

INSULATES THE FUTURE

EPD® Environmental Product Declaration

THE INTERNATIONAL EPD SYSTEM

The environmental impacts of this product have been assessed over its whole life cycle. Environmental Product Declaration has been verified by an independent third party.

ODE STARFLEX Glasswool Insulation Materials
in accordance with EN15804 and ISO14025

CPC Code: 3712 Glasswool Insulation

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Market Coverage: Worldwide
Declaration Number
S-P-00671



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Company Profile

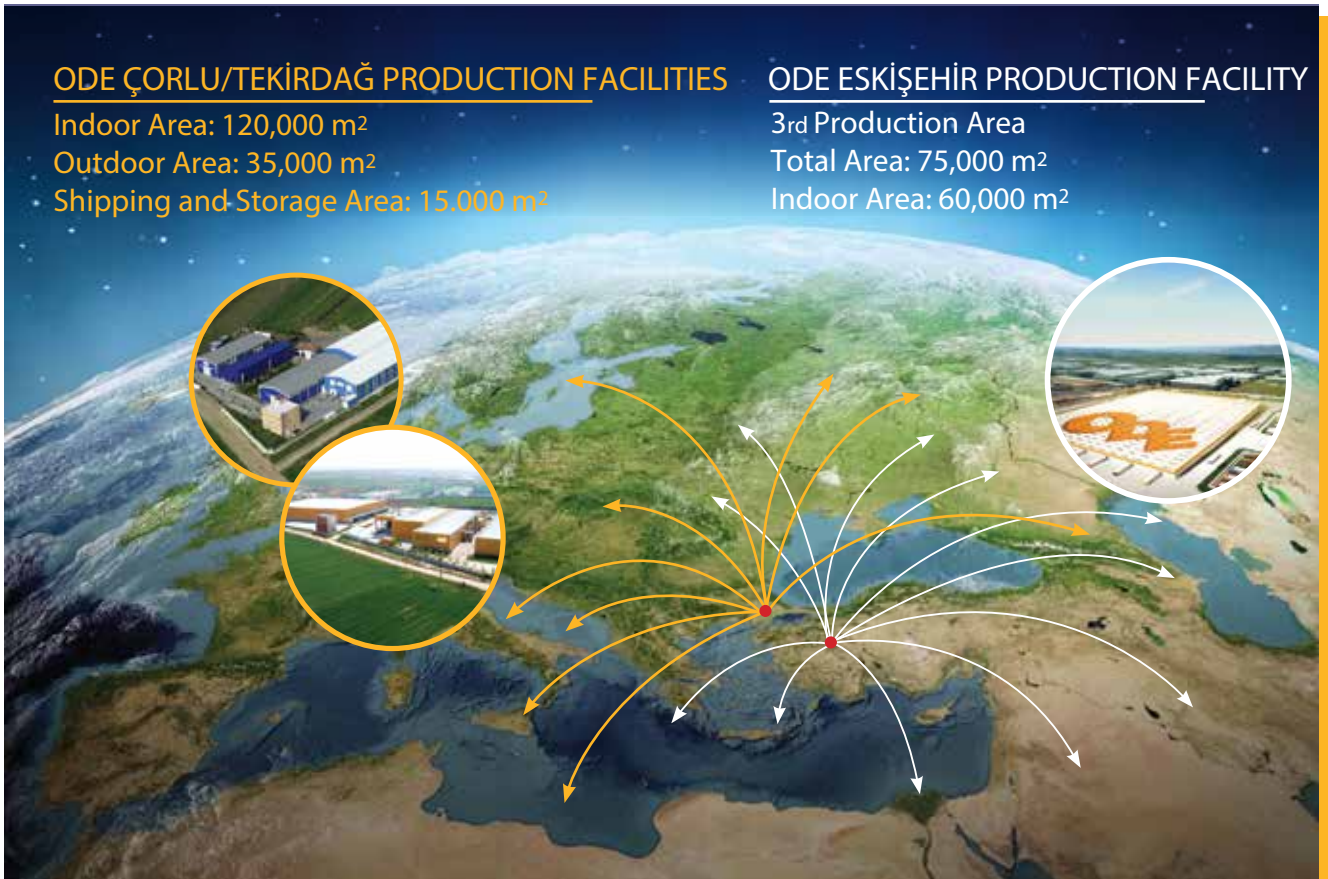
30 Years of Experience in Insulation; ODE

ODE Yalıtım Sanayi ve Ticaret A.Ş. was founded in 1985 to operate as a contractor in construction industry. Becoming an importer in 1990 and a manufacturer in 1996, ODE became a regional power in 2010 with international quality production and widespread dealer network. Today it is among the largest manufacturers of insulation sector with 4 modern production facilities (ODE R-flex Production Facility, ODE Isipan Production Facility, ODE Membran Production Facility, ODE Starflex Glasswool Production Facility) spread over 120,000 m² outdoor and 35,000 m² indoor area, product range over 4,000 products and expert staff.

Leader in transport and storage with its logistic centre spread over 15,000 m² indoor area, ODE has commissioned its 3rd production base in Eskişehir in 2015, commemorating its 30th year. When the factory, spread over 75 thousand m² area of which 60 thousand m² is indoor area, reaches full capacity it will produce 20 thousand tons of elastomeric rubber foam, 25 million m² membrane and 5 million m² shingle yearly.

Regional Power from Europe to China

The first and only insulation brand to participate TURQUALITY® Support Program, ODE exports to 75 countries on 5 continents ranging from Belgium to Moldova; Australia to Pakistan. With its new facility for elastomeric rubber foam, which will be the largest investment between Europe and Far East, ODE aims to be the largest insulation company of Turkey and the regional powerhouse of Far East-Europe line.





INSULATES THE FUTURE

100% Ozone Friendly and Environmentally Responsible Production

Focusing its works towards the goal of a more habitable world and proving its commitment to this concept with solid works, ODE became the first and only insulation company in 2010, to attend the Umbrella project initiated in Turkey in 2009 with the cooperation of T.R. Ministry of Environment and UNIDO. Having its efforts certified in international platforms by receiving grant from United Nations Industrial Development Organization (UNIDO), ODE has completed its 2 year long research and development studies and has switched to 100% OZONE FRIENDLY production.

Focusing especially to “Efficiency” for a sustainable future to exceed far beyond being a manufacturing supplier, ODE continues to support this goal with innovations in its production. Developing “standard” and “premium” product ranges, ODE provides high quality solutions suiting customer demands. Initiating EPD (Environmental Product Declaration) process for all its brands, ODE will be able to present the environmental performance of its products already registered with quality documents such as ISO, CE, TSE, etc. most transparently with EPD documentation.

Extends the Industry with Its Leading Enterprises and Social Responsibility Consciousness

Taking a lead role in foundation of many associations, especially İZODER, ODE signs leading projects aimed at raising public awareness in insulation and energy efficiency. Striving to take place in works that will leave a legacy, ODE changed company motto to “Insulates the future” in early 2014. Acting with global responsibility that comes with being in the global market, ODE continues to take its place in many international activities and successfully represent Turkish insulation industry and Turkey.



Programme Related Information

EPD Programme Holder	The International EPD System www.environdec.com Valhallavägen 81, 114 27 Stockholm, Sweden
Product Category Rules	Insulation Materials 2014:13 Version 1.0 EN 15804:2012 + A1:2013 Sustainability of Construction Works
Generic PCR Review	Technical Committee of the International EPD® System
Independent Verification	<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External <input type="checkbox"/> EPD® Process Certification
Approved and Verified by	Mr. Vladimír Koci, PhD Šárecká 5, 16000 Prague 6, Czech Republic
EPD Prepared by	Metsims Sustainability Consulting www.metsims.com
Calculation Procedures	SimaPro 8.0 LCA Software (Metsims Sustainability Consulting)
System Boundaries	<input type="checkbox"/> Cradle to Gate <input checked="" type="checkbox"/> Cradle to Gate with options <input type="checkbox"/> Cradle to Grave
Disclaimer	All values provided in this Environmental Product Declaration are a direct result from the use of characterisation factors and calculation rules as defined in the SimaPro software. The environmental indicators used for these calculations are based on CML Baseline V4.2 April 2013. For more information about this Environmental Product Declaration or its contents, contact process owner, Mrs Derya GÜRBÜZ ILGAZ on d.ilgaz@dode.com.tr
Demonstration of Verification	<div style="border: 1px solid black; padding: 5px;"> <p>PCR Review was conducted by: Technical Committee of EPD International AB. Valhallavägen 81, 114 27 Stockholm, Sweden www.environdec.com info@environdec.com</p> <p>Independent Verification and data, according to ISO 14025:2006 Internal <input type="checkbox"/> <input checked="" type="checkbox"/> External</p> <p>Third Party Verifier: Mr Vladimír Koci, PhD Šárecká 5, 16000 Prague 6, Czech Republic</p> </div>

Statement

The LCA for this EPD is conducted according to the guidelines of ISO 14040/44, the requirements given in the Product Category Rules (PCR) document for Insulation Materials 2014:13 Version 1.0, compliant with EN 15804 and the general program guidelines by The International EPD System in accordance with ISO 14025 standards.

The inventory for the LCA study is based on the 2014 May - 2015 April production figures for Starflex glasswool products from ODE's main production plant is located in Çorlu, Turkey. This LCA was modelled with SimaPro 8.0 LCA software using Ecoinvent version 3.01 database and impact factors.

EPD of thermal insulation materials may not be comparable if they do not comply with EN 15804.

This EPD covers the Cradle to Gate with Options (disposal).

The EPD certificate, its background data and the results will be used for business-to-business communications and is expected to be a reliable document for green building designers, architectures, manufacturers of construction products and the other stakeholders in the construction sector to understand the potential environmental impacts caused by Starflex glasswool insulation materials.



STARFLEX GENERAL FEATURES

Starfelx blankets and boards are the insulating blankets and boards, used for thermal and sound insulation of buildings and HVAC ducts from outside.

COMPONENTS	AMOUNT, %
SAND	1%
FELDSPAR	5%-6%
LIMESTONE AND SODA ASH	4%
BORAX	<5%
SODIUM SULPHATE	<1%
RECYCLED GLASS	>60%
PHENOL FORMALDEHYDE RESIN	10%-20%
BINDER ADDITIVES	3%

Copmosition of Starflex glasswool insulation materials

No component of product is on SVHC list.

APPLICATION AREA

Depending on the field and purpose of application, blankets and panels with different coating materials are available at different sizes and technical properties. ODE Starflex Glasswool insulation products are mainly used for thermal insulation whereas they can be used for acoustic insulation. Application field of ODE Starflex Glasswool insulation products are given below:

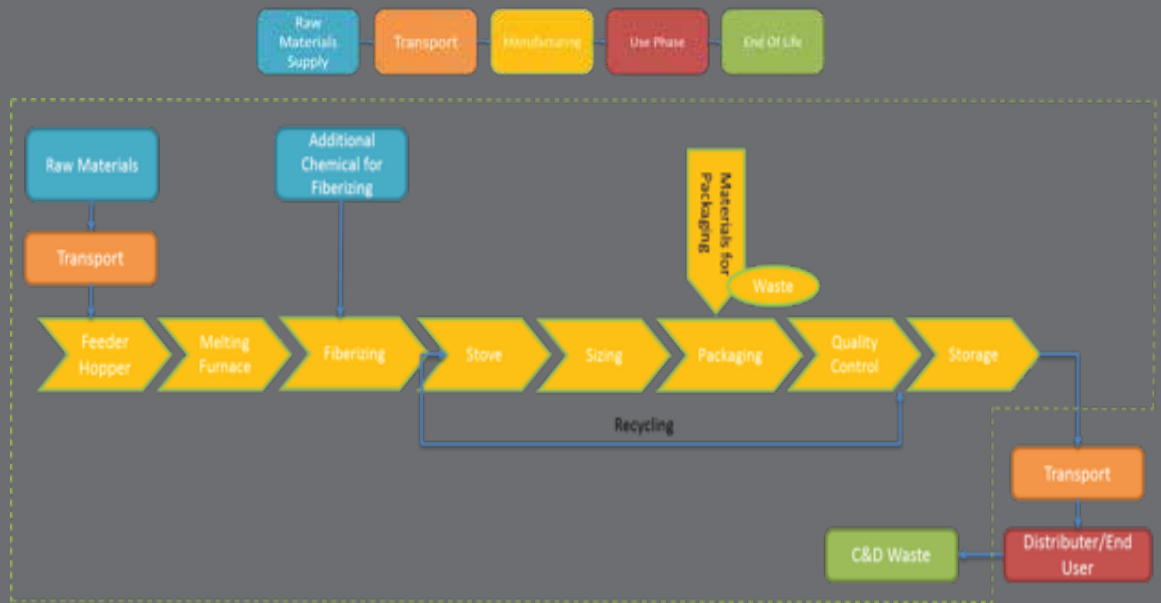
- Exterior walls and internal surface of any walls and reinforced concrete elements,
- Interior partitions and adjacent walls,
- Walls adjacent to stair cases and elevator shafts,
- Back of radiator (reduces heat losses caused by transfer),
- Thermal and acoustic insulation of HVAC systems,
- Thermal insulation and acoustic insulation on the facade,
- Interior thermal insulation and acoustic insulation of wooden carcass buildings.

PRODUCT	THERMAL CONDUCTIVITY W/MK (10 °C) (EN 12667-EN 12939)	FIRE CLASSIFICATION (EN 13501-1)	THICKNESS TOLERANCE (EN 13162-14303)
STARFLEX 044	0.044	Euroclass A1	T1
STARFLEX 042	0.042		T1
STARFLEX 040	0.040		T1
STARFLEX 037	0.037		T1-T3
STARFLEX 035	0.035		T1-T3
STARFLEX 032	0.032		T1-T3
STARFLEX 031	0.031		T3

Technical Specifications of Starflex glasswool insulation materials

For more information of products you can see TDS abd DOP documents from www.ode.com.tr

Production Process and System Boundary



System Boundary of the LCA study conducted on Starflex glasswool products

Upstream Processes (A1: Raw Material Supply)

In this report, for Starflex glasswool insulation materials, production starts with raw materials, mainly locally sourced but some transported from other parts of the world. For glasswool products glass cullet have the biggest ratio within the composition, nearly 80%, and it is provided from a local company located in Kocaeli, Turkey. Environmental impacts during the production of all raw materials are reflected in this EPD.

Core Processes (A2:Transportation and A3: Manufacturing)

Transport is relevant for delivery of raw materials to the plant and internal transport within the manufacturing plant for each product group.

Manufacture of glasswool products are starts with feeder continues with melting silica sand at high temperatures and making it fibres. Both natural gas and electricity are consumed during the production of Starflex glasswool insulation materials. Electricity consumed within the packaging process is also considered d in manufacturing stages.

Downstream Processes (C4: Disposal)

All glasswool products end up at C&D landfill as their final fate and modelled as such in this LCA.

Packaging waste is assumed to end up at packaging recycling streams due to the relevant national law in Turkey in 2014, which requires manufacturers to have certain percentage of their packaging waste to be recovered (C4).

Benefits and loads beyond the product system boundary in information Module D

No possible benefits of recycling and re-use were taken into account in the LCA work here.



LCA Calculation Rules

Functional Unit	The functional unit for glasswool products is '1 m ² glasswool insulation material that provides a thermal insulation of R=1 m ² K/W.
Goal and Scope	The EPD evaluates the environmental impacts of 1 m ² glasswool insulation material with a different densities and thickness (Starflex products under the name Starflex 042, Starflex 040, Starflex 037, Starflex 035, Starflex 032 Starflex 031) that provides a thermal insulation of R=1 m ² K/W.
System Boundaries	The system boundary covers A1-A3 product stages referred as 'Raw Material Supply', 'Transport' and 'Manufacturing' and C4 as Disposal.
Estimates and Assumptions	There are no additional product scenerio developed for this EPD. Packaging waste is modelled based on the enforced collection rates in Turkey at the time.
Cut-Off Rules	Cut-off criteria were not applied.
Background Data	Ecoinvent database were used as generic background data source.
Data Quality	Raw materials, electricity, water use and waste data were collected from ODE.
Period Under Review	This data is representative of 2014 May - 2015 May production figures for Starflex Starflex Glasswool insulation materials.
Allocations	There is no co-products allocation for Starflex Glasswool insulation products. Hence, there is no need for co-product allocation. Transport is allocated according to tonnages for almost all raw materials bought by ODE.
Comperability	A comparison or an evaluation of EPD data is only possible where EN 15804 has been followed, and the same building context and product-specific characteristics of performance are taken into account and the same stages have been included in the system boundary. According to EN 15804, EPD of construction products may not be comperable if they do not comply with the standards.

PRODUCT NAME	WEIGHT OF PRODUCT THAT PROVIDES 1M2K/W THERMAL INSULATION, kg
ODE STARFLEX 042	0.40
ODE STARFLEX 040	0.48
ODE STARFLEX 037	0.56
ODE STARFLEX 035	0.63
ODE STARFLEX 032	0.77
ODE STARFLEX 031	1.52

Weight of product that provides 1 m²K/W thermal insulation

ENVIRONMENTAL IMPACTS

During the modeling, all values are taken into account for 1 kg of glasswool insulation materials and calculated impacts are multiplied with the required amount of glasswool products that gives thermal insulation $R=1\text{m}^2\text{K/W}$. The required amount of glasswool products for Starflex 044, 042, 040, 037, 035, 032 and 031 are calculated by considering the density and thickness of each product.

PRODUCT STAGE			CONSTRUCTION PROCESS			USE STAGE						END OF LIFE STAGE			BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES	
Raw Materials Supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse-Recycling-Recovery 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

The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1, A2, A3) and the loads beyond the system boundaries (C4). The system boundaries in tabular form for all modules are shown in the table above.

All energy calculations were obtained using Cumulative Energy Demand methodology, while environmental impacts are calculated with the CML-IA baseline V4.2 within SimaPro 8.0.

In this EPD, the environmental impacts of six different types of ODE Starflex products are given; Starflex 044, 042, 040, 037, 035, 032 and 031. The difference between these products is the required amount of material that provides the thermal insulation $R=1\text{ m}^2\text{K/W}$. Each product has different density and thickness values.



ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 042 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	9.90E-01	3.41E-04
ODP	[kg CFC11 eq.]	6.44E-08	8.38E-12
POCP	[kg ethene eq.]	2.83E-04	6.96E-08
AP	[kg SO ₂ eq.]	3.55E-03	2.40E-07
EP	[kg PO ₄ ³⁻ eq.]	1.70E-03	1.57E-05
ADPE	[kg Sb eq.]	2.85E-07	4.28E-11
ADPF	[MJ eq.]	1.75E+01	8.15E-04
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

RESOURCE USE FOR ODE STARFLEX 042 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	5.44E-01	2.33E-05
PERM	[MJ]	0	0
PERT	[MJ]	5.44E-01	2.33E-05
PENRE	[MJ]	9.10E+00	8.15E-04
PENRM	[MJ]	0	0
PENRT	[MJ]	9.10E+00	8.15E-04
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	2.14E-01	8.43E-07
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 042 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	7.21E-02	0
NHWD	[kg]	1.74E+01	0.40E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	2.91E-03	3.15E-03
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Exported Energy		

ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 040 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	1.19	0.00041
ODP	[kg CFC11 eq.]	7.75E-08	1.01E-11
POCP	[kg ethene eq.]	3.40E-04	8.37E-08
AP	[kg SO ₂ eq.]	4.27E-03	2.89E-07
EP	[kg PO ₄ ³⁻ eq.]	2.04E-03	1.89E-05
ADPE	[kg Sb eq.]	3.42E-07	5.14E-11
ADPF	[MJ eq.]	2.10E+01	9.81E-04
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

RESOURCE USE FOR ODE STARFLEX 040 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	6.55E-01	2.80E-05
PERM	[MJ]	0	0
PERT	[MJ]	6.55E-01	2.80E-05
PENRE	[MJ]	1.09E+01	9.81E-04
PENRM	[MJ]	0	0
PENRT	[MJ]	1.09E+01	9.81E-04
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	2.58E-01	1.01E-06
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 040 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	8.68E-02	0
NHWD	[kg]	2.09E+01	0.48E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	3.50E-03	3.79E-03
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Ecported Energy		

ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 037 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	1.38	0.000474
ODP	[kg CFC11 eq.]	8.97E-08	1.17E-11
POCP	[kg ethene eq.]	3.93E-04	9.69E-08
AP	[kg SO ₂ eq.]	4.95E-03	3.35E-07
EP	[kg PO ₄ ³⁻ eq.]	2.36E-03	2.19E-05
ADPE	[kg Sb eq.]	3.96E-07	5.95E-11
ADPF	[MJ eq.]	2.43E+01	1.14E-03
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

RESOURCE USE FOR ODE STARFLEX 037 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	7.58E-01	3.24E-05
PERM	[MJ]	0	0
PERT	[MJ]	7.58E-01	3.24E-05
PENRE	[MJ]	1.27E+01	1.14E-03
PENRM	[MJ]	0	0
PENRT	[MJ]	1.27E+01	1.14E-03
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	2.98E-01	1.17E-06
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 037 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	1.00E-01	0
NHWD	[kg]	2.42E+01	0.56E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	4.05E-03	8.44E-03
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Exported Energy		

ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 035 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	1.57	0.000539
ODP	[kg CFC11 eq.]	1.02E-07	1.33E-11
POCP	[kg ethene eq.]	4.47E-04	1.10E-07
AP	[kg SO ₂ eq.]	5.62E-03	3.80E-07
EP	[kg PO ₄ ³⁻ eq.]	2.69E-03	2.49E-05
ADPE	[kg Sb eq.]	4.51E-07	6.77E-11
ADPF	[MJ eq.]	2.77E+01	1.29E-03
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

RESOURCE USE FOR ODE STARFLEX 035 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	8.61E-01	3.68E-05
PERM	[MJ]	0	0
PERT	[MJ]	8.61E-01	3.68E-05
PENRE	[MJ]	1.44E+01	1.29E-03
PENRM	[MJ]	0	0
PENRT	[MJ]	1.44E+01	1.29E-03
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	3.39E-01	1.33E-06
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 035 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	1.14E-01	0
NHWD	[kg]	2.75E+01	0.63E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	4.61E-03	4.99E-03
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Ecported Energy		

ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 032 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	1.92	0.000661
ODP	[kg CFC11 eq.]	1.25E-07	1.63E-11
POCP	[kg ethene eq.]	5.48E-04	1.35E-07
AP	[kg SO ₂ eq.]	6.89E-03	4.66E-07
EP	[kg PO ₄ ³⁻ eq.]	3.30E-03	3.05E-05
ADPE	[kg Sb eq.]	5.52E-07	8.30E-11
ADPF	[MJ eq.]	3.39E+01	1.58E-03
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

RESOURCE USE FOR ODE STARFLEX 032 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	1.06E+00	4.52E-05
PERM	[MJ]	0	0
PERT	[MJ]	1.06E+00	4.52E-05
PENRE	[MJ]	1.77E+01	1.58E-03
PENRM	[MJ]	0	0
PENRT	[MJ]	1.77E+01	1.58E-03
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	4.16E-01	1.64E-06
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 032 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	1.40E-01	0
NHWD	[kg]	3.37E+01	0.77E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	5.65E-03	6.12E-03
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Exported Energy		

ENVIRONMENTAL IMPACTS FOR ODE STARFLEX 031 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
GWP	[kg CO ₂ eq.]	3.76	0.00129
ODP	[kg CFC11 eq.]	2.45E-07	3.18E-11
POCP	[kg ethene eq.]	1.07E-03	2.64E-07
AP	[kg SO ₂ eq.]	1.35E-02	9.13E-07
EP	[kg PO ₄ ³⁻ eq.]	6.45E-03	5.97E-05
ADPE	[kg Sb eq.]	1.08E-06	1.62E-10
ADPF	[MJ eq.]	6.64E+01	3.10E-03
Legend	GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources		

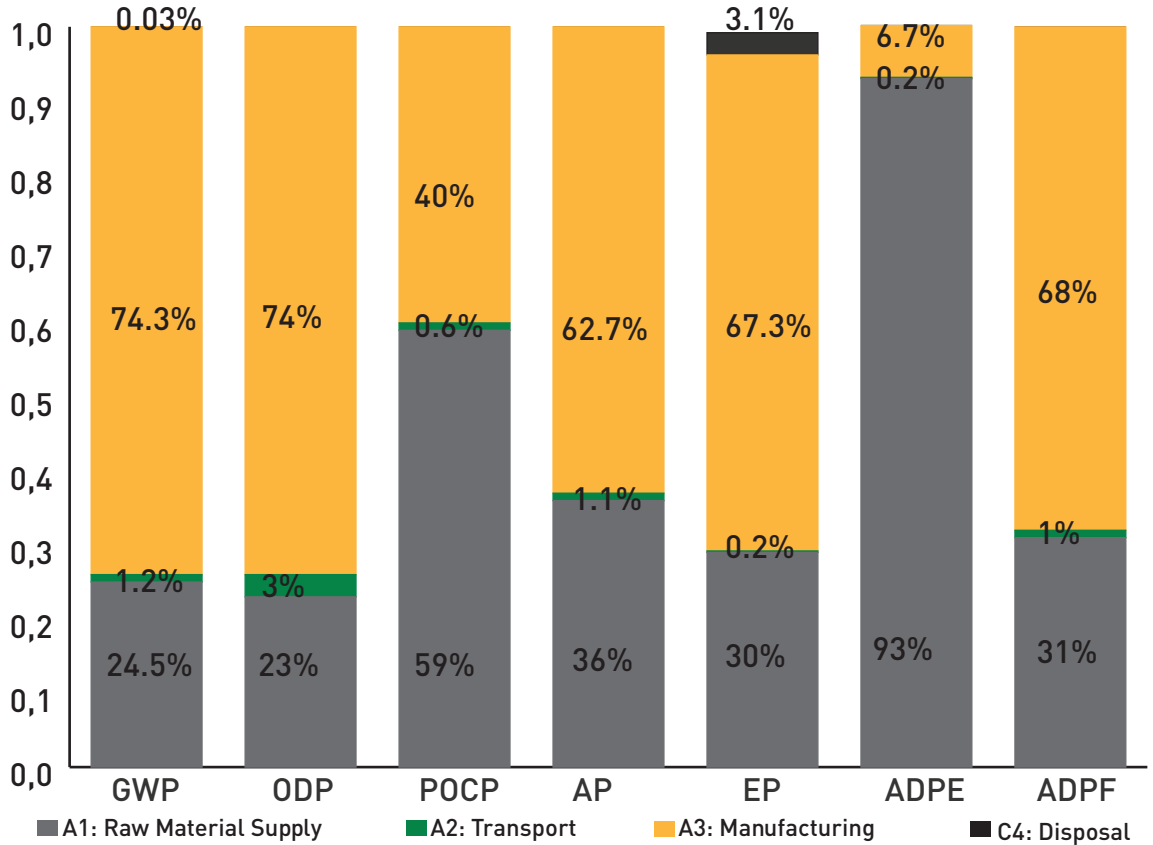
RESOURCE USE FOR ODE STARFLEX 031 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
PERE	[MJ]	2.07E+00	8.84E-05
PERM	[MJ]	0	0
PERT	[MJ]	2.07E+00	8.84E-05
PENRE	[MJ]	3.46E+01	3.10E-03
PENRM	[MJ]	0	0
PENRT	[MJ]	3.46E+01	3.10E-03
SM	[kg]	0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	8.14E-01	3.20E-06
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water		

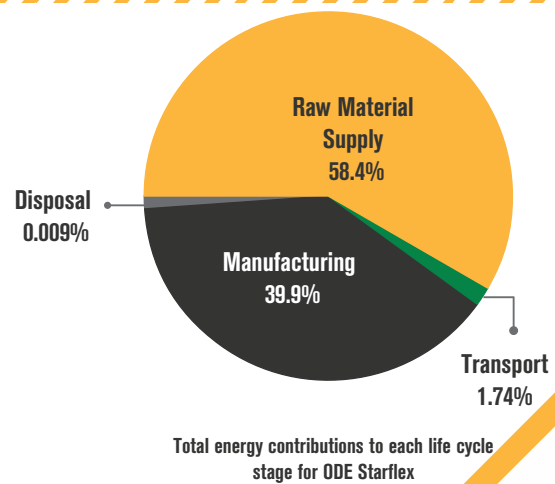
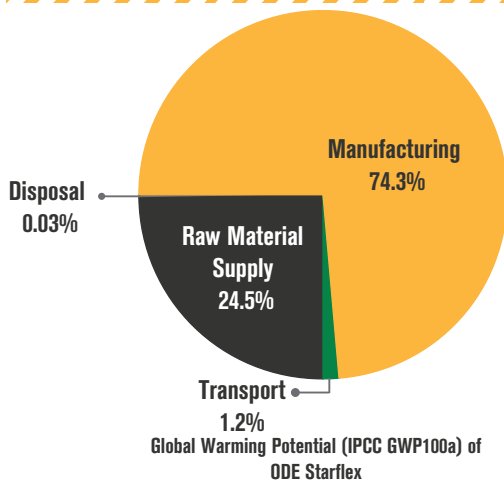
OUTPUT FLOWS AND WASTE CATEGORIES FOR ODE STARFLEX 031 THAT PROVIDE 1 M2K/W THERMAL INSULATION

Parameter	Unit	A1-A3	C4
HWD	[kg]	2.74E-01	0
NHWD	[kg]	6.60E+01	1.52E+00
RWD	[kg]	0	0
CRU	[kg]	0	0
MFR	[kg]	1.11E-02	1.20E-02
MER	[kg]	0	0
EE [Typ]	[MJ]	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Exported Energy		

ENVIRONMENTAL INTERPRETATION



Among all impact categories except photochemical oxidation and abiotic depletion potential for non-fossil sources, manufacturing (A3) represents the life cycle stage with the biggest impact. The GWP of manufacturing is 74%, while raw material supply has about 25% of the total carbon emissions followed by transport with 1% of the impact. The end of life of Glasswool products has little or no effect on GWP.



■ A1: Raw Material Supply ■ A2: Transport
■ A3: Manufacturing ■ C4: Disposal



/EN 15804/ EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

/EN 13501-1/ Fire classification of construction products and building elements-Part 1: Classification using test data from reaction to fire tests.

/EN 13162/ Thermal insulation products for buildings. - Factory made mineral wool (MW) products - Specification

/EN 14303/ Thermal insulation products for building equipment and industrial installations. Factory made mineral wool (MW) products.

/EN 12939/ Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Thick products of high and medium thermal resistance

/EN 12667/ Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

/ISO 14040-44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)

/ISO 14020/ Environmental labels and declarations -- General principles

/GPI/ General Programme Instructions

/PCR for Insulation Materials, The International EPD System/ Prepared by Life Cycle Engineering srl, 2014:13 Version 1.0, DATE 2014-04-16

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025.www.environdec.com

/Ecoinvent / Ecoinvent Centre, www.Eco-invent.org

/SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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