
PRODUCT ENVIRONMENTAL PROFILE

SureWave SFC

General Information

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Reference Product and Methodology

ABB's SureWave is the new generation of Static Frequency Converter (SFC) allows the connection of 60 Hz powered equipment to a 50 Hz supply network and 50 Hz powered equipment to a 60 Hz supply network. Additionally, the SureWave SFC can stabilize the frequency and the voltage to allow the correct operation of sensitive equipment when the supply is not sufficiently regulated.

Table 1 – Reference product

Description	Quantity
SureWave SFC Model	PCS120-42-225
Nominal Output Power (kVA)	2250 kVA
Mass	4500 kg

The constituent modules are reported.

Table 2 – Constituent modules

Description	Quantity
SureWave SFC Termination Enclosure	2
SureWave SFC PE120	3
PCS120 Power Electronic Building Block (PEBB)	18

Homogeneous Environmental Families

The environmental data are representative also for the 250 kVA to 2250 kVA range of products. Constituent modules for these variants are reported below

Table 3 – Constituent modules for the variants

SFC Variants (nominal kVA)	Weight (kg)	Termination (no. of units)	PE120 (no. of units)	PEBB120 (no. of units)
SureWave SFC 250kVA	488	0	1	2
SureWave SFC 500 kVA	734	0	1	4
SureWave SFC 750 kVA	981	0	1	6
SureWave SFC 1000 kVA	3,365	2	2	8
SureWave SFC 1250 kVA	3,611	2	2	10
SureWave SFC 1500 kVA	3,858	2	2	12
SureWave SFC 1750 kVA	4,686	2	3	14
SureWave SFC 2000 kVA	4,932	2	3	16
SureWave SFC 2250 kVA	5,179	2	3	18

The impacts of the different life cycle stages can be extrapolated to other products of the same homogeneous environmental family by applying a rule of proportionality to the following parameters:

Table 4: Extrapolation factors included in the homogeneous environmental family

SFC Variant	Manufacturing	Distribution	Installation	Use	End of life
PCS120 SFC 250kVA	0.107	0.107	0.331	0.111	0.0912
PCS120 SFC 500 kVA	0.146	0.146	0.331	0.222	0.133
PCS120 SFC 750 kVA	0.185	0.185	0.331	0.333	0.174
PCS120 SFC 1000 kVA	0.670	0.670	0.667	0.444	0.670
PCS120 SFC 1250 kVA	0.709	0.709	0.667	0.556	0.712
PCS120 SFC 1500 kVA	0.747	0.747	0.667	0.667	0.753
PCS120 SFC 1750 kVA	0.922	0.922	1.000	0.778	0.917
PCS120 SFC 2000 kVA	0.961	0.961	1.000	0.889	0.958
PCS120 SFC 2250 kVA	1.000	1.000	1.000	1.000	1.000

Functional Unit

To convert the frequency of 60 Hz powered equipment to a 50 Hz supply network, and 50 Hz powered equipment to a 60 Hz supply network, and convert the supply voltage to a different voltage to match the requirement of the load, during 15 years.

Constituent Materials

Total mass of reference product, packaging and elements supplied with reference products: 5,521 kg. In the following table the distribution data for material, expressed as percentage of the total mass, is reported.

Table 5: Content declaration – Product

Materials	Unit	%	Environmental / hazardous properties
Metals			
Iron, steel, and stainless steel	2,540	50.4%	
Copper and copper alloys	951	18.9%	
Aluminium and aluminium alloys	319	6.4%	

Materials	Unit	%	Environmental / hazardous properties
Other metals	0	<0.1%	
Plastics	0	<0.1%	
Polyamide	111	2.2%	
ABS	42.8	0.9%	
Polycarbonate	21.0	0.4%	
Other Thermoplastics	173	3.4%	
Elastomers	12.9	0.3%	
Other plastics	1.56	<0.1%	
Electronics	0	<0.1%	
Electric cables	171	3.4%	
PCBAs	67.5	1.3%	
LCD screen	9.24	0.2%	
Batteries	0.00600	<0.1%	
Other electronics components	256	5.1%	
Other materials	21.7	0.4%	
Subtotal (Product)	4,690	93.4%	

Table 6: Content declaration –Packaging

Materials	Unit	%	Environmental / hazardous properties
Wood	329	6.5%	
Paper and cardboard	4.50	0.0%	
Subtotal (packaging)	342	6.6%	

Table 7: Content declaration – Summary (Product and Packaging)

Materials	Unit	%
Metals	3,810	75.7%
Plastics	362	7.2%
Others	859	17.1%

Environmental Impacts

System Boundaries

The life cycle assessment has been performed on SureWave SFC 2250 kW including installation materials and packaging. The following life cycle stages are considered: manufacturing, distribution, installation, use and end-of-life. The life cycle stages taken into account in the environmental impact analysis are:

Manufacturing

The manufacturing stage includes the environmental impacts associated with extraction and processing of raw materials used to produce the product and its packaging, transport to the manufacturing site, and assembly at the manufacturing site.

Location of the manufacturing plant: ABB Limited - Power Conditioning Products, 111 Main North Road, Napier, 4110, New Zealand.

The energy model used in the manufacturing stage is the ecoinvent v3.7.1 electricity mix for New Zealand: Electricity, medium voltage {NZ} market for electricity, medium voltage.

Distribution

The distribution stage includes the transportation in its packaging from the manufacturer's last logistics platform to the distributor and from the distributor to the installation place. The distribution is modeled by considering the distances from the manufacturing site to the countries where the product will be distributed in the year 2022.

End-of-life management of the packaging materials leaving the last logistic platform up to their end-of-waste status or disposal of the final residues are also included in the distribution stage.

Installation

The installation stage of the product at the place of use includes manufacturing, packaging and procurement of materials and components not supplied with the reference product but required for its installation, and management of the waste generated at the installation place.

Use

The use stage considers the product operation during 15 years of reference life time and includes energy consumption and production, distribution, installation and end-of-life of the components required to maintain the product over the reference life time.

Energy consumption is calculated considering a calculated average efficiency of 96.0%. The energy models used in this phase are the specific energy mixes based on ABB sales. For European target countries the energy models used are from ELCD v3.2 while for extra-European target countries the energy models are from ecoinvent v3.7.1.

Table 8: Countries selected for modelling SureWave use phase, and respective emission factors

Item description	Percentage used for weighted average	Emission factor (kg CO2/kwh)
USA	20%	0.544
United Arab Emirates	60%	0.544
Australia	20%	0.991

The maintenance operations include the substitution of the components reported in the following table.

Table 9: Components for maintenance (2.25MVA for 15 years)

Module	Enclosure air filter cartridge	PEBB 120 air filter	PEBB 120 fan assy	Busbar terminal contact grease
Commercial reference	2UCS004403B007	2UCM002893B004	2UCM003720B020	2UCM003720B021
Qty	30	18	18	1

Table 10: Components for maintenance for the SFC variants included in the homogeneous environmental family

SFC variant\Module	Enclosure air filter cartridge	PEBB 120 air filter	PEBB 120 fan assy	Busbar terminal contact grease
PCS120 SFC 250kVA	6	6	6	1
PCS120 SFC 500 kVA	6	6	6	1
PCS120 SFC 750 kVA	6	6	6	1
PCS120 SFC 1000 kVA	24	12	12	1
PCS120 SFC 1250 kVA	24	12	12	1
PCS120 SFC 1500 kVA	24	12	12	1
PCS120 SFC 1750 kVA	30	18	18	1
PCS120 SFC 2000 kVA	30	18	18	1
PCS120 SFC 2250 kVA	30	18	18	1

End of Life

This stage, as described in the PCR, includes impacts associated with transportation to collect the product, its transportation from the installation site to the final end of life treatment site, and end of life treatment processes. A value of 1,000 km transport by lorry is used for the transportation to treatment, as provided the PCR for local transport.

Geographical and Representativeness

Data used are site specific: the manufacturing stage occurs at ABB while the installation, use, and end of life stages occur in the specific target countries in which the SFC will be distributed in 2022 (as per

Table 8).

Technological Representativeness

Materials and processes data are specific for the production of SureWave SFC.

Life Cycle Impact Assessment


The environmental impacts, reported in the following table, are calculated by using SimaPro v9.2 and the databases ecoinvent v3.7.1 and ELCD v3.2.

Environmental Impact Indicators

Parameter	Unit	Total	Manufacturing			Distribution		Installation		Use		End of life	
Global warming potential (GWP)	kg CO2 eq.	3.80E+06	4.96E+04	1.3%	9.61E+02	<0.1%	-5.82E+02	<0.1%	3.75E+06	98.7%	3.26E+02	<0.1%	
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	1.61E-01	2.59E-03	1.6%	1.95E-04	0.1%	9.14E-06	<0.1%	1.58E-01	98.2%	1.05E-04	<0.1%	
Acidification potential (AP)	kg SO2 eq.	8.29E+03	3.89E+02	4.7%	2.54E+01	0.3%	5.32E-02	<0.1%	7.87E+03	95.0%	1.53E+00	<0.1%	
Eutrophication potential (EP)	kg PO43- eq.	8.74E+03	2.54E+02	2.9%	2.68E+00	<0.1%	-5.91E-01	<0.1%	8.49E+03	97.1%	-1.36E+00	<0.1%	
Formation potential of tropospheric ozone (POCP)	kg C2H4 eq.	4.37E+02	3.70E+01	8.5%	6.13E-01	0.1%	-1.02E-01	<0.1%	3.99E+02	91.4%	1.31E-02	<0.1%	
Abiotic depletion potential – Elements	kg Sb eq.	2.64E+01	2.09E+01	78.9%	1.32E-03	<0.1%	1.52E-04	<0.1%	5.58E+00	21.1%	1.10E-03	<0.1%	
Abiotic depletion potential – Fossil fuels	MJ, net calorific value	5.60E+07	5.96E+05	1.1%	1.24E+04	<0.1%	3.10E+02	<0.1%	5.54E+07	98.9%	5.21E+03	<0.1%	
Total use of primary energy during the life cycle	MJ	5.78E+07	6.76E+05	1.2%	1.25E+04	<0.1%	3.15E+02	<0.1%	5.71E+07	98.8%	5.27E+03	<0.1%	
Net use of fresh water	m3	1.03E+04	6.79E+02	6.6%	7.54E-01	<0.1%	-4.66E-02	<0.1%	9.65E+03	93.4%	7.19E-01	<0.1%	

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