Environmental Product Declaration

EPD I – ANPA - 2

PASS M0

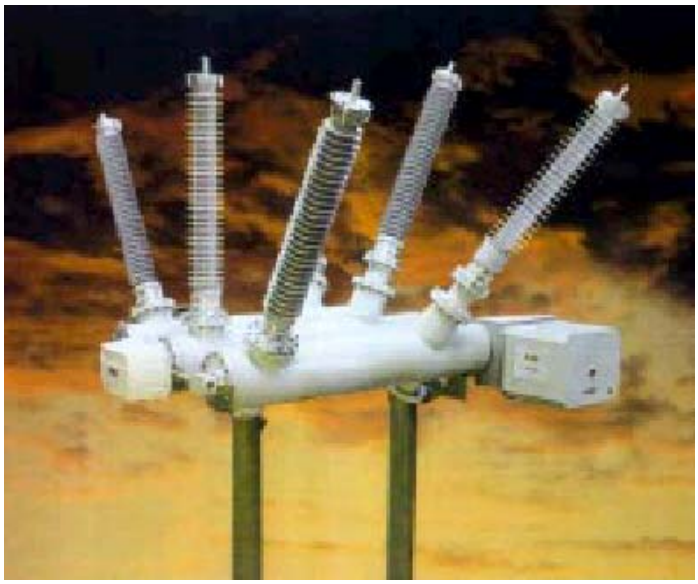

ABB T&D SpA - ADDA

Presentation

Aim of this document is to supply information on the environmental performances of the PASS M0 product life cycle, conforming to the "General rules for the drafting of Environmental Product Declaration" (ANPA, July 2001 draft) and to the category "Product Specific Requirements".
The environmental performance is measured by means of an LCA study carried out in accordance to ISO 14040 standards.

Manufacturer information

ABB T&D SpA - ADDA
Viale Pavia 3
26900 Lodi – Italy
web: www.abb.com/it

Lodi manufacturing site has been certified since 1992 according to ISO 9001 standards and since 1998 according to ISO 14001.

Product description

PASS, is an acronym for Plug and Switch System, is a prefabricated multifunctional equipment, isolated in gas, for high-voltage distribution substations (rated voltage higher than 72.5 kV up to 170 kV), including circuit breakers, disconnectors and earth disconnectors, current and voltage transformer as well as sensors for measuring the thickness of SF6 gas. One of PASS's main characteristics is its modular design and standardized components, which allow to obtain different configurations of the product. PASS can also be effectively utilized for the retrofitting of substations isolated in air.

Scope of declaration

The model being surveyed by this study is the single-bar PASS M0 for distribution substations whose main electrical widths are as follows:

- Rated current: 2.500 A
- Rated voltage: 145 kV – 170 kV
- Frequency: 50/60 Hz

Functional unit

The functional unit, as specified by the Product Specific Requirements PSR-I 02:2001, is the high-voltage bay.

System boundaries

The boundaries of the system being surveyed by the LCA study are in accordance to PSR I 02:2001.
For what not specified by the Product Specific Requirements the following holds true:

Production

The system includes the production phases of all material concurring to make the bay the amounts shown in the chart.

Materials	[g]	%
Iron	614	27.0
Steel	136	6.0
Stainless steel	160	7.0
Aluminum	785	34.6
Copper	138	6.1
Resins	206	9.1
Silicone rubber	83	3.7
SF6	36	1.6
Miscellaneous	2	0.1
Total	2160	95.1
Weighted	2270	100.0
Cut-off		**4.85**

Data regarding processes under the organization's control regard the ABB T&D - Adda Division manufacturing site located in Lodi.

Ninety-nine percent of data regarding associated production processes are specific data.

The reference energy mix is the Italian one (ANPA I – LCA version 2 databank).

Packaging of components and of finished product are not included in the system.

Sulphur exafluoride losses at the Lodi location are equal to 3% of the compound being treated.

Transportation

The system includes the transportation phases of finished and semifinished products concurring to make up the finished product. The transportation of finished product to clients was not considered since the product is sold on the international market.

Usage

The product usage phase brings along potential impacts, energy consumption and waste due to the production and supply of dissipated energy due to the Joule effect.

The reference energy mix used in the usage phase is the European one (ANPA I – LCA version 2 databank).

The energy losses in the usage phase due to the resistance of the main circuit (measured phase resistance equal to 85*10-6 W.) are equal to 251.300 MJ.

Yearly mass losses of sulphur exafluoride by the equipment are evaluated to be 0.3%.

End of life

The environmental performance declaration regarding the phase of the product's end of life is made under the hypothesis that the best available technology is used and is based on the following scenario.

Material	**Recycle [g]**	**Recovery [g]**	**Landfill [g]**	**Emission [g]**
Iron	553		61	
Steel	122	226	14	
Stainless steel	144		16	
Aluminum	707		79	
Copper	110		28	
Resins		202	4	
Silicone rubber			83	
SF6		34		1.7
Miscellaneous			2	
Partial	**1636**	**236**	**286**	**1.7**

* by recovery we mean the incineration process with energy recovery

** by emissions we mean emissions into the atmosphere attributable to the gas end of life, before the final recovery and/or disposal.

Environmental performance declaration

Consumption of resources

Consumption of main resources associated to the various phases of the life cycle is the following:

Resource	Production [kg]	Use [kg]	End of life [kg]
Water	180.000	1.680.000	-27.000
Bauxite	3.110	4	-2.500
Limestone	347	218	0
Coal	1.110	9.350	-258
Iron	915	97	-748
Natural gas	1.120	1.080	-88
Wood	28	70	0
Lignite	50	11.800	-24
Copper	148	0.8	-86
Oil	1.720	2.140	-1.510
Sand	68	53	0
Salt	419	7	-35
Uranium	0.062	0.801	-0.04
Zinc	11	0	0

Consumption of gross energy

The consumption of gross energy tied to the various phases of the life cycle and distinguished between the non-renewable and the renewable energy is the following:

Non renewables	Production [kg]	Use [kg]	End of life [kg]
Coal	21.000	177.600	-4.900
Gas	57.000	56.200	-4.570
Lignite	500	118.200	-240
Oil	77.500	96.200	-68.100
Uranium	28.000	360.500	-19.600
Total	184.900	808.700	-97.410
Renewable			
Hydro	42.500	52.100	-31.600
Wood	560	1.400	0
Total	43.060	53.500	-31.600
Total gross energy	**227.960**	**862.200**	**-129.010**

Potential Environmental Impacts

Potential environmental impacts tied to the various phases of the life cycle are the following:

Impact category	Production	Use	End of life
Acidification (kgSO2eq)	97.1	273	-65
Climate changes (kgCO2eq)	36.400	90.100	35.900
Eutrophication (kgPO4eq)	5.89	9.24	-3.2
Depletion of stratospheric ozone layer (kgCFC11eq)	0.0026	0	0
Photochemical ozone creation (kgC2H4eq)	22.12	20.11	-14.5

Waste

Waste produced in the various phases of the life cycle are the following

Waste	Production [kg]	Use [kg]	End of life [kg]
Industrial	14.251	5	-5.165
Hazardous	20.11	0.59	10.3

Land usage

The surface occupied by a PASS M0 is equal to:

Station	PASS M0 (sqmt)
Surface occupied	13.1

Additional information

Traceability of potential impacts

Potential environmental impacts regarding the supply of electric power are those associated to the usage of the analysis data of the inventory contained in the I-LCA database, version 2 (ANPA-October 2000).

1 MJ produced with energy mix	Italian	European
Acidification (kgSO2eq)	0.00151	0.00102
Climate changes (kgCO2eq)	0.197	0.144
Eutrophication (kgPO4eq)	0.0000582	0.0000346
Depletion of stratospheric ozone layer (kgCFC11eq)	0	0
Photochemical ozone creation (kgC2H4eq)	0.000170	0.0000753

Treatment procedures for exafluoride gas

All processes involving the treatment of SF6 follow the procedures set by the "Technical brochure no.117" of the CIGRE Guide in order to avoid the leakage of gas in the atmosphere.
ABB organized a world-wide service centers network which can offer:

- gas recovery service
- supply or leasing of equipment for gas treatment
- training courses for personnel in charge of recycling the gas

Reference documents

- ANPA (July 2201 draft) "General rules for the drafting of Environmental Product Declarations"
- LCA study of the PASS M0 (ref. EPD I – 2 rev. 0).
- Product Specific Requirements (PSR - I 02:2001)
- ISO 14020 (2000) "Environmental labels and declarations – Principles and guidelines"
- ISO/TR 14025 (2000) "Environmental labels and declarations – Type III environmental declarations"
- CIGRE Guide (1997) "Technical brochure no. 117"

Validation

The truthfulness of the information contained in this document is guaranteed by the EPD I – ANPA - 2 validation provided by ANPA.