ENVIRONMENTAL PRODUCT DECLARATION

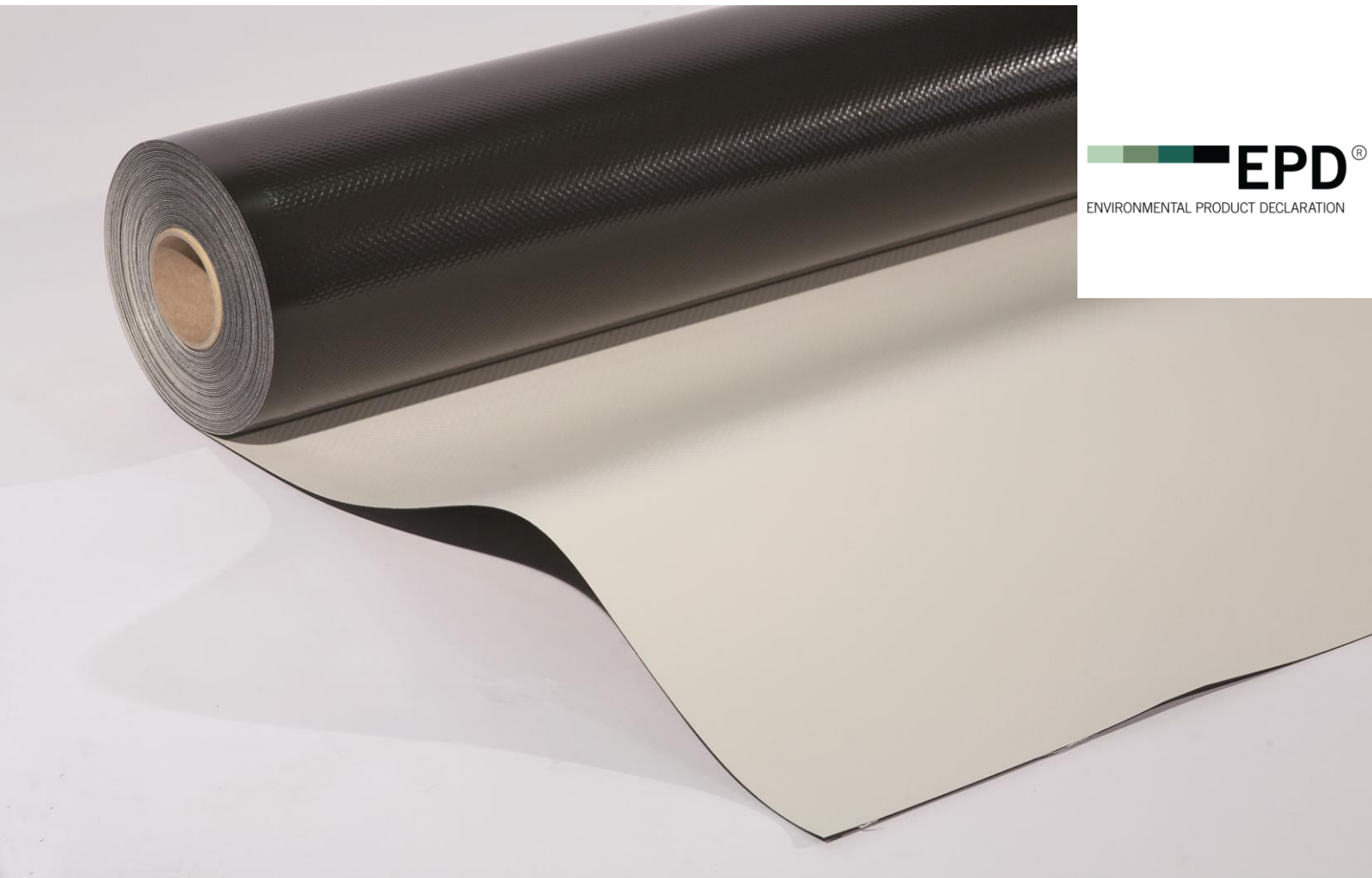
as per ISO 14025 and EN 15804

Owner of the Declaration	Soprema srl
Publisher	The International EPD® System
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Registration number	S-P-01603
Declaration number	MR-ENV-EPD-SOP-202000005-EN
ECO EPD Ref. No.	00000974
Issue date	05.07.2019
Valid to	04.07.2024

FLAGON TPO

Soprema srl

www.ibu-epd.com / https://epd-online.com/



GENERAL INFORMATION

EPD OWNER

Soprema s.r.l.,Via industrale dell'Isola 3, 24040 Chignolo d'Isola (BG), Italy

PROGRAMME OPERATOR

The International EPD® System, Valhallavägen 81, 114 27 Stockholm, Sweden

REFERENCE DOCUMENT

Standard EN 15804:2012+A1:2013

PRODUCT CATEGORY RULES (PRCs)

- PCR 2012:01 v 2.3

FUNCTIONAL UNIT

The functional unit is 1 m² of installed membrane (namely 1 m^2 produced multiplied by the membrane installation overlapping factor 1.12 (mechanically-fixed), 1.08 (fully-adhered and loose-laid)) for all waterproofing systems with flexible sheets for roofing, divided by the reference building service lifetime (90 years).

CONTACTS

For additional information relative to the activities of the Soprema s.r.l. or in regards to this environmental declaration, please contact: Roberto Baronio – rbaronio@soprema.it

TECHNICAL SUPPORT

by Life Cycle Engineering (www.lcengineering.eu)

VERIFICATION

Independent verification of the declaration and data, according to ISO 14025:2006

EPD process certification for EPD verification

Third party verifier: ICMQ

Accredited or approved by: ACCREDIA. For individual verifiers: "The International EPD® System"

EPDs within the same product category but from different programmes may not be comparable

EPD of construction products may not be comparable if they do not comply with EN 15804

REFERENCES

G.L. Baldo, M. Marino, S. Rossi; "Analisi del ciclo di vita LCA – Nuova edizione aggiornata"; Edizioni Ambiente; 2008

General Programme Instructions for the International EPD® System v. 2.5, 2015

Product Category Rules PCR 2012:01 v 2.3 "Construction products and construction services"

PCR 2014:12 v 1.0 "Flexible sheets for waterproofing - bitumen , plastic or rubber sheets for roof waterproofing"

Product Category Rules PCR 2007:08 v 3.1 "Electricity, steam and hot/cold water generation and distribution"

EN15804:2012 + A1:2013

ISO 14040:2006

ISO 14044:2017

ISO 14025:2010

THE COMPANY



Soprema is an independent group established in 1908 and now present in 90 countries worldwide. Thanks to its 59 production plants, Soprema successfully satisfies the construction sector needs, providing a wide range of waterproofing and insulation products. At present, Soprema is waterproofing membranes world leader.

Soprema is present in Italy since 2007. Here, under the brand of FLAG, it produces synthetic waterproofing membranes in PVC or TPO. Such products are ready to be employed in most residential and domestic sectors: roofing, underground and hydraulic works, both for internal and external purposes.

Since the beginnings in 1963, FLAG had a central role in the waterproofing membranes sector, becoming over the years a key player in the European market. Being part of Soprema Group allowed FLAG to penetrate the worldwide market.

On the basis of the end-use applications, many different waterproofing membranes typologies are available. Firstly, those products can be divided as **reinforced** and **homogeneous** membranes. The former, reinforced either with glass wool or polyester fleeces, is chiefly employed for industrial or domestic roofing. The latter instead are mainly used for hydraulic works and civil engineering.

Secondly, membranes can be either **PVC**- or **TPO**-based, with the former being the standard material for synthetic membranes and the latter (namely Thermoplastic PolyOlefins) being introduced only since late '90s. In both cases, over the years Soprema achieved the experience to ensure the high standards of quality and laying time requested by modern constructions and works.

Recently, FLAG changed name Soprema s.r.l.


SOPREMA

SCOPE AND TYPE OF EPD

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✓	✓	MND	MND	MND	✓	MND	MND	MND	MND	✓	✓	✓	✓

GEOGRAPHICAL SCOPE

Global

SOFTWARE

Simapro 9

DATABASE

Ecoinvent 3.5, Plastics Europe

FUNCTIONAL UNIT

1 m^2 roof waterproofing installed with flexible sheets for roofing, with a reference roof service life of 90 years. The membrane is supposed to be renewed every 30 years. Moreover, the former sheet is replaced with the new one, which goes on to the End of Life phase. However, both roof and membrane service life values are provided by PCR 2014:12 and used exclusively for calculations. They may not be representative of the actual service lifetimes. Service lifetime is also influenced by design and use conditions and regular maintenance according to the manufacturer's indications.

The LCA study includes all the processes ("cradle to grave" approach) according to EN15804 as presented in the table above.



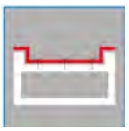
PRODUCTS

Object of this EPD® are the following membranes, that differ in the installation method, thus in the end-use:

FLAGON® TPO EP/PR - EP/PR-F

(AVERAGE BETWEEN TWO PRODUCT FAMILIES)

REINFORCED WITH POLYESTER NET AND COUPLED WITH A POLYESTER NON-WOVEN FABRIC (EP/PR-F), UV-RESISTANT.



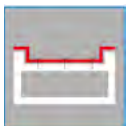
MECHANICALLY-FIXED

INSTALLATION PROCESS

Suitable for flat or sloped roofing. The waterproofing system is mechanically fixed to the support, in order to prevent the wind from removing or damaging it. Such system must resist to atmospheric agents and UV rays, as well as to a moderate pedestrian use due to maintenance.

FLAGON® TPO EP/PV-F

REINFORCED WITH GLASS WOOL AND COUPLED WITH POLYESTER NON-WOVEN FABRIC, UV-RESISTANT.



FULLY-ADHERED

INSTALLATION PROCESS

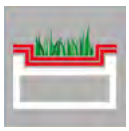
Suitable for non-covered flat or sloped roofing. The waterproofing system adheres completely to the support, in order to prevent the wind from removing or damaging it. Such system must resist to atmospheric agents and UV rays, as well as to a moderate pedestrian use due to maintenance. A proper layer of glue is put on the surface before the membrane is installed.

FLAGON® TPO EP/PV

REINFORCED WITH GLASS WOOL. UV-RESISTANT



LOOSE-LAID
WITH GRAVEL



LOOSE-LAID
FOR HANGING GARDENS/GREEN ROOFS



LOOSE-LAID
FOR PEDESTRIAN ZONES

INSTALLATION PROCESS

Suitable for sub-flat (max 5% slope) roofing. On the basis of their final use (pedestrian zones, hanging gardens, parking lots, etc), the membranes are fixed with different materials. In any case, they must be protected from any potential damage their final use can cause them.



FLAGON® TPO membranes were initially used for hydraulic works. However, their range of applicability expanded considerably over time, serving now also as waterproofing membranes for roofing, both for external and internal uses.
General features of FLAGON® TPO are excellent weldability, high degradation and atmospheric conditions resistance, high mechanical resistance, flexibility at low temperatures. In addition, they are rotproof, insensible to hot-cold cycles, compatible with most of thermal insulators and resistant to roots growing and microorganisms attacks.
However, there are products which are characterised by some peculiar features, being for instance UV-resistant or fireproof.

FLAGON® TPO membranes durability is remarkable: at present, 15-years-old installed membranes does not show any sign of degradation. Indeed, laboratory tests (FLAG & LyondellBasell) foresee a lifetime beyond 25 years. Currently, FLAGON® TPO waterproofing membranes are recognised as the most flexible, easy-to-handle and easily-weldable.
Moreover, for a give width, FLAGON® TPO membranes weigh 25% less than PVC ones. This feature makes them particularly suitable when compliance with HQE (High Quality Environmental) standars are required.



SPECIFICATION OF THE PRODUCT

RAW MATERIAL	Flagon® EP/PR – EP/PR-F*	Flagon® EP/PV-F**	Flagon® EP/PV***
TPO	65%	56%	62%
Additives and charges	31%	34%	36%
Reinforcing material	4%	2%	2%
Polyester non-woven fabric	<1%	9%	<1%

* *Average between two product families including EP/PR, EP/PR SC, EP/PR DE, EP/PR-F DE, EP/PR V DE (components equivalent for PREMIO), EP/PR V-F DE, EP/PR-F SC, EP/PR-F*

** *Components equivalent for PREMIO STICK*

*** *Components equivalent for ECO*

In the table, components used for the membranes production are shown. Among the wide range of thicknesses each Flagon® membrane is produced, only membranes 1.5 mm-thick are studied in this work. In addition, since each membrane is available in a wide range of colours, the study was performed on an average-colour membrane.

Part of the TPO used comes from the plant production scraps recycling. In the case of Flagon® EP/PR – EP/PR-F it accounts for around 6% of total TPO used, around 8% for Flagon® EP/PV-F and EP/PV.



PRODUCTION PROCESS

Chignolo d'Isola's plant Line 3 is entirely devoted to FLAGON® TPO membranes manufacturing. This production line has been operating since 2009.

The scheme below shows the synthetic membrane manufacturing process. The exclusive production method created by FLAG allows the direct co-extrusion on both reinforcing material sides.

In such way it is possible to achieve the complete reinforcing material embedment, which is a peculiar feature of all FLAGON® TPO membranes.

All FLAGON® TPO membranes are realised by means of a co-extrusion process in a two-tone version, adopting a "signal-layer" system that allows the production of monolayer membranes with different chemical-physical properties on the two sides.

In addition, this system permits the immediate recognition of potential membrane damages (holes or lacerations), since the underlying dark colour would appear.

EXTRUSION CHAMBER LOADING

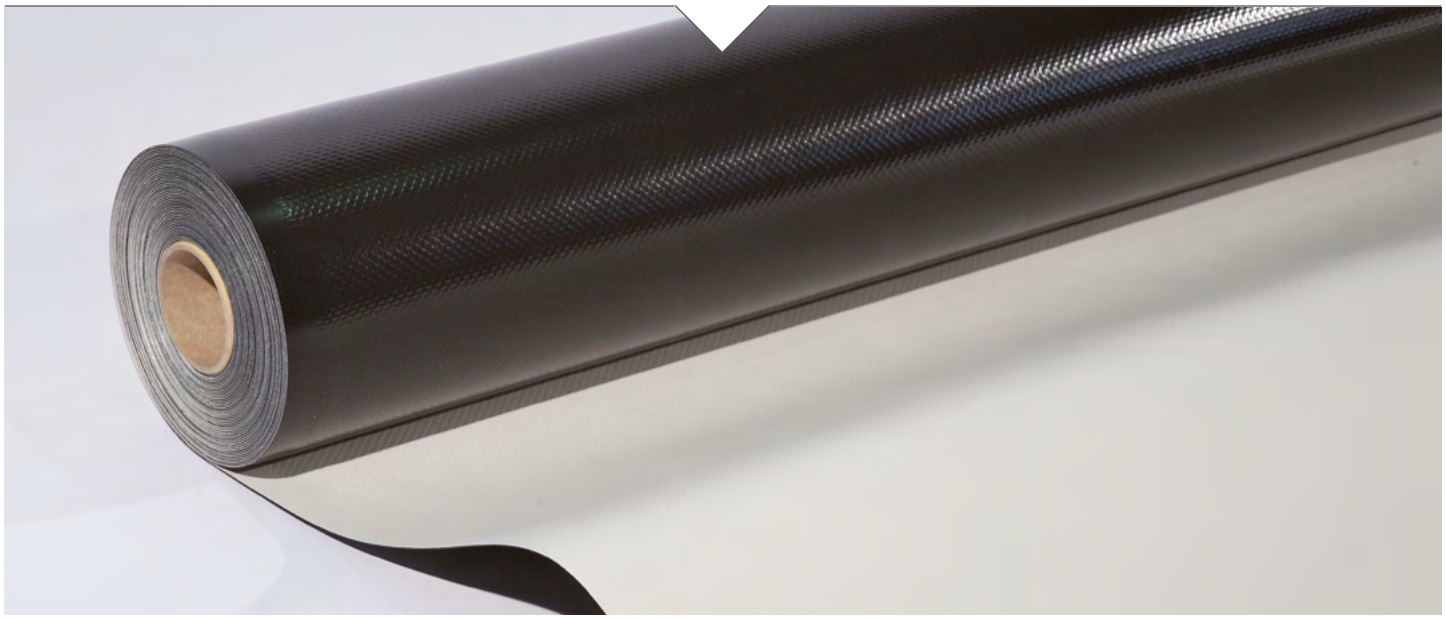
EACH CHAMBER LOADED WITH THE RAW MATERIALS MIXTURE, BY MEANS OF A HOPPER

CO-EXTRUSION

MIXTURE HEATED AND COMPRESSED BY SCREW, THEN FORCED TO A CO-EXTRUSION DIE, WHERE THE EXTRUDERS CONVERGE

LAMINATING

USING A CALENDER, THE DESIRED THICKNESS IS OBTAINED



FLAGON® EP/PR - EP/PR-F

ENVIRONMENTAL IMPACT

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
GWP	kg CO_2 eq	4.50E-02	1.44E-03	3.92E-03	2.41E-03	2.59E-03	1.11E-01	5.30E-04	3.26E-02	-3.06E-02
ODP	kg CFC-11 eq	1.17E-08	2.71E-10	4.47E-11	4.52E-10	1.89E-11	2.49E-08	9.93E-11	4.18E-12	-3.04E-09
AP	kg SO_2 eq	1.49E-04	6.25E-06	8.89E-06	1.15E-05	1.38E-06	3.53E-04	2.35E-06	2.44E-06	-1.26E-04
EP	kg PO_4^{3-} eq	4.42E-05	1.27E-06	8.16E-07	2.29E-06	1.73E-07	9.74E-05	4.81E-07	6.22E-07	-1.00E-05
POCP	kg C_2H_4 eq	1.13E-05	2.09E-07	4.76E-07	3.73E-07	1.05E-07	2.49E-05	7.58E-08	7.68E-08	-5.49E-06
ADPe	kg Sb eq	3.56E-09	2.87E-12	1.93E-10	4.79E-12	1.66E-09	1.08E-08	1.05E-12	2.21E-09	-1.42E-10
ADPf	MJ	1.21E+00	2.04E-02	6.15E-02	3.43E-02	4.61E-03	2.66E+00	7.50E-03	-4.98E-05	-4.61E-01

CAPTION:

GWP: 1E+01 is equal to 1 x 10^1 = 1 x 10 = 10 kg CO_2eq/m^2 / year

GWP Global Warming Potential
ODP Ozone Depletion Potential
AP Acidification Potential
EP Eutrophication Potential
POCP Photochemical Ozone Creation Potential
ADPE Abiotic Depletion Potential - Non fossil resources (elements)
ADPF Abiotic Depletion Potential - Fossil fuels

FLAGON® EP/PR - EP/PR-F

USE OF RESOURCES

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
PERE	MJ	4.68E-02	5.37E-05	6.59E-04	8.95E-05	3.03E-04	9.59E-02	1.97E-05	1.58E-04	-3.50E-02
PERM	MJ	0.00E+00	0.00E+00	1.87E-03	0.00E+00	0.00E+00	3.74E-03	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	4.68E-02	5.37E-05	2.53E-03	8.95E-05	3.03E-04	9.96E-02	1.97E-05	1.58E-04	-3.50E-02
PENRE	MJ	6.11E-01	2.06E-02	1.80E-02	3.44E-02	5.10E-03	1.38E+00	7.54E-03	-2.20E-04	-5.06E-01
PENRM	MJ	7.13E-01	0.00E+00	5.11E-02	0.00E+00	0.00E+00	1.53E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.32E+00	2.06E-02	6.91E-02	3.44E-02	5.10E-03	2.91E+00	7.54E-03	-2.20E-04	-5.06E-01
SM	kg	8.14E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-03	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.33E-04	9.69E-07	9.93E-06	1.64E-06	2.91E-06	2.98E-04	3.55E-07	3.98E-06	-1.04E-04

PERE Renewable energy (carrier)
PERM Renewable energy (feedstock)
PERT Renewable energy (total)
PENRE Non-renewable energy (carrier)
PENRM Non-renewable energy (feedstock)
PENRT Non-renewable energy (total)
SM Use of secondary materials
RSF Use of renewable secondary fuels
NSRF Use of non-renewable secondary fuels
FW Use of Net Fresh Water

FLAGON® EP/PR - EP/PR-F

OUTPUT FLOWS AND WASTE PRODUCTION

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.18E-02	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-02	0.00E+00
EE*	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Since EE is equal to zero there is no need to specify thermal and electrical energy

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
HWV	kg	2.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-09	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	5.23E-04	0.00E+00	5.97E-04	0.00E+00	0.00E+00	2.24E-03	0.00E+00	-2.01E-03	0.00E+00
RWD	kg	3.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.03E-07	0.00E+00	-9.46E-06	0.00E+00

CRU Components For Re-Use
MFR Material For Recycling
MER Materials For Energy Recovery
EE Exported Energy

HWD Hazardous Waste Disposed
NHWD Non-Hazardous Waste Disposed
RWD Radioactive Waste Disposed

FLAGON® EP/PV-F

ENVIRONMENTAL IMPACT

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE	
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C4**
GWP	kg CO_2 eq	5.95E-02	1.83E-03	3.96E-03	1.06E-02	1.20E-02	1.76E-01	6.88E-04	4.83E-03
ODP	kg CFC-11 eq	2.80E-08	3.44E-10	4.31E-11	1.98E-09	5.17E-11	6.09E-08	1.29E-10	3.65E-11
AP	kg SO_2 eq	2.17E-04	7.96E-06	8.61E-06	4.12E-05	3.93E-05	6.28E-04	3.05E-06	2.18E-06
EP	kg PO_4^{3-} eq	4.65E-05	1.62E-06	7.95E-07	7.43E-06	5.64E-06	1.24E-04	6.24E-07	1.40E-06
POCP	kg C_2H_4 eq	1.57E-05	2.66E-07	4.63E-07	1.63E-06	4.53E-06	4.52E-05	9.83E-08	8.40E-07
ADPe	kg Sb eq	3.48E-09	3.65E-12	1.86E-10	3.13E-11	1.43E-09	1.03E-08	1.36E-12	2.67E-12
ADPf	MJ	1.51E+00	2.60E-02	5.93E-02	1.50E-01	1.99E-01	3.88E+00	9.73E-03	3.87E-03

CAPTION:

GWP: 1E+01 is equal to 1 x 10^1 = 1 x 10 = 10 kg CO_2eq/m^2 / year

GWP Global Warming Potential
ODP Ozone Depletion Potential
AP Acidification Potential
EP Eutrophication Potential
POCP Photochemical Ozone Creation Potential
ADPE Abiotic Depletion Potential - Non fossil resources (elements)
ADPF Abiotic Depletion Potential - Fossil fuels

FLAGON® EP/PV-F

USE OF RESOURCES

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE	
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C4**
PERE	MJ	7.79E-02	6.83E-05	5.68E-04	2.76E-04	5.61E-03	1.69E-01	2.55E-05	1.56E-04
PERM	MJ	0.00E+00	0.00E+00	1.87E-03	0.00E+00	0.00E+00	3.74E-03	0.00E+00	0.00E+00
PERT	MJ	7.79E-02	6.83E-05	2.44E-03	2.76E-04	5.61E-03	1.73E-01	2.55E-05	1.56E-04
PENRE	MJ	8.23E-01	2.61E-02	1.55E-02	1.50E-01	1.43E-01	2.32E+00	9.78E-03	4.68E-03
PENRM	MJ	8.69E-01	0.00E+00	5.11E-02	0.00E+00	8.24E-02	2.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.69E+00	2.61E-02	6.66E-02	1.50E-01	2.25E-01	4.32E+00	9.78E-03	4.68E-03
SM	kg	1.31E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-03	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m³	1.89E-04	1.23E-06	9.57E-06	7.07E-06	1.71E-04	7.56E-04	4.61E-07	9.23E-07

PERE Renewable energy (carrier)
PERM Renewable energy (feedstock)
PERT Renewable energy (total)
PENRE Non-renewable energy (carrier)
PENRM Non-renewable energy (feedstock)
PENRT Non-renewable energy (total)
SM Use of secondary materials
RSF Use of renewable secondary fuels
NSRF Use of non-renewable secondary fuels
FW Use of Net Fresh Water

FLAGON® EP/PV-F

OUTPUT FLOWS AND WASTE PRODUCTION

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE	
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C4**
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE*	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Since EE is equal to zero there is no need to specify thermal and electrical energy

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE	
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C4**
HWV	kg	6.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-08	0.00E+00	0.00E+00
NHWD	kg	4.38E-03	0.00E+00	5.76E-04	0.00E+00	0.00E+00	9.91E-03	0.00E+00	6.46E-02
RWD	kg	2.43E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.85E-06	0.00E+00	0.00E+00

CRU Components For Re-Use
MFR Material For Recycling
MER Materials For Energy Recovery
EE Exported Energy

HWD Hazardous Waste Disposed
NHWD Non-Hazardous Waste Disposed
RWD Radioactive Waste Disposed

FLAGON® EP/PV

ENVIRONMENTAL IMPACT

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
GWP	kg CO_2 eq	3.81E-02	1.42E-03	3.82E-03	1.84E-03	5.05E-03	1.01E-01	2.42E-02	3.06E-02	-2.89E-02
ODP	kg CFC-11 eq	1.50E-09	2.67E-10	4.31E-11	3.48E-10	3.69E-10	5.05E-09	4.53E-09	3.60E-12	-2.87E-09
AP	kg SO_2 eq	1.16E-04	6.17E-06	8.58E-06	8.40E-06	1.56E-05	3.09E-04	1.07E-04	2.22E-06	-1.19E-04
EP	kg PO_4^{3-} eq	3.30E-05	1.25E-06	7.89E-07	1.73E-06	2.71E-06	7.90E-05	2.19E-05	5.59E-07	-9.46E-06
POCP	kg C_2H_4 eq	1.03E-05	2.06E-07	4.60E-07	2.73E-07	5.30E-07	2.35E-05	3.46E-06	7.10E-08	-5.19E-06
ADPe	kg Sb eq	2.59E-09	2.83E-12	1.86E-10	3.68E-12	1.34E-09	8.24E-09	4.79E-11	2.09E-09	-1.34E-10
ADPf	MJ	1.04E+00	2.01E-02	5.93E-02	2.63E-02	4.05E-02	2.38E+00	3.42E-01	-8.95E-05	-4.35E-01

CAPTION:

GWP: 1E+01 is equal to 1 x 10^1 = 1 x 10 = 10 kg CO_2eq/m^2 / year

GWP Global Warming Potential

ODP Ozone Depletion Potential

AP Acidification Potential

EP Eutrophication Potential

POCP Photochemical Ozone Creation Potential

ADPE Abiotic Depletion Potential - Non fossil resources (elements)

ADPF Abiotic Depletion Potential - Fossil fuels

FLAGON® EP/PV

USE OF RESOURCES

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
PERE	MJ	1.76E-02	3.19E-05	1.42E-03	4.16E-05	1.08E-02	5.97E-02	5.42E-04	1.42E-04	-3.18E-02
PERM	MJ	1.99E-02	2.10E-05	1.02E-03	2.73E-05	5.37E-04	4.29E-02	3.56E-04	6.86E-06	-1.25E-03
PERT	MJ	3.74E-02	5.29E-05	2.44E-03	6.89E-05	1.13E-02	1.03E-01	8.98E-04	1.49E-04	-3.31E-02
PENRE	MJ	4.29E-01	2.03E-02	1.55E-02	2.64E-02	9.80E-02	1.18E+00	3.44E-01	-2.52E-04	-4.78E-01
PENRM	MJ	6.93E-01	0.00E+00	5.11E-02	0.00E+00	0.00E+00	1.49E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.12E+00	2.03E-02	6.66E-02	2.64E-02	9.80E-02	2.67E+00	3.44E-01	-2.52E-04	-4.78E-01
SM	kg	1.13E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-03	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m³	1.11E-04	9.55E-07	9.57E-06	1.24E-06	1.28E-03	2.81E-03	1.62E-05	3.53E-06	-9.77E-05

PERE Renewable energy (carrier)
PERM Renewable energy (feedstock)
PERT Renewable energy (total)
PENRE Non-renewable energy (carrier)
PENRM Non-renewable energy (feedstock)
PENRT Non-renewable energy (total)
SM Use of secondary materials
RSF Use of renewable secondary fuels
NSRF Use of non-renewable secondary fuels
FW Use of Net Fresh Water

FLAGON® EP/PV

OUTPUT FLOWS AND WASTE PRODUCTION

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-02	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-02	0.00E+00
EE*	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Since EE is equal to zero there is no need to specify thermal and electrical energy

		PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END OF LIFE STAGE		BENEFITS AND LOADS
IMPACT CATEGORY	**UNIT**	**A1**	**A2**	**A3**	**A4**	**A5**	**B4**	**C2**	**C3**	**D**
HWV	kg	4.98E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-11	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	3.05E-03	0.00E+00	5.76E-04	0.00E+00	0.00E+00	7.25E-03	0.00E+00	-1.90E-03	0.00E+00
RWD	kg	1.66E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.32E-06	0.00E+00	-8.96E-06	0.00E+00

CRU Components For Re-Use
MFR Material For Recycling
MER Materials For Energy Recovery
EE Exported Energy

HWD Hazardous Waste Disposed
NHWD Non-Hazardous Waste Disposed
RWD Radioactive Waste Disposed




LEROY MERLIN
LEROY MERLIN







CALCULATION RULES

A1
UPSTREAM
Process

A2+A3
CORE
Process

A4
TRANSPORT
to end users



LCA METHODOLOGY



CUT-OFF RULES

LCA model has been processed considering all main input/output associated with core process in accordance with the threshold valued stated in PCR 2012:01 v2.3 (ch. 7.6), namely the sum of the excluded material flows to the core module shall not exceed 1% of mass and energy.

Hence, the following aspects were considered negligible:

- Production of packaging for the raw materials input process, except for PE packaging film;
- Drill electricity consumption related to mechanical installation;
- Water emissions from core process.

A5
INSTALLATION
Process

B4
USE
Stage

C2+C3+C4
END OF LIFE
Stage



ALLOCATION

Allocation occurs anytime a system is producing more than a single output. In this case it is necessary to choose a technique to proper split the environmental burdens among the output flows; international standards ISO 14044 and PCR 2012:01 v2.3 provide guidelines about how to deal with this issue, that have been implemented in this project as well.

Soprema produces several product types that are not object of the study. Therefore, it is important to establish an allocation method based on physical variables to split input and output flows to the multi-products: allocation by square-metre of membrane produced has been chosen as most representative tool for the system understudy.

TRANSPORTATIONS

Impacts calculations related to transports in SimaPro are performed according to the EcoInvent model.

All the transports is assumed by truck or by ship.

For Module A2, since no specific data are available, 500 km is used as average value (provided by Soprema) for raw materials transportation from suppliers to the plant. For module A4, specific information are provided, such as quantity transported and destination per each trip.

CALCULATION RULES

A1
UPSTREAM
Process

A2+A3
CORE
Process

A4
TRANSPORT
to end users

PRODUCT STAGE

A1

- RAW MATERIALS SUPPLY
- GENERATION OF ELECTRICITY FROM NATIONAL GRID
- NG SUPPLY FOR INTERNAL CHP SYSTEM



A2+ A3

- RAW MATERIALS TRANSPORT TO PLANT 500 KM BY TRUCK (A2);
- MANUFACTURING PROCESS;
- ELECTRICITY AND HEAT GENERATION FROM CHP SYSTEM;
- WATER USAGE;
- EMISSIONS TO AIR;
- MANUFACTURING PROCESS WASTE TREATMENT, CONSIDERING ALSO WASTE TRANSPORT (50 KM BY TRUCK)

CHIGNOLO D'ISOLA POWER PLANT (CHP SYSTEM)

According to the diagnoses and data-gatherings performed by Soprema on Chignolo d'Isola plant, one kWh of electricity per square meter of final product is modelled as 66% supplied by national grid (considered in A1 module) and 34% produced internally by the CHP system (considered in A3 module).

Soprema Power Plant is based on a combined cycle technology (electricity and thermal). The most relevant issue concerning CHP technology is how to allocate the environmental impact due to fuel combustion, since a multi-output is present. The approach suggested by PCR 2007:08 provided by the International EPD® System was chosen for this project. A dedicated emission factor is computed for both heat and power, according to the amount of produced energy for each class. The result of CHP modelling is a specific emission factor for both electrical and thermal energy, namely the quantity of methane to be burned to produce 1 kWh of energy carrier. This latter parameter is strictly related to CHP system efficiency.

A5
INSTALLATION
Process

B4
USE
Stage

C2+C3+C4
END OF LIFE
Stage

CONSTRUCTION PROCESS STAGE

A4

MEMBRANES TRANSPORTATION TO END USERS, BY TRUCK AND/OR SHIP





	FLAGON® EP/PR - EP/PR-F	FLAGON® EP/PV-F	FLAGON® EP/PV
	812 KM	**798** KM	**561** KM
	308 KM	**313** KM	-

The distances mentioned above are average values, weighted on the quantity transported

CALCULATION RULES

A1
UPSTREAM
Process

A2+A3
CORE
Process

A4
TRANSPORT
to end users

CONSTRUCTION PROCESS STAGE



A5

EACH INSTALLATION METHOD IS CHARACTERISED BY SPECIFIC MATERIAL CONSUMPTIONS, SHOWED IN TABLES BELOW.

HOWEVER, THEY SHARE THE WELDING MACHINE ELECTRIC CONSUMPTION OF 0.020 kWh/m^2.



A5
INSTALLATION
Process

B4
USE
Stage

C2+C3+C4
END OF LIFE
Stage



FLAGON®
EP/PR - EP/PR-F
MECHANICAL FIXING



FLAGON®
EP/PV-F
FULL ADHESION



FLAGON®
EP/PV
LOOSE LAYING

	0.0075 kg/m² NAILS	**0.2** kg/m² POLYURETHANE GLUE	**82** kg/m² GRAVEL
	120 mm OVERLAP	**80** mm OVERLAP	**80** mm OVERLAP
	0.020 kWh/m² ELECTRICITY	**0.020** kWh/m² ELECTRICITY	**0.020** kWh/m² ELECTRICITY

CALCULATION RULES

A1
UPSTREAM
Process

A2+A3
CORE
Process

A4
TRANSPORT
to end users

USE STAGE

B4

ACCORDING TO PCR2014:12 RULES, TWO REPLACEMENTS ARE CONSIDERED IN THIS STUDY.

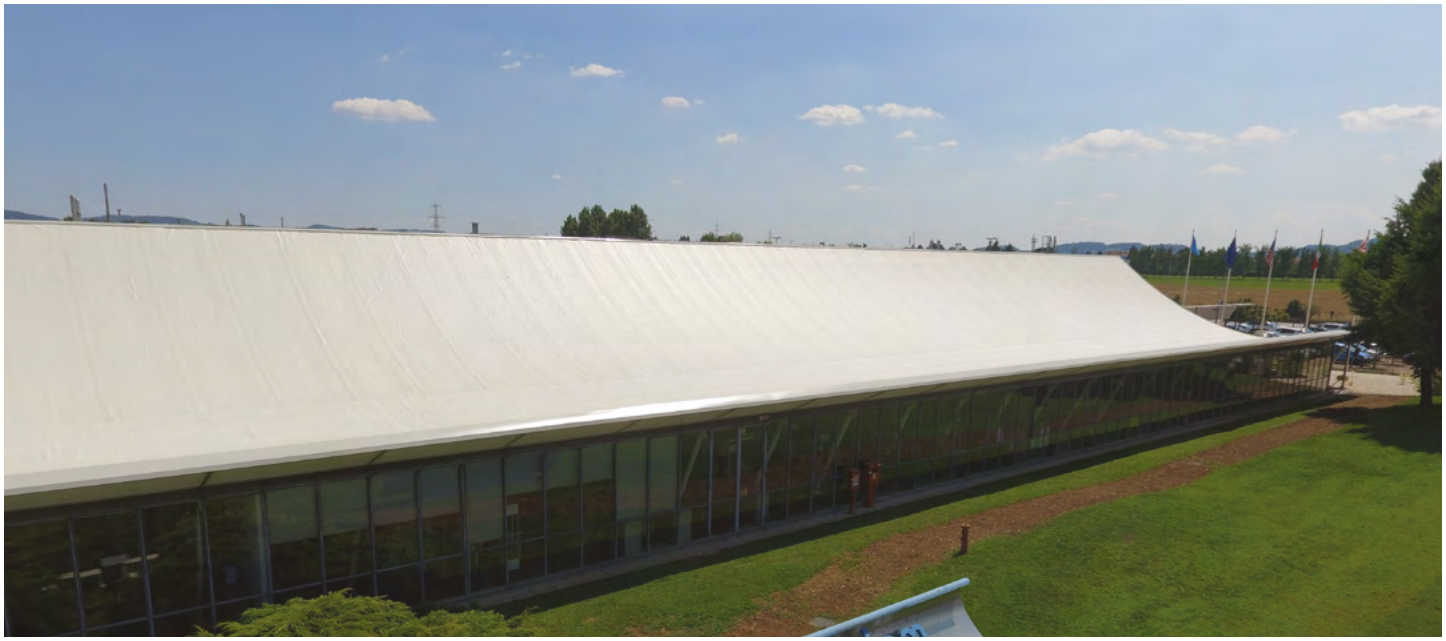
(REPLACEMENT MODULE INCLUDES ALL THE PREVIOUS STAGES DOUBLED (A1,A2,A3,A4 AND A5))



2X

PRODUCT STAGE

CONSTRUCTION PROCESS STAGE



A5
INSTALLATION
Process

B4
USE
Stage

C2+C3+C4
END OF LIFE
Stage

END OF LIFE STAGE

C2+C3+C4

OUT-OF-SERVICE MEMBRANES
TRANSPORTATION TO TREATMENT SITES
(50 KM BY TRUCK)



END-OF-LIFE TREATMENT SCENARIOS



FLAGON® EP/PR - EP/PR-F

FLAGON® EP/PV

FLAGON® EP/PV-F

70%
RECYCLING*

100%
SANITARY LANDFILL**

30%
INCINERATION WITH ENERGY RECOVERY

**The only environmental impact due to recycling process is the waste transportation to the recycling site*
***This scenario does not mean as an instruction how to treat the Flagon® EP/PV-F product family at the end of life, but a worst case analysis based on a precautionary choice.*

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SOPREMA GROUP

SOPREMA at your disposal

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You will find all the information on
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