



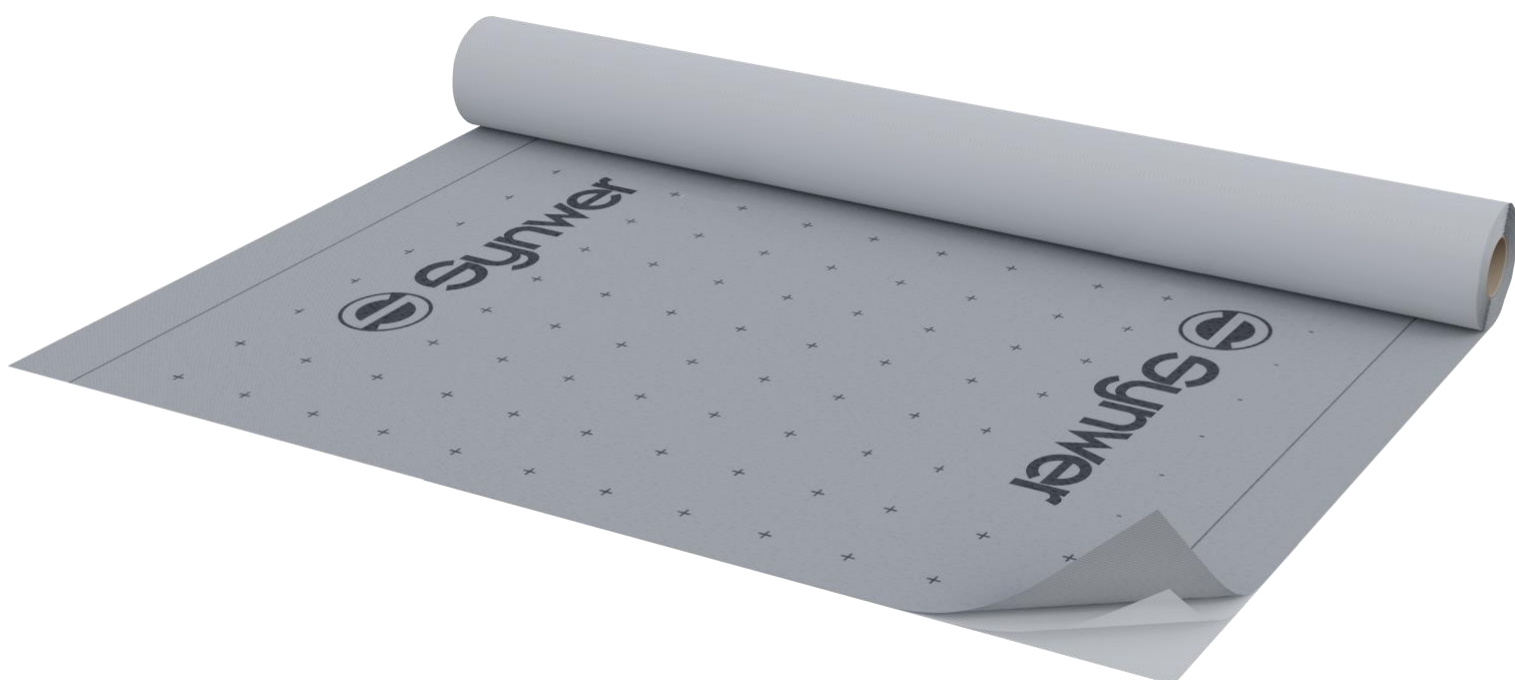
# Environmental Product Declaration

as per ISO 14025 and EN 15804

|                           |                        |
|---------------------------|------------------------|
| Owner of the declaration: | Synwer GmbH            |
| Publisher:                | Kiwa-Ecobility Experts |
| Programme operator:       | Kiwa-Ecobility Experts |
| Registration number:      | EPD-Synwer-177-EN      |
| Issue date:               | 23.09.2022             |
| Valid to:                 | 22.09.2027             |

## Synwer® – Head Protector FH 170

Breathable membrane for pitch roof and wall



**1. General information**

**Synwer GmbH**

**Programme operator**  
 Kiwa-Ecobility Experts  
 Voltastr. 5  
 13355 Berlin  
 Germany

**Declaration number**  
 EPD-Synwer-177-EN

**This declaration is based on the Product Category Rules**

PCR B - Plastic and rubber sheets for roof, wall, and floor waterproofing, 2021-12-28 (draft)

**Issue date**  
 23.09.2022

**Valid to**  
 22.09.2027



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**Synwer – Head Protector FH 170**

**Owner of the declaration**  
 Synwer GmbH  
 Gierlichsstraße 23  
 53840 Troisdorf  
 Germany

**Declared product / declared unit**  
 1 m<sup>2</sup> breathable membrane for pitch roof and wall

**Scope**

Head Protector FH 170 is breathable membrane for pitch roof and wall is a product of the product series Head Protector. It is produced and distributed by Synwer GmbH, located in Troisdorf (Germany). The EPD refers to the specific product.

EPD type: Cradle to gate with modules C1-C4 and module D

Kiwa-Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidence.

**Verification**

The European standard EN 15804+A2:2019 serves as the core PCR.

Independent verification of the declaration and data according to ISO 14025:2011-10

internal

external



Niels Jonkers - PLUK sustainability  
 (Third party verifier)

## 2. Product

### 2.1 Product description

Head Protector FH 170 is a highly diffusible three-layer membranes for pitch roof and wall made of two layers of polypropylene (PP) fleece and an in-between layer of polyurethan (PU) film. The PU film is glued together with the PP fleece with a PU adhesive. This product is heat and UV resistant, its outdoor exposure is up to 8 months and it is resistant against driving rain. The membranes can be applied under solar modules.

### 2.2 Application

Breathable membranes are installed either under flat or inclined roof constructions and/or on walls. The main purpose of the product is protection of the building against penetrating moisture.

### 2.3 Technical data

| Essential characteristics                                 | Unit             | Performance       |
|---|------------------|-------------------|
| Length (EN 1848-2)  | m                | 50                |
| Width (EN 1848-2)   | m                | -                 |
| Mass per unit area (EN 1849-2)                            | g/m <sup>2</sup> | 170 (±10)         |
| Resistance to water penetration (EN 1928 Method A)        | -                | W1                |
| Water vapour transmission (DIN EN ISO 12572)              | m                | 0.08-0.16 (±n.s.) |
| Reaction to fire (EN 13501-1)                             | -                | Class E           |
| Tensile strength MD (EN 12311-1)                          | N/50mm           | 320 (± n.s.)      |
| Tensile strength CD (EN 12311-1)                          | N/50mm           | 220 (± n.s.)      |
| Elongation MD (EN 12311-1)                                | %                | 55 (±n.s.)        |
| Elongation CD (EN 12311-1)                                | %                | 75 (±n.s.)        |
| Tear resistance MD (EN 12310-1)                           | N                | 170 (± n.s.)      |
| Tear resistance CD (EN 12310-1)                           | N                | 230 (± n.s.)      |
| Determination of flexibility at low temperature (EN 1109) | °C               | /                 |
| After artificial ageing (EN 13859-1; EN13859-2)           |                  |                   |
| Resistance to water penetration (EN 1928 Method A)        | -                | -                 |
| Tensile strength MD (EN 12311-1)                          | N/50mm           | -                 |
| Tensile strength CD (EN 12311-1)                          | N/50mm           | -                 |
| Elongation MD <sup>1</sup> (EN 12311-1)                   | %                | -                 |
| Elongation CD <sup>1</sup> (EN 12311-1)                   | %                | -                 |
| Hazardous substances                                      | -                | no                |
| Classification according to product data sheet ZVDH       | -                |                   |
| Impact test TU Berlin                                     | -                |                   |
| Outdoor exposure time                                     | months           | -                 |
| Temperature resistance                                    | °C               | - 40/+80          |

### 2.4 Placing on the market/ Application rules

In the EU/EFTA (excluding Switzerland) the placing on the market is covered by Regulation (EU) No. 305/2011 of 9 March 2011. For the product use the respective national provisions shall apply. The products are packed and transported as rolls. The products need a declaration in accordance with EN 13859-2:2014 (Flexible sheets for waterproofing) and the CE marking.

## 2.5 Base materials / Ancillary materials

Head Protector 170 FH is made of PP fleece, PU foil and PU adhesive.

| Raw material               | Unit | Value  |
|----------------------------|------|--------|
| Polypropylene (PP) fleece* | %    | 74-77% |
| Polyurethan (PU) film      | %    | 18-19% |
| Polyurethan (PU) adhesive  | %    | 4-8%   |

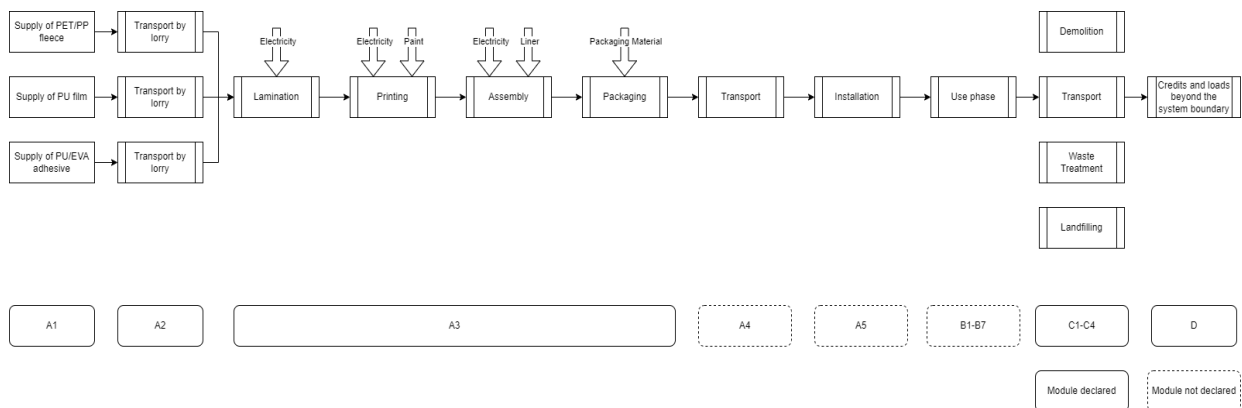
There is no biogenic carbon in the products.

The product does not contain substances listed on the "Candidate list of substances of very high concern for authorisation" which exceed the limits for registration with EChA.

## 2.6 Manufacturing

The manufacturing is located at Synwer GmbH, Gierlichsstraße 23, 53840 Troisdorf, Germany. The top and bottom fleece (PP) as well as film (PU) are already supplied and delivered as a finished product. The top fleece differs from the bottom web in terms of thickness. The fleeces are laminated to the up and downside of a film. Prior to the lamination, the glue is melted in extruders and subsequently applied to the fleece via slot dies. Subsequently a logo is printed on the product, and it is cut in size. If necessary self-adhesive tapes are applied to the side edges of the side of the webs. Finally, the rolls are stacked on reusable pallets and in packed in foil.

The manufacturing process is shown in the following figure:



**Figure 1: Process flow chart of the production of Head Protector**

## 2.7 Packaging

The breathable membranes for pitch roof and wall are wrapped on a cardboard winding tube. The rolls are then packed in PE film and stacked on reusable pallets, which are also packed in PE plastic film. All packaging materials are recyclable or even reusable (pallets).

## 2.8 Reference Service Life (RSL)

The RSL of a membrane is strongly dependant on the RSL of the roof. If the product is installed properly a RSL of 30 years can be assumed (BNB Service Life of Building Components).

### 3. LCA: Calculation rules

#### 3.1 Declared unit

In accordance with the PCR B 1 m<sup>2</sup> membrane is chosen as the declared unit.

| Product                   | Unit                    | Value |
|---------------------------|-------------------------|-------|
| Declared Unit             | m <sup>2</sup> membrane | 1     |
| Unit weight               | g/m <sup>2</sup>        | 170   |
| Conversion factor to 1 kg | -                       | 5.88  |

#### 3.2 System boundary

The EPD is a complete life cycle with a functional unit. It considers all potential environmental impacts of the product from the cradle to the end of life. Table under LCA: Results provides an overview of the information modules or product life cycle phases considered in the LCA. The manufacturing phase includes the production or extraction and processing of raw materials, the transport to the respective production plant and the production of the breathable membrane for pitch roof and wall. All inputs (raw materials, precursors, energy, and auxiliary materials) as well as the by-products and waste are considered for all life cycle phases. Finally, only production-related energy consumption (excluding administration and social rooms) is considered.

The year 2020 represents the time reference for raw materials and electricity consumption. Due to the production location Germany is considered as the geographical reference area. However, environmental effects such as the greenhouse effect can occur with a strong spatial and temporal offset.

The following production steps are considered during the manufacturing phase:

- Extraction and processing of the raw materials (fleece (PP/PE), foil (PU), adhesive (PU/EVA))
- Transport to the production site
- Processing of the products (lamination, printing, cutting, rewinding, finishing)
- Packaging (including packaging material)
- End-of-life (including transport)

Secondary fuels are not included in the production process and are therefore not considered. The waste materials and quantities produced are included in the respective modules.

#### 3.3 Estimates and assumptions

All datasets chosen for the LCA refer to the EU as the geographic reference. Transport distances for all raw materials used (raw materials, operating materials, packaging) could be recorded. A payload factor of 50 percent was used for all truck transports (suppliers, disposal transports and internal transports), which corresponds to a full delivery and empty return trip. A data set for a non-specific truck was used for phase A2. For the end-of-life waste scenario 100% incineration has been assumed. The end-of-life waste scenario per input material has been chosen and for each raw material 100% incineration has been modeled.

#### 3.4 Cut-off criteria

All flows that contribute more than 1% on the total mass, energy or environmental impact are included in the LCA. It can be assumed that the neglected processes would have contributed less than 5% to the impact categories considered. All process specific data could be determined and modelled using generic data (EcoInvent 3.6).

### **3.5 Period under review**

All process-specific data was collected for the operating year 2020. The quantities of raw and auxiliary materials as well as energy consumption have been recorded and averaged over the entire operating year 2020.

### **3.6 Data quality**

Overall, the quality of the data can be considered as good. In the operating data survey, all relevant process-specific data could be collected. The data relating to the manufacturing, transports and packaging of breathable membranes for pitch roof and wall were determined by the Synwer GmbH.

Secondary data were taken from the EcoInvent database, version 3.6. The database is regularly updated and thus complies with the requirements of ISO 14044 (background data not older than 10 years). The background data meets the requirements of EN 15804. The quantities of raw materials, consumables and suppliers used as well as the energy consumption have been recorded and averaged over the entire year of operation. The general rule has been complied that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

The selection of the best fitting data sets is based on research and the help of experts. The transport distances for the waste treatments as well as the used environmental profiles for loads and benefits are based on the data from the NIBE EPD online application R<THiNK.

### **3.7 Allocation**

Allocations were avoided as far as possible. There are no coproducts or byproduct in the manufacturing of breathable membranes for pitch deck and walls. Based on energy consumption measurements, the energy requirements of production were allocated to the individual products. Recyclebare production waste (PP and PE fleece) is collected and sold to the third party. The production waste sent to incineration is modelled through the combustion process of the specific material and the avoided conventional energy production is credited in module D.

### **3.8 Comparability**

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

#### 4. LCA: Scenarios and additional technical information

For C1 it has been assumed that the product can be uninstalled manually by using hand cutting tools.

The end-of-life waste scenario per input material has been chosen and for each row material 100% incineration has been modeled under the consideration of suitable loads and benefits.

Note: The transport distances of the waste are based on the standard waste scenarios of the NMD Determination Method (SBK 2019): incineration 150 km/ recycling 50 km / landfill 100 km; vehicle: truck, unspecified. For energy recovery, it is assumed that only fossil raw materials are substituted, considering the calorific values of the raw materials of the declared product and energy and thermal efficiencies of 18% and 32%. According the EN 15804, loads are credited in A3 or C3 to C4 and benefits are credited in module D.

#### 5. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared specific product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IRP: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

**Description of the system boundary**

| Product stage       |           |                 | Construction process stage                    |                                    | Use stage |               |        |             |                |                        |                       | End of life stage             |           |                  |          | Benefits and loads beyond the system boundaries |
|---------------------|-----------|-----------------|---|------------------------------------|-----------|---------------|--------|-------------|----------------|------------------------|-----------------------|-------------------------------|-----------|------------------|----------|---|
| Raw material supply | Transport | Manu- facturing | Transport from manu- facturer to place of use | Construction -installation process | Use       | Main- tenance | Repair | Replacement | Refur- bishmen | 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               | MND   | MND                                | MND       | MND           | MND    | MND         | MND            | MND                    | MND                   | X                             | X         | X                | X        | X   |

X=Module declared | MND=Module not declared

**Results of the LCA – Environmental impact: 1 m<sup>2</sup> Head Protector FH 170**

| Parameter   | Unit                      | A1       | A2       | A3        | C1       | C2       | C3       | C4       | D         |
|---|---------------------------|----------|----------|-----------|----------|----------|----------|----------|-----------|
| <b>Core environmental impact indicators (EN 15804+A2)</b>       |                           |          |          |           |          |          |          |          |           |
| ADP-mm  | kg Sb-eqv                 | 5,41E-06 | 4,51E-07 | 1,18E-06  | 0,00E+00 | 8,72E-08 | 1,04E-07 | 0,00E+00 | -5,38E-07 |
| ADP-f   | MJ                        | 1,51E+01 | 2,68E-01 | 3,12E+00  | 0,00E+00 | 5,19E-02 | 9,28E-02 | 0,00E+00 | -4,32E+00 |
| AP  | mol H <sup>+</sup> eqv.   | 2,38E-03 | 1,03E-04 | 7,33E-04  | 0,00E+00 | 2,00E-05 | 1,45E-04 | 0,00E+00 | -5,48E-04 |
| EP-fw   | kg PO4 eqv.               | 2,04E-05 | 1,80E-07 | 2,61E-05  | 0,00E+00 | 3,47E-08 | 7,33E-08 | 0,00E+00 | -2,62E-05 |
| EP-m  | kg N eqv.                 | 4,84E-04 | 3,64E-05 | 1,51E-04  | 0,00E+00 | 7,03E-06 | 7,71E-05 | 0,00E+00 | -1,01E-04 |
| EP-t  | mol N eqv.                | 4,29E-03 | 4,01E-04 | 1,77E-03  | 0,00E+00 | 7,75E-05 | 7,63E-04 | 0,00E+00 | -1,49E-03 |
| GWP-b   | kg CO <sub>2</sub> eqv.   | 3,23E-03 | 8,22E-06 | -1,74E-02 | 0,00E+00 | 1,59E-06 | 1,56E-05 | 0,00E+00 | -1,42E-02 |
| GWP-f   | kg CO <sub>2</sub> eqv.   | 5,90E-01 | 1,78E-02 | 2,26E-01  | 0,00E+00 | 3,44E-03 | 4,41E-01 | 0,00E+00 | -2,94E-01 |
| GWP-luluc   | kg CO <sub>2</sub> eqv.   | 1,91E-04 | 6,52E-06 | 3,17E-04  | 0,00E+00 | 1,26E-06 | 1,53E-06 | 0,00E+00 | -2,10E-04 |
| GWP-total   | kg CO <sub>2</sub> eqv.   | 5,93E-01 | 1,78E-02 | 2,09E-01  | 0,00E+00 | 3,44E-03 | 4,41E-01 | 0,00E+00 | -3,08E-01 |
| ODP   | kg CFC 11 eqv.            | 9,87E-09 | 3,93E-09 | 7,56E-09  | 0,00E+00 | 7,60E-10 | 9,22E-10 | 0,00E+00 | -2,39E-08 |
| POCP  | kg NMVOC eqv.             | 1,70E-03 | 1,14E-04 | 4,25E-04  | 0,00E+00 | 2,21E-05 | 1,82E-04 | 0,00E+00 | -3,21E-04 |
| WDP   | m <sup>3</sup> world eqv. | 4,90E-01 | 9,60E-04 | 6,12E-02  | 0,00E+00 | 1,86E-04 | 7,60E-03 | 0,00E+00 | -6,40E-03 |
| <b>Additional environmental impact indicators (EN 15804+A2)</b> |                           |          |          |           |          |          |          |          |           |
| ETP-fw  | CTUe                      | 1,46E+01 | 2,39E-01 | 3,64E+00  | 0,00E+00 | 4,63E-02 | 3,84E-01 | 0,00E+00 | -1,58E+00 |
| HTP-c   | CTUh                      | 1,73E-10 | 7,76E-12 | 6,43E-11  | 0,00E+00 | 1,50E-12 | 2,20E-11 | 0,00E+00 | -3,61E-11 |
| HTP-nc  | CTUh                      | 7,79E-09 | 2,62E-10 | 2,35E-09  | 0,00E+00 | 5,06E-11 | 8,62E-10 | 0,00E+00 | -1,30E-09 |
| IRP   | kBq U235 eqv.             | 8,88E-03 | 1,12E-03 | 7,74E-03  | 0,00E+00 | 2,17E-04 | 1,19E-04 | 0,00E+00 | -8,23E-03 |
| PM  | disease incidence         | 3,22E-08 | 1,60E-09 | 6,37E-09  | 0,00E+00 | 3,10E-10 | 5,40E-10 | 0,00E+00 | -1,93E-09 |
| SQP   | -                         | 7,44E-01 | 2,33E-01 | 2,86E+00  | 0,00E+00 | 4,50E-02 | 1,90E-02 | 0,00E+00 | -4,46E-01 |

**ADP-mm**=Abiotic depletion potential for non-fossil resources | **ADP-f**=Abiotic depletion for fossil resources potential | **AP**=Acidification potential, Accumulated Exceedance | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment | **EP-T**=Eutrophication potential, Accumulated Exceedance | **GWP-b**=Global Warming Potential biogenic | **GWP-f**=Global Warming Potential fossil fuels | **GWP-luluc**=Global Warming Potential land use and land use change | **GWP-total**=Global Warming Potential total | **ODP**=Depletion potential of the stratospheric ozone layer | **POCP**=Formation potential of tropospheric ozone | **WDP**=Water (user) deprivation potential, deprivation- weighted water consumption | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems | **HTP-c**=Potential Toxic Unit for Humans toxicity, cancer | **HTP-nc**=Potential Toxic Unit for humans, non-cancer | **IRP**=Potential Human exposure efficiency relative to U235, human health | **PM**=Potential incidence of disease due to Particulate Matter emissions | **SQP**=Potential soil quality index



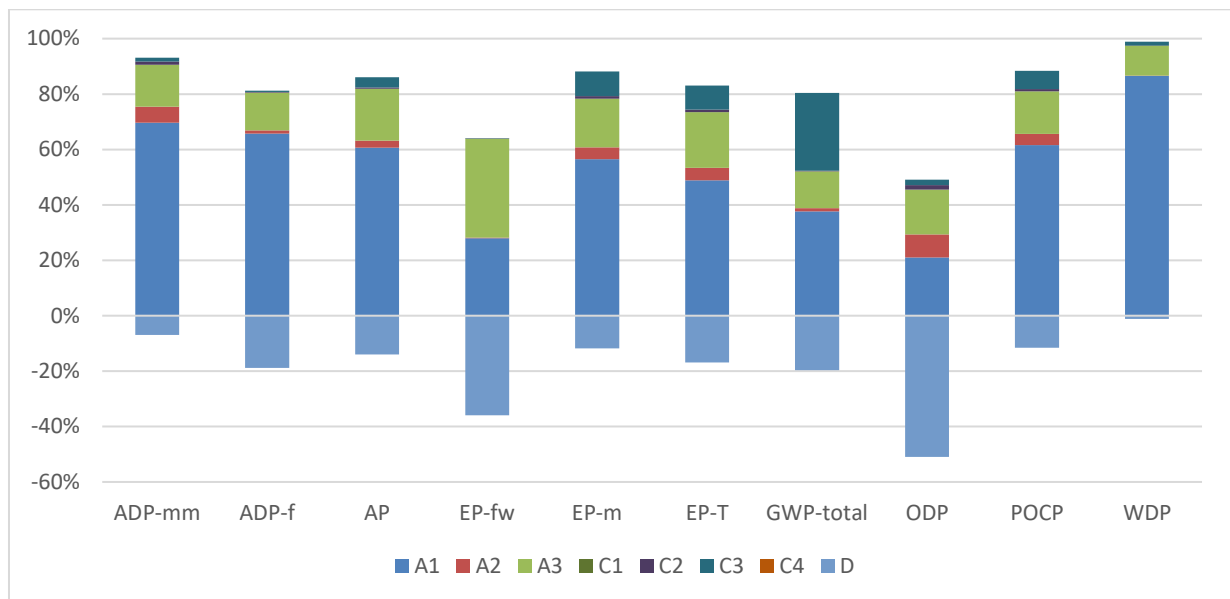
**Results of the LCA – Resource u and environmental information: 1 m<sup>2</sup> Head Protector FH 170**

| Parameter | Unit | A1       | A2       | A3       | C1       | C2       | C3       | C4       | D         |
|-----------|------|----------|----------|----------|----------|----------|----------|----------|-----------|
| PERE      | MJ   | 4,19E-01 | 3,36E-03 | 5,84E-01 | 0,00E+00 | 6,50E-04 | 1,76E-03 | 0,00E+00 | -2,95E-01 |
| PERM      | MJ   | 0,00E+00 | 0,00E+00 | 7,96E-02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00  |
| PERT      | MJ   | 4,19E-01 | 3,36E-03 | 6,66E-01 | 0,00E+00 | 6,50E-04 | 1,76E-03 | 0,00E+00 | -2,95E-01 |
| PENRE     | MJ   | 1,07E+01 | 2,85E-01 | 2,99E+00 | 0,00E+00 | 5,51E-02 | 1,02E-01 | 0,00E+00 | -4,71E+00 |
| PENRM     | MJ   | 5,48E+00 | 0,00E+00 | 3,14E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00  |
| PENRT     | MJ   | 1,62E+01 | 2,85E-01 | 3,35E+00 | 0,00E+00 | 5,51E-02 | 1,02E-01 | 0,00E+00 | -4,71E+00 |
| SM        | 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  |
| 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   | 1,00E-02 | 3,27E-05 | 2,27E-03 | 0,00E+00 | 6,32E-06 | 2,46E-04 | 0,00E+00 | -1,01E-03 |
| HWD       | Kg   | 2,16E-06 | 6,80E-07 | 1,12E-06 | 0,00E+00 | 1,32E-07 | 4,45E-07 | 0,00E+00 | -3,20E-06 |
| NHWD      | Kg   | 2,52E-02 | 1,70E-02 | 1,63E-02 | 0,00E+00 | 3,29E-03 | 5,33E-03 | 0,00E+00 | -9,87E-03 |
| RWD       | Kg   | 7,67E-06 | 1,76E-06 | 9,57E-06 | 0,00E+00 | 3,41E-07 | 1,59E-07 | 0,00E+00 | -1,07E-05 |
| 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 | 1,13E-02 | 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 | 1,76E-03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00  |

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 fresh water | 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 | EE=Exported energy

## 6. LCA: Interpretation

As shown in the figure below, A1 (raw material supply) and A3 (manufacturing) dominate in most environmental core indicators. The highest impact among raw materials is attributed to the fleece, followed by the film. Lamination has the highest influence within the manufacturing phase (module A3). The highest benefits beyond system boundaries (module D) originate from the incineration of virgin materials fleece and film at the end-of-life of the product. All transports (modules A2, C2) have only a minor impact within all environmental core indicators.



**Figure 2: Head Protector FH 170 - Impact of the individual modules on the environmental core indicators**

The data quality can be classified as good overall. All relevant process-specific data could be collected in the operational data collection. Consistent data sets from the EcoInvent database (version 3.6) were available for almost all inputs and outputs. The background data meet the requirements of EN 15804, and the production data were recorded for the 2020 operating year. The quantities of raw materials and supplies used as well as energy consumption were recorded for the entire operating year.

## 7. References

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