ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	BMI Group Holdings UK Ltd
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BMI-20250692-IBA1-EN
Issue date	11/05/2026
Valid to	10/05/2031

Wolfin GWSK, Wolfin GWSK FR

BMI Group

Institut Bauen und Umwelt e.V.

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1. General Information

BMI Group

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-BMI-20250692-IBA1-EN

This declaration is based on the product category rules:

Plastic and elastomer roofing and sealing sheet systems, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

11/05/2026

Valid to

10/05/2031

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

Wolfin GWSK, Wolfin GWSK FR

Owner of the declaration

BMI Group Holdings UK Ltd
Thames Tower, Station Rd -
- Reading RG1 1LX
United Kingdom

Declared product / declared unit

1 m² plastic and elastomer roofing and sealing membrane system produced.

Scope:

This Declaration applies for Wolfin GWSK and Wolfin GWSK FR roofing and sealing membranes manufactured at the Štúrovo plant in Slovakia.

The LCA results of Wolfin GWSK FR with a thickness of 2.3 mm and a surface weight of 2.7 kg/m² (worst-case scenario) are declared. Section 5 indicates a factor with which the results for Wolfin GWSK can be calculated in a thickness of 2.8 mm.

The LCA is based on average production data from July 2024 to June 2025.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Mr Stephen Forson ,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Wolfin GWSK are high-polymer, bitumen-compatible synthetic roofing and sealing membranes with a special central fleece and cold self-adhesive underlay manufactured in an extrusion process.

Designation acc. to DIN SPEC 20000-201:DE/E1 PVC-P-BV-E-(GV)-1.5 (-2.0) -SK
Designation acc. to DIN SPEC 20000-202:BA PVC-P-BV- E-(GV)-1.5 (-2.0) -SK
(EU) Directive No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The product has a Declaration of Performance taking consideration of DIN EN 13956:2012 and DIN EN 13967:2017, and CE marking.

Use is governed by the respective national regulations.

2.2 Application

Wolfin GWSK/FR is used as roof waterproofing for exposed and covered flat roofs. The application allows for glued installation loose or with ballast (gravel, paving, parking deck and greenery).

Wolfin GWSK is also used as a damp-proof sheet (type A) and as a tanking sheet (type T).

The manufacturer's installation instructions must be followed during processing. For detailed information, please refer to the installation manual available at www.bmigroup.com

2.3 Technical Data

Constructional data

Name	Value	Unit
Waterproof as per EN 1928	Passed	-
Artificial ageing as per EN 1297	Passed	-
Dimensional stability as per EN 1107-2	≤ 0.5	%
Folding in the cold as per EN 495-5	≤ -20	°C
Bitumen compatibility as per EN 1548	Passed	-
Resistance to root penetration (for green roofs) as per EN 13948 (FLL)	Passed	-
Tensile strain as per EN 12311-2	≥ 200	%
Resistance to impact loads as per EN 12691	≥ 600	mm
Shear resistance of the seam joint as per EN 12317-2	≥ 600	N/50mm
Tear propagation resistance as per EN 12310-2	≥ 150	N

Product performance values in line with the Declaration of Performance in terms of its essential characteristics in accordance with DIN EN 13956

2.4 Delivery status

The products are stacked on pallets and the number of rolls per pallet and roll dimensions depend on the specific product and its thickness.

Further information and delivery status information can be found online at www.bmigroup.com/de.

2.5 Base materials/Ancillary materials

Wolfin GWSK and Wolfin GWSK FR comprise:

Name	Value	Unit
Polyvinylchloride	45-55	%
Polymer Plasticisers	30-40	%
Acrylic Impact Modifiers	0.5-2.5	%
Stabilisers	1-3	%
Fillers	4-8	%
Carbon Black, Pigments and Additives (Varying depending on colour)	0.1-2.5	%
Flame Retardant	0-1.5	%

Wolfin GWSK features a self-adhesive layer.
This product contains substances listed in the Candidate List of Substances of Very High Concern for Authorisation (SVHC) exceeding 0.1 percentage by mass: No.

This product/article/at least one partial article contains other Carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: No.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): No*

** Biocide products are incorporated strictly into the grey color variations to provide specific functional protection. These substances are fully compliant with the Biocidal Products Regulation (BPR) and do not meet the criteria for SVHC or CMR 1A/1B classification. Their inclusion in the representative model ensures that the entire product range is covered by a conservative safety margin*

2.6 Manufacture

BMI synthetic membranes are manufactured using an extrusion process. The production begins with the preparation of a dry blend of the selected polymers, performance-enhancing additives, and other optional ingredients in the required proportions. This mixture is extruded into granules, which constitute the main compound of the membrane.

From these granules, a film extrusion process is carried out to obtain the membrane. In certain product types, the compound is extruded onto the top and bottom of a scrim to create laminated layers. The membrane is then cooled by passing through a series of rollers before being wound into rolls or cut to size. Depending on the composition and intended application, additional steps may include applying a backing layer or incorporating further functional additives.

For packaging, cardboard cores, labels, and plastic films are used to ensure safe handling, storage, and transport.

2.7 Environment and health during manufacturing

The health and safety of production personnel are prioritised, indicating that working conditions are designed to mitigate risks associated with the manufacturing process. Waste gases generated during production are effectively managed through collection and filtration systems, such as exhaust gas scrubbers, which help to reduce air pollution and improve air quality in and around the facility. Furthermore, the production facility complies with all applicable regulatory standards

regarding exhaust gases, wastewater, solid waste, and noise emissions. This is crucial for minimising environmental impact and ensuring the health and safety of the workers.

2.8 Product processing/Installation

Wolfin GWSK is a cold self-adhesive plastic roofing membrane. It features a glass fleece and a self-adhesive layer. The self-adhesive layer generally eliminates the need for additional mechanical fastening, allowing flat roof waterproofing to be carried out more quickly and efficiently.

The homogeneity of the surface, even in the seam area, is ensured by a single-sided adhesive-free welding edge.

2.9 Packaging

Wolfin rolls are compactly palletized, secured and wrapped in PE foil, and dispatched in such state. All the included packaging material can be sorted and collected for recycling.

2.10 Condition of use

When installed properly and subjected to typical loads, Wolfin roofing membranes maintain their integrity and fulfill their function throughout their service life, assuming professional installation and proper use and maintenance.

2.11 Environment and health during use

There are no adverse effect on the environment and health during the period of use.

2.12 Reference service life

The service life depends on climatic conditions, the thickness of the membrane, the colour and the application method. Based on durability studies for analogous products and field performance data, it is reasonable to expect a service life of up to 35 years assuming professional installation, proper use and maintenance. This value has not been declared according to ISO 15686.

2.13 Extraordinary effects

Fire

Wolfin GWSK waterproofing membrane is classified in Construction Product Class E, as defined by EN 13501-1.

Fire protection

Name	Value
Building material class (as per EN 13501-1)	Class E
Burning droplets	-
Smoke gas development	-

Water

The substances used in Wolfin GWSK are not soluble in water, nor do they react with water.

Accordingly, there are no consequences for the environment even in the event of unforeseen contact with water.

Mechanical destruction

There are no known negative consequences for the environment in the event of unforeseen mechanical destruction of the membrane material.

2.14 Re-use phase

At the end of their service life, Wolfin GWSK waterproofing sheets should be selectively removed in order to be recycled. This process is key to maintaining a closed-loop material cycle and maximising the recovery of material from used polymeric membranes.

2.15 Disposal

The preferred end-of-life approach for Wolfin GWSK/FR polymeric waterproofing membranes is recycling, with the objective of maintaining a closed-loop material system. This pathway involves the sheets being collected, cleaned, and processed through a shredding plant.

In line with the company's commitment to circularity, significant work is currently being done to establish the necessary recycling infrastructure and research the integration of recovered materials into new products. Considering these active initiatives and the membranes' long service life, recycling is assessed as the most appropriate disposal scenario.

As an alternative disposal option, energy recovery is considered.

The European Waste Catalogue designates the PVC Synthetic membranes under Waste Code 17 02 03.

2.16 Further information

Further information, such as installation guidelines, brochures, declarations of performance and others can be found online at www.bmigroup.com/de.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 m² of Wolfin GWSK FR roof membrane produced. The Declaration applies for a thickness of 2.3 mm and a surface weight of 2.7 kg/m².

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m^2
Grammage	2.7	kg/m^2
Layer thickness	0.0023	m

Section 5 indicates a factor with which the results for Wolfin GWSK* can be calculated in a thickness of 2.8 mm.

*This EPD also covers the Wolfin GWSK variant. The FR version is selected as the representative product as it contains flame retardants, resulting in a more complex material matrix. A variance analysis confirms that the maximum difference between these two products is within 1%, ensuring the results are representative for both.

3.2 System boundary

This EPD is based on the system boundary cradle to gate with options, modules C1-C4, and module D (A1-A3 + C + D and additional modules. The additional modules are A4 and A5). The system boundaries of the EPD followed the modular structure set forth by EN 15804+A2.
The LCA takes into account the following modules:

- A1: Provision and Processing of raw materials (e.g. dry blends of polymeric compounds including pigments, processing aids, stabilisers, fillers, flame retardants, carrier materials and others) used for the production of the membrane and the intermediate products.
- A2: Transport of raw materials to the factory by truck.
- A3: Manufacture of roofing membranes in the factory (including energy supply, water supply and packaging

materials such as wooden pallets, cardboard and PE film.)

- A4: Transport of the produced membrane to the building site.
- A5: Installation of the membrane into the building by means of hot-air welding (including welding energy), disposal or recycling of packaging.
- C1: Manual deconstruction and removal of the membrane with no environmental burdens (recovery).
- C2: Transport of the recovered membrane to waste-processing facility.
- C3: Processing of the recovered membrane for material recycling (Scenario 1 - C3/1) or energy recovery (Scenario 2 - C3/2).
- C4: Product waste disposal/landfilling. (No further environmental burdens since the waste treatment processes are fully allocated and accounted for within Module C3).
- D: Benefits for reuse, recovery and/or the recycling process of the membrane, and benefits from the avoided production of virgin material. (Scenario 1 - D/1) or benefits from the thermal treatment of the product waste and packaging material. (Scenario 2 - D/2).

3.3 Estimates and assumptions

At the end of life stage, Scenario 1 considers that 100% of material is recycled, while Scenario 2 considers 100% of the material going to energy recovery.
The specific formulations of each membrane were modeled as accurately as possible by grouping similar raw materials into relevant categories, based on available information regarding composition and/or suppliers. This approach allowed for a more practical and consistent modeling process. The selection of datasets from the Sphera MLC 2025.1 (CUP 2025.1) database was an informed decision, aimed at best representing the materials and processes involved.

3.4 Cut-off criteria

All primary operational data was considered, including recipe constituents, energy consumption and water usage. Transport processes were also accounted for, covering all inputs and outputs associated with the product. The limit of 5% of negligible processes in terms of mass and energy input required in PCR Part A is complied with. Transport burdens for packaging were considered as well.

Machinery, systems, and infrastructure required for production were excluded from the system boundaries. Furthermore, corporate overheads represent a major category typically omitted from EPD calculations. This encompasses the entire administrative and human side of the business, such as the energy consumed by headquarters (including office lighting, heating, and cooling) as well as the environmental impact of business travel and daily employee commuting. These factors are considered "support functions" rather than direct physical inputs to the product's manufacturing process, therefore, they are excluded to ensure the data remains focused purely on the material's industrial lifecycle.

3.5 Background data

The LCAfE software system developed by Sphera Solutions has been used to model the life cycle of the declared product. The underlying database is CUP 2025.1.

3.6 Data quality

The data used in this LCA study were collected by BMI Group GmbH. The data collection was based on annual consumptions from the production location in Štúrovo. All the collected data and data used for the creation of the LCA model are highly confidential.

The Sphera MLC background data was last revised in 2025. The quality of the data surveyed can be regarded as very good. The robustness of the LCA data can be valued as very good from the perspective of technological and geographical representativeness.

3.7 Period under review

The period of study is the year between July 2024 and June 2025.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

3.9 Allocation

The BMI production site is located in Štúrovo, Slovakia. At this production site, BMI is manufacturing various products.

Accordingly, the energy consumption values were allocated to the specific products based on production quantities and their respective shares. Furthermore, production and recipe data were utilised to determine the raw material quantities.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The underlying database used is CUP 2025.1.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Only the product packaging contains biogenic carbon, not the actual product.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.068	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical information serves as a basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	~900	km
Capacity utilisation (including empty runs)	80	%

Installation into the building (A5)

Stage A5, representing installation, was modelled assuming additional membrane consumption due to overlapping, and electricity consumption for hot-air welding, which has higher emissions compared to self adhesive membranes. This

generalised scenario was used to cover the average case across all membranes. Both membrane overuse and electricity consumption figures were sourced from the company's own installation manuals, making the A5 stage, like A1-A3, based on accurate primary data.
Since in this stage the packaging is disposed of, its End of Life was also grouped as A5.

Name	Value	Unit
Electricity consumption	0.015	kWh
Overlaps (Membrane Seams)	5.6	%
Cardboard and Paper (Packaging)	0.08	kg/m^2
Plastic (Packaging)	0.16	kg/m^2
Plywood (Packaging)	0.07	kg/m^2

Electricity Mix

Name	Value	Unit
GWP (SK: Residual Grid Mix - Sphera)	0.237	kg CO2eq/kWh

End of life (C1-C4)

For modeling the end-of-life stage, two different scenarios are calculated, each of which represents a 100 % scenario.

Name	Value	Unit
Recycling (Scenario 1)	100	%
Transport (Scenario 1)	100	km
Energy Recovery (Scenario 2)	100	%
Transport (Scenario 2)	50	km

Since the deconstruction and removal of the product requires only manual labor, no material nor environmental inputs/outputs have been considered in the module C1.

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Based on these EoL considerations, environmental credits are claimed in Module D for both recycling and energy recovery. The recycling scenario credits the avoided production of virgin material (secondary material recovery), while the incineration scenario credits the avoided production of conventional heat and electricity.

5. LCA: Results

The following tables show the results of the indicators concerning impact estimates, use of resources as well as the waste and other output flows with reference to 1m² roofing membrane produced.

The mentioned indicators are applying the characterization factors (EF. 3.1) prescribed by the JRC (Joint Research Center) of the European Commission. The impact assessment results are only relative statements that make no claims regarding the endpoints of the impact categories, the exceedance of threshold values, safety margins, or risks.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
GWP-total	kg CO_2 eq	6.13E+00	1.6E-01	4.37E-01	0	1.86E-02	9.65E-03	8.28E-01	5.52E+00	0	-4.17E+00	-1.68E+00
GWP-fossil	kg CO_2 eq	6.23E+00	1.58E-01	3.18E-01	0	1.83E-02	9.53E-03	8.2E-01	5.52E+00	0	-4.14E+00	-1.67E+00
GWP-biogenic	kg CO_2 eq	-9.67E-02	1.24E-03	1.19E-01	0	1.4E-04	7.05E-05	6.58E-03	8.27E-04	0	-2.47E-02	-7.25E-03
GWP-luluc	kg CO_2 eq	3.55E-03	6.85E-04	1.48E-04	0	8.37E-05	4.57E-05	1.51E-03	8.91E-04	0	-3.7E-03	-2.24E-03
ODP	kg CFC11 eq	1.84E-10	7.57E-14	8.92E-12	0	8.53E-15	4.33E-15	2.15E-11	7.41E-12	0	-5.29E-11	-2.96E-11
AP	mol H^+ eq	1.39E-02	2.39E-04	6.2E-04	0	2.76E-05	1.44E-05	1.37E-03	1.4E-03	0	-6.67E-03	-2.18E-03
EP-freshwater	kg P eq	1.82E-05	4.06E-07	5.52E-07	0	4.71E-08	2.46E-08	6.35E-06	5.76E-07	0	-5.73E-06	-9.26E-07
EP-marine	kg N eq	3.1E-03	9.16E-05	1.35E-04	0	1.06E-05	5.53E-06	3.53E-04	4.56E-04	0	-2.04E-03	-6.42E-04
EP-terrestrial	mol N eq	3.41E-02	9.85E-04	1.51E-03	0	1.14E-04	5.94E-05	4.09E-03	6.02E-03	0	-2.34E-02	-7.38E-03
POCP	kg NMVOC eq	1.4E-02	2.15E-04	6.34E-04	0	2.48E-05	1.29E-05	8.54E-04	1.23E-03	0	-1.08E-02	-1.67E-03
ADPE	kg Sb eq	6.55E-07	1.16E-08	2.98E-08	0	1.34E-09	6.94E-10	2.17E-07	5.55E-08	0	-4.76E-07	-2E-07
ADPF	MJ	1.78E+02	2.09E+00	7.13E+00	0	2.42E-01	1.26E-01	1.08E+01	8.69E+00	0	-9.76E+01	-2.86E+01
WDP	m^3 world eq deprived	1.41E+00	6.5E-04	4.75E-02	0	7.56E-05	3.95E-05	1.27E-01	5.44E-01	0	-1.56E-01	-1.34E-01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PERE	MJ	1.4E+00	1.49E-01	1.19E+01	0	1.73E-02	8.98E-03	7.14E+00	2.2E+00	0	-1.45E+01	-9.85E+00
PERM	MJ	1.12E+01	0	-1.12E+01	0	0	0	0	0	0	0	0
PERT	MJ	1.26E+01	1.49E-01	7.22E-01	0	1.73E-02	8.98E-03	7.14E+00	2.2E+00	0	-1.45E+01	-9.85E+00
PENRE	MJ	9.59E+01	2.09E+00	1.02E+01	0	2.42E-01	1.26E-01	8.96E+01	8.75E+01	0	-9.76E+01	-2.86E+01
PENRM	MJ	8.19E+01	0	-3.07E+00	0	0	0	-7.88E+01	-7.88E+01	0	0	0
PENRT	MJ	1.78E+02	2.09E+00	7.13E+00	0	2.42E-01	1.26E-01	1.08E+01	8.69E+00	0	-9.76E+01	-2.86E+01
SM	kg	0	0	0	0	0	0	0	0	0	2.45E+00	8.24E-02
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.31E-02	4.65E-05	1.63E-03	0	5.52E-06	2.94E-06	5.22E-03	1.36E-02	0	-1.62E-02	-6.47E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
HWD	kg	8.14E-04	9.66E-11	4.56E-05	0	1.11E-11	5.75E-12	3.41E-07	4.57E-09	0	-3.15E-08	-1.94E-08
NHWD	kg	1.16E-01	4.03E-04	8.8E-03	0	4.61E-05	2.37E-05	2.98E-01	2.5E+00	0	-4.32E-02	-1.49E-02

RWD	kg	2.25E-03	3.29E-06	1.45E-04	0	3.84E-07	2.01E-07	1.29E-03	1.47E-04	0	-1.35E-03	-1.88E-03
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	8.24E-02	0	0	0	2.81E+00	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	7.29E+00	0	2.39E-01	2.39E-01
EET	MJ	0	0	0	0	0	0	0	1.33E+01	0	4.29E-01	4.29E-01

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

Parameter	Unit	A1-A3	A4	A5	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PM	Disease incidence	1.19E-07	2.3E-09	4.89E-09	0	2.66E-10	1.38E-10	1.15E-08	3.03E-08	0	-6.46E-08	-1.84E-08
IR	kBq U235 eq	5.05E-01	4.29E-04	3E-02	0	5.03E-05	2.64E-05	1.98E-01	1.68E-02	0	-1.71E-01	-2.74E-01
ETP-fw	CTUe	8.32E+01	1.8E+00	2.99E+00	0	2.12E-01	1.12E-01	2.8E+00	6.78E+00	0	-5.65E+01	-3.43E+00
HTP-c	CTUh	1.67E-09	3.56E-11	6.82E-11	0	4.13E-12	2.15E-12	1.67E-10	2.13E-10	0	-1.32E-09	-2.82E-10
HTP-nc	CTUh	3.66E-08	1.85E-09	1.5E-09	0	2.15E-10	1.12E-10	5.51E-09	1.75E-08	0	-2.56E-08	-6.81E-09
SQP	SQP	4.28E+01	5.61E-01	4.62E-01	0	6.65E-02	3.54E-02	3.98E+00	1.54E+00	0	-6.74E+00	-5.66E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 - for the indicator "Potential Human exposure efficiency relative to U235". This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 - for the indicators "abiotic depletion potential for non-fossil resources", "abiotic depletion potential for fossil resources", "water (user) deprivation potential, deprivation- weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans – cancerogenic", "Potential comparative toxic unit for humans - not cancerogenic", "potential soil quality index". The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

The LCA results from the tables above are based on an average Wolfin GWSK FR membrane with a thickness of 2.3 mm. As there is a linear connection between the LCA results for Wolfin GWSK 2.3 mm and Wolfin GWSK 2.8 mm, the following formula can be used for calculating the results of all evaluation categories and modules for Wolfin GWSK 2.8 mm:

P(W2.8) = P(W2.3) * 1.22
Where:
* P(W2.8)= LCA indicator (e.g. GWP) for Wolfin GWSK 2.8 mm
* P(W2.3)= LCA indicator (e.g. GWP) for Wolfin GWSK 2.3 mm
This EPD was created using a software tool.

6. LCA: Interpretation

The data show that the impacts from module A1 dominate across most impact categories, indicating that raw materials are the main environmental hotspot for synthetic membranes. PVC and plasticisers represent over 70% of the total mass and are the main contributors among all materials to the environmental burdens, explaining the strong dominance of module A1 compared to all other stages in most categories. In comparison, the transport, manufacturing, and installation modules have only a minor influence on the overall results.

Scenario 2 (incineration) results in considerably higher CO_2 emissions in module C3, mainly due to combustion, while the associated recovery credits are around 65% lower than in Scenario 1 (recycling). Differences are also observed across several other categories, such as water use, likely due to the higher process-water demand typical of waste-to-energy systems.

Overall, the environmental performance of these membranes is primarily determined by their raw material inputs. Ongoing efforts within the company and across the wider industry aim to increase polymer recycling rates and the proportion of recycled content, which is expected to lead to a further reduction of their overall environmental impact.

7. Requisite evidence

There is no requisite evidence required for the declared product.

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