ENVIRONMENTAL PRODUCT DECLARATION

INSULATION MADE OF STONE WOOL (MANUFACTURED IN GLIWICE)

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Declaration was prepared by :
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ISO 14001:2004, ISO 18001:2007, ISO 9001:2008, OHSAS 18001:2007

The assessment was carried out at ITB in accordance with EN 15804 + A1: 2014-04 and the information contained in the declaration was verified in accordance with § 8.1.4. PN-EN ISO 14025

Basic information

Life cycle analysis (LCA): A1-A3 modules in accordance with EN 15804 (Cradle to Gate)
The year of preparing the EPD: 2012
The year of updating the EPD: 2016
Declared durability (RSL) – 30 years
PCR: EN 16783+ITB PCR A (PCR based on EN 15804)
Functional unit (FU): 1 m^2K/W for λ = 0.039 W/mK, ρ = 105.5 kg/m^3, weight = 4.1 kg)
The Manufacturer declares, that since the environmental declaration was prepared in 2013, there have been no changes in the production technology of products covered by this declaration.

Product characteristics

In SAINT-GOBAIN ISOVER POLAND (SGIP) plant in Gliwice 86% of stone wool produced is evaluated by this LCA study: Akusto, Polterm Uni, Polterm Max/Max Plus, Dachoterm G/SL, Fasoterm NF. Stone wool is used in construction as thermal and acoustic insulation.

Table 1. Information on ISOVER stone wool

Product	Stone wool
Standard	EN 13162
Mean density of wool, kg/m3	105.5
Fire class	A1
Production volume, Mg	10402
λ used for calculations, W/mK	0.039
Use	Insulation of roofs, walls and insulation systems

Allocation

The environmental impact of the ISOVER system is generalized, the calculations are based on the ISOVER product declarations. The allocation guidelines in the EPD declaration are based on ITB-PCR A. The 100% of raw materials for the ISOVER stone wool product have been inventoried and assigned. Post-production sewage, household waste, electricity and gas consumption were assigned to the production process of the product according to the percentage volumes of a given product group.

The production of ISOVER glass wool and stone wool in Gliwice is located on separate production lines without by-products. Emissions are measured separately, as shown in module A3. The limits of the life cycle analysis for the tested products include the "Production phase", modules A1-A3 (from cradle to gate), in accordance with EN 15804 + A1. Office actions were also taken into account.

System limits

The limits of the life cycle analysis of the analyzed products include the "Production phase", modules A1-A3 (from cradle to gate), according to EN 15804 + A1 and ITB-PCR A. In the assessment, all relevant parameters from the collected production data are recognized, i.e. all raw materials used in the technological process, consumption of heat energy, internal fuel and electricity consumption, production waste and all available emissions from measurements to the environment. Office impacts were also taken into account. This study also takes into account certain materials and energy, which in the production process constitute less than 1%. It can be assumed that the total sum of omitted processes does not exceed 5% of the total impact. In accordance with EN 15804, machinery and facilities (capital goods) during production are excluded from the assessment, as well as the transport of employees.

Data collection period

The data for manufacture of the ISOVER products refer to year 2011. The life cycle assessment was prepared for Poland as reference area.

Data quality

The values determined to calculate the LCIA originate from verified and inventoried LCI ISOVER Saint-Gobain. Data was verified by ISO auditor.

Assumptions and estimates

Impacts for each product and technological process were inventoried and calculated separately. All raw material consumption, water, emissions are described in the EPD. Emission to air from the production of heat from gas combustion, was estimated using official conversion factors for energy carriers.

Databases

The data for the processes come from the following databases: insulation (ISOVER SAINT-GOBAIN specific EPD for glass and mineral wool), Tauron (electricity). Specific data quality analysis was a part of external ISO 14001 audit. Characterization factors are CML ver. 4.2 based on EN 15804:2013+A1 version (PN-EN 15804+A1:2014-04).

Energy mix

Energy mix for calculation year 2011 according to national energy mix reported by Statistics Poland (GUS).

Additional information

Detailed information on product applications are described in the technical characteristics or on the Manufacturer's website.

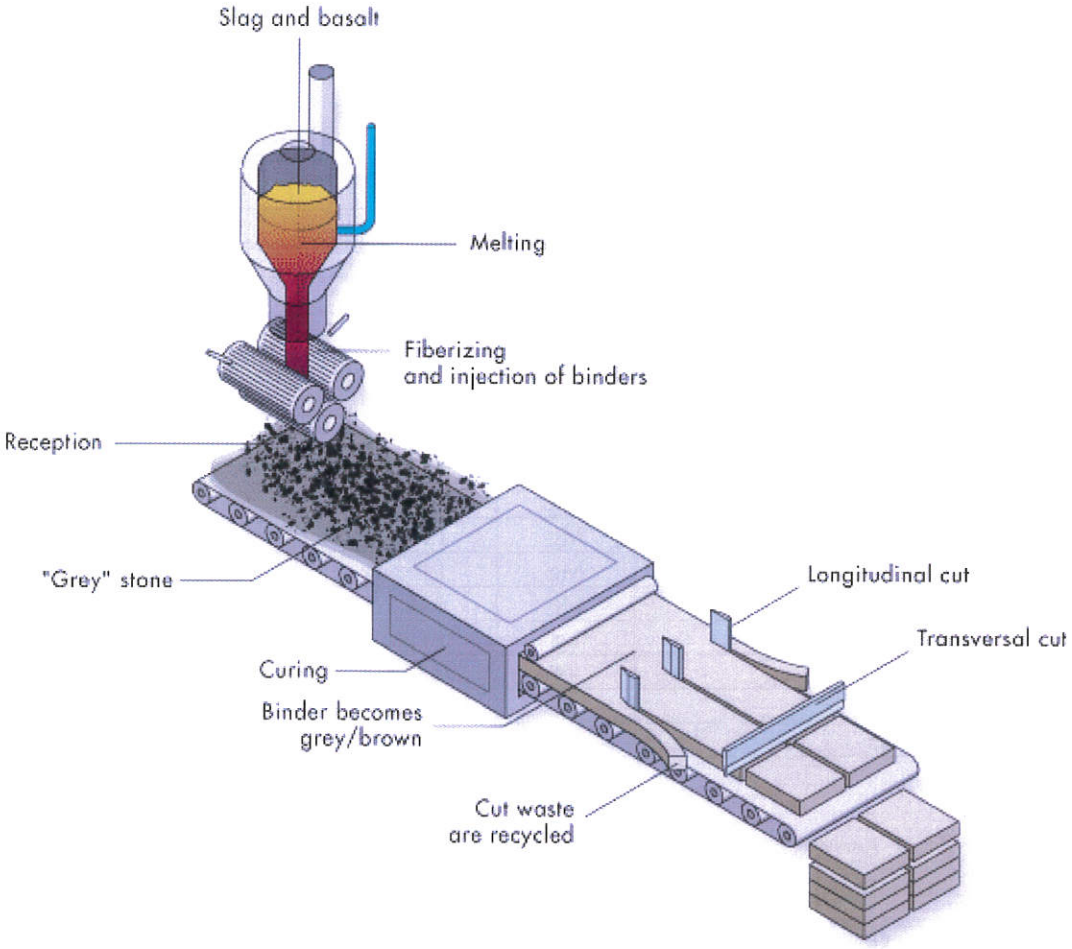
Raw materials and energy

Table 2. Raw materials used for stone wool production

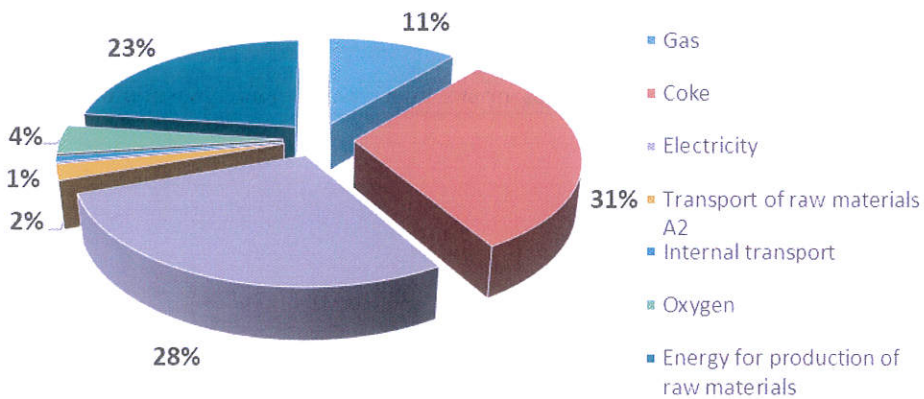
Material	Unit	Stone wool	Amount of material for:	
			Mg	FU (4.1 kg)
Basalt	Mg	2 638.9	0.1836	0.00075
Gabbro	Mg	7 467.0	0.5195	0.00213
Dolomite	Mg	1 506.6	0.1048	0.00043
Crushed steel	Mg	4 754.1	0.3307	0.0014
Ammonia water	Mg	6.60	0.0005	1.88E-06
Resin	Mg	785.0	0.0546	0.00023
Oil emulsion	Mg	60.3	0.0042	1.72E-05
Ammonium sulfate	Mg	4.9	0.0003	1.4E-06
Silane	Mg	1.9	0.0001	5.42E-07
Urea	Mg	509.7	0.0355	0.00015
Silicon	Mg	12.6	0.0009	3.59E-06
Silane	Mg	1.9	0.0001	5.42E-07
Pallets	Mg	2.40	0.0002	6.84E-07
Cardboard	kg	10.00	0.0007	2.85E-06
PE film	kg	0.82	0.0001	2.34E-07
Glue	kg	10.00	0.0007	2.85E-06
Glass veil	Mg	22.00	0.0015	0.0007

Table 3. Energy consumption in specific life cycle stages

Primary energy consumption	Amount of energy [MJ] for:	
	Mg	FU (4.1 kg)
Production stage A3		
Gas (52.26 nm^3/Mg of glass wool. 35.6 MJ/nm^3)	1820	7.5
Coke	5091	20.9
Electricity	4656	19.1
Transport of raw materials A2	394	1.6
Internal transport (Diesel + LPG)	137	0.6
Oxygen	705	2.9
Extraction of raw materials A1		
Energy for production of raw materials	3835	15.7
Total energy consumption	16650	68.3



Pic. 1 ISOVER stone wool production scheme



Pic 2. Percentage share of particular energy carriers

Emissions (LCI) and impact of product on environment

Table 4. Emissions to air during the A3 production phase

Emissions in phase A3	Unit	Total amount	Amount of emission for:	
			Mg	FU (4.1 kg)
Dust	kg	3263	0.26	0.0011
CO	kg	21529	1.73	0.0071
CO_2	kg	9544000	770.71	3.16
NO_2	kg	6273	0.51	0.0021
SO_2	kg	27992.1	2.26	0.0093
Phenol	kg	1760	0.14	0.00057
Formaldehyde	kg	838.7	0.068	0.00028
Ammonia	kg	8099.6	0.65	0.0027
HCl	kg	24.53	0.002	0.000008
HF	kg	100	0.008	0.00003

Table 5. Emissions to water during the A3 production phase

Water and sewage A3	Unit	Total amount	Additional information
Water total	m^3	13734	
Sanitary wastewater	m^3	13734	treated
Sanitary sewage composition			
BOD5	mg/l	116,54	Analysis according to PN- 84/C-04578/5
COD	mg/l	355,4	Analysis according to PN -74/C-04578/5
pH		7,8	Analysis according to PN-ISO 10390:1997
Suspension	mg/l	115,7	Analysis according to PN-72/C-04559/2
Volatile phenols	mg/l	1,58	Analysis according to PN-ISO 6439:1994
Formaldehyde	mg/l	0,086	Analysis according to PN-71/C-04593
Ammonium nitrogen	mg/l	12,9	Analysis according to PN-76/C-04576/1
Petroleum substances	mg/l	0,1	Analysis according to PN-78/C-04565.01

Table 6. Waste generated during A3 production phase.

Waste	Unit	Amount for Mg	Amount for FU	Treatment
Crushed rocks and debris	Mg	0.07	0.0001	re-use
Paper packaging	Mg	0.0008	0.01	recycling
Plastic packaging	Mg	0.002	0.005	recycling
Ash from gas treatment	Mg	0.01	0.0007	recycling
Metals (steel and iron scrap)	Mg	8.1E-05	0.12	recycling
Soil and stones	Mg	0.0014	0.007	recycling
Toners	Mg	1.2E-05	0.77	recycling
Oil	Mg	6.7E-05	0.14	recycling
Wood	Mg	0.003	0.003	recycling
Other	Mg	0.42	2.3E-05	landfill

Table 7. List of environmental impact categories in the life cycle phases on Mg

Environmental impact	**Unit**	*CRADLE TO GATE + A4*			
		A1	**A2**	**A3**	**A4**
Environmental impact					
Global warming potential GWP	kg CO_2	355.0	28.0	1151.4	8.2
Depletion potential of the stratospheric ozone layer ODP	kg CFC11	6.50E-05	0	0.000005	3E-05
Acidification potential of soil and water AP	kg SO_2	1.5	0.137	4.41	0.04
Formation potential of tropospheric ozone POCP	kg C_2H_4	0.14	0.014	0.058	0.006
Eutrophication potential EP	kg PO_4	0.2	0.024	0.43	0.006
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	0.16	0	0.02	0
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	3693	376	12048	68
Environmental aspects					
Net use of fresh water	m^3	3.1	0.01	0.2795	0
Use of raw materials	Mg	0.85	0	1.2497	0
Use of renewable energy	MJ	142	0	372.54	0
Use of non-renewable energy	MJ	3835	394.8	12421	74
Waste	kg	0.25	0	0.13	0

Table 8. List of environmental impact categories in the life cycle phases on functional unit (FU)

Environmental impact	**Unit**	*CRADLE TO GATE + A4*			
		A1	**A2**	**A3**	**A4**
Environmental impact					
Global warming potential GWP	kg CO_2	1.46	0.11	4.72	0.034
Depletion potential of the stratospheric ozone layer ODP	kg CFC11	2.67E-07	2.67E-09	1.93E-08	1.23E-07
Acidification potential of soil and water AP	kg SO_2	0.0062	0.0006	0.0181	0.00016
Formation potential of tropospheric ozone POCP	kg C_2H_4	0.0006	0.0001	0.0002	2.46E-05
Eutrophication potential EP	kg PO_4	0.0008	0.0001	0.0018	2.46E-05
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	0.0007	0	0.0001	0
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	15.14	1.54	49.40	0.28
Environmental aspects					
Net use of fresh water	m^3	0.0127	0	0.0011	0
Use of raw materials	Mg	0.0035	0	0.0051	0
Use of renewable energy	MJ	0.5822	0	1.5274	0
Use of non-renewable energy	MJ	15.72	1.62	50.93	0.3034
Waste	kg	0.0011	0	0.0004	0

Table 9. List of environmental impact categories Cradle to Gate A1-A3

Environmental Product Declaration – Stone wool (Gliwice)			
EPD	Start date	November 2012	
	End date	December 2012	
	Update	January 2016	
	Validity	January 2021	
	Database	Inventoried LCI ISOVER Saint-Gobain. ITB	
	Localisation	POLAND	
	Representativeness	1 factory in Poland (Gliwice)	
	LCA methodology	ITB/EN15804/CML2010	
	Allocation	99% of impacts	
	Representativeness	1 year. 2011	
	System limits	Cradle to Gate. A1-A3	
	Unit	**Values of indicator (a) on:**	
		Mg	**FU (4.1 kg)**
Environmental impact			
Global warming potential GWP	kg CO_2	1534.4	6.3
Depletion potential of the stratospheric ozone layer ODP	kg CFC11	0.00007	2.88E-07
Acidification potential of soil and water AP	kg SO_2	6.04	0.025
Formation potential of tropospheric ozone POCP	kg C_2H_4	0.21	0.0009
Eutrophication potential EP	kg PO_4	0.65	0.0027
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	0.18	0.0007
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	16117.3	66.08
Environmental aspects			
Net use of fresh water	m^3	3.4	0.014
Use of raw materials	Mg	2.1	0.009
Use of renewable energy	MJ	514.5	2.1
Use of non-renewable energy	MJ	16650.6	68.27
Waste	Mg	0.39	0.0016
Environmental impact	**Per capita in Poland (b)**	**Standard values (a/b*100%) [%]**	
Global warming potential GWP	9000 kg CO_2	17	0.07
Depletion potential of the stratospheric ozone layer ODP	0.0069 kg CFC11	1	0.004
Acidification potential of soil and water AP	80.4 kg SO_2	8	0.031
Formation potential of tropospheric ozone POCP	32.23 kg C_2H_4	1	0.003
Eutrophication potential EP	78.3 GJ	21	0.09
Abiotic depletion potential (ADP-elements) for non-fossil resources	65.62 kg PO_4	1	0.004
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	292 m^3	1	0.005

Verification

Assessment was prepared by Instytut Techniki Budowlanej (www. itb.pl) in accordance with - CEN TC 350. EN 15804. PCR ITB
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) ☐ internal ☒ external
Verification according to Verification Form by ECO PLATFORM: Halina Prejzner. PhD. Eng. LCI audit and input data verification A1-A4: Dominik Bekierski. MSc. Eng.. d.bekierski@itb.pl LCA and report: Michał Piasecki. PhD. Eng.. m.piasecki@itb.pl

ITB is a member of ECO-PLATFORM - Association of entities performing EPD environmental product declarations in Europe

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