Statement of Verification

BREG EN EPD No.: 000337 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Sika Sarnafil Waterproofing Systems (Shanghai) Ltd

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

Sika G 410-12 L (1.2mm)

Company Address

No. 4555 Huaning Road
Xinzhuang Industry Park
Shanghai
201108 China

BUILDING TRUST

Signed for BRE Global Ltd	Emma Baker Operator	23 February 2021 Date of this Issue
27 February 2017 Date of First Issue		22 February 2026 Expiry Date

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Environmental Product Declaration

EPD Number: 000337

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Global 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**
Sika Sarnafil Waterproofing Systems (Shanghai) Ltd No. 4555 Huaning Road Xinzhuang Industry Park Shanghai 201108 China	Sika Technology AG Tüffenwies 16 Zürich 8048 Switzerland www.sika.com/sustainability
Declared/Functional Unit	**Applicability/Coverage**
1 m^2 Sarnafil® G410-12 L roofing membrane for a reference service life of 35 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: Pat Hermon

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

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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 Sarnafil® G410 L produced by Sika Sarnafil Waterproofing Systems at the following manufacturing facility:

Sika Sarnafil Waterproofing Systems (Shanghai) Ltd
No. 4555 Huaning Road
Xinzhuang Industry Park
Shanghai
201108 China

Construction Product:

Product Description

Sarnafil® G410 L is multi-layer, synthetic roof waterproofing sheet based on premium-quality polyvinyl chloride (PVC) containing ultraviolet light stabilizers and an inlay of glass non-woven. Sarnafil® G 410 L has a unique lacquer coating applied to the top of the membrane to reduce staining from airborne dirt and pollutants.

Sarnafil® G410 L is a hot air weldable roof membrane, formulated for direct exposure, and available in various colours and 1.2mm,1.5mm,1.8mm & 2.0mm thick variants. Sarnafil® G410 L is designed for use in adhered as well as ballasted applications (with appropriate protection).

The results presented in this EPD refer Sarnafil® G410-12 L (thickness of 1.2mm), with a mass of 1.5 kg/m^2.

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Technical Information

Property	Value, Unit
Overall thickness as per GB /T328.5	-5 / +10 %
Tensile strength as per GB/T328.9	≥ 10 MPa
Elongation at break as per GB/T328.9	≥ 200 %
Dimensional stability as per GB/T328.13	≤ 0.1 %
Low temperature bend as per GB /T328.15	No crack
Water tightness as per GB/T328.10	Watertight
Impact resistance as per GB/T20624.2	Watertight
Static load resistance as per GB/T328.25	Watertight
Joint peel resistance as per GB/T328.21	≥ 3 N/mm
Tear strength as per GB/T529	≥ 50 N/mm
Water absorption as per GB12952 Wet weight Dry weight	 ≤ 4 % ≥ -0.4 %
Heat ageing as per GB/T18244 Breaking strength retention Elongation at break ret. Low temperature bend	 ≥ 85 % ≥ 80 % No crack
Chemical resistance as per GB12952 Breaking strength retention Elongation at break ret. Low temperature bend	 ≥ 85 % ≥ 80 % No crack
Artificial weather as per 12952 Breaking strength retention Elongation at break ret. Low temperature bend	 ≥ 85 % ≥ 90 % No crack
Water vapour permeability as per EN1931	15’000
UV exposure as per EN 1297	>5000 h / grade 0, Pass
SRI (Solar Reflectance Index) as per ASTM E 1980 Solar reflectance as per GB/T31389	108 (white, initial) 0.80
Reaction to fire as per GB8624	B_2(E)

Further information about the product including product data sheets can be accessed via www.sika.cn.

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Main Product Contents

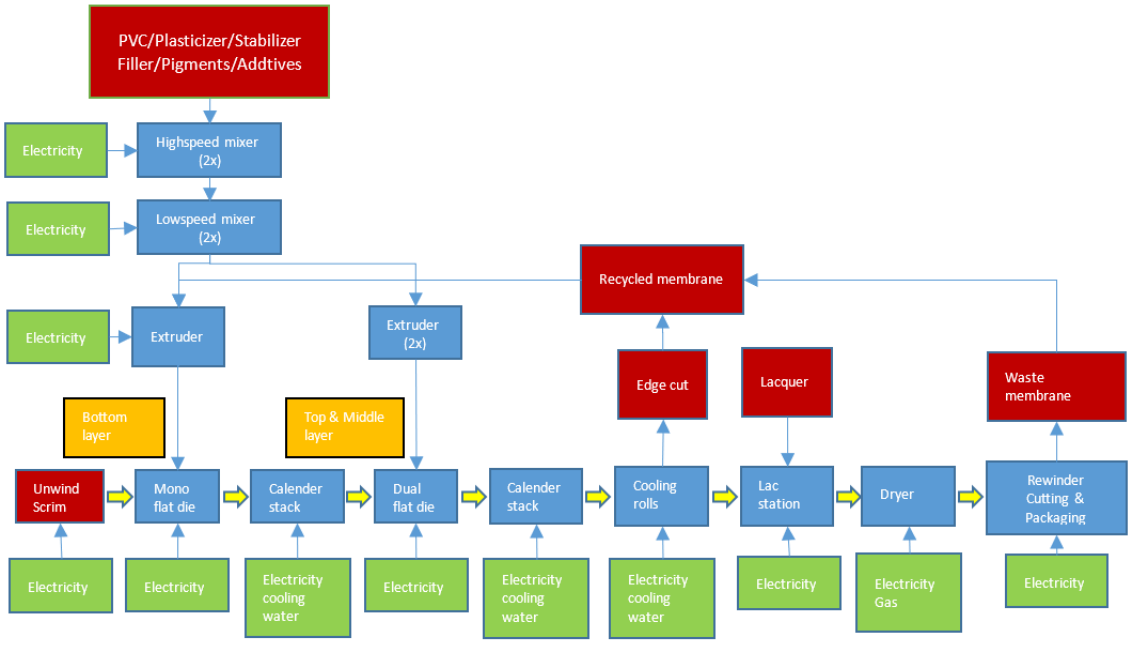
The main material and chemical inputs for Sarnafil® G410 L are shown in the table below.

Material/Chemical Input	%
Polyvinyl Chloride (PVC)	45 - 55
Plasticizers	30 - 34
Stabilizers	1.2 - 1.7
Lubricants	0.1 - 1.2
Pigments	8 - 13
Fillers	8 - 12
Carrier	1.5 - 3.5

Manufacturing Process

The Sarnafil PVC membranes are produced from the raw materials directly to membrane master rolls by mixing and extrusion line. The process includes mixing of all raw materials into a hot dry blend in highspeed mixer and cooling down by low speed mixer. The dry blends are fed to the corresponding extruders. In the extruders, the dry blend is processed into a melt and further shaped via flat sheet dies and polishing calendars to a reinforced membrane. Between the second polishing station and the final cooling and winding equipment, the lacquering station is located for finishing of the top layer. The PVC master rolls proceed then for final cutting and packaging to contractor rolls.

Process flow diagram



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Construction Installation

Sarnafil® G410 L adhered membranes are bonded to suitable substrates with Sarnacol® adhesives. Roof perimeters are secured using peelstops with a membrane coverstrip. Sarnafil® G410 L ballasted membranes are loose laid. Roof perimeters are secured using a Sarnabar® & cord with a membrane coverstrip. All seam overlaps are joined by hot air welding using manual hot air welding machines and pressure rollers, or automatic welding machines.

Use Information

Installation works must be carried out only by trained Sarnafil Contractors, in accordance with Sika instructions and the Sarnafil Project specification.

The reference service life of Sarnafil G410 L membranes is as stated by the BBA Agrément Certificate 08/4531 (Adhered Systems) & 08/4530 (Protected Membranes). Available evidence indicates that the membrane will have a service life in excess of 35 years, although a service life in excess of 40 years can be achieved with periodic maintenance. See BBA for details.

End of Life

No input (energy, water) is considered for the dismantling, as it is assumed to be handmade. The membrane can be recycled or disposed of in an incinerator or landfill. As shown in the "Scenarios and Additional Technical Information", an incineration scenario was assumed for the purpose of this EPD.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1m^2 of reinforced Sarnafil G410 L membrane for a reference service life of 35 years.

System boundary

In accordance with the modular approach as defined in EN 15804, this cradle to gate with options EPD includes the product stage (A1-A3), construction process stage (A4-A5), end-of-life stage (C1-C4, excluding C2) as well as benefits beyond the system boundary (D).

Data sources, quality and allocation

The primary data provided by Sika derive from the plant at Shanghai, China for 2019. Background LCI datasets are taken from the databases of GaBi software (version 10) and ecoinvent (version 3.6). All datasets are less than 10 years old. Production waste that was reclaimed and reused internally was simulated as closed-loop recycling in Modules A1-A3. Benefits from incineration of product and for the disposal of packaging are included as benefits in Module D; this also applies to the reuse of wooden pallets.

Cut-off criteria

All data was taken into consideration (recipe constituents, thermal energy used, electricity used). Transportation was considered for all inputs and outputs. The manufacturing of the production machines and systems and associated infrastructure were not considered in the LCA.

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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	3.81E+00	4.55E-09	1.94E-02	1.04E-03	1.90E-03	1.32E-05	8.56E+01
Construction process stage	Transport	A4	9.96E-02	1.44E-17	2.84E-04	5.26E-05	-6.14E-05	3.25E-09	1.34E+00
	Construction	A5	6.56E-01	4.28E-10	2.11E-03	1.17E-04	1.81E-04	1.31E-06	8.61E+00
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+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	MND	MND	MND	MND	MND	MND	MND
	Waste processing	C3	4.03E+00	8.32E-15	5.29E-03	1.71E-04	8.51E-05	1.76E-06	6.97E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.53E+00	-1.54E-09	-3.64E-03	-4.32E-04	-4.32E-04	-3.85E-07	-2.03E+01

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;

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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	8.10E+00	2.05E+00	1.01E+01	5.70E+01	3.18E+01	8.88E+01
Construction process stage	Transport	A4	6.81E-03	0.00E+00	6.81E-03	1.34E+00	0.00E+00	1.34E+00
	Construction	A5	1.24E+00	-1.93E-01	1.05E+00	5.98E+00	-3.34E+01	8.94E+00
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+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	MND	MND	MND	MND	MND	MND
	Waste processing	C3	-1.57E+00	0.00E+00	1.57E+00	4.10E+01	-3.34E+01	7.57E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	-3.50E+00	0.00E+00	0.00E+00	-2.08E+01

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

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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	7.67E-02	0.00E+00	0.00E+00	2.33E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	2.18E-05
	Construction	A5	7.21E-03	0.00E+00	0.00E+00	2.95E-03
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+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	MND	MND	MND	MND
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	8.32E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-8.21E-03

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

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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	3.05E-06	4.63E-02	1.24E-03
Construction process stage	Transport	A4	1.43E-10	5.09E-05	6.05E-07
	Construction	A5	2.88E-07	1.03E-01	1.30E-04
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+00	0.00E+00	0.00E+00
	Transport	C2	MND	MND	MND
	Waste processing	C3	3.42E-08	2.51E+00	2.40E-04
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-9.87E-09	-6.69E-03	-1.89E-04

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

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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	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	MND	MND	MND	MND
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.17E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

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Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	**Transport of the Sarnafil® G410-12 L membranes to the building site**		
	Fuel type / Vehicle type	Litre of fuel type per distance or vehicle type	0.000047
	Distance:	km	1,000
	Capacity utilisation (not including empty returns)	%	85
	Bulk density of transported products	kg/m^3	1,341.67
A5 – Installation in the building	**Installation of the Sarnafil® G410-12 L membranes**		
	Ancillary materials for installation (overlap of membrane material)	%	5.4
	Energy use (welding energy for membrane installation)	kWh/m2	0.016
	Waste materials from installation (losses of excess membrane material during installation)	%	4
Reference service life	**Reference Service life of the Sarnafil® G410-12 L membranes**		
	Reference Service Life (RSL) (based on BBA)	years	35
C1 to C4 End of life,	**End of life of the Sarnafil® G410-12 L membranes**		
	Membrane incineration at end of life (Module C3)	%	100
	Energy dismantling (Module C1 – no inputs, completed by hand)	kWh/m2	0
Module D	The benefits from incineration of product and waste are credited in Module D, since in modern incineration plants the energy of combustion is used to produce electricity and thermal energy.		

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Summary, comments and additional information

Interpretation

The displayed results apply to Sarnafil® G410-12 L (thickness 1.2 mm). To calculate results for other thicknesses, the following formula can be used:

Ix = ((x + 0.48) / 1.69) * I1.2

[Ix = the unknown parameter value for Sarnafil® G410-x L systems with a thickness of "x" mm (e.g. 1.5 mm)]

Figure 1 shows the relative contributions of the different modules to the various environmental impact categories and to primary energy use in a dominance analysis.

As can be seen from the results, the product stage (Modules A1-A3) contributes the most significantly to all environmental impact categories and primary energy use. The installation of the membranes (Module A5) also plays a role due to waste disposal and the impacts from the losses and overlap, however to a lesser extent than the product stage. For this reason, the product stage is examined more closely in the following interpretation.

The dominant influence in most environmental impact categories arises from the raw materials involved in the production of the membrane, which represent at least 85% of the impacts in each environmental impact category, except for EP, where 70% is from the formulation, 9% is from the packaging and 21% is from the production process and ODP, where 51% is from the formulation, 34% is from the packaging and 15% is from the production process

Within the raw materials, PVC polymer, the plasticizers and the pigments play an important role for the different indicators. The PVC polymer plays an important role in terms of GWP (47%), EP (48%), POCP (32%), ADPF (47%), ADPE (49%), PERT (63%) and PENRT (48%). The plasticizers influence GWP (38%), EP (24%), POCP (37%), ADPF (44%), PERT (19%) and PENRT (43%). Finally, the pigments mainly influence AP (76%), EP (13%), POCP (28%) and PERT (11%). The influence of stabilizers is mostly visible in ADPE, EP and ODP, the influence of the lacquer is mainly visible in ODP and the influence of the carrier material is visible in ADPE. The influence of the fillers and processing aids is minimal in comparison to the other material components. The polymers, plasticizers, and pigments, which make up the highest share of the membrane mass, have the greatest influence on the environmental impact categories.

Within the membrane production process, the greatest influence is the power consumption. The production process contributes the most to EP (21%), GWP (18%), ODP (15%), POCP (14%), AP (11%) and PERT (15%).

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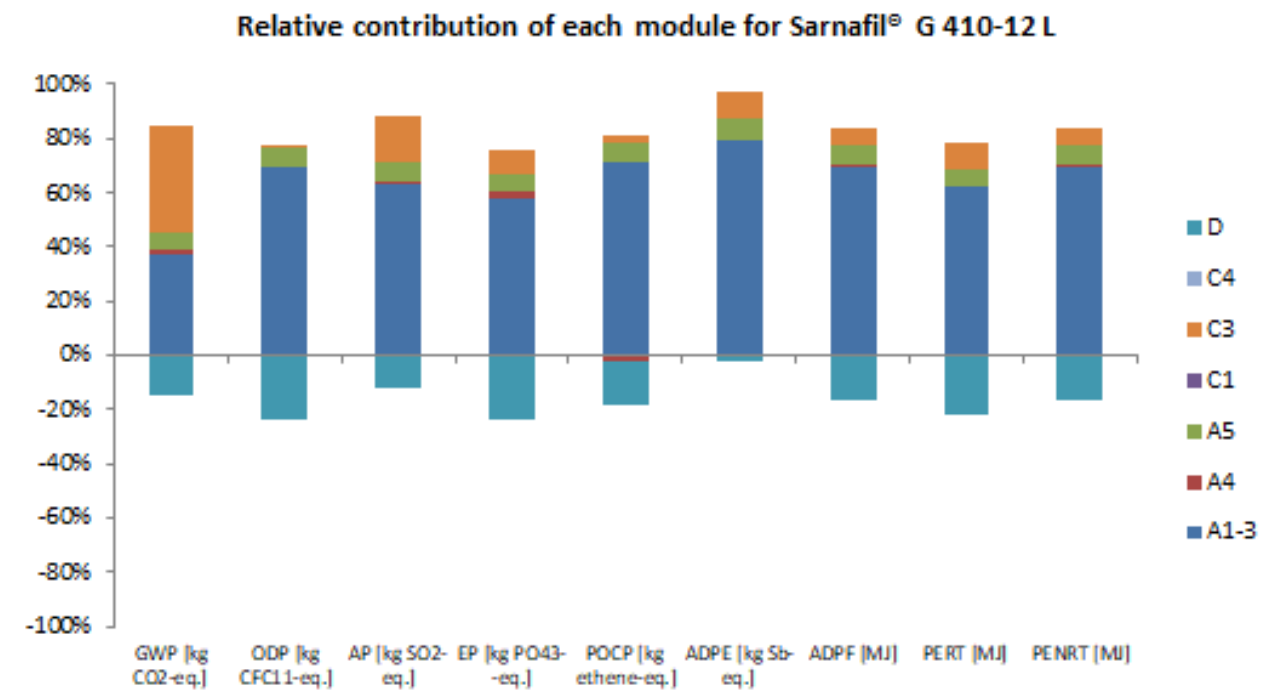

Figure 1

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