Statement of Verification

BREG EN EPD No.: 000508 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Synthos S.A.

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

1 m3 of Synthos XPS insulation with an average density up to 32.16 kg/m3.

Company Address

Synthos S.A.
ul. Chemików 1
Oświecim
32-600

synthos

Signed for BRE Global Ltd	Emma Baker Operator	08 June 2023 Date of this Issue
08 June 2023 Date of First Issue		07 June 2028 Expiry Date

BRE Global Verified EPD

BRE Global Ltd., Garston, Watford WD25 9XX.
T: +44 (0)333 321 8811 F: +44 (0)1923 664603 E: Enquiries@breglobal.com

ECO PLATFORM EPD VERIFIED

Environmental Product Declaration

EPD Number: **000508**

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013
Commissioner of LCA study	**LCA consultant/Tool**
Synthos S.A. ul. Chemików 1 Oświecim 32-600	LCA consultant: Roger Connick Tool: BRE LINA v2.0
Declared Unit	**Applicability/Coverage**
1 m^3 of Synthos XPS insulation with an average density up to 32.16 kg/m^3.	Product Average.
EPD Type	**Background database**
Cradle to Gate with options	ecoinvent

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Nigel Jones
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A1:2013 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑		☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Synthos Dwory 7 sp. z o.o.
ul. Chemików 1
32-600 Oświęcim
Poland

Synthos Kralupy a.s.
O. Wichterleho 810
278 01 Kralupy nad Vltavou
Czech Republic

Construction Product:

Product Description

Synthos XPS boards are thermoinsulating panels made of foamed polystyrene. Material consists of small cells of less than 1 mm in diameter, which are closed and keeping air inside as insulator. XPS panels have very good insulating parameters (thermal conductivity coefficient between 0.029 and 0.036 W/m·K), perfect hydrophobic features (low water absorption by immersion, diffusion, resistance against freeze-thaw), and good or very good mechanical strength (compressive, shear, bending, tensile), constant over time under the impact of static and dynamic loads.

They are suitable for use as

- Thermal insulation in buildings
- Thermal insulation for building equipment and industrial installations
- Light-weight fill products for civil engineering in various applications

The most typical uses are:

- Load-bearing and thermal insulation underneath foundation slabs
- External horizontal and vertical thermal insulation of in-ground construction
- Insulation of inverted roof

However, the range of applications is much wider:

- Perimeter insulation of walls above and below ground level
- Insulation of floors and floorings
- Insulation of strip footings
- Insulation of classical flat-roofs
- Insulation of transportation routes and parking lots
- Insulation of plinths and attics

- Insulation of railways and tramways
- Insulation of terraces, loggias and balconies
- Insulation of pitched roofs
- Insulation of elements of agricultural, utility and livestock buildings
- Insulation of places where cold bridges may appear
- Insulation of window jambs and door openings
- Insulation of reinforced concrete tie beams and other elements made of homogenous concrete
- XPS sandwich panels
- Construction panels with XPS core
- Formwork
- Other thermoinsulation applications in constructions with the accordance to the local regulations and standards

More information to be found at: www.synthosxps.com

Technical Information

Property	Value, Unit
Colour	Grey or black
Minimum service temperature	-60°C
Maximum service temperature	70 °C
Surface finishing	Smooth (from extrusion), embossed (shattered), planned-trimmed, planned-trimmed with grooves
Edges finishing	Straight, half-lapped, tongue-and-groove
Thicknesses range	20 to 300 mm, with tolerance T1 to T3
Length range	1000 to 3000 mm (standard 1250 mm)
Width	600 mm
Density range	Between 29 and 47 kg/m^3
Compressive stress levels	250, 300, 500, and 700 kPa
Compressive strength at 2% deformation	100 to 300 kPa
Compressive strength at 5% deformation	150 to 600 kPa
Compressive creep of 1.5% at loads	110 to 250 kPa
Bending (flexural) strength	300 to 600 kPa
Tensile strength perpendicular to faces	100 to 400 kPa
Shear strength	35 to 360 kPa
Elasticity modulus in compression	9 to 42 MPa
Kirchhoff modulus in shearing	3 to 17 MPa
Resistance to cyclic compressive load using square or sinusoidal wave load	deformation of 5% after 2 million cycles under loads between 120 and 600 kPa
Dimensional stability under specified conditions – temperature 70 °C and relative humidity 90%	Less than 5% of deformation
Dimensional stability under specified conditions – temperature 70 °C and load 40 kPa	Less than 5% of deformation
Linear coefficient of thermal expansion:	Longitudinally – less than 0.08 mm/m; Transversely – less than 0.06 mm/m; via thickness less than 0.05 mm/m

Property	Value, Unit
Dynamic stiffness	80 to 380 MN/m^3
Thermal conductivity coefficient in standard 10°C	Between 0.029 and 0.036 W/m·K
Thermal conductivity coefficient in -60°C	Between 0.023 and 0.028 W/m·K
Thermal conductivity coefficient in 70°C	Between 0.036 and 0.049 W/m·K
Long term water absorption by total immersion levels	0.7; 1.5 %
Short term water absorption	Between 0.5 and 2.5 kg/m^3
Long-term water absorption by diffusion levels	1 to 5
Freeze-thaw resistance levels	1 to 5
Average achieved open cells content	Less than 5%
Resistance against XA1 aggressive environment (acc. to EN 206-1) at temperature (23±2) ºC	Less than 0.6% change of weight after 8 weeks of exposition and drying into constant mass
Fungus resistance	The material does not serve as a source for the growth of fungi
Reaction to fire	Euroclass E or F
Durability of reaction to fire	Does not deteriorate in time
Global Warming Potential (GWP) of celluliar gas	Less than 5
Ozone Depletion Potential (ODP) of celluliar gas	0
Emissions of Volatile Organic Compounds	BREEAM International New Construction v2.0 (2016) – Exemplary level

Main Product Contents

Material/Chemical Input	%
Polystyrene	98-99
Others	1-2

Manufacturing Process

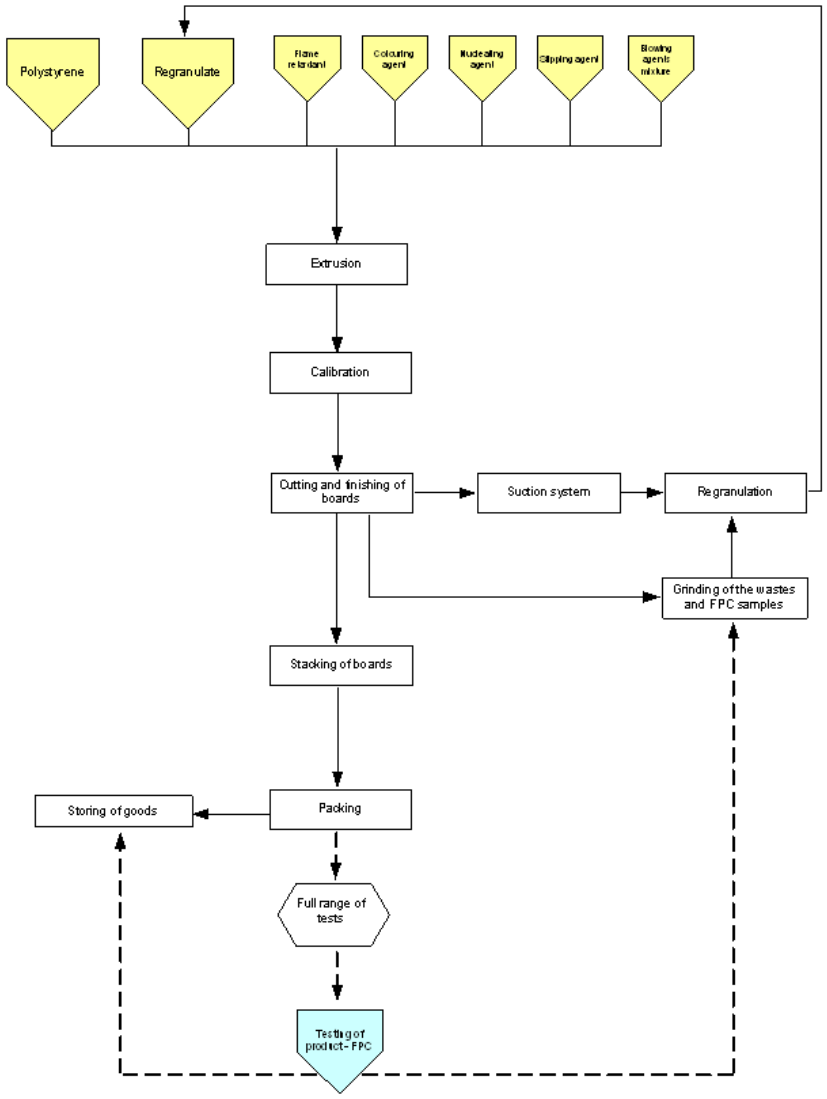
The manufacturing process of Synthos XPS boards consists of mixing of polystyrene mixture, extruding, foaming and finishing of panels into boards.

Polystyrene resin is combined with additives including flame retardants, colour agent and nucleating agent. This is then heated up, creating a melted mixture. Blowing agents are then added into the mixture including carbon dioxide. No CFCs (chlorfluorcarbons), HCFCs (hydrochlorfluorcarbons) or HFCs (hydrofluorcarbons) are added. The mixture then is cooled down and finally foams into air, creating foam mass which is pressed into the shape of panels.

Edges of panels are finished into various finishings - half-lapped edges, straight ones, tongue-and-groove ones. The surface can be finished or remains natural, from extrusion. Finishing of surface may be with embossed structure (”waffle”), trimmed – planned, or with grooves along plates.

Ready boards are collected into stacks, wrapped with PE foil, and packages stored on foamed polystyrene beams.

Process flow diagram



Construction Installation

Synthos XPS insulation boards are installed on the particular application field, horizontally or perpendicularly (using drilling, cap nails and adhesive). The boards are then cut on the fields to remove excess, if required, and an installation wastage rate of 5% has been specified. This is an industry average XPS installation wastage percentage obtained from Annexe D of the BRE EN 15804 Product Category Rules (PCR) document.

Approximately 65% - 75% of Synthos insulation products are sold and installed in Poland.

End of Life

No data was available for modules C1 and C2, only modules C3 and C4 have been declared. In this LCA, results for both 100% to landfill and 100% to incineration with energy recovery (and resultant module D impacts) have been listed. The 100% incineration with energy recovery scenario assumes that the XPS insulation has a calorific value of 46 MJ per kg (British Plastics Federation). The dataset used to calculate the avoided impacts of electricity consumption in a future system was 'Electricity, medium voltage {PL}| market for | Alloc Def, U'.
The 100% to landfill and 100% to incineration with energy recovery scenarios will enable the end-user of the EPD to calculate the impacts associated with the specific waste XPS scenario of their own country/region, based on the recovery rate of XPS from building demolition sites.

Life Cycle Assessment Calculation Rules

Declared unit description

1 m^3 of Synthos XPS insulation with an average density up to 32.16 kg/m^3.

System boundary

This is a cradle-to-gate with options EPD, reporting all production life cycle stages (modules A1 to A3), construction and installation process stages (modules A4 & A5) and end-of-life stages (C3, C4 & D where appropriate) in accordance with EN 15804:2012+A1:2013.

Data sources, quality and allocation

Specific primary data derived from the Synthos XPS production processes in Dwory, Poland and Kralupy, Czech Republic, have been modelled using BRE LINA v2.0 and the BRE LINA database v2.1.20. In accordance with the requirements of EN15804, data within five years of the publication of this EPD has been used. The manufacturer-specific data from Synthos S.A. covers a period of one year (01/04/19 – 31/03/20). Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.2 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804. Since 100% of Synthos XPS production was modelled at each facility, no allocation procedures were required to enable allocation of processes to the Synthos XPS insulation products. However, it was noted in the original data collection form submissions that there were slightly fewer input materials consumed compared to total production output at both the Dwory and Kralupy sites. Therefore, an uplift was applied proportionally across all input materials to make up this deficit and ensure a 100% mass balance at both sites.

Quality Level	Geographical representativeness	Technical representativeness	Time representativeness
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e. identical technology).	n/a
Fair	n/a	n/a	There is approximately 5-6 years between the ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European and UK datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore Very Good. The quality level of time representativeness is Fair as the background LCI datasets are based on ecoinvent v3.2 which was compiled in 2015. Therefore, there is approximately 5-6 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

No inputs or outputs have been excluded and all raw materials, transport, energy, water use and wastes are included. The only exception is direct emissions to soil, which is not measured. Emissions to air, water and soil and wastewater output were not measured in module A5.

LCA Results (100% to landfill scenario)

(MND = module not declared; AGG = aggregated)

Parameters describing environmental impacts									
			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	1.09e+2	1.34e-7	3.57e-1	2.93e-2	7.11e-2	1.62e-5	2.54e+3
	Transport	A2	3.98e-1	7.33e-8	1.33e-3	3.52e-4	2.32e-4	1.05e-6	6.02e+0
	Manufacturing	A3	2.66e+1	1.41e-6	1.20e-1	9.13e-2	1.35e-2	3.40e-5	4.67e+2
	Total (of product stage)	A1-3	1.36e+2	1.61e-6	4.79e-1	1.21e-1	8.48e-2	5.13e-5	3.01e+3
Construction process stage	Transport	A4	3.31e+0	6.10e-7	1.11e-2	2.92e-3	1.93e-3	8.72e-6	5.00e+1
	Construction	A5	2.17e+1	5.00e-6	1.44e-1	4.45e-2	2.44e-1	2.77e-4	6.56e+2
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	3.74e+0	8.88e-8	2.39e-3	2.38e-1	1.03e-3	4.89e-7	8.20e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

LCA Results (continued)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.56e+1	1.79e-2	1.57e+1	AGG	AGG	AGG
	Transport	A2	7.99e-2	2.98e-7	7.99e-2	AGG	AGG	AGG
	Manufacturing	A3	3.27e+1	1.13e-4	3.27e+1	AGG	AGG	AGG
	Total (of product stage)	A1-3	4.84e+1	1.80e-2	4.85e+1	1.56e+3	1.45e+3	3.01e+3
Construction process stage	Transport	A4	6.64e-1	2.47e-6	6.64e-1	4.97e+1	0.00e+0	4.97e+1
	Construction	A5	3.61e+1	1.27e-3	3.61e+1	6.82e+2	0.00e+0	6.82e+2
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	2.74e-1	7.54e-7	2.74e-1	8.34e+0	0.00e+0	8.34e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0

PERE = Use of renewable primary energy excluding renewable primary energy 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 non-renewable primary energy 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 resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	9.98e-1	0.00e+0	0.00e+0	1.65e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	1.30e-3
	Manufacturing	A3	0.00e+0	0.00e+0	0.00e+0	1.38e-1
	Total (of product stage)	A1-3	9.98e-1	0.00e+0	0.00e+0	1.79e+0
Construction process stage	Transport	A4	0.00e+0	0.00e+0	0.00e+0	1.08e-2
	Construction	A5	4.99e-2	0.00e+0	0.00e+0	4.86e-1
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	9.30e-3
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	0.00e+0

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.15e+0	3.06e-1	4.12e-5
	Transport	A2	2.52e-3	2.81e-1	4.15e-5
	Manufacturing	A3	1.25e-1	5.67e-1	1.18e-3
	Total (of product stage)	A1-3	1.27e+0	1.15e+0	1.26e-3
Construction process stage	Transport	A4	2.10e-2	2.33e+0	3.45e-4
	Construction	A5	6.26e-3	3.22e+1	5.21e-5
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	6.26e-3	3.22e+1	5.21e-5
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Manufacturing	A3	0.00e+0	5.65e-2	2.77e-2	0.00e+0
	Total (of product stage)	A1-3	0.00e+0	5.65e-2	2.77e-2	0.00e+0
Construction process stage	Transport	A4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Construction	A5	0.00e+0	1.45e+0	1.39e-3	0.00e+0
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	0.00e+0

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

LCA Results (100% to incineration with energy recovery scenario)

(MND = module not declared; AGG = aggregated)

Parameters describing environmental impacts									
			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	1.09e+2	1.34e-7	3.57e-1	2.93e-2	7.11e-2	1.62e-5	2.54e+3
	Transport	A2	3.98e-1	7.33e-8	1.33e-3	3.52e-4	2.32e-4	1.05e-6	6.02e+0
	Manufacturing	A3	2.66e+1	1.41e-6	1.20e-1	9.13e-2	1.35e-2	3.40e-5	4.67e+2
	Total (of product stage)	A1-3	1.36e+2	1.61e-6	4.79e-1	1.21e-1	8.48e-2	5.13e-5	3.01e+3
Construction process stage	Transport	A4	3.31e+0	6.10e-7	1.11e-2	2.92e-3	1.93e-3	8.72e-6	5.00e+1
	Construction	A5	2.17e+1	5.00e-6	1.44e-1	4.45e-2	2.44e-1	2.77e-4	6.56e+2
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.88e+2	-6.85e-6	-2.40e+0	-1.52e+0	-1.28e-1	-1.38e-4	-6.39e+3

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

LCA Results (continued)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.56e+1	1.79e-2	1.57e+1	AGG	AGG	AGG
	Transport	A2	7.99e-2	2.98e-7	7.99e-2	AGG	AGG	AGG
	Manufacturing	A3	3.27e+1	1.13e-4	3.27e+1	AGG	AGG	AGG
	Total (of product stage)	A1-3	4.84e+1	1.80e-2	4.85e+1	1.56e+3	1.45e+3	3.01e+3
Construction process stage	Transport	A4	6.64e-1	2.47e-6	6.64e-1	4.97e+1	0.00e+0	4.97e+1
	Construction	A5	3.61e+1	1.27e-3	3.61e+1	6.82e+2	0.00e+0	6.82e+2
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.95e+2	-1.49e-4	-5.95e+2	-5.95e+3	0.00e+0	-5.95e+3

PERE = Use of renewable primary energy excluding renewable primary energy 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 non-renewable primary energy 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 resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	9.98e-1	0.00e+0	0.00e+0	1.65e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	1.30e-3
	Manufacturing	A3	0.00e+0	0.00e+0	0.00e+0	1.38e-1
	Total (of product stage)	A1-3	9.98e-1	0.00e+0	0.00e+0	1.79e+0
Construction process stage	Transport	A4	0.00e+0	0.00e+0	0.00e+0	1.08e-2
	Construction	A5	4.99e-2	0.00e+0	0.00e+0	4.86e-1
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	1.82e-2
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	-1.22e+1

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.15e+0	3.06e-1	4.12e-5
	Transport	A2	2.52e-3	2.81e-1	4.15e-5
	Manufacturing	A3	1.25e-1	5.67e-1	1.18e-3
	Total (of product stage)	A1-3	1.27e+0	1.15e+0	1.26e-3
Construction process stage	Transport	A4	2.10e-2	2.33e+0	3.45e-4
	Construction	A5	9.15e-1	3.72e+0	3.01e-3
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	0.00e+0
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.02e-1	-6.00e+0	-2.94e-3

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Manufacturing	A3	0.00e+0	5.65e-2	2.77e-2	0.00e+0
	Total (of product stage)	A1-3	0.00e+0	5.65e-2	2.77e-2	0.00e+0
Construction process stage	Transport	A4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Construction	A5	0.00e+0	1.45e+0	1.39e-3	0.00e+0
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	C2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Waste processing	C3	0.00e+0	0.00e+0	3.22e+1	1.48e+3
	Disposal	C4	0.00e+0	0.00e+0	0.00e+0	0.00e+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00e+0	0.00e+0	0.00e+0	0.00e+0

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	46.8% of goods are delivered directly to production sites. Distances have been calculated using google maps, and distances between address of company and delivery address. 52.1% of goods are delivered to distribution centres and local stores. Distances have been calculated using google maps, and distances between address of company and delivery address.		
	Fuel type / Vehicle type	Litre of diesel per km	0.227
	Direct deliveries to construction sites distance:	km	321
	Direct deliveries to distribution centres and stores distance:	km	295
	Capacity utilisation (incl. empty returns)	%	26
	Bulk density of transported products	kg/m^3	32.16
A5 – Installation in the building	Synthos XPS insulation boards are installed on the particular application field, horizontally or perpendicularly (using drilling, cap nails and adhesive). The boards are then cut on the fields to remove excess, if required, and an installation wastage rate of 5% has been specified. This is an industry average XPS installation wastage percentage obtained from Annexe D of the BRE EN 15804 Product Category Rules (PCR) document. Approximately 65% - 75% of Synthos products are sold and installed in Poland.		
	Installation wastage rate	%	5
C3, C4 & D - End of life	In this LCA, module C3 and C4 results for both 100% to landfill and 100% to incineration with energy recovery (and resultant module D impacts) have been listed. The 100% incineration with energy recovery scenario assumes that the XPS insulation has a calorific value of 46 MJ per kg (British Plastics Federation). The dataset used to calculate the avoided impacts of electricity consumption in a future system was 'Electricity, medium voltage {PL}| market for | Alloc Def, U'. This will enable the end-user of the EPD to calculate the impacts associated with the specific waste XPS scenario of their country/region, based on the recovery rate of XPS from building demolition sites.		

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