BSE 017 434
- LCA instruction 3BSG000021
- MSR 1999:1 Bestämmelser certifierade miljövarudelarationer, EPD from the Swedish Environmental management Council

The above mentioned documents are available upon request.



EPD Glossary

Acidification, AP
Chemical alternation of the environment, resulting in hydrogen ions being produced more rapidly than they are dispersed or neutralized. Occurs mainly through fallout of sulfur and nitrogen compounds from combustion processes. Acidification can be harmful to terrestrial and aquatic life.

Eutrophication
Enrichment of bodies of water by nitrates and phosphates from organic material or the surface runoff. This increases the growth of aquatic plants and can produce algal blooms that deoxygenate water and smother other aquatic life.

Global warming potential, GWP
The index used to translate the level of emissions of various gases into a common measure to compare their contributions to the absorption by the atmosphere of infrared radiation. GWPs are calculated as the absorption that would result from the emission of 1 kg of a gas to that from emission of 1 kg of carbon dioxide over 100 years.

Life cycle assessment, LCA
A management tool for appraising and quantifying the total environment impact of products or activities over their entire life cycle of particular materials, processes, products, technologies, services or activities. Life cycle assessment comprises three complementary components-inventory analysis, impact analysis and improvement analysis.

Ozone depletion potential, ODP
The index used to translate the level of emissions of various substances into a common measure to compare their contributions to the breakdown of the ozone layer. ODPs are calculated as the change that would result from the emission of 1 kg of a substance to that from emission of 1 kg of CFC-11 (a freon)

Photochemical ozone creation, POCP
The index to translate the level of emissions of various gases into a common measure to compare their contributions to the change of ground-level ozone concentration. POCPs are calculated as the change that would result from the emission of 1 kg of a gas to that from emission of 1 kg of ethylene.

ABB AB
Machines
Elmotorgatan 2
721 70 Västerås
Sweden
Tel: +46 21 32 90 00
Fax: +46 21 32 95 10
Internet: www.abb.com/motors&drives

3BSM901310 Rev A 2008-07-07
The information and specifications contained in this brochure are subject to change without notice.