# Statement of Verification

BREG EN EPD No.: 000058 Issue 02

ECO EPD Ref. No. 000190

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:

Synthos XPS Insulation Board

## Company Address

Synthos S.A.
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Oswiecim
32-600

| | | |
|---|---|---|
| Signed for BRE Global Ltd | Emma Baker<br>Operator | 11 August 2020<br>Date of this Issue |
| 15 June 2015<br>Date of First Issue | | 31 March 2022<br>Expiry Date |



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# Environmental Product Declaration

## EPD Number: 000058

## General Information

| EPD Programme Operator | Applicable Product Category Rules |
|---|---|
| BRE Global<br>Watford, Herts<br>WD25 9XX<br>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.<br>Ul. Chemików 1<br>Oswiecim<br>32-600 | Julia Barnard<br>BRE Ltd.<br>Bucknalls Lane<br>Watford<br>WD25 9XX |
| **Declared/Functional Unit** | **Applicability/Coverage** |
| 1m$^2$ of 100mm thick Synthos XPS insulation board, i.e. 0.1 m$^3$ with an average density up to 36 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<br>☐Internal ☒ External |
| (Where appropriate [b])Third party verifier:<br>Victoria Blake |
| a: Product category rules<br>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)

This environmental product declaration is for 1 square metre of Synthos XPS Insulation Board produced by Synthos S.A. at the following manufacturing facilities:

| | |
|---|---|
| Synthos Kralupy a.s.<br>Otto Wichterleho Str. 810<br><br>Kralupy nad Vlavou<br>278 01<br>Czech Republic | Synthos Dwory 7 spolka z ograniczona odpowiedzialnoscia Spolka Jawna<br>ul. Chemików 1<br><br>Oswiecim<br>32-600<br>Poland |

# Construction Product:

## Product Description

The product group evaluated in this study is Synthos XPS (Extruded Polystyrene) insulation boards produced at 2 facilities; Dwory, Poland and Kralupy, Czech Republic.

The group comprises the following products: Synthos XPS Prime G & Synthos XPS Prime S.

## Technical Information

| Property | Value, Unit |
|---|---|
| Colour | White/Silver, n/a |
| Fire Euroclass | E/F, n/a |
| Density Range | 22-36, kg/m$^3$ |
| Thickness Range | 20-160, mm |
| Thermal Conductivity | 0.033, W/Mmk |
| Water Absorption | <0.7,% |
| Tensile Strength | 100-400, kPa |

| Property | Value, Unit |
|---|---|
| Shear Strength | 170-270, kPa |
| Compressive Stress | 250-700, kPa |
| Bending Strength | 300-600 kPa |
| Compressive Creep | 100-250 kPa |

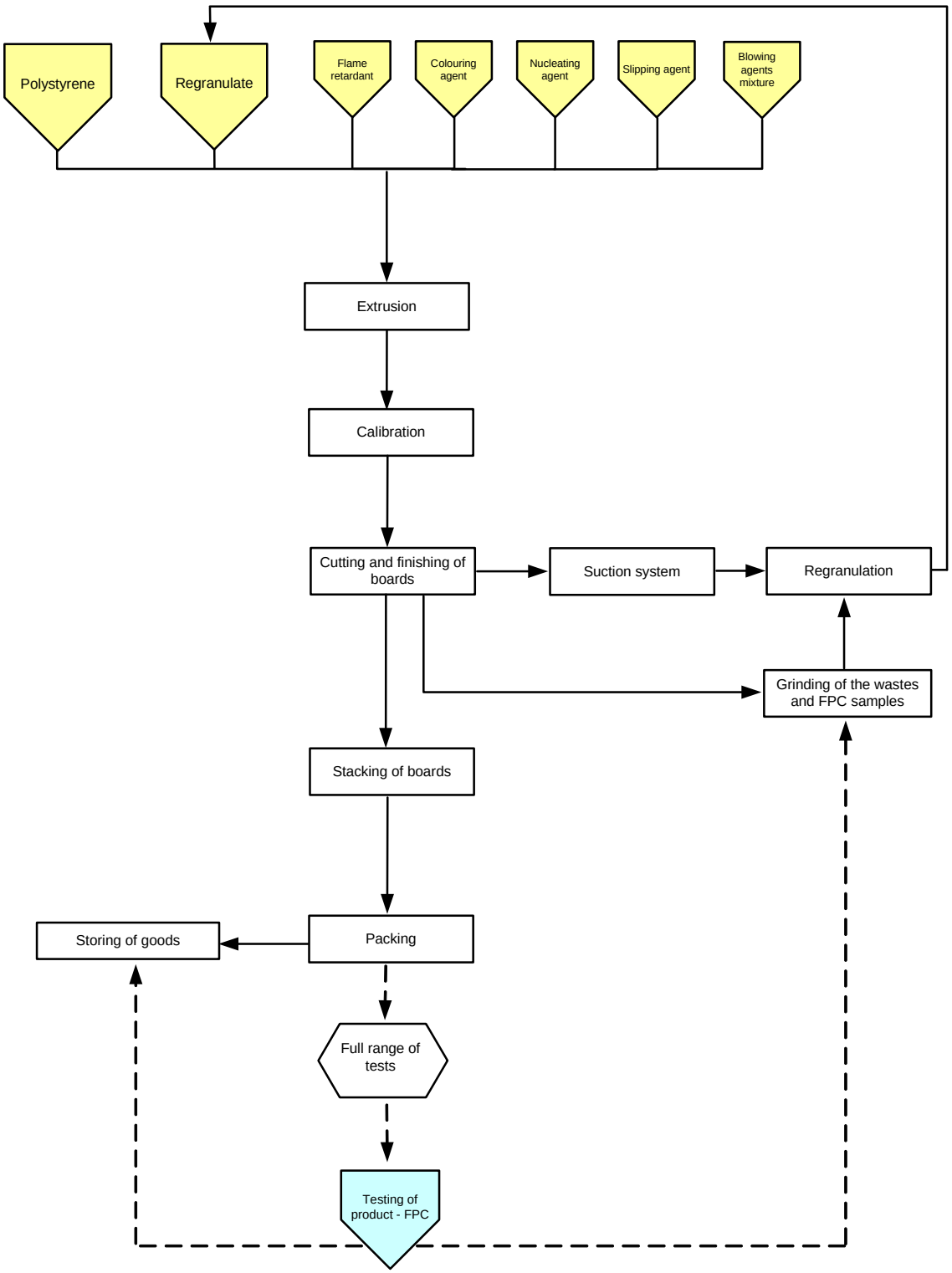
## Main Product Contents

| Material/Chemical Input | % |
|---|---|
| Polystyrene | 86 |
| Carbon dioxide | 5 |
| Dimethyl ether | 3 |
| Fire Retardant | 3 |
| Additives & Pigments | 3 |

## Manufacturing Process

The XPS insulation products are manufactured in a process of extrusion and foaming of polystyrene and finishing of panels into boards. Polystyrene resin is combined with additives including flame retardants, heated up, creating melted mixture. Blowing agents are added into the mixture including carbon dioxide. The mixture is then cooled, and finally foamed creating the foam mass, which is then extruded into shape. Edges of panels are finished into various finishings including half-lapped joints. Waste material is regranulated and put back into the compound to be re-extruded in a continuous loop. The finished product is then packaged and made ready for transport.

## Process flow diagram



## Construction Installation

The construction stage assumes an average transport distance from the factory to the construction site, and an average installation wastage rate of 1% to reflect supply to order. The scenario also includes quantities for energy in the installation process, as well as ancillary materials required.

## Use Information

Synthos XPS insulation board is suitable for a variety of uses, including use as perimeter insulation of walls and floors (also with very heavy load), insulation of strip footings, insulation of layer walls, insulation of places where cold bridges may appear, construction of partition walls, thermal insulation of inverted roofs, insulation of transportation routes and parking lots, exterior basement wall insulation, plaster base, and XPS sandwich panels. More information at: www.synthosxps.com.

## End of Life

The scenario assumes 50% of the material is recovered for recycling and 50% is sent to landfill disposal. Within the recycling route there would be some impact for the manual sorting of XPS waste and removal of contaminants; there is also the potential for up to 1% of the waste to be incinerated for energy recovery; however the impacts associated with these activities have not been modelled in the calculation scenario.

# Life Cycle Assessment Calculation Rules

## Declared / Functional unit description

1m$^2$ of 100mm thick Synthos XPS insulation board, i.e. 0.1m$^3$ with an average density up to 36 kg/m$^3$.

## System boundary

The system boundary of the EPD is according to the modular approach as defined in EN 15804. This cradle to gate with options EPD includes the modules A1-A3, A4, A5, C3, C4 and D.

## Data sources, quality and allocation

Specific foreground data derived from the XPS production processes is used in the production LCA for modules A1-A1. Generic data is used for all other upstream and downstream processes that are beyond the control of the manufacturer.

Modelling of the life cycle of Synthos XPS insulation board is performed using SimaPro 8 LCA software from PRé. All relevant background LCI datasets are taken from the Ecoinvent database v2.2. Where the creation of alternative datasets was required, these have been created using Ecoinvent datasets.

As far as we are aware all data sets are complete and conform to the system boundary and the criteria for the exclusion of inputs and outputs according to the requirements specified in EN 15804.

Data quality is in line with the requirements of EN 15804 and ISO 14025.

100% of production from both sites, Dwory and Kralupy were included in the LCA study; therefore no further allocation of resources was necessary. On site generation of electricity was taken into account and converted into an appropriate MWh value based on the means of generation.

A final representative model was created for Synthos XPS insulation board as a weighted average, based on the relative output of each specific product manufactured at either site, by mass.

## Cut-off criteria

The inventory process in this LCA includes all data related to raw material, packaging and consumable items, and the associated transport to the manufacturing site. Process energy and water use, direct production waste and emissions to air and water are included. Scenarios have been developed to account for downstream processes such as demolition and waste treatment in accordance with the requirements of EN 15804.

## LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; 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 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 22.4 | 3.19E-05 | 0.0812 | 0.00624 | 0.022 | 1.68E-07 | 479 |
| Construction process stage | Transport | A4 | 0.0553 | 5.23E-08 | 0.000268 | 6.01E-05 | 2.14E-05 | 1.68E-11 | 0.722 |
| | Construction | A5 | 0.992 | 8.33E-05 | 0.00537 | 0.000532 | 0.0286 | 9.42E-09 | 42.4 |
| End of life | Disposal | C4 | 0.199 | 1.88E-08 | 6.22E-05 | 4.92E-05 | 4.36E-05 | 6.05E-11 | 0.108 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -4.7 | -1.16E-05 | -0.0175 | -0.00139 | -0.005 | -9.88E-08 | -121 |

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 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 2.98 | 0 | 2.98 | 476 | 0 | 476 |
| Construction process stage | Transport | A4 | 0.00112 | 0 | 0.00112 | 0.709 | 0 | 0.709 |
| | Construction | A5 | 0.439 | 0 | 0.439 | 42.6 | 0 | 42.6 |
| End of life | Disposal | C4 | 0.00465 | 0 | 0.00465 | 0.129 | 0 | 0.129 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0.13 | 0 | 0.13 | -119 | 0 | -119 |

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

### 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 | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 0 | 0 | 0 | 0.283 |
| Construction process stage | Transport | A4 | 0 | 0 | 0 | 6.68E-05 |
| | Construction | A5 | 0 | 0 | 0 | 0.011 |
| End of life | Disposal | C4 | 0 | 0 | 0 | 2.79E-05 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | -0.0625 |

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 | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 0.589 | 0.000323 | 2.25E-04 |
| Construction process stage | Transport | A4 | 9.77E-06 | 9.74E-08 | 1.58E-05 |
| | Construction | A5 | 0.119 | 0.0162 | 7.36E-04 |
| End of life | Disposal | C4 | 1.80 | 1.13E-07 | 3.12E-6 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0.0286 | -1.38E-04 | 1.17E-04 |

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

| 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 | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 0 | 0.0063 | 0 | 1.27 |
| Construction process stage | Transport | A4 | 0 | 0 | 0 | 0.00013 |
| | Construction | A5 | 0 | 6.30E-05 | 0 | 0.355 |
| End of life | Disposal | C4 | 0 | 0 | 0 | 0.00226 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | -0.556 |

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 | Transport of product by lorry (16-32t) | | |
| | Fuel type / Vehicle type | Litre of fuel type per distance or vehicle type | 0.302 |
| | Distance | km | 100 |
| | Capacity utilisation (incl. empty returns) | % | 29 |
| | Bulk density of transported products | $kg/m^3$ | 36 |
| A5 – Installation in the building | Installation of product | | |
| | Ancillary materials for installation (bituminous adhesive) | $kg/m^2$ | 1.5 |
| | Ancillary materials for installation (cap nails, 4pcs at approx. 5g each) | $g/m^2$ | 20 |
| | Energy use (electricity) | $kWh/m^2$ | 0.03 |
| | Waste materials from installation wastage (total amount of material wasted during installation) | % | 1 |
| | Waste materials sorted on site for recycling, energy recovery, disposal (specified by route) – Installation waste sorted for recycling | kg | 0.018 |
| | Waste materials sorted on site for recycling, energy recovery, disposal (specified by route) – Installation waste sorted for disposal to landfill | kg | 0.018 |
| C1 to C4 End of life, | Disposal of product | | |
| | Waste for recycling (waste XPS recovered) | % | 50 |
| | Waste for final disposal (waste XPS sent to landfill) | % | 50 |
| Module D | The benefits and loads for module D have been calculated based on the following scenario. Where 50% of a wasted XPS insulation board (3.6 kg x 0.5 = 1.8 kg) is sent to a recycling facility with a 95% recycling efficiency, the output of the recycling process produces 1.71 kg (i.e. 0.95 x 1.8 kg) recycled polystyrene which is available for use in a new process, and the remaining 0.09 kg sent to landfill disposal.<br><br>The recycling process incorporates the energy required for cutting, melting, degassing and pelletizing the waste polystyrene (based on the specifications of ARTEC MODUL 240).<br><br>The recycled polystyrene can be substituted for virgin polystyrene as a 1:1 replacement, therefore avoiding 1.71 kg of virgin material. | | |

## Summary, comments and additional information

### Interpretation

For the weighted average Synthos XPS insulation board (Figure 1), the findings from the LCA study show that for the A1-A3 production stage the environmental impacts arise primarily from the polystyrene input material and the fuel sources chosen to represent the on-site energy generation for both sites, Dwory and Kralupy.

For all impact categories, except ODP and POCP, the majority of the impacts are associated with the production stage A1-A3 (Figure 2). For ODP and POCP, a greater proportion of the impacts arise from the A5, construction installation stage and is associated with the bituminous adhesive; the proportions are emphasised however due to the small absolute values for these categories.

There is some energy use associated with the crushing and heating of the waste XPS, preparing it for use in a new system. The output is a recycled polystyrene material, which can be substituted 1:1 for the virgin material that would be required to produce further XPS and other polystyrene products. This is modelled in module D.

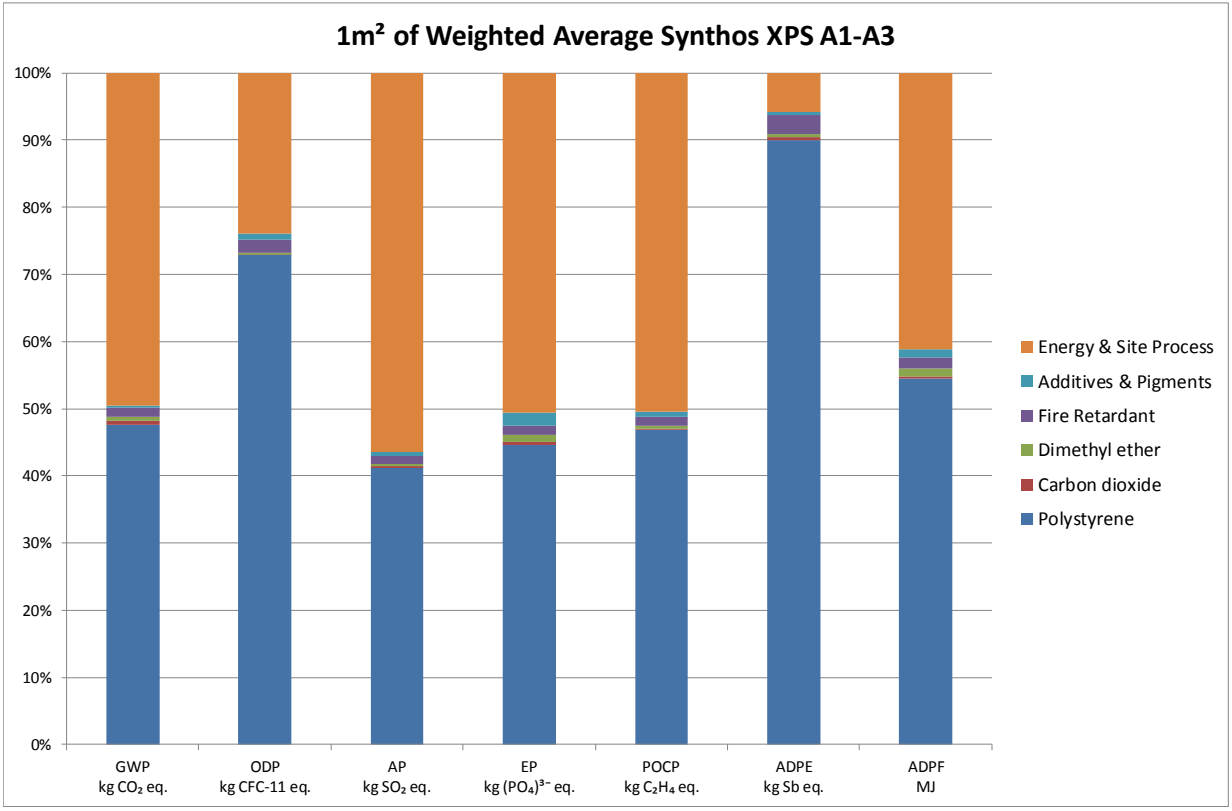
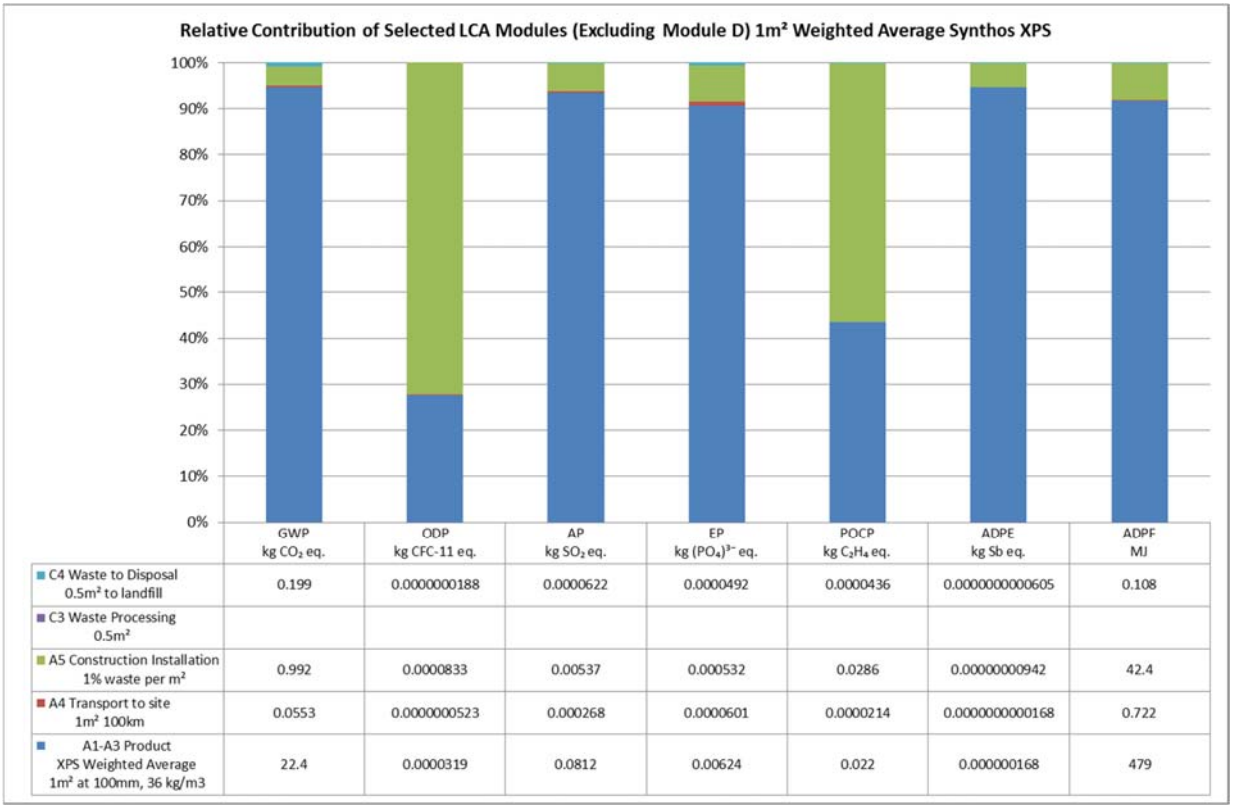



Figure 1




| | GWP kg $CO_2$ eq. | ODP kg CFC-11 eq. | AP kg $SO_2$ eq. | EP kg $(PO_4)^{3-}$ eq. | POCP kg $C_2H_4$ eq. | ADPE kg Sb eq. | ADPF MJ |
|---|---|---|---|---|---|---|---|
| C4 Waste to Disposal 0.5m² to landfill | 0.199 | 0.0000000188 | 0.0000622 | 0.0000492 | 0.0000436 | 0.0000000000605 | 0.108 |
| C3 Waste Processing 0.5m² | | | | | | | |
| A5 Construction Installation 1% waste per m² | 0.992 | 0.0000833 | 0.00537 | 0.000532 | 0.0286 | 0.00000000942 | 42.4 |
| A4 Transport to site 1m² 100km | 0.0553 | 0.0000000523 | 0.000268 | 0.0000601 | 0.0000214 | 0.0000000000168 | 0.722 |
| A1-A3 Product XPS Weighted Average 1m² at 100mm, 36 kg/m3 | 22.4 | 0.0000319 | 0.0812 | 0.00624 | 0.022 | 0.000000168 | 479 |

Figure 2

## References


BRE Global. BRE Environmental Profiles 2013: Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013. PN 514. Watford, BRE, 2014.

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.

PRé Consultants bv. SimaPro 8 LCA Software 2013. http://www.pre-sustainability.com

ecoinvent Centre. Swiss Centre for Life Cycle Inventories. http://www.ecoinvent.org

Technical Data Sheets: Synthos XPS G, Synthos XPS Prime G, Synthos XPS Prime S, Synthos XPS Prime, Synthos XPS S, & Synthos XPS. December 2013.

ARTEC machinery GmbH, Offer Number 13-A029b, Dated 10.04.2014, Plastics Recycling Plant, Type MODUL 240, technical specifications.