

Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021, except those parts related to publish an EPD via a program operator, for the specific:

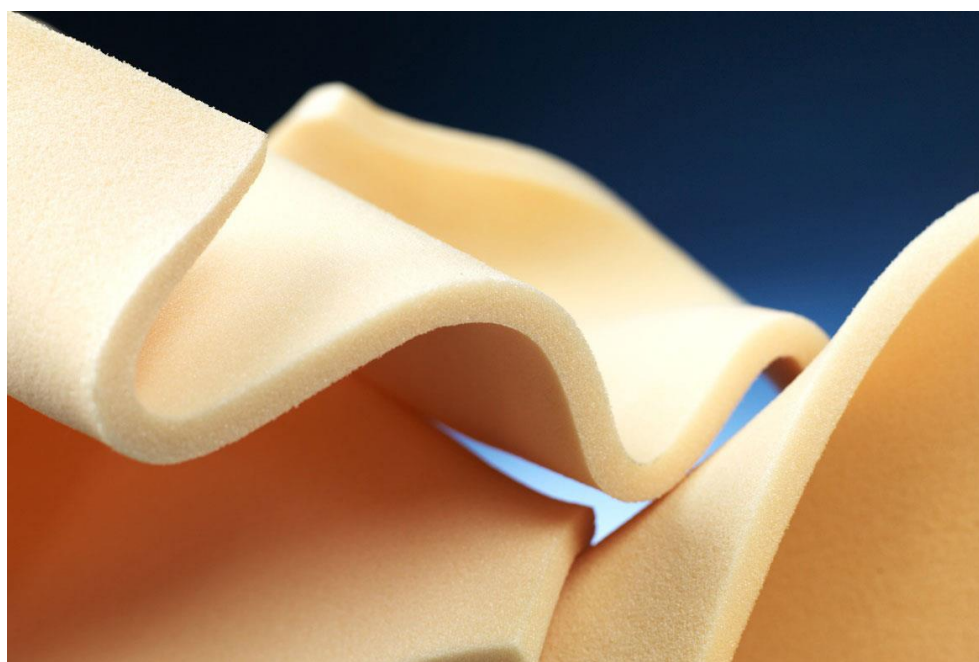
Divinycell H

from

Diab Group AB

| | |
|----------------------|------------------------|
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| Third party verifier | Martin Erlandsson, IVL |

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General information

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Diab Group AB

Contact: Per Hökfelt, VP Sustainability & QEHS

Description of the organization:

Diab is a global company that develops, manufactures, and sells core materials for sandwich composite structures used in for example leisure boats, wind turbine blades and components for aircraft, trains, industrial applications, and buildings. The core materials have a combination of characteristics such as low weight, high strength, insulation properties and chemical resistance.

The company has production units in Sweden, Italy, US, Lithuania, and China.

The market for core material is growing due to the underlying demand for energy efficiency, which is leading to a greater need for high-strength, lightweight solutions. Wind turbines, leisure boats and various applications requiring the combination of lightweight and high strength are the main application areas for the material.

Product-related or management system-related certifications: Diab is a world leader in high-performance composite core materials. Diab has developed composite core material development for over sixty years, supplying a wide range of markets including marine, wind energy, transport, aerospace and industry. Diab has ISO 9001- and 14001-certificates

Name and location of production site:

Diab produces PVC core materials at one location in Sweden and one location in China

Product information

Product name: IPN grades: Divinycell H, HP, HM, HCP, HT, MX and CY

Product identification: Divinycell IPN Grades (Interpenetrating Polymer Network)

Product description: Divinycell IPN is a mixture of thermoplastic PVC and thermoset polyurea and polyamide. The main products are available in sheets ranging from appr. 90 mm down to 0,5mm. Further it can be milled and grooved to various structures according to customer requests. The IPN core is used in various sandwich constructions and has a proven track record in virtually every application area where sandwich composites are employed including the marine (leisure, military and

commercial), land transportation, wind energy, civil engineering/infrastructure, buildings and general industrial markets.

Datasheets for all specific grades are available for all Divinycell IPN-grades on our website www.diabgroup.com.

UN CPC code: 363 (semi-manufactures of plastics)

Geographical scope: The production occurs in Sweden and China. Since the PVC core is used globally, the end-of-life scenario has been calculated with global data.

LCA information

Functional unit / declared unit: 1 kg lightweight Divinycell IPN core material block

Reference service life: Minimum 25 years

Time representativeness: Data representative for production year 2021.

Database and LCA software used: Ecoinvent 3.8 and SimaPro 9.3

Description of system boundaries:

A1: Extraction and processing of raw materials and Generation of electricity, steam and heat from primary energy resources

A2: Transports from suppliers to Diab and in between production units

A3: Manufacturing of the product at Diab and packaging materials used. The PVC is used in various sandwich constructions.

A5: Waste handling of packaging material

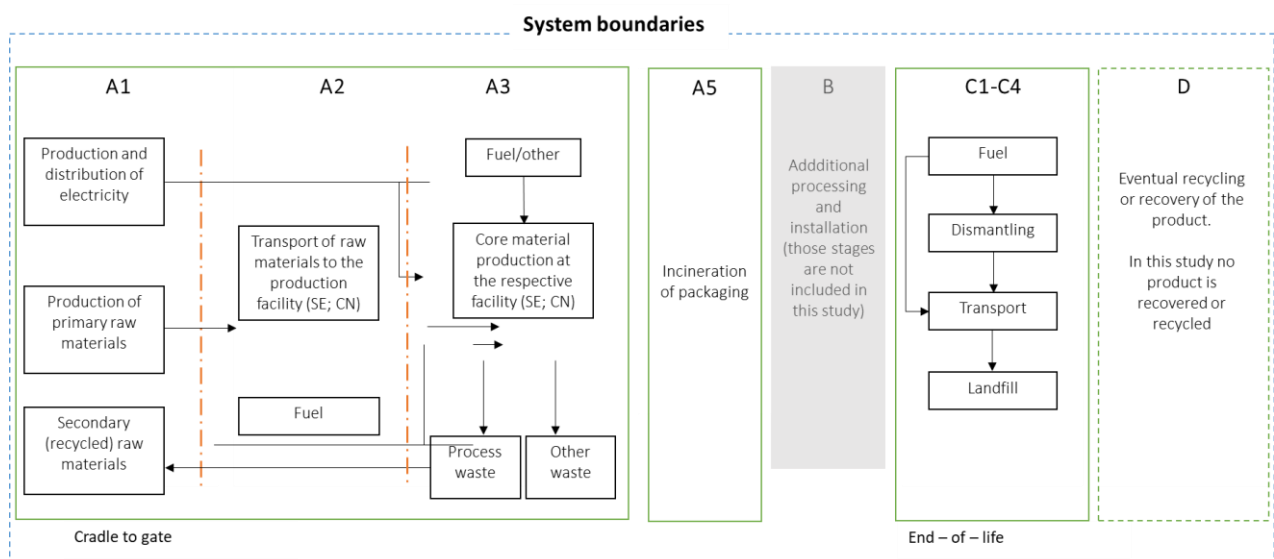
C1: The products are demolished and cut into manageable sizes before being sent off to landfill.

C2: Transportation of the material to landfill

C3: No reuse, recycling or recovery is considered.

C4: Currently, there is no reliable technology to separate the PES from the sandwich construction to be recycled. The PVC is therefore assumed to be landfilled.

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

| | Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Resource recovery stage |
|----------------------|---------------------|-------------|---------------|----------------------------|---------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|------------------------------------|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| Module | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules declared | x | x | x | ND | x | ND | ND | ND | ND | ND | ND | ND | x | x | x | x | x |
| Geography | SE, CN, GLO | SE, CN, GLO | SE, CN, GLO | - | GLO | - | - | - | - | - | - | - | GLO | GLO | GLO | GLO | GLO |
| Specific data used | 31 % | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | - | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | +/- 70 % | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Content information

| Product components | % | Post-consumer material, weight-% | Biogenic material, weight-% and kg C/kg |
|---------------------|------------|----------------------------------|---|
| PVC | < 50 | 0 | |
| Anhydride | < 1 | 0 | |
| AZDN | <1 | 0 | |
| Isocyanate | < 50 | 0 | |
| TOTAL | 100 | 0 | |
| Packaging materials | Weight, kg | Weight-% (versus the product) | Weight biogenic carbon, kg C/kg |
| Cardboard | 0,026 | 0,026 | 0,011 |
| TOTAL | 0,026 | | |

Diab declares that the product does not contain substances from the candidate list of SVHC for Authorization in levels above 0.1% by weight.

Scenario and technical information

Additional information for module A5, Installation in the building. In the calculations for Divinycell IPN grades only handling of packaging material is included in the calculation.

| Scenario information | Unit (expressed per functional unit or per declared unit) | |
|--|--|----------------------------------|
| Ancillary materials for installation (specified by material) | kg | Not included in the calculations |
| Water use | m ³ | Not included in the calculations |
| Other resources use | kg | Not included in the calculations |
| Quantitative description of energy type (regional mix) and consumption during the installation process | kWh or MJ | Not included in the calculations |
| Waste materials on the building site before waste processing, generated by the product's installation | kg | Cardboard: 0,0258 |
| Output materials as result of waste processing at the building site e.g. of collection for recycling for energy recovery, disposal | kg | Not included in the calculations |
| Direct emissions to ambient air, soil and water | kg | Not applicable |

Additional information for module C, End-of-life.

In the end-of-life stage the product is separated from the construction and thereafter sent to landfill. Presently, there exists no methodology to separate the constituent materials and recycle the components separately. There is, however, ongoing research in the area. The assumption that all material is going to landfill is a conservative approach considering that polymers possess the potential for energy recovery. However, landfill remains the most likely scenario at the moment.

| End-of-life (C1-C4) | Unit (per declared unit) | Weight |
|--|---|--------|
| Collection processes specified by type | kg collected separately | 1 |
| | kg collected with mixed construction waste | 0 |
| Recovery system specified by type | kg for re-use | 0 |
| | kg for recycling | 0 |
| | kg for energy recovery | 0 |
| Disposal specified by type | kg product or material for final deposition | 1 |
| Assumptions for scenario development e.g. transportation | km | 50 |

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

| Results per functional or declared unit | | | | | | | | | | | |
|---|---|----------|-----------|----------|-----------------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1 | A2 | A3 | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-fossil | kg CO ₂ eq. | 5.69E+00 | 7.59E-02 | 2.63E-01 | 6.03E+00 | 8.60E-04 | 9.93E-01 | 3.32E-02 | 0.00E+00 | 1.05E-02 | 0.00E+00 |
| GWP-biogenic | kg CO ₂ eq. | 2.55E-02 | -2.06E-04 | 3.28E-01 | 3.53E-01 | 4.07E-02 | 3.51E-04 | 2.83E-05 | 0.00E+00 | 1.07E-04 | 0.00E+00 |
| GWP-luluc | kg CO ₂ eq. | 3.64E-03 | 3.38E-05 | 1.61E-04 | 3.83E-03 | 2.91E-07 | 9.91E-05 | 1.31E-05 | 0.00E+00 | 1.07E-05 | 0.00E+00 |
| GWP-total | kg CO ₂ eq. | 5.72E+00 | 7.57E-02 | 5.91E-01 | 6.38E+00 | 4.16E-02 | 9.93E-01 | 3.33E-02 | 0.00E+00 | 1.06E-02 | 0.00E+00 |
| ODP | kg CFC 11 eq. | 4.52E-06 | 1.80E-08 | 4.09E-10 | 4.53E-06 | 7.09E-11 | 2.12E-07 | 7.69E-09 | 0.00E+00 | 3.20E-09 | 0.00E+00 |
| AP | mol H ⁺ eq. | 4.41E-02 | 4.20E-04 | 1.20E-09 | 4.45E-02 | 7.19E-06 | 1.03E-02 | 1.35E-04 | 0.00E+00 | 8.90E-05 | 0.00E+00 |
| EP-freshwater | kg P eq. | 1.66E-03 | 5.77E-06 | 1.29E-10 | 1.66E-03 | 1.02E-07 | 3.08E-05 | 2.14E-06 | 0.00E+00 | 3.05E-06 | 0.00E+00 |
| EP-marine | kg N eq. | 8.83E-03 | 1.26E-04 | 0.00E+00 | 8.95E-03 | 3.68E-06 | 4.57E-03 | 4.06E-05 | 0.00E+00 | 3.07E-05 | 0.00E+00 |
| EP-terrestrial | mol N eq. | 6.94E-02 | 1.38E-03 | 1.12E-10 | 7.08E-02 | 3.21E-05 | 5.01E-02 | 4.44E-04 | 0.00E+00 | 3.34E-04 | 0.00E+00 |
| POCP | kg NMVO C eq. | 2.22E-02 | 4.22E-04 | 6.39E-02 | 8.65E-02 | 7.90E-06 | 1.38E-02 | 1.36E-04 | 0.00E+00 | 9.66E-05 | 0.00E+00 |
| ADP-minerals & metals* | kg Sb eq. | 6.09E-05 | 2.38E-07 | 1.07E+00 | 1.07E+00 | 2.30E-09 | 5.11E-07 | 1.16E-07 | 0.00E+00 | 3.44E-08 | 0.00E+00 |
| ADP-fossil* | MJ | 1.03E+02 | 1.22E+00 | 1.66E+00 | 1.06E+02 | 5.87E-03 | 1.36E+01 | 5.03E-01 | 0.00E+00 | 2.47E-01 | 0.00E+00 |
| WDP* | m ³ | 1.18E+03 | 4.59E-02 | 2.63E-01 | 1.18E+03 | 9.57E-04 | 2.13E-02 | 1.50E-03 | 0.00E+00 | 1.08E-02 | 0.00E+00 |
| Acronyms | GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption | | | | | | | | | | |

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact – additional mandatory and voluntary indicators

| Results per functional or declared unit | | | | | | | | | | | |
|---|------------------------|----------|----------|----------|-----------------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1 | A2 | A3 | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-GHG ¹ | kg CO ₂ eq. | 5.69E+00 | 7.60E-02 | 2.63E-01 | 6.03E+00 | 8.60E-04 | 9.93E-01 | 3.33E-02 | 0.00E+00 | 1.05E-02 | 0.00E+00 |

Use of resources

| Results per functional or declared unit | | | | | | | | | | | |
|---|---|----------|----------|----------|-----------------|-----------|----------|----------|----------|-----------|----------|
| Indicator | Unit | A1 | A2 | A3 | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
| PERE | MJ | 1.50E+01 | 2.51E-02 | 3.16E-01 | 1.54E+01 | 4.23E-02 | 7.66E-02 | 7.08E-03 | 0.00E+00 | 4.19E-03 | 0.00E+00 |
| PERM | 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 | 0.00E+00 |
| PERT | MJ | 1.50E+01 | 2.51E-02 | 3.16E-01 | 1.54E+01 | 4.23E-02 | 7.66E-02 | 7.08E-03 | 0.00E+00 | 4.19E-03 | 0.00E+00 |
| PENRE | MJ | 1.10E+02 | 1.29E+00 | 1.66E+01 | 1.28E+02 | 7.96E+00 | 1.45E+01 | 5.34E-01 | 0.00E+00 | 2.63E-01 | 0.00E+00 |
| PENRM | MJ | 1.98E+01 | 0.00E+00 | 3.13E-01 | 2.01E+01 | -3.13E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -1.98E+01 | 0.00E+00 |
| PENRT | MJ | 1.30E+02 | 1.29E+00 | 1.69E+01 | 1.48E+02 | 7.65E+00 | 1.45E+01 | 5.34E-01 | 0.00E+00 | -1.95E+01 | 0.00E+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 | 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 | 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 | 0.00E+00 |
| FW | m ³ | 0.00E+00 | 0.00E+00 | 4.90E-03 | 4.90E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Acronyms | <p>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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water;</p> <p>* Energy stored as material in the product and the packing material is direct balanced out and not reported (<5%).</p> | | | | | | | | | | |

¹ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Waste production and output flows

Waste production

| Results per functional or declared unit | | | | | | | | | | | |
|---|------|----------|----------|----------|-----------------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1 | A2 | A3 | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
| Hazardous waste disposed | 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 | 0.00E+00 |
| Non-hazardous waste disposed | kg | 0.00E+00 | 0.00E+00 | 5.03E-01 | 5.03E-01 | 2.58E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 |
| Radioactive waste disposed | 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 | 0.00E+00 |

Output flows

| Results per functional or declared unit | | | | | | | | | | | |
|---|------|----------|----------|----------|-----------------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1 | A2 | A3 | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
| Components for re-use | 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 | 0.00E+00 |
| Material for recycling | 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 | 0.00E+00 |
| Materials for energy recovery | kg | 0.00E+00 | 0.00E+00 | 5.03E-01 | 5.03E-01 | 2.58E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy, electricity | 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 | 0.00E+00 |
| Exported energy, thermal | 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 | 0.00E+00 |

Information on biogenic carbon content

| Results biogenic carbon content | | |
|--------------------------------------|------|----------|
| BIOGENIC CARBON CONTENT | Unit | QUANTITY |
| Biogenic carbon content in product | kg C | 0 |
| Biogenic carbon content in packaging | kg C | 0,007* |

* The inherent energy is assumed to be direct balanced out and therefore not reported as RPEM.

Differences versus previous versions

- Updating calculations according to the new standard EN 15804:2012+A2:2019
- Production site in Italy has been removed.

References

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14 Construction products (EN 15804:A2) (1.3.0)

Ecoinvent 3.8 database, <http://www.ecoinvent.org/>

LCA software SimaPro Analyst 9.3.0.3

Domhagen, M., (2023) LCA of divynycell PET, IPN and PES core materials, Methodology report for the development of EPDs.



www.diabgroup.com