Environmental Product Declaration

Double Break Disconnector type SDB range 123 - 420 kV.

Organizational framework

Manufacturer:
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Lead Centre

ABB Ltd. Division in Łódź belongs to Business HV Disconnectors as a part of the Business Area BA High Voltage Technology "PTHV", and consists of five main manufacturing sites:

PLZWA - Poland Łódź Lead Centre
RUELE - Russia Ekaterinburg
AUTIL - Australia Sydney
INTAD - India Maneja Baroda
EGHVO - Egypt Cairo

The products consist of high voltage disconnectors for use in electrical AC and DC transmission systems for voltages above 36 kV.

Environmental management:
Process of environmental management system (EMS) implementation according to international standard ISO 14001 have been started five years ago. A Polish Disconnectors Division in the middle of 1997 received the certificate as first one in the BU.

Implementation status	PLZWA	Implemented
	RUELE	Will be completed 2002
	AUTIL	Implemented
	INTAD	Implemented
	EGHVO	Will be completed 2002

Product description:
Disconnectors are mechanical switch devices, provide which in the open position an visible insulating distance. They are able to open or close a circuit if either a negligible current is switched, or if no significant change occurs in the voltage between the terminals of the poles.
The ABB range of disconnectors cover all common switching station arrangements for 36 to 800 kV; 800A to 4000A and 100 to 160 kA (Ip, peak short-circuit current).

Product range

Type	Double-break disconnector
Voltage	123 kV ÷ 550 kV
Op. Mechanism	Motor or Manual
Current	1600 A ÷ 4000 A
Ip	125 kA
Earth Switch	one or two for pole

Type	SDB ... n	SDB ... p	SDB ... pc/q
	Ip	Ip	Ip
123 kV	125 kA	125 kA	125 kA
145 kV	125 kA	125 kA	125 kA
170 kV	125 kA	125 kA	125 kA
245 kV	125 kA	125 kA	125 kA
300 kV	125 kA	125 kA	125 kA
420 kV	125 kA	125 kA	125 kA
550 kV	125 kA	125 kA	125 kA
Associated built-in Earthling Switch (123 – 300) kV –TEC; (420 – 550) kV – TEB			

Environmental performance

The data and calculation are in accordance with Product Specific Requirements (PSR 2000:4) for Medium/High-Voltage Disconnectors, dated September 2000, which applying rules included in ISO 14040÷43, specifies the following baselines for the LCA calculation.

Functional unit has been set to:
a device that can serve as a disconnector in a three pole power transmission system, operational for 20 years, at current 2500 A and voltage 123÷245 kV when in the closed position, in all kind of climate without polar climate.

System boundaries
The life cycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly of the device, transportation and use of the product and dismantling 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 20 years and average load assumed as 50% of nominal current. Polish mix of energy has been used for calculating energy consumption during manufacturing and a European mix of energy for calculating energy losses during use and disposal phase.
The SDB123 and SDB 245 have been chosen for the Life Cycle Assessment study and for device in-between these limits the environmental impact may be interpolated.
No energy consumed by drives during lifetime has been taken into account due to the fact that it is less than 3% total disconnectors energy consumption.

The table below lists the materials used and their quantities:

Summary of materials	kg / device	
	SDB 123p	SDB 245p
Aluminium	191,78	258,70
Cooper	63,19	63,19
Plastic	10,60	10,82
Porcelain	630,00	810,00
Steel	663,02	818,25
Wood (packaging)	160,00	190,00
Lubricant	0,718	0,718

Allocation unit

The factor for allocation of common environmental aspects during manufacturing is calculated as the ratio of the functional unit to the sum of all functional units produced annually in the relevant part of the production unit.

Resource utilisation

Inventory			Manufacturing phase		Use phase	
Use of non-renewable resources			**SDB 123p**	**SDB 245p**	**SDB 123p**	**SDB 245p**
Ag	(material, resource)	kg	0,04	0,05	0,00	0,00
Al	(material, resource)	kg	170,39	210,27	0,00	0,00
Coal	(energy, resource)	kg	1947,99	2323,68	12410,67	16908,98
Cu	(material, resource)	kg	63,76	63,76	32,09	32,09
Fe	(material, resource)	kg	716,76	885,06	0,01	0,01
Gas	(energy, resource)	m^3	573,13	737,97	0.00	0,00
Gas	(energy, resource)	kg	75,88	87,08	863,75	1175,01
Oil	(energy, resource)	kg	257,53	300,65	1356,93	1838,84
S	(material, resource)	kg	3,80	4,88	0,00	0,00
U	(energy, resource)	kg	0,01	0,01	0,48	0,65
*Zn	(material, resource)	kg	3,32	4,03	0,25	0,25
Use of renewable resources						
Wood	(material, resource)	kg	160,00	190,00	0,00	0,00
Hydro power		MJ	21,64	23,78	0,09	0,09
Water		m^3	2,47	3,00	0,19	0,19

Energy consumption and losses	kWh			
	Manufacturing phase		Use phase	
	SDB 123p	SDB 245p	SDB 123p	SDB 245p
Electrical energy	803,05	924,55	45190,76	61615,76
Heat energy	779,00	779,00	0,00	0,00

The average Polish electricity mix is defined as being 2,9% hydro, 36,3% lignite and 60,8% stone coal. The average European electrical energy is defined as being 10% gas, 15% hydro, 36% nuclear, 10% oil, 19% stone coal and 10% lignite coal. The resultant resource utilisation is shown in the table above

Waste	kg / device	
Hazardous waste	**SDB 123p**	**SDB 245p**
After production	7,974	9,681
After usage	0,604	0,604
After end of life	0,000	0,000
Regular waste (to landfill)		
After production	346,602	431,746
After usage	2,661	2,661
At final disposal total waste	1436,296	1825,746
At final disposal waste to recycling	719,891	944,241

The classification data for emissions are as below

Category of impact	Equivalent unit per device	Manufacturing SDB 123p	Usage phase SDB 123p	Total life cycle SDB 123p
Global warming GWP (100 years)	kg CO_2	6685,15	23041,08	29726,23
Acidification	mol H+	784,99	4545,21	5330,20
Ozone depletion ODP	kg CFC-11	0,00	0,00	0,00
Photochemical oxidants POCP	kg ethylene	0,96	5,43	6,39
Eutrophication	kg CO_2	75,26	303,69	378,95

Category of impact	Equivalent unit per device	Manufacturing SDB 245p	Usage phase SDB 245p	Total life cycle SDB 245p
Global warming GWP (100 years)	kg CO_2	8129,77	31333,90	39463,67
Acidification	mol H+	933,00	6179,81	7113,41
Ozone depletion ODP	kg CFC-11	0,00	0,00	0,00
Photochemical oxidants POCP	kg ethylene	1,11	7,35	8,46
Eutrophication	kg CO_2	89,09	410,41	499,50

The values are based upon the indexes specified in Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 1999-11-25 by the Swedish Environmental Management Council

Additional qualifying factors

Recycling and disposal

The disconnectors consist of large metals parts (aluminium, copper, steel) relatively easy to dismantling and recycling
The description of decommissioning can be found in the:

- Service instruction 1HPL 500 611 E
- Sales manual (on CD)
- LCA report TR 02-003
- 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 (in percentage of total impact).

Category of impact	SDB 123p	SDB 245p
Global warming GWP	78%	79%
Acidification	85%	87%
Photochemical oxidants	85%	87%
Eutrophication	80%	82%

The manufacturer declaration

This EPD comply with the Product Specific Requirement, PSR 2000:4 for, Medium/High-Voltage Disconnectors, dated September 2000 with the Swedish Environmental Councils (requirements for environmental product declarations dated 25 November 1999).

References

- LCA report TR 02-003
- PSR for Disconnectors (PSR 2000:4) www.environdec.com/eng/doc/psr
- Service instructions 1HPL 500 611 E
- Sales manual (on CD)
- Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 2000-03-27 by the Swedish Environmental Management Council

The above mentioned documents are available upon request

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