Statement of Verification

BREG EN EPD No.: 000170 Issue 02

ECO EPD Ref. No. 00000577

This is to verify that the

Environmental Product Declaration

provided by:

Falcon Panel Products Ltd

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

Resysta® Profiles

Company Address

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Signed for BRE Global Ltd	Emma Baker Operator	07 December 2017 Date of this Issue
23 October 2017 Date of First Issue		22 October 2022 Expiry Date

Environmental Product Declaration

EPD Number: 000170

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**
Falcon Panel Products Ltd. Clock House Station Approach Shepperton Middlesex TW17 8AN United Kingdom www.falconpp.co.uk	thinkstep Ltd. 73 Watling Street London EC4M NBJ www.thinkstep.com
Declared/Functional Unit	**Applicability/Coverage**
1 tonne Resysta profile used as decking or façade over its reference service life (60 years)	Product Average.
EPD Type	**Background database**
Cradle to Gate with options	GaBi

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: Kim Allbury
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 sites

The production data used in this EPD are representative of manufacture of Resysta materials mix at Resysta International GmbH and of extrusion of finished decking and façade products at Salamander Industrie-Produkte GmbH.

Resysta International GmbH
Hochstraße 21
D-82024 Taufkirchen bei München
Germany

Salamander Technische Kunststoffprofile GmbH
Deverhafen 4
26871 Papenburg
Germany

Construction Product:

Product Description

Resysta profiles offer the look and feel of wood but are made from a fibre reinforced hybrid material comprising rice husks and polymers. They are extremely weather-resistant against sun, rain, snow and salt water. Resysta profiles are also very durable, requiring minimal care and are resistant to attack by insects and fungi. As such, they do not splinter, swell or crack and can also be provided in a range of colours and shapes. Coating is optional – the modelled product is uncoated as these are the type sold in the UK by Falcon Panel Products Ltd.

Publicly available marketing literature and technical data on Resysta profiles are available on the Resysta web site (Resysta 2017).

Technical Information

Property	Value, Unit
Solid Density (ASTM D2395:2002)	Approx. 1460 kg/m³
Typical Area Density for Grooved Decking (including hollows/voids)	19.14 kg/m^2
Typical Area Density for Cladding (including hollows/voids)	10.36 kg/m^2

Property	Value, Unit
Coefficient of linear thermal expansion (ASTM D696)	3.6 x 10^{-5} mC
Water absorption & humidity (ASTM D1037:2006a)	Little to no water absorption (only surface moistening)
Slip test (wet area barefoot) (DIN 51097)	Class C (Least slippery)
Fire rating (German/European norm) (BS EN ISO 11925-2)	B2 (E) - standard flammable (with additional treatment B1 reachable)
Fire rating according NFPA (US Norm) (ASTM E84)	Class A (flame propagation 25, smoke emission 450)
Fire rating (British standard) (BS 476-7)	Class 1
Emission (LGA-tested safety & contamination)	LGA test passed
Brinell hardness (HB) (BS EN 1534)	81.1 N/mm²
Coefficient of sliding and friction μ (BS EN 13893)	0.46
Axial withdrawal force (of screws) (BS EN 320.2011-07)	5777 N
Thermal conductivity (λ) BS (EN 12664)	0.199 W/(mK)
Bending strength (BS EN ISO 178)	46 N/mm²
Bending modulus (BS EN ISO 178)	3850 N/mm²
Tensile strength (BS EN ISO 527)	21.8 N/mm²
Tensile modulus (BS EN ISO 527)	2340 N/mm²
Shearing strength (BS EN 392)	16.8 N/mm²
Durability resistance against wood-destroying fungi (basidiomycetes) (DIN V EN V 12038:2002)	The material has not been affected, highest durability - Class 1
Durability - resistance against rotting fungi (DD CEN/TS 15083-2)	No attack by the test fungi, highest durability class 1 (very durable)
Durability against mould fungi and wood discolouring fungi (BS EN 15534-1:2012)	Very durable against wood discolouring fungi
Durability against subterranean termites (ASTM D3345-08)	High Durability against subterranean Termites - nearly no weight loss
Specific surface and volume resistances (DIN IEC 60093 measuring voltage 100 V)	Surface resistance Rx=8,0*10(13) Ω Specific surface resistance α=8,1*10(14) Ω Volume resistance Rx=2,2*10(13) Ω Specific volume resistance α=6,3*10(14) Ω

Main Product Contents

The overall composition of Resysta profiles are given below.

Material/Chemical Input	%
Polyvinyl chloride	40
Rice husk	27
Calcium carbonate filler	20
Acrylic polymer	5
Impact modifier	4
Stabiliser	4
Pigment	1

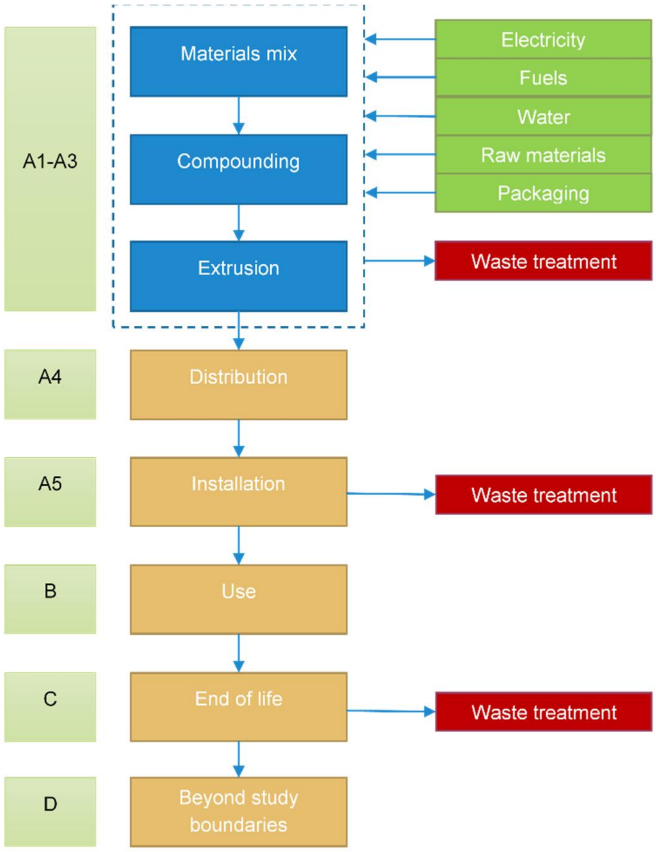
Manufacturing Process

The Resysta profile manufacturing process involves three separate processing steps.

1. Production of the Resysta material mix - the main raw material inputs are combined to make the Resysta material mix. A major component of the material mix is rice husks, which are imported from Malaysia.

2. Conversion into pellets ready for extrusion - the Resysta material mix is combined with PVC and calcium carbonate filler to produce a product with the desired specifications for making profiles for decking and façade. The combined material is compounded into pellets.
3. Production of finished profile products - finally, the pellets are extruded to manufacture the finished profile products for decking and façade.

Process flow diagram



Construction Installation

The typical solid density is 1460 kg/m^3. The area density varies by application and product type. For 22 x 125 Grooved Decking (DKG12522) the area density is 19.14 kg/m^2. For 13 x 173 Cladding (CP140) the area density is 10.36 kg/m^2. Resysta profiles are available in a range of dimensions so if the quantities and dimensions are specified correctly there should be very little installation waste. It is assumed that only 2% of the product is wasted during installation.

Installation materials (screws, batons, etc.) have been excluded from this assessment as these will vary according to the specific requirements of each construction project.

Use Information

Resysta profiles are very long-lasting and hardwearing and once installed it is assumed that there no requirement for further treatment or maintenance (e.g. painting/varnishing, repair or refurbishment). Resysta profiles also require no water or energy during building operation.

End of Life

Due to the nature of Resysta profiles and their locations on buildings, deconstruction would typically be carried out manually. The end of life treatment of Resysta profiles is modelled based on the average UK treatment mix for non-hazardous construction and demolition waste.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1 tonne Resysta profile used as decking or façade.

System boundary

The system boundary of the EPD is according to the modular approach as defined in EN 15804. The cradle-to-gate with options EPD includes the product stage (A1-A3); transport to the construction site (A4); installation (A5); use (B1-B7); dismantling/deconstruction (C1); transport to waste processing (C2); recovery (C3); disposal at end-of-life (C4), and potential benefits and loads beyond the system boundary (D).

Data sources, quality and allocation

Foreground System
Modules A1-A3: primary data relating to the production of the Resysta material mix in 2015 were supplied by Resysta International GmbH based on production at their manufacturing site in Munich, Germany. Primary data could not be obtained for the second production stage but Resysta confirmed that this was a standard industrial compounding process so it was modelled based on GaBi data for equivalent processes. Salamander Technische Kunststoffprofile GmbH provided primary data for extrusion of the finished decking and façade profiles in 2015.

Modules A4-A5: distribution and installation was modelled based on representative data supplied by Falcon Panel Products Ltd for use by customers in the UK. It is assumed that 2% of product is wasted during installation and the additional quantity of Resysta profiles needed to make up for this loss is also modelled. The split between end-of-life options is the same as that described for modules C1-C4 below. Installation materials (screws, batons, etc.) have been excluded from this assessment as these will vary according to the specific requirements of each construction project.

Modules B1-B7: Resysta profiles are very long-lasting and hard-wearing so the use phase scenario is based on the assumption that the use phase lifetime will be 60 years (as noted in the Scenario Table at the end of this EPD). Resysta profiles do not have any emissions associated with their use, therefore the results for module B1 have been assessed as zero. Due to the high durability of Resysta profiles it is assumed that once installed there will be no requirement for further treatment or maintenance (e.g. painting/varnishing, repair or refurbishment) during this lifetime; therefore the results for modules B2-B5 are assessed as zero. Resysta profiles require no water or energy during building operation so the results for modules B6 and B7 have also been assessed as zero.

Modules C1-C4: it is assumed that deconstruction at end of life is undertaken manually. The end of life scenario is based on representative data for disposal of non-hazardous construction and demolition waste in the UK in 2016 (89.2% of the waste is sent for energy recovery and 10.8% to landfill). 0.540 kWh is recovered from each kg Resysta profile sent to energy recovery.

Module D: credits are assigned for recovered electricity from incineration of waste Resysta profiles generated during installation and at end of life. It is assumed that this recovered electricity avoids an equivalent amount of electricity supplied by the UK grid mix. No credits are assigned for thermal energy as this is not typically recovered in the UK.

Background System
The LCA was modelled using GaBi LCA software. The background system comprising impacts associated with raw material production, energy generation, distribution, waste treatment, etc. were based on the most up to date datasets available sourced from the GaBi 2017 databases.

Allocation
Economic allocation was used to partition burdens associated with rice cultivation and milling to the rice husks, which is a co-product of rice milling (along with white rice, rice bran and rice polish). On this basis, 2.3% of the total impacts of these processes were allocated to the rice husks.

Allocation of site-wide data for production processes was not required as production takes place at dedicated facilities and no co-products are generated. No other allocation was required in the foreground system.

Allocation in the background datasets was as reported in the GaBi database documentation available here: http://www.gabi-software.com/international/support/gabi/.

Cut-off criteria

All data related to raw material, packaging material 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. Where specific background datasets were not available, suitable proxies were used to fill the data gaps.

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	1790	3.48E-07	6.94	0.851	0.711	0.00526	40500
Construction process stage	Transport	A4	45.8	3.4E-11	0.194	0.024	0.00857	3.77E-06	617
	Construction	A5	81.4	1.74E-08	0.168	0.0188	0.0152	1.23E-04	856
Use stage	Use	B1	0	0	0	0	0	0	0
	Maintenance	B2	0	0	0	0	0	0	0
	Repair	B3	0	0	0	0	0	0	0
	Replacement	B4	0	0	0	0	0	0	0
	Refurbishment	B5	0	0	0	0	0	0	0
	Operational energy use	B6	0	0	0	0	0	0	0
	Operational water use	B7	0	0	0	0	0	0	0
End of life	Deconstruction, demolition	C1	0	0	0	0	0	0	0
	Transport	C2	2.90	2.33E-12	0.00274	5.85E-04	1.49E-05	2.59E-07	39.5
	Waste processing	C3	1660	5.21E-07	1.38	0.0749	0.0423	8.59E-04	2080
	Disposal	C4	1.77	1.79E-12	0.0105	0.00143	8.26E-04	6.36E-07	23.0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-259	-6.42E-10	-0.841	-0.0699	-0.046	-3.59E-05	-3130

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	6000	3730	9730	34800	10100	44900
Construction process stage	Transport	A4	28.8	INA	28.8	621	INA	621
	Construction	A5	205	INA	205	951	INA	951
Use stage	Use	B1	0	INA	0	0	INA	0
	Maintenance	B2	0	INA	0	0	INA	0
	Repair	B3	0	INA	0	0	INA	0
	Replacement	B4	0	INA	0	0	INA	0
	Refurbishment	B5	0	INA	0	0	INA	0
	Operational energy use	B6	0	INA	0	0	INA	0
	Operational water use	B7	0	INA	0	0	INA	0
End of life	Deconstruction, demolition	C1	0	INA	0	0	INA	0
	Transport	C2	2.04	INA	2.04	39.8	INA	39.8
	Waste processing	C3	502	INA	502	2370	INA	2370
	Disposal	C4	2.77	INA	2.77	23.8	INA	23.8
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-724	INA	-724	-4280	INA	-4280

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	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.0303	0	0	26.4
Construction process stage	Transport	A4	0	0	0	0.0533
	Construction	A5	6.07E-04	0	0	0.641
Use stage	Use	B1	0	0	0	0
	Maintenance	B2	0	0	0	0
	Repair	B3	0	0	0	0
	Replacement	B4	0	0	0	0
	Refurbishment	B5	0	0	0	0
	Operational energy use	B6	0	0	0	0
	Operational water use	B7	0	0	0	0
End of life	Deconstruction, demolition	C1	0	0	0	0
	Transport	C2	0	0	0	0.00378
	Waste processing	C3	0	0	0	4.17
	Disposal	C4	0	0	0	0.00452
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0	0	0	-1.12

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	0.00268	247	1.73
Construction process stage	Transport	A4	2.90E-05	0.0445	0.00123
	Construction	A5	5.41E-05	20	0.037
Use stage	Use	B1	0	0	0
	Maintenance	B2	0	0	0
	Repair	B3	0	0	0
	Replacement	B4	0	0	0
	Refurbishment	B5	0	0	0
	Operational energy use	B6	0	0	0
	Operational water use	B7	0	0	0
End of life	Deconstruction, demolition	C1	0	0	0
	Transport	C2	2.07E-06	0.00315	8.22E-05
	Waste processing	C3	1.64E-05	639	0.112
	Disposal	C4	3.76E-07	110	0.000324
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.37E-06	-2.78	-0.473

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	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
Construction process stage	Transport	A4	0	0	0	0
	Construction	A5	0	0	24.5	49.7
Use stage	Use	B1	0	0	0	0
	Maintenance	B2	0	0	0	0
	Repair	B3	0	0	0	0
	Replacement	B4	0	0	0	0
	Refurbishment	B5	0	0	0	0
	Operational energy use	B6	0	0	0	0
	Operational water use	B7	0	0	0	0
End of life	Deconstruction, demolition	C1	0	0	0	0
	Transport	C2	0	0	0	0
	Waste processing	C3	0	0	890	1730
	Disposal	C4	0	0	0	0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0	0	0	0

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

bre

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Truck, Euro 6, 28 - 32t gross weight / 22t payload capacity Container ship, 27500 dwt payload capacity, ocean going	Litre/100 km Litre/100 t.km	42.6 (diesel) 0.401 (HFO)
	Manufacturing site to distribution centre: - Truck - Container ship Distribution centre to installation site: - Truck	 km km km	 528 340 150
	Truck capacity utilisation (empty returns not modelled as assumed loading would be optimised by logistics company)	%	85
	Bulk density of transported products	kg/m^3	1460
A5 – Installation in the building	Installation is done manually. Installation materials (screws, batons, etc.) have been excluded from this assessment as these will vary according to the specific requirements of each construction project. Resysta profiles are available in a range of dimensions so if specified correctly there should be very little waste (loss = 2%). The split between waste treatment options is the same as that described for modules C1-C4 (energy recovery = 89.2%, landfill = 10.8%).	Loss, %	2
B2 – Maintenance B3 – Repair B4 – Replacement B5 – Refurbishment	Resysta profiles are very long-lasting and hardwearing; once installed it is assumed that there is no requirement for further treatment or maintenance.		
Reference service life	Resysta profile products are relatively new on the market so the typical reference service life cannot be determined based on existing products. However, based on the nature of the product and its known durability performance Falcon Panel Products estimate that Resysta profiles should last the lifetime of the building in which they are installed (60 years has been estimated to be a typical building lifetime). Hence, for the purposes of this EPD the reference service life of Resysta profiles has been assumed to be 60 years.	Years	60
B6 – Use of energy; B7 – Use of water	Resysta profiles require no water or energy during building operation.		
C1 to C4 End of life,	Transport of demolition waste to treatment facility (same truck parameters as listed in A4 above).	km	50
	Waste treatment based on Defra's UK Statistics on Waste, for year 2012 (Defra 2016).	% recovery % landfill	89.2 10.8
D – Potential benefits and loads beyond the system boundaries	Municipal waste incinerators in the UK generally only recover electricity, heat recovery is much less common; as such, only electricity recovery has been credited in the model. 0.540 kWh electricity is recovered from each kg Resysta profile sent to energy recovery in module C3 and A5; this is assumed to avoid an equivalent quantity of electricity sourced from the UK grid. Pallets are also modelled as being incinerated with energy recovery in A5. Again, credit has only been applied for electricity recovery (0.624 kWh/kg pallet) and this also offsets electricity generated by the UK grid.		

Interpretation

Figure 1 shows the contribution to the total life cycle impact from the different modules reported in this EPD. It can be seen that the production stage (A1-A3) is the most important for all impact categories. The waste recovery module (C3) has a large contribution for ozone layer depletion and global warming potential impact categories. Other modules generally have only a minor contribution to the total.

Figure 2 shows the contribution of different manufacturing processes and raw materials to the total impact from modules A1-A3. For most impact categories production of PVC has a large or dominant contribution to the total. Transport is significant for acidification and eutrophication potentials. The influence of rice husks is clearly visible in the global warming impact category where the carbon dioxide sequestered in this material can be seen.

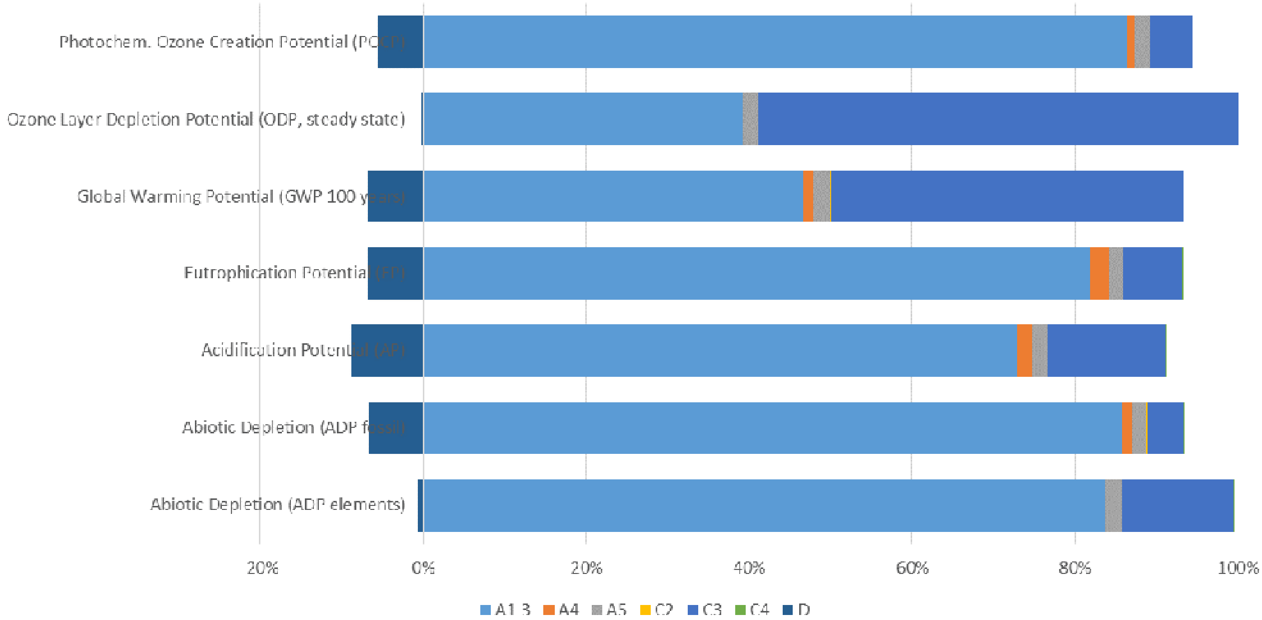


Figure 1 - Contribution from different life cycle modules to the total impact for the impact categories assessed in this EPD study

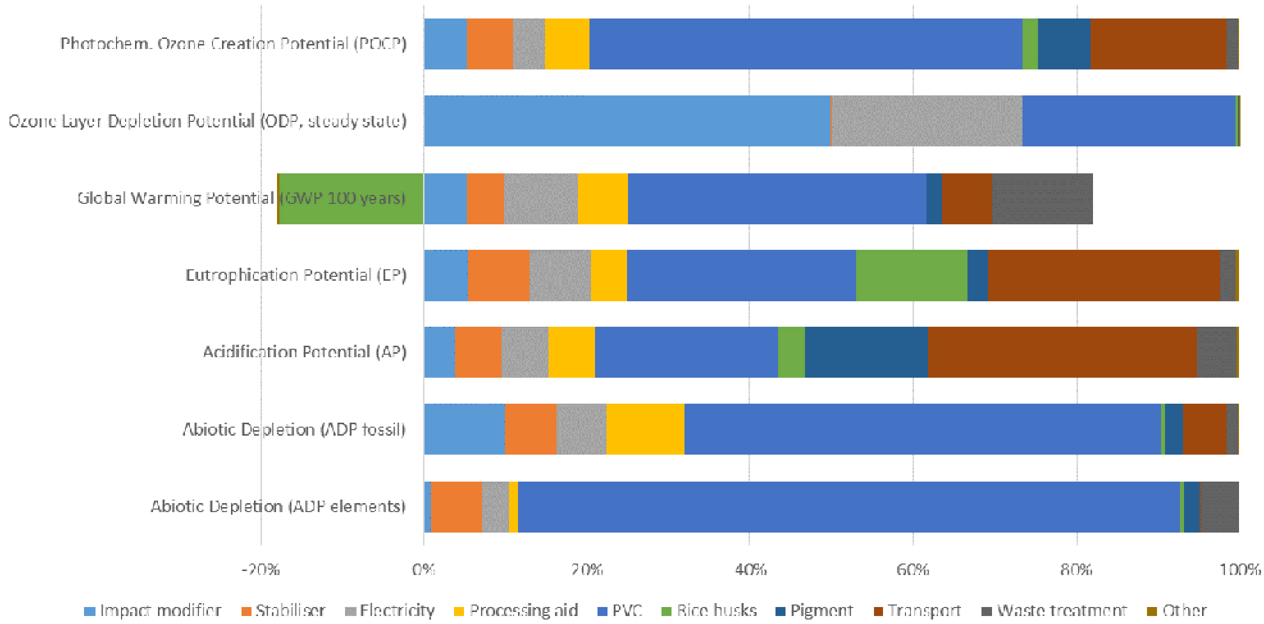


Figure 2 - Contribution from different processes to the total impact from the manufacturing stage (A1-A3) for the impact categories assessed in this EPD study

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