ravaber® BIO

Environmental Product Declaration

for Ravaber Bio Glass Wool
in accordance with ISO 14025 and EN 15804

Programme: The International EPD® System, www.environdec.com
EPD Turkey, www.epdturkey.org

Programme operator: EPD International AB & EPD Turkey

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EPD®
THE INTERNATIONAL EPD® SYSTEM

TURKEY EPD®
ENVIRONMENTAL PRODUCT DECLARATIONS

PROGRAMME INFORMATION

Programme	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com Regional Office: EPD Turkey, Nef 09 B Blok 7/15 Kagithane/Istanbul, Turkey, www.epdturkey.org
Product Category Rules (PCR)	Construction Products and Construction Services 2012:01, version 2.3 SUB-PCR to PCR 2012:01 Thermal Insulation Products (EN 16783:2017) Versiyon 2.2
PCR Review Was Conducted By	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. Contact via: info@environdec.com
Verification	Independent verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third Party Verifier	Ing. Luca Giacomello, PMP® Corso Gamba 36 C 10144 Torino - Italy Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Data Follow Up	Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No
LCA Study & EPD Design Conducted By	Semtrio Sustainability Consulting AND Plaza No:10-12 Kozyatagi Istanbul/Turkey www.semtrio.com

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

COMPANY INFORMATION

RAVABER Kayseri Manufacturing Plant, Turkey

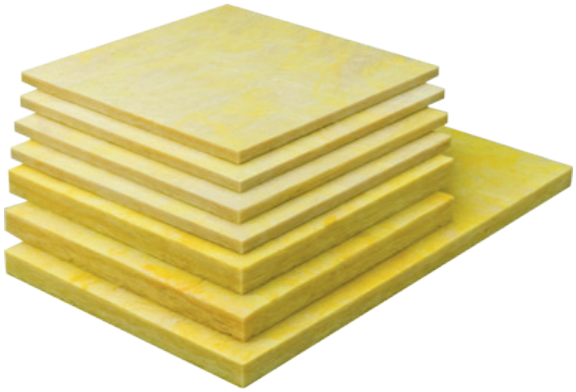
The owner of the EPD - RAVABER - operates in more than 350 locations in 40 countries, being a member of the Belgium-based Ravago Group and a leader in the insulation industry by meeting the mineral rockwool requirement of an area of 20,000,000 sqm annually with its wide product range for thermal insulation, sound insulation and fire safety. RAVABER is located in Kayseri Organized Industrial Zone with its high technology equipment investments in a total area of 80,000 sqm with 56,000 sqm indoor area. RAVABER is the biggest mineral wool manufacturer in the region with an annual production capacity of 120,000 tonnes.

In addition to 25 different types of mineral rockwool products, RAVABER is producing Ceramic Wool and Agro used in soilless agriculture. RAVABER has become the only company in the sector supplying all mineral wool products in the last quarter of 2018 by starting mineral wool production with the new production line of glass wool. Ravaber, the only manufacturer that can produce all mineralwool insulation materials under the same roof, offers a wide range of products with new Ravaber bio according to various application areas.

Ravago ravaber®

PRODUCT INFORMATION

RAVABER Bio Glass Wool provides maximum insulation by preventing deterioration, decay, mold retention, corrosion and rusting. Thanks to the international patented phenol formaldehyde free binder, glass fibre can be produced as stabil and standard. In this way, RAVABER Bio does not dust, itch and it is eco-friendly. Depending on the product type, the temperature of use is in the range of -50 /+250°C. Noncohesive RAVABER Bio products can be used up to 500 ˚C. RAVABER Bio is classified as "A1" group noncombustible materials and are used in the range of -20 + 400 ° C according to the application area.



Silica sand, also known as silicon dioxide (SiO_2), is a compound that is in the form of free quartz or a combination of silicates that is found in nature in high quantities and widely used in many industries. RAVABER Bio is an insulation material obtained by melting the locally supplied silica sand at about 1250 ° C and transforming it into fibers. RAVABER Bio does not undergo dimensional deformations such as swelling, blistering or shrinkage even when subjected to heat and humidity. Its water vapour diffusion resistance factor $\mu = 1$ and its declared thermal conductivity is $0.031 \leq \lambda \leq 0.040$ W/mK. (at 10˚C).

UN CPC code: 37990, Non-metallic mineral products n.e.c. (including mineral wool, expanded mineral materials, worked mica, articles of mica, non-electrical articles of graphite or other carbon and articles of peat). HS Code: 6806.

Geographical scope: Global.

TECHNICAL SPESIFICATIONS

PROPERTIES	SYMBOL	UNIT	EN STANDARD						TS EN 13162
Material	MW		RAVABER BIO						STANDARD
Thickness	dN	mm	80	100	120	140	160	180	TS EN 13162
Width	b	cm	120	120	120	120	120	120	TS EN 823
Length	l	cm	1000	800	600	600	500	500	TS EN 822
Organic Content	%	%	4.5						TS EN 822
Average fibre diameter	(mm - μ)	micron	5						-
Declared Thermal Conductivity (10 °C)	λort	W/mK	0.040						TS EN 13820
Thermal Resistance	RD	m^2K/W	2	2.5	3	3.5	4	4.5	TS EN 12667
Average breaking strength	kPa	-	10						ISO 10635
Reaction to fire	-	-	A1						TS EN 13501-1
Max. Usage Temperature	-	°C	250						-
Facing	No Facing								
Compression Ratio	4.5/1								

LCA INFORMATION

Functional unit / declared unit: The functional unit is providing a thermal insulation on 1 sqm of product with a thermal resistance of 1 $K.m^2.W^{-1}$.

Declared Unit weight for 1 sqm with a thermal resistance of 1 $K.m^2.W^{-1}$.

Density, kg/m3	Thickness, mm	Thermal Conductivity, W/m.K	Weight, kg
9	37	0.037	0.333

Reference service life: N/A
EPD Type (System Boundary): Cradle-to-gate

Data Collection: Specific data (primary data) was used for the Core Module and was gathered from the RAVABER Manufacturing Plant. The manufacturing data are monitored and recorded in RAVABER data collection system specifically per unit of product. Data represents the period from 1st January 2018 to 31th October 2018. For secondary data Ecoinvent v3.5 datasets was used. LCA was modelled in SimaPro v9.0.0.31.
Allocation: No allocation conducted for input materials and energy consumption was collected specifically per functional unit.
Calculation Methods: All resource use values are calculated from Cumulative Energy Demand V1.11 in SimaPro outputs; water consumption from inventory. Potential environmental impacts are calculated with the CML-IA baseline V 3.05, in SimaPro software.

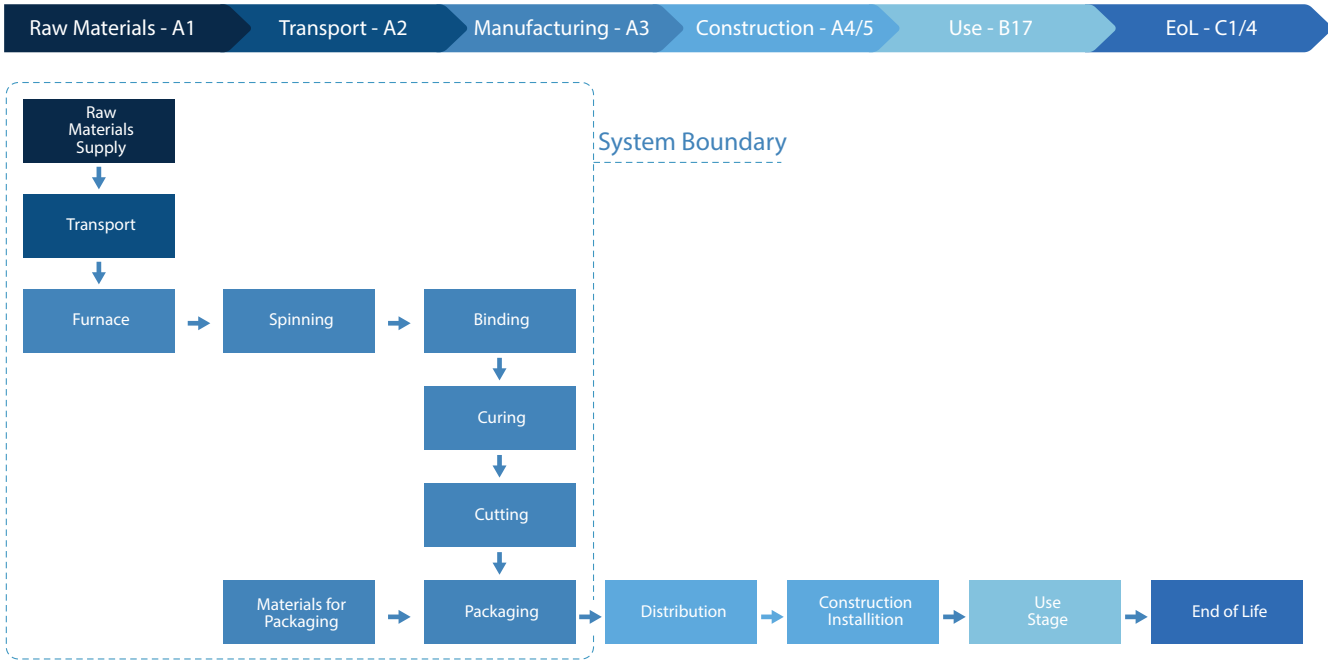
Cut-off Rules: Cut-off rule of 1% regarding waste and wastewater treatment was applied. Regarding to material and chemical inputs, no cut-off rule has been applied.
Excluded lifecycle stages: Downstream Processes A4/5, B1/7, C1/4 and module D are not evaluated in this LCA study. The EPD is intended to be as cradle to gate (A1 to A3). This EPD only covers the Cradle to Gate stage because other stages are very dependent on particular scenarios.

Included life cycle stages per EN 15804:

Product stage			Construction stage		Use stage							End of life stage				Resource recovery stage
Raw materials	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND: Module not declared.

System diagram:



Upstream Processes

A1) Raw material supply:
•Extraction and processing of raw materials (e.g. mining processes)
•Energy generation in the upstream processes

Glass cullet is used as secondary materials in the production system. All elementary flows at resource extraction have been included.

Core Processes

The scope of the core module is defined by the organizational boundaries and includes all activities which the manufacturing organization is in control of. In this LCA Study the core process includes transportation of raw materials to production plant, impacts generated by fuel burned in the core process, impacts due to the electricity production according the country energy mix.

A2) Transportation:
•External transportation to the core processes and internal transport

A3) Manufacturing:
•Manufacturing of the glass wool product
•Packaging materials

CONTENT DECLARATION

Materials	Percentage, %
Silica sand	45-60
Glass cullet	20-35
Borax	1-10
Soda ash	7-20
Formaldehyde	9-14

Packaging: PE packaging film is used to cover the end products. Classfied as Distribution Packaging: designed for the purposes of transport, handling and/or distribution.

Borax is included in the Candidate List of Substances of Very High Concern for authorisation under the REACH regulations are included in composition of RAVABER's products, above the threshold for registration with the European Chemicals Agency or above 0.1 % (wt/wt).

Silica sand: Silicon dioxide, also known as silica, is an oxide of silicon with the chemical formula SiO_2, most commonly found in nature as quartz and in various living organisms. In many parts of the world, silica is the major constituent of sand.

Glass: Glass recycling is the processing of waste glass into usable products. Glass that is crushed and ready to be remelted is called cullet.

Borax: Borax, also known as sodium borate, sodium tetraborate, or disodium tetraborate, is an important boron compound, a mineral, and a salt of boric acid. Powdered borax is white, consisting of soft colourless crystals that dissolve in water.

Soda ash: The Heavy/Dense Soda Ash produced from the Trona ore. Trona ore is extracted using the solution mining, which is a safe and environment friendly operating method. The Trona solution, which goes through the monohydrate process, is transformed into Sodium Carbonate, also named natural sodium carbonate.

Formaldehyde: Formaldehyde is a naturally occurring organic compound with the formula CH_2O. It is the simplest of the aldehydes. The common name of this substance comes from its similarity and relation to formic acid.

ENVIRONMENTAL PERFORMANCE

PARAMETERS		UNIT	TOTAL A1 to A3
USE OF RESOURCES FOR GLASS WOOL WITH RESIN			
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	13.79
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	13.79
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	16.34
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	16.34
Secondary material		kg	<0.1
Renewable secondary fuels		MJ, net calorific value	0.00
Non-renewable secondary fuels		MJ, net calorific value	0.00
Net use of fresh water		m^3	0.007
POTENTIAL ENVIRONMENTAL IMPACTS FOR GLASS WOOL WITH RESIN			
Global warming potential (GWP)		kg CO_2 eq.	1.03
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	5.77E-08
Acidification potential (AP)		kg SO_2 eq.	4.98E-03
Eutrophication potential (EP)		kg PO_4^{3-} eq.	6.02E-04
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	2.56E-04
Abiotic depletion potential – Elements		kg Sb eq.	1.03E-06
Abiotic depletion potential – Fossil resources		MJ, net calorific value	14.44
WASTE PRODUCTION AND OUTPUT FLOWS FOR GLASS WOOL WITH RESIN			
Hazardous waste disposed		[kg]	1.43E-04
Non-hazardous waste disposed		[kg]	0.045
Radioactive waste disposed		[kg]	0
Components for reuse		[kg]	0
Material for recycling		[kg]	0.3479
Materials for energy recovery		[kg]	0
Exported energy, electricity		[MJ]	0

ENVIRONMENTAL PERFORMANCE

PARAMETERS		UNIT	TOTAL A1 to A3
USE OF RESOURCES FOR GLASS WOOL WITHOUT RESIN			
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	14.40
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	14.40
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	19.70
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	19.70
Secondary material		kg	<0.1
Renewable secondary fuels		MJ, net calorific value	0.00
Non-renewable secondary fuels		MJ, net calorific value	0.00
Net use of fresh water		m^3	0.009
POTENTIAL ENVIRONMENTAL IMPACTS FOR GLASS WOOL WITHOUT RESIN			
Global warming potential (GWP)		kg CO_2 eq.	1.38
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	6.04E-08
Acidification potential (AP)		kg SO_2 eq.	6.91E-03
Eutrophication potential (EP)		kg PO_4^{3-} eq.	8.20E-04
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	3.22E-04
Abiotic depletion potential – Elements		kg Sb eq.	8.57E-07
Abiotic depletion potential – Fossil resources		MJ, net calorific value	17.44
WASTE PRODUCTION AND OUTPUT FLOWS FOR GLASS WOOL WITHOUT RESIN			
Hazardous waste disposed		[kg]	1.43E-04
Non-hazardous waste disposed		[kg]	0.045
Radioactive waste disposed		[kg]	0
Components for reuse		[kg]	0
Material for recycling		[kg]	0.3479
Materials for energy recovery		[kg]	0
Exported energy, electricity		[MJ]	0

THE ENVIRONMENT IMPACTS for the DIFFERENT THICKNESSES of the PRODUCT

Density, kg/m³	Thickness, mm	Thermal Conductivity, W/m.K	Multiplication Factor
9	50	0.333	1.000
9	80	0.342	1.027
9	100	0.036	0.108
12	100	0.456	1.369
12	50	0.456	1.369
12	50	0.396	1.189
12	100	0.456	1.369
16	25	0.544	1.634
16	50	0.528	1.586
24	25	0.864	2.595
24	50	0.816	2.450
9	50	0.297	0.892
16	25	0.640	1.922
9	80	0.360	1.081
12	50	0.480	1.441
16	50	0.624	1.874
24	25	0.768	2.306
24	50	0.840	2.523

"The LCA study has been conducted for Ravaber Bio Glass Wool with Resin and without Resin additive and includes the range of thicknesses between 25 mm and 100 mm and of different density between 9 kg/m3 and 24 kg/m3; both for Ravaber Bio Glass Wool with Resin and without Resin. A reference unit has been selected as value of R= 1 m2 .K / W for 33 mm - Glass Wool with Resin and without Resin. To determine the environmental impacts associated with a given product thickness in the table above, the results specified in this EPD must be multiplied by the corresponding multiplication factor; applicable for both Ravaber Bio Glass Wool with Resin and without Resin."

References

- Declaration of Performance (DoP) and CE marking / https://ec.europa.eu/growth/sectors/construction/product-regulation/performance-declaration_en
- Ecoinvent 3.5 / http://www.ecoinvent.org/
- Eurima - European Insulation Manufacturers Association / https://www.eurima.org/about-mineral-wool/production-process.html
- ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework
- ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines
- ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures
- Ravaber / http://www.ravaber.com/en/index.php
- Regulation (EU) No 305/2011 / https://eur-lex.europa.eu/legal-content/ET/TXT/PDF/?uri=CELEX:32011R0305&from=EN
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- The International EPD® System / Sub-PCR-I Thermal insulation products (EN 16783) / https://www.environdec.com/PCR/Detail/?Pcr=12883

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