

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

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|--------------------------|--------------------------------------|
| Owner of the Declaration | NMC S.A. |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
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CLIMAFLEX® made of NMC NATUREFOAM®
NMC S.A.

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

1. General Information

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|---|---|--|--|---|--|-------------------------------------|--|
| <p>NMC S.A.</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-NMC-20170078-IBD3-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 07.2017 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 27.04.2017</p> <hr/> <p>Valid to 26.04.2022</p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p> | <p>CLIMAFLEX® made of NMC NATUREFOAM®</p> <hr/> <p>Owner of the Declaration NMC S.A. Gert-Noel Strasse BE-4731 Eynatten</p> <hr/> <p>Declared product / Declared unit 1 m³ insulation material CLIMAFLEX® made of NMC NATUREFOAM®</p> <hr/> <p>Scope: Product line CLIMAFLEX® made of NMC NATUREFOAM® Thermal insulation products for building equipment and industrial insulations made of polyethylene foam (PEF) according to EN14313. This declaration is an Environmental Product Declaration according to /ISO14025/ describing the specific environmental performance of the product produced in Belgium.</p> <p>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.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p>Vito D'Incognito (Independent verifier appointed by SVR)</p> | The CEN Norm /EN 15804/ serves as the core PCR | | Independent verification of the declaration according to /ISO 14025/ | | <input type="checkbox"/> internally | <input checked="" type="checkbox"/> externally |
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| Independent verification of the declaration according to /ISO 14025/ | | | | | | | |
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2. Product

2.1 Product description / Product definition

CLIMAFLEX® made of NMC NATUREFOAM® is a professional bio-polyethylene-based closed-cell foam pipe insulation for continuous energy saving and condensation control purposes. CLIMAFLEX® made of NMC NATUREFOAM® provides solutions that follow all necessary guidelines and standards for any type of installation.

Products with self adhesive strip are available (range XT); this variation with self adhesive strip is not included in the calculations.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 14313/ - Thermal Insulation products for building equipment and industrial installations. Factory made polyethylene foam (PEF) and the CE-marking. For the application and use the respective national provisions apply.

2.2 Application

CLIMAFLEX® made of NMC NATUREFOAM® are used to insulate pipes in industrial installations and building equipment

- Polyethylene foam is a cost-efficient material with good insulating properties.
- Products made of PE foam yield a good cost/performance ratio.
- Polyethylene Foam allows condensation control in fresh-and waste water systems

2.3 Technical Data

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 14313/ apply. Further data:

| Name | Value | Unit |
|--------------------------------------|--------------------|--------|
| Gross density | 28 | kg/m³ |
| Thermal conductivity | 0.036 - 0.045 | W/(mK) |
| Reaction to Fire Acc.to /EN 13501-1/ | BI-s1d0/CI-s1d0/ E | - |

| | | |
|---|------------------------|----|
| Max Service Temperature Acc. to /EN 14707 | 100 | °C |
| Min Service Temperature | 0 | °C |
| Water absorption Acc. to EN 13472 | WS005 | |
| Traces quantities of water soluble ions and pH-value Acc. to EN 13468 | Cl15 - F10 - pH 5.5 | |

2.4 Delivery status

The PE products are supplied as tubes and shaped pieces. The tubes are delivered in lengths of 2 m packed in cardboard. Different insulation thicknesses are available for all common pipe diameters up to an outer diameter of 114 mm. The insulation pipes are available with self-adhesive. This EPD is limited on the foam itself. It does not take into account the closure system.

2.5 Base materials / Ancillary materials

Base materials

CLIMAFLEX® made of NMC NATUREFOAM® are flexible insulation materials based on bio-polyethylene, which is produced using a mixture of up to seven basic component materials. The following table displays an average weighted of different elements of the formulation, and this for the complete CLIMAFLEX® made of NMC NATUREFOAM® product range. The CLIMAFLEX® range is composed of 2 groups whose formulation differs slightly according to their fire rating. For small thickness products (5, 9 and 13mm) the fire classification is Euroclass BI s1 d0 (Acc. to EN /13501-1/) and for large thickness products (20 and 25mm) the fire rating is Euroclass CI s1 d0 (Acc. to EN /13501-1/). This LCA study was carried out on the basis of the weighted average of the 2 ranges.

| Name | Value | Unit |
|----------------------------|-------|------|
| BIO-PE | 57,1 | % |
| NMC Internally recycled PE | 15,7 | % |
| LLDPE | 6,0 | % |
| Flame retardant | 4,4 | % |
| Pigment 1 Black | 0,6 | % |
| Pigment 2 | 2,1 | % |
| Volume stabilizer | 1,5 | % |
| Blowing Agent | 12,5 | % |

BIO-PE and fillers are the main components of the product and are responsible for the characteristics and performance of the product

The blowing agent causes the expansion during manufacturing. The flame retardant ensures the fire resistance and conformity with fire protection regulations (see section 2.13).

According the European Chemicals Regulation "REACH" manufacturers, importers and downstream users must register their chemicals and are responsible for their safe use. NMC S.A. uses exclusively verifiably registered and approved substances in its production. Products manufactured and put on the market by NMC do need to be registered. CLIMAFLEX® made of NMC NATUREFOAM® do not contain SVHC substances. Antimony trioxide and halogenated flame retardants are applied.

2.6 Manufacture

The manufacturing process consists of a continuous extrusion. Solid pellets of thermoplastic resin are fed into a melting zone in which the resin is melted, to form a flowable thermoplastic mass. The thermoplastic mass is then metered to a mixing zone where it is thoroughly mixed with a blowing agent under pressure. The mixture of thermoplastic resin and blowing agent is then forced through a die, which imparts a shape to the thermoplastic mass, into a zone of lower pressure (i.e. atmospheric pressure). The blowing agent expands to form the cells of the foam and the thermoplastic foam is cooled through an inline water cooler. At the end of the inline cooler the profiles are cut to the required dimensions.

Quality assurance :

The manufacture is certified ISO 9001 for the quality management and the product is certified for CE marking according CPR (CE Certificate of conformity N° 0749-CPR-BC1-571-4133-0001-01 and 0749-CPR-BC1-571-4133-0002-01)

2.7 Environment and health during manufacturing

During all manufacturing steps of NMC S.A. Belgium, the production follows all national guidelines and regulations. Solar panels are installed on the roof of the warehouse to reduce the requirement for grid electricity.

2.8 Product processing/Installation

CLIMAFLEX® made of NMC NATUREFOAM® can be installed using basic tools (e.g. craft knives). No special tools, nor specific protection is necessary. When applying adhesives the information given in the relevant safety data sheets is to be heeded. Any glue and adhesive tapes used during the installation phase were not included in the LCA. Recommendations on how to use the product are described in the application manuals or videos. More details are listed on the Web Page www.nmc.eu

2.9 Packaging

CLIMAFLEX® made of NMC NATUREFOAM® products are packed in cardboard boxes and transported on reusable pallets. All packaging material can be recycled.

2.10 Condition of use

During the use of the products for the purpose for which they are intended, there are no modifications unless one of the effects listed in extraordinary impacts occurs (see point 2.13).

2.11 Environment and health during use

There are no particular effects on environmental and health impacts during use related to the material composition of the product. The CLIMAFLEX® made of NMC NATUREFOAM® products are used in a wide range of applications across the building sector. The PEF foams fulfil the German, Belgian and French regulations regarding the emission of VOC with emissions far below the most stringent limit values. The Eurofin Product Testing institute, at the request of the CEFEP (European group of PEF and FEF manufacturers) has made a wide range of tests for different PEF products from different manufacturers.

The insulation of heating pipes with CLIMAFLEX® made of NMC NATUREFOAM® allows a reduction of CO₂ emissions during the full service life of the installation. The quantification of this in-use benefit is not within the scope of this EPD, however, this could be calculated using an LCA for the complete pipe/insulation system, and has to be evaluated in the frame of the LCA from the complete heating installation. A software program available on NMC's website <http://cit.nmcinsulation.eu/> allows for the calculation of the heat flow and insulation benefit under real use conditions.

2.12 Reference service life

The function of CLIMAFLEX® made of NMC NATUREFOAM® is to insure the insulation of heating and sanitary installations for a reference service life (RSL) of 50 years. This duration is based on the frequency of replacement of sanitary and heating piping in buildings. Although the insulation pipes are still effective after 50 years, it is assumed that when replacing the piping, the insulation (CLIMAFLEX®) is not reused and is disposed of with the piping. 50 years is the minimum Reference Service Life recommended in /EN16783/ "PCR for factory made thermal insulation products".

2.13 Extraordinary effects

Fire

According to CLIMAFLEX® made of NMC NATUREFOAM® is classified as a combustible insulation material. Due to its material structure, CLIMAFLEX® made of NMC NATUREFOAM® does not contribute to an uncontrollable spread of fire under installation conditions typical on a building site. The product is self-extinguishing reducing its contribution to any fire event. There is no possibility of the material self-igniting. CLIMAFLEX® made of NMC NATUREFOAM® does not propagate the fire horizontally or vertically. The smoke development in case of fire is very low (class S1).

Fire protection

| Name | Value |
|-------------------------|---------|
| Building material class | BI / CI |
| Burning droplets | d0 |
| Smoke gas development | S1 |

Water

CLIMAFLEX® made of NMC NATUREFOAM® is a closed cell foam and obtain the best water absorption class WS005 according to the product standard

Mechanical destruction

CLIMAFLEX® made of NMC NATUREFOAM® is chemically inert and does not present any environmental or health risk if mechanically destructed. CLIMAFLEX® made of NMC NATUREFOAM® is not UV resistant. The product is not recommended for outside applications without complementary UV protection

2.14 Re-use phase

In principle, if removed carefully, CLIMAFLEX® made of NMC NATUREFOAM® can be reused on any other piping system of similar dimensions. Any material not suitable for reuse is fully recyclable.

2.15 Disposal

CLIMAFLEX® made of NMC NATUREFOAM® is fully recyclable using the same recycling systems as those used for other forms of PE waste. Any non-recycled material should be disposed of the materials according to the local regulations, and by the European Waste Catalogue (<http://www.wastesupport.co.uk/ewc-codes/>) waste code 07 02 13 waste Plastic "Low Density Polyethylene"

2.16 Further information

Additional information about CLIMAFLEX® made of NMC NATUREFOAM® can be found on the NMC web Site www.nmc.eu Here specification clauses, data sheets and application manuals can be found.

3. LCA: Calculation rules

3.1 Declared Unit

This declaration refers to 1 m³ of produced pipe insulation product. For the LCA calculations, as the product is foam and have some tolerances, the density declared is the average worst case between the product categories.

The thermal conductivity coefficient (Lambda-value) and R-value per 25 mm thickness per product brand is provided below as additional information and support for installers.

Declared unit

| Name | Value | Unit |
|---|---|-------------------|
| Declared unit | 1 | m ³ |
| Gross density | 28 | kg/m ³ |
| Volume for 1kg | 0.032482 | kg |
| Conversion factor from 1 m ³ to 1 Linear meter | Value per 1 m ³ divided section of the insulation pipe (m ²) | m |

Thermal Conductivity λ : 0.040 W/mK at (40°C)
R-value- thickness- : 25 mm : +/- 3.5 (m²K/W)
depending of the pipe diameter.

3.2 System boundary

The Data collection refers to the yearly production in 2016.

Module A1 to A3: The LCA calculation covers the production of the raw materials, transport of these to the plant, the mixing of raw materials according to the respective recipes, manufacturing of the foam product and packaging for dispatch. All production takes place exclusively in Eynatten, Belgium.

Module A4: Transport of the final product to the application site. The average transport distance has been calculated based on a weighted value for NMC's main customers representing more than 50% of the sales volume in 2016. Capacity utilisation by volume is

100%. However, given the low density of the product, capacity utilisation by mass has been estimated as 10%.

Module A5: The products can be placed end to end and the remaining pieces can be reused on other pipes. The calculations do not contain any installation waste. Cardboard as packaging material is assumed to be recycled. As input material cardboard made of waste paper is considered. Thus, environmental burden for packaging material are considered already in A1-A3. The value of the environmental impact for A5 is declared as "0".

Module B1-B7: The foam insulation products do not require maintenance, replacement or refurbishment while in use. The information modules B1 – B7 are not declared.

Using insulation material influences the energy consumption of the overall heating and cooling equipment. This is not taken into account, as the EPD refer to the product 'insulation material'.

Module C1: Disassembly is done manually. There are no impacts associated with C1. The information module is not declared.

Module C2: For the transport at end-of-life stage an average distance to landfill is assumed to be 100 km.

Module C3: The chosen scenario of 100% landfilling does not require any waste processing. Module C3 is not declared.

Module C4: The environmental burden for the chosen scenario of 100% landfilling is declared in module C4. The product contains raw materials from renewable sources. By calculating the environmental burden for the production process the sequestration of CO₂ from atmosphere has taken into account. The environmental effects of (bio-)plastic on a landfill site in the next 100 years cannot be foreseen as a full picture today. In this declaration it is assumed, that the sequestered CO₂ is still integrated in a solid matrix.

Module D: The end-of-life scenarios for packaging material and product do not deliver any benefits for the next system. Recycling of cardboard is a closed cycle with the production process. The product is landfilled; energy or material gain cannot be expected.

3.3 Estimates and assumptions

The LCA calculation is conducted using the GaBi-database. Not all necessary LCIs are included in the database. Where data were missing or were unavailable or where suppliers were unable to provide complete information, proxy datasets have been used. The environmental burden for the production of pigments, flame retardants and volume stabilizers are approximated.

3.4 Cut-off criteria

Any glue and adhesive tapes used during the installation (A5) have not been included as quantification of these materials is uncertain and their use by the various installers is too diverse, adhesives and glues are not required in all/most cases, but may be used for some applications.

In this study no others cut-off criteria have been applied and all elementary incoming processes as well as all energy and water inputs and waste outputs have been counted.

3.5 Background data

The software system for life cycle engineering /GaBi 7/ developed by thinkstep AG was used to perform this LCA. The GaBi LCI database /GaBi 7/ provides the life cycle inventory data for several of the raw and process materials obtained from the background system. The most recent update of the database was in 2016.

3.6 Data quality

All the foreground data requiring such energy or raw material coming from production, were verified and cross-checked before being included in the model. Most of the life cycle inventories for the basic materials are available in the /GaBi 7/ database. For electrical and thermal energy regional specific grid mixes and regional specific supply for natural gas were considered.

3.7 Period under review

The production data for the year 2016 were used for the realization of this study.

3.8 Allocation

There is no co-product or by-product generated during the production of NMC's products. Due to lack of specific data per production line and product, the energy has been allocated per overall produced volume of insulation foam.

Production waste

Most of the production waste from the process (machine start, end of production, non-conforming products, etc.) is recycled internally in order to be reused in the manufacturing process. These impacts are accounted for in A1-A3. Smaller amounts are disposed of on a landfill site.

Installation and End-of-Life waste

Installation of the foam products is done by hand and requires no special equipment apart from a knife. Installation off-cut is not considered in this calculations. Any glue and adhesive tapes used during the installation phase were not included in the LCA.

3.9 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.

4. LCA: Scenarios and additional technical information

Transport to the building site (A4)

| Name | Value | Unit |
|---|-------|-------------------|
| Litres of fuel | 0.341 | l/100km |
| Transport distance | 426 | km |
| Capacity utilisation (including empty runs) | 10 | % |
| Gross density of products transported | 28 | kg/m ³ |
| Capacity utilisation volume factor | 0.5 | - |

Reference service life

| Name | Value | Unit |
|------------------------------|-------|------|
| Reference service life years | 50 | a |

End of life (C1-C4)

| Name | Value | Unit |
|-------------|-------|------|
| Landfilling | 28 | kg |

5. LCA: Results

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

| 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 | MND | X | X | X | X |

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ CLIMAFLEX® made of NMC NATUREFOAM®

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C3 | C4 | D |
|-----------|--|---------|----------|---------|----------|---------|----------|---------|
| GWP | [kg CO ₂ -Eq.] | -4.91 | 4.19 | 0.00 | 0.18 | 0.00 | 1.94 | 0.00 |
| ODP | [kg CFC11-Eq.] | 6.91E-8 | 3.41E-12 | 0.00E+0 | 1.50E-13 | 0.00E+0 | 4.76E-12 | 0.00E+0 |
| AP | [kg SO ₂ -Eq.] | 8.18E-1 | 1.98E-2 | 0.00E+0 | 8.09E-4 | 0.00E+0 | 5.36E-3 | 0.00E+0 |
| EP | [kg (PO ₄) ³⁻ -Eq.] | 5.58E-1 | 4.97E-3 | 0.00E+0 | 2.02E-4 | 0.00E+0 | 5.31E-3 | 0.00E+0 |
| POCP | [kg ethene-Eq.] | 1.62E-1 | -8.18E-3 | 0.00E+0 | -3.29E-4 | 0.00E+0 | 6.11E-4 | 0.00E+0 |
| ADPE | [kg Sb-Eq.] | 3.87E-2 | 3.78E-7 | 0.00E+0 | 1.67E-8 | 0.00E+0 | 4.01E-7 | 0.00E+0 |
| ADPF | [MJ] | 713.92 | 57.75 | 0.00 | 2.54 | 0.00 | 27.81 | 0.00 |

Caption: 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

RESULTS OF THE LCA - RESOURCE USE: 1 m³ CLIMAFLEX® made of NMC NATUREFOAM®

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C3 | C4 | D |
|-----------|-------------------|---------|-------|------|------|------|---------|------|
| PERE | [MJ] | 1366.93 | 2.98 | 0.00 | 0.13 | 0.00 | 2.12 | 0.00 |
| PERM | [MJ] | 667.24 | 0.00 | 0.00 | 0.00 | 0.00 | -667.24 | 0.00 |
| PERT | [MJ] | 2034.17 | 2.98 | 0.00 | 0.13 | 0.00 | 2.12 | 0.00 |
| PENRE | [MJ] | 951.43 | 58.06 | 0.00 | 2.55 | 0.00 | 28.92 | 0.00 |
| PENRM | [MJ] | 248.48 | 0.00 | 0.00 | 0.00 | 0.00 | -248.48 | 0.00 |
| PENRT | [MJ] | 1199.91 | 58.06 | 0.00 | 2.55 | 0.00 | 28.92 | 0.00 |
| SM | [kg] | 9.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| RSF | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| NRSF | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| FW | [m ³] | 0.29 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Caption: 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 – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m³ CLIMAFLEX® made of NMC NATUREFOAM®

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C3 | C4 | D |
|-----------|------|---------|---------|---------|---------|---------|---------|---------|
| HWD | [kg] | 2.87E-4 | 3.03E-6 | 0.00E+0 | 1.33E-7 | 0.00E+0 | 1.12E-7 | 0.00E+0 |
| NHWD | [kg] | 7.39E+0 | 4.60E-3 | 0.00E+0 | 2.02E-4 | 0.00E+0 | 2.70E+1 | 0.00E+0 |
| RWD | [kg] | 9.36E-2 | 1.20E-4 | 0.00E+0 | 5.28E-6 | 0.00E+0 | 4.38E-4 | 0.00E+0 |
| CRU | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| MFR | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| MER | [kg] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EEE | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EET | [MJ] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Caption: 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; EEE = Exported thermal energy

6. LCA: Interpretation

The base polymer used by NMC is produced from renewable resources (biomass). While growing of the plants, atmospheric carbon dioxide is sequestered. 1 kg of bio-polyethylene contains the carbon of 3.14 kg CO₂. In the production process energy and material are necessary, which lead to CO₂ emissions. Summarizing these effects results in an overall

negative value for GWP of -2.15 kg CO₂e per 1 kg of bio-polyethylene. The total value for GWP (A1-A3) refers to the applied input materials and the emissions for the total process chain to achieve the foam product.

For the EoL-scenario landfilling is assumed. Polyethylene is assumed not to be biodegradable.

Thus the sequestered CO₂ remains bonded in hydrocarbon chains. Further longterm effects of plastics on a landfill site on the ecosystems cannot be foreseen so far. The operation of the landfill site requires energy and material, which result to environmental burden for all impact categories, Transport processes (A2, A4 and C2) also contributes to all impact categories listed.

The most impacting modules of the LCA are the modules A1 to A3 and more particularly the raw material supply. Due to the low density of the final product, A4 (transport) has a comparatively high GWP (4,28 kg CO₂-Eq./m³). The value for primary energy demand results mostly from renewable resources due to the use of bio-based polyethylene rather than fossil-based polyethylene.

7. Requisite evidence

7.1. VOC emissions

Eurofins Product Testing A/S has tested a wide range and variety of typical PEF (Polyethylene foam) products marketed in the EU from CEFEP (European Group of PEF/FEF manufacturers) Based on the loading factor 0.05m²/m³ (determined after consideration of the real life applications of PEF products (in living rooms) and recommendations by the experts of the test institute) all results were found to be

An improvement path to further improve the impact of CLIMAFLEX® would be to reuse or recycling 100% of CLIMAFLEX® rather than put on Landfill the material at end of life. From a resource perspective, landfill should also be avoided.

The use of bio-polyethylene for the manufacture of CLIMAFLEX® makes it possible to obtain a value near to 0 with regard to global warming potential - electricity consumption is the main source of emissions during manufacturing. One of the solutions to continue to improve the assessment of CLIMAFLEX® would be to modify the sources of electrical supply. For example, by increasing the photovoltaic power installed at the NMC s.a. site or by finding suppliers that produce electricity from more renewable energy sources.

clearly below the limit values. For all samples below 100mg/m³ TVOC after 28 days. Certificates are available on request.

7.2 Leaching

According to /EN 13468/ the content of water-soluble chloride ions for CLIMAFLEX® is <15mg/kg

8. References

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin (pub.):
Generation of Environmental Product Declarations (EPDs);

General Principles

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2015/10
www.ibu-epd.de

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/

/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

ISO 14040:2006

ISO 14040:2006: Environmental management — Life cycle assessment — Principles and framework

Product Category Rules for Building-Related Products and Services

Institute Construction and Environment e.V. (IBU)
Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report Version 1.5

PCR Guidance-Texts for Building-Related Products and Services

From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU) Part B: Requirements on the EPD for Insulating materials made of foam plastics

ISO 14044:2006

ISO 14044:2006: Environmental management — Life cycle assessment — Requirements and guidelines

CEN/TR 15941:2010

CEN/TR 15941:2010: Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data

EN 16783

EN 16783:2017 Thermal insulation products – PCR for factory made and in-situ formed products for preparing environmental product declarations

EN 13501-1

EN 13501-1: 2007+A1: 2013 Fire classification of construction products and building elements. Classification using test data from reaction to fire tests

EN ISO 8497:1997

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Sampling, testing and evaluation

were performed according to the latest version of /CEN TS 16516/,AgBB/,/ISO 16000-3/,/ISO 16000-6/,/ISO16000-9/,/ISO 16000-11/.

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Gabi ts

GaBi 7 GaBi Software-System and Database for Life Cycle Engineering Copyright © 1992-2016 Thinkstep AG Compilation: 7.3.0.40 DB version 6.115

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