Environmental Product Declaration

Converter Module DCS 400

ABB Automation
Div. Drives, Lampertheim Germany

Organisational framework

Manufacturer
ABB Automation Products GmbH
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Germany

ABB Automation Products GmbH in Lampertheim is a part of ABB's Automation segment. It develops and supplies electrical machines and drives for ABB Group's customers world-wide and carries responsibility for several key product groups, including DC drives , enclosed converter and drive systems for speed control of electric motors.

Environmental management
The ISO 14001 international environmental management standard has been implemented and the factory has been certified since 2000. Life cycle assessment is applied to new products.

Product description
ABB Automation Products GmbH, Drives Group comprises the following product lines

- ❖ DCS 400 power range 9 to 522 kW
- ❖ DCS 500 power range 10 to 4,6 MW
- ❖ DCS 600 power range 10 to 4,6 MW

Material according to the table below is used for the product:

Type of Material	*kg/product*	*kg / kW*
Packaging materials	0,06	0,005
Sulphuric acid	0,10	0,0083
Copper	1,00	0,083
Iron	5,28	0,440
Aluminium	1,62	0,135
other materials	0,76	0,38

DCS400

Use of the product
Electric motors account for 65 per cent of the electricity consumed in industrial applications. Conventional electric motors that drive, for example, Extruders, Metals, Cranes, Paper Machines, Ski Lifts, Cement Mills, Mining, and Winders are fixed-speed devices. In variable speed drives, motor speed is directly varied electronically. This results in considerable energy savings over less efficient systems. Saving energy helps save the environment through reduced emissions from energy production, hence the most significant environmental aspect of ABB Automation, Drives Group is to help its customers save energy as well as reducing losses of products manufactured.

The DCS 400 drive is a cost-efficient and easy-to-use solution for controlling small DC motors. The DCS 400 makes control more efficient in all types of industrial applications with small DC motors. It is used in many applications including conveying, printing, mixing and ski-lift machinery.

The product does not need periodic maintenance and causes no emissions during use.

A more comprehensive description on ABB Automation, Drives Group's environmental aspects and actions can be found on the web-site www.abb.com/motors&drives.

Environmental performance

Functional unit

The investigated drive in the study referenced below is an DCS 401.0020 which is a 500 V, 12 kW device with protection class IP00. To make comparisions between different drive units easier, numerical values given in the following chapters are normalized for a drive of 1 kW which is regarded as a so-called functional unit.

The environmental impacts of the DCS 400 were studied with the help of life cycle assessment (LCA) using the Evaluation method “Eco-indicator 95”.
The product was considered to have a lifetime of 10 years, usagetime of 1560 h/a in a 12 kW winder application in Central Europe.

DCS 400 products are manufactured at ABB’s factory in Lampertheim, Germany. For the evaluation of the environmental performance and the LCA study, it was assumed that the product is manufactured in Lampertheim

Boundaries of the LCA

The life cycle assessment covers all phases of the product’s life, i.e.

- ◊ data of raw materials and components of the product and significant processes at suppliers, including energy and chemicals usage, production waste and emissions as well as internal transports
- ◊ manufacturing phase of the product at ABB Automation Products GmbH
- ◊ usage phase as described under “Functional unit”
- ◊ all parts are landfilled, because the directions of the waste management for industrial waste are missing in Germany at the moment

Positive aspects of using the product at customers have not been included

The data and calculations are in accordance with Product Specific Requirements (PSR) for Variable Speed Electric Drives, which specifies the following baselines for the LCA calculation.

Calculations are based on an estimated lifetime of 10 years when operating 1560 hours per year. A German mix of energy has been used for calculating energy

Resource utilization

	Manufacturing phase unit / product	Usage phase unit / product	Disposal phase unit / product
Use of non-renewable resources			
Coal kg	13.41	1.074,29	0,00
Aluminium (Al) kg	1.62	0.00	0,00
Copper (Cu) kg	1.00	0.00	0.00
Iron (Fe) kg	4.57	0.00	0.00
Manganese (Mn) kg	0.19	0.00	0.00
Natural Gas kg	2.65	45,22	0.0002
Uranium (U) mg	277,02	22.817,67	0.00
Oil kg	5.15	25,43	0,0099
Use of renewable resources			
Hydro Power MJ	0.79	0,00	0.00

Energy consumption and losses

	kWh / product			kWh / kW		
Energy form	**Manufacturing phase**	**Usage phase**	**Disposal phase**	**Manufacturing phase**	**Usage phase**	**Disposal phase**
Electrical energy	5,0	2340,00	-	0,417	195,00	-

The average German electricity mix is defined as being 94 percent stone coal, 4 percent gas and 2 percent oil.
The resultant resource utilization is shown in the table above.

Waste	g / Product	g / kW
Hazardous waste		
During manufacturing	13,1	1,09
At disposal phase	-	-
Landfill waste		
During manufacturing phase	242,9	20,24
At disposal phase	9832,0	819,3
Mineral waste		
During manufacturing	261,7	21,81
At disposal phase	-	-
Industrial waste		
During manufacturing phase	29,2	2,43
At disposal phase	-	-

The classification data for emissions are as follows:

Environmental effect	Equivalent unit	Manufacturing phase	Usage phase	Total life cycle
Global warming potential GWP	kg CO_2 / kW	53.97	1591,44	1645,41
Acidification potential AP	kmol H+ / kW	0,28	8,90	9,18
Eutrophication	kg O_2 / kW	0,00	0,04	0,04
Ozone depletion potential ODP	kg CFC-11 / kW	0.00	0.00	0.00
Photochemical oxidants POCP	kg ethylene / kW	0.01	0,15	0,16

Comments

Almost all environmental impacts of the product come from the usage phase and are favourable which means that the product when used has a positive impact on the environment, compared to conventional applications. The absolute value of the manufacturing, dismantling and transports is only 1 % of that of the usage phase.

The best way to improve the product's environmental compatibility would be to enhance the DC converter's efficiency. Most of the environmental loads come from the heatsink and especially PCBs.

Instructions on how to recycle an end-of-life product are given in the document "DCS 400 product family, Environmental information, Recycling instructions" which is available from ABB Automation Products, Drives Group.

Category of impact	Usage in % of total
Global warming GWP	96.15 %
Acidification AP	96.98 %
Ecotoxicological Classification for Aquatic1 Ecosystems ECA	96.41 %
Ozone depletion ODP	94.15 %
Photochemical oxidants POCP	91.24 %

References

1. User's Manual for type DCS 400 Thyrstor power from 20 to 522 kW, code 3ADW 000 095 R0125
2. DCS 400 product family, Environmental Information, Recycling Instructions (3ADW000155R0101)
3. DCS 400 Life Cycle Assessment

The above mentioned documents are available upon request.

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.

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.

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