

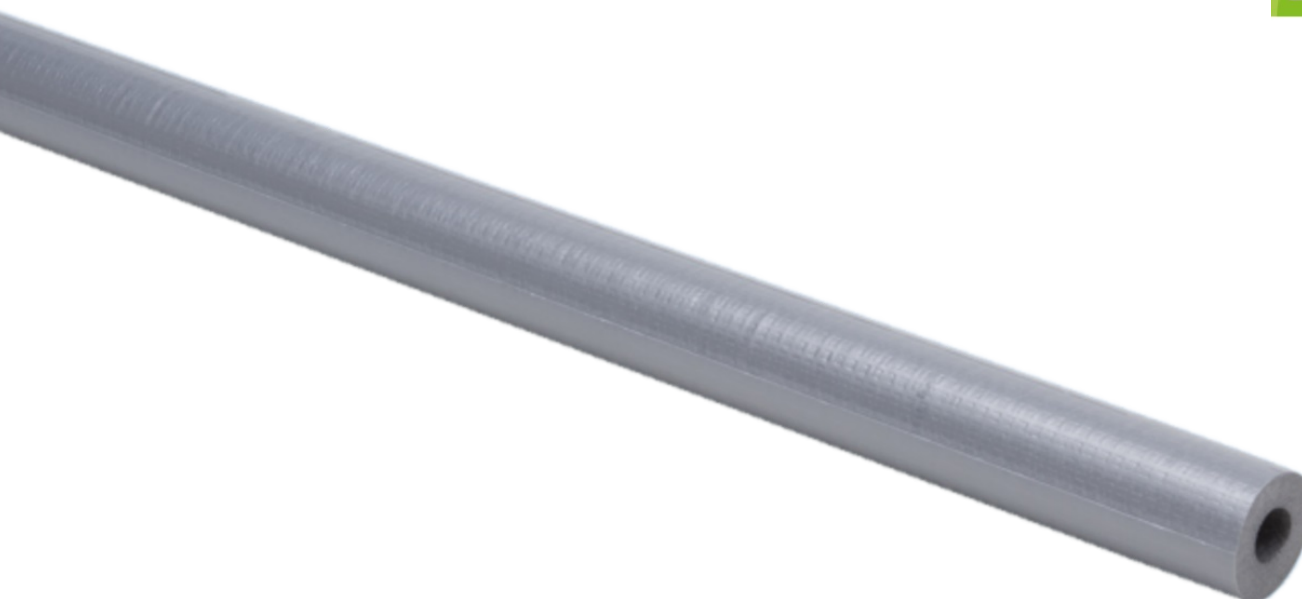
# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Adolf Würth GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AWU-20230268-IBD1-EN
Issue date	12.09.2023
Valid to	12.09.2027

**flexen® PE-Stabil**  
**Adolf Würth GmbH & Co. KG**

[www.ibu-epd.com](http://www.ibu-epd.com) | <https://epd-online.com>



## 1. General Information

### Adolf Würth GmbH & Co. KG

**Programme holder**

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

**Declaration number**

EPD-AWU-20230268-IBD1-EN

**This declaration is based on the product category rules:**

Insulating materials made of foam plastics, 01.08.2021  
(PCR checked and approved by the SVR)

**Issue date**

12.09.2023

**Valid to**

12.09.2027



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



Florian Pronold  
(Managing Director Institut Bauen und Umwelt e.V.)

### flexen® PE-Stabil

**Owner of the declaration**

Adolf Würth GmbH & Co. KG  
Reinhold-Würth-Str. 12-17  
74653 Künzelsau  
Germany

**Declared product / declared unit**

flexen® PE-stabil

**Scope:**

Product line flexen® PE-stabil Thermal insulation products for building equipment and industrial insulations made of Polythene-based, closed-cell foam pipe insulation with a robust protective coating (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 at the site of Eynatten.

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	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Vito D'Incognito,  
(Independent verifier)

## 2. Product

### 2.1 Product description/Product definition

flexen® PE-stabil is the Professional Polythene-based closed-cell foam pipe insulation with a robust PE protective coating for continuous energy saving and condensation control purposes.

flexen® PE-stabil provides solutions that follow all necessary guidelines for any type of installation cf. PCR.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) - 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

flexen® PE-stabil is used to insulate pipes for heating and plumbing.

- Polyethylene foam is a cost-efficient material with good insulating properties.
- Products made of PE foam yield an excellent cost/performance ratio.
- Heat loss control and noise reduction in fresh-and waste water and heating system

### 2.3 Technical Data

#### Constructional 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	26.7	kg/m <sup>3</sup>
Thermal conductivity	0.04	W/(mK)
Reaction To Fire Acc. to EN 13501-1 depending on the thickness	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	Cl < 20 – F < 4 - pH 5,8	-

### 2.4 Delivery status

The PE products are supplied as tubes. The tubes are delivered in lengths of 2 m packed in cardboard boxes. The insulating sleeves in the flexen® PE-stabil have a thickness ranging from 4 to 25 mm and an inside diameter ranging from 15 to 42 mm. These products are categorized according to thermal conductivity (Lambda\*). The category of product with lambda 0,040 (W/(mK)) (acc. to *EN ISO 8497* and *EN 12667*).

### 2.5 Base materials/Ancillary materials

#### Base materials

flexen® PE-stabil is a flexible insulation material based on Polyethylene with a protecting coating of PE, which consists of around 7 basic components. The following table displays the different elements of the formula.

This product contains substances listed in *the candidate list* (date: 08.07.2021) exceeding 0.1 percentage by mass: **No**.

This product 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**.

Name	Value	Unit
LDPE	65.80	%
Flame retardant	1.9	%
LLDPE	6.48	%
Internally recycled PE	14.73	%
Pigment	2.42	%
Volume stabilizer	0.98	%
Blowing Agent	7.69	%

PE and fillers give the aspect of the product. The blowing agent causes the expansion during manufacturing and the flame retardants ensure the fire resistance. According to the European Chemicals Regulation *REACH* Manufacturers, importers and downstream users must register their chemicals and are responsible for their safe use on their own. For its production the production plant uses exclusively verifiably registered and approved substances. flexen® PE-stabil does not contain Substances of Very High Concern (SVHC). 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 to 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 the thermoplastic mass 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, such as atmospheric pressure. The blowing agent expands to form the cells of the foam and the thermoplastic foam is cooled through an inline water cooler. The protection coating "skin" is applied by co-extrusion. The "skin" is made with solid pellets of thermoplastic resin and some additives, which is, with the help of an extruder, applied around the foam. There is not a foaming agent used in this case. The die is positioned around the "naked" foam and deposits a small thickness ( $\pm 0.1$ mm) of PE film on the foam. At the end of this process the profiles are cut at dimension.

Quality assurance :

The manufacture is certified *ISO 9001* for quality management.

The product corresponds to the product standard *EN 14313* and has a Declaration of

Performance according to the DOP no.

LE\_0870609015\_01\_M\_flexen\_PE\_Stabil

(see [www.wuerth.de](http://www.wuerth.de))

### 2.7 Environment and health during manufacturing

During all manufacturing steps the production follows the national guidelines and regulations. Solar panels are installed on the roof of the warehouses.

### 2.8 Product processing/Installation

flexen® PE-stabil can be installed using basic tools like knives. No special tools or specific

protection is necessary. When applying adhesives the information given in the relevant safety data sheets is to be heeded. The recommendations on how to use the product are described in the application manuals or videos. More details are listed on the Web Page WÜRTH (wuerth.de).

### 2.9 Packaging

flexen® PE-stabil products are packed in cardboard boxes and transported on reusable pallets. The packaging material can be recycled. The pallets used to transport the products are taken back or exchanged when the flexen® PE-stabil is delivered, so the use of pallets is a closed loop economy.

### 2.10 Condition of use

During the use of the product for the purpose for which they are intended, there are no modifications to the product during the use, except if due to extraordinary impact (see point 2.13).

### 2.11 Environment and health during use

There are no particular aspects of the material composition during the use. flexen® PE-stabil products are used in a wide range and variety of applications for which the product is intended. The PEF foams fulfil the German, Belgian and French regulations regarding the emission of VOC with emissions far below the most severe limit values. The Eurofin Product Testing institute, on the demand 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 allows a drastic reduction of CO<sub>2</sub> emission during the full service life of the installation. The quantification of this is not in the topic of this EPD, and has to be evaluated in the frame of the LCA from the complete installation

### 2.12 Reference service life

The function of flexen® PE-stabil is to ensure 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 products are still effective after 50 years, it is assumed that when replacing the piping, the insulation is not reused and is disposed of with the piping. 50 years is the minimum Reference Service Life

recommended in EN16783.

Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

### 2.13 Extraordinary effects

#### Fire

Fire According to flexen® PE-stabil are classified as EURO CLASS E and therefore have a limited speed of inflammation.

#### Fire protection

Name	Value
Building material class	E

#### Water

flexen® PE-stabil are closed cell foam and obtain the better water absorption class WS005 according to the product standard

#### Mechanical destruction

flexen® PE-stabil are flexible foam covered with a PE protective coating

flexen® PE-stabil are not UV resistant. The use is not recommended for outside applications without complementary UV protection.

### 2.14 Re-use phase

In principle, if removed carefully, flexen® PE-stabil can be reused on any other piping system of similar dimensions. Any material not suitable for reuse is fully recyclable.

### 2.15 Disposal

flexen® PE-stabil are 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* waste code 07 02 13 waste Plastic "Low Density Polyethylene"

### 2.16 Further information

Additional information about flexen® PE-stabil stabil can be found on the web site WÜRTH (wuerth.de). Here specification clauses, data sheets and application manuals can be found.

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The declaration refers to 1 m<sup>3</sup> of produced insulation product. For the LCA calculations, as the product is foam and has some tolerances, the density declared is the average 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
Gross density	26.7	kg/m <sup>3</sup>
Declared unit	1	m <sup>3</sup>
Conversion factor from 1 m <sup>3</sup> to 1 linear meter	Value for 1 m divided section of the insulation pipe (m <sup>2</sup> )	m
Gross Density volume for 1 kg	0.02667	m <sup>3</sup>
Thermal Conductivity at 40°C	0.040	W/(mK)

Thermal Conductivity λ: 0.040 W/mK at (40°C)

R-value- thickness: 25 mm: +/- 3,5 (m<sup>2</sup>K)/W depending on the pipe diameter.

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning the variability of the production process, geographical representativeness and the influence of background data and preliminary products

compared to the environmental impacts caused by the actual production.

### 3.2 System boundary

The Data collection refers to the yearly production in 2021

#### 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 the main customers representing more than 91% of the sales volume in 2021. 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 a packaging material is assumed to be recycled. As input material cardboard made of waste paper is considered. Thus, the environmental burden for packaging material is 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. Although the insulation flexen® PE-stabil contributes to a significant reduction of CO<sub>2</sub> emissions from the heating or cooling equipment, this is not taken into account in this LCA. It should, however, be taken into account in the calculation of environmental impacts of the complete heating and cooling systems or of the complete building.

#### Module C1:

As for the installation of the product, the disassembly is done manually and does not require any specific equipment. Disassembly is generally carried out at the same time as the replacement or removal of sanitary pipes. Consequently, there are no impacts associated with C1.

**Module C2:** Transport at the end-of-life stage is modelled as a Euro Cargo 0-6 mix truck with diesel fuel. The average distance to mechanical recycling is assumed to be 100 km.

#### Module C3:

The legislation is pushing more in this direction and the overall pressure on plastic recycling is growing, the scenario with 100 % mechanical recycling is considered. The environmental burden is declared in module C3.

**Module C4:** The environmental burden for 100% landfilling is 0 because 100 % mechanical recycling is considered.

**Module D:** The end-of-life scenarios for packaging material and product do not deliver any benefits for the next system. Recycling cardboard is a closed cycle with the production process. The flexen® PE-stabil foam is fully recyclable and can be

used as a direct one-for-one substitute for virgin PE-LD granulates, with only minor additive additions.

### 3.3 Estimates and assumptions

The LCA calculation is conducted using the *Gabi ts* - 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 2021 life cycle database used in the GaBi 10 software environment (Service Pack 2021001000)* developed by *Thinkstep AG* was used to perform this LCA.

### 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 contained in the *GaBi 10 software*. For electrical and thermal energy Belgium-specific grid mixes and Belgium-specific supply for natural gas were considered.

### 3.7 Period under review

The production data for the year 2021 were used for the realization of this study

### 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: Germany

### 3.9 Allocation

There is no co-product or by-product generated during the production. Due to the 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.

#### 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

### 3.10 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.

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties of biogenic carbon**

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.

If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO<sub>2</sub>.

**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	5.58	kg C

**Transport to the building site (A4)**

Name	Value	Unit
Litres of fuel	0.069	l/100km
Transport distance	489	km
Capacity utilisation (including empty runs)	10	%
Gross density of products transported	26.7	kg/m <sup>3</sup>

**Reference service life**

Name	Value	Unit
Reference service life	50	a

**End of life (C1-C4)**

Name	Value	Unit
Recycling	26.7	kg

## 5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = 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	MND	X	X	X	X

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m<sup>3</sup> flexen® PE-stabil

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> eq	1.02E+02	2.44E+00	0	2.27E-01	2.93E+00	0	-6.75E+01
GWP-fossil	kg CO <sub>2</sub> eq	1.02E+02	2.45E+00	0	2.28E-01	2.89E+00	0	-6.7E+01
GWP-biogenic	kg CO <sub>2</sub> eq	-2.94E-01	-3.09E-02	0	-2.23E-03	4.03E-02	0	-5.72E-01
GWP-luluc	kg CO <sub>2</sub> eq	1.41E-01	2.19E-02	0	1.54E-03	1.12E-03	0	-9.29E-03
ODP	kg CFC11 eq	3.52E-08	3.07E-13	0	2.24E-14	1.19E-10	0	-4.1E-10
AP	mol H <sup>+</sup> eq	2.34E-01	2.88E-03	0	2.7E-04	4.14E-03	0	-9.3E-02
EP-freshwater	kg P eq	4.35E-04	8.63E-06	0	8.14E-07	1.93E-05	0	-1.26E-04
EP-marine	kg N eq	5.16E-02	9.78E-04	0	9E-05	1.65E-03	0	-2.72E-02
EP-terrestrial	mol N eq	5.4E-01	1.15E-02	0	1.07E-03	1.67E-02	0	-2.84E-01
POCP	kg NMVOC eq	1.9E-01	2.94E-03	0	2.72E-04	4E-03	0	-8.88E-02
ADPE	kg Sb eq	1.04E-01	1.55E-07	0	2.3E-08	1.68E-06	0	-1.7E-05
ADPF	MJ	3.41E+03	3.22E+01	0	2.99E+00	8.68E+01	0	-2.58E+03
WDP	m <sup>3</sup> world eq deprived	5.78E+00	2.85E-02	0	2.55E-03	2.09E-01	0	-1.14E+00

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: 1 m<sup>3</sup> flexen® PE-stabil

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
PERE	MJ	4.49E+02	2.34E+00	0	2.07E-01	5.35E+01	0	-1.93E+02
PERM	MJ	0	ND	ND	ND	ND	ND	ND
PERT	MJ	4.49E+02	2.34E+00	0	2.07E-01	5.35E+01	0	-1.93E+02
PENRE	MJ	1.99E+03	3.23E+01	0	3E+00	8.68E+01	0	-2.58E+03
PENRM	MJ	1.44E+03	ND	ND	ND	ND	ND	ND
PENRT	MJ	3.43E+03	3.23E+01	0	3E+00	8.68E+01	0	-2.58E+03
SM	kg	1.38E+01	ND	ND	ND	ND	ND	ND
RSF	MJ	0	ND	ND	ND	ND	ND	ND
NRSF	MJ	0	ND	ND	ND	ND	ND	ND
FW	m <sup>3</sup>	5.26E-01	2.56E-03	0	2.4E-04	2.45E-02	0	-3.06E-01

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: 1 m<sup>3</sup> flexen® PE-stabil

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
HWD	kg	4.07E-04	1E-10	0	1.59E-11	9.17E-09	0	-2.41E-07
NHWD	kg	2.75E+00	4.92E-03	0	4.89E-04	1.15E-01	0	-7.13E-01
RWD	kg	1.1E-01	6.04E-05	0	5.58E-06	2.02E-02	0	-2.16E-02
CRU	kg	0	ND	ND	ND	ND	ND	ND
MFR	kg	0	ND	1.38E+01	ND	3.75E+01	ND	ND
MER	kg	0	ND	ND	ND	ND	ND	ND
EEE	MJ	0	ND	ND	ND	ND	ND	ND
EET	MJ	0	ND	ND	ND	ND	ND	ND

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:  
1 m<sup>3</sup> flexen® PE-stabil**

Parameter	Unit	A1-A3	A4	A5	C2	C3	C4	D
PM	Disease incidence	7.43E-06	2.17E-08	0	2.06E-09	3.3E-08	0	-6.99E-07
IR	kBq U235 eq	9.2E+00	9.01E-03	0	8.42E-04	1.4E+00	0	-2.14E+00
ETP-fw	CTUe	1.74E+03	2.28E+01	0	2.12E+00	3.37E+01	0	-1.23E+03
HTP-c	CTUh	4.27E-08	4.67E-10	0	4.37E-11	8.32E-10	0	-3.02E-08
HTP-nc	CTUh	2.48E-06	2.51E-08	0	2.4E-09	2.58E-08	0	-1.41E-06
SQP	SQP	2.92E+02	1.34E+01	0	1.27E+00	5.45E+01	0	-1.32E+02

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

This EPD was created using a software tool.

## 6. LCA: Interpretation

The use of internal recycled material in flexen® PE-stabil reduces the need for raw materials and avoids wasting resources. flexen® PE-stabil has a very low density, which means that little raw material is needed for high insulation efficiency, which results in significant energy savings. In addition, flexen® PE-stabil is largely made of low-density polyethylene, so it is fully recyclable and can be recycled when it reaches the end of its life. As there is a variation in density between the different references of the flexen® PE-stabil range, a sensitivity analysis has been performed. The results of the LCA are given for 1m<sup>3</sup> of product calculated with an average weighted foam density of 26.7 kg/m<sup>3</sup>. For the lowest density, the impacts are lowered by 13.9% and for the highest density the impacts should be majored by 31.1%. However, these maximum densities of 33 and 35 kg/m<sup>3</sup> only represent 4 references produced and sold in rather low volumes, and the same is true for the lowest density of 23 kg/m<sup>3</sup>, which only represents 2 references in the flexen® PE-stabil range. Most references are very close to the average density, but all impact factors can be recalculated based on their density. When we analyse the complete life cycle, we see that the most impacting part for all environmental impact factors is the production module and more particularly the raw materials part. With regard to global warming for the complete life cycle, more than 95% comes from the production module 1,4% from transport to the places of installation and 3% comes from the end of life. A more in-depth analysis of the production module A1 to A3 shows that the production of raw materials and their transport account for

almost 96% of the impact Global Warming Potential. As the flexen® PE-stabil is fully recyclable; the choice for the end of life was that of 100% recycling. This avoids the use of new raw materials and or the exploitation of renewable or non-renewable resources. The end of life in 100% landfill has a slight impact, especially from the point of view of climate change. However, the 100% incineration scenario has the greatest impact because during incineration there is a significant release of carbon dioxide. The insulation with flexen® PE-stabil of the sanitary and heating piping contributes to a significant reduction of CO<sub>2</sub> emissions from the heating or cooling equipment, this is not considered in this LCA. It should, however, be taken into account in the calculation of environmental impacts of the complete heating and cooling systems or of the complete building. One way to continue to reduce the environmental impact of the flexen® PE-stabil would be to continue to diversify our energy sources by switching more and more to renewable energies. To this end, after having greatly increased the number of photovoltaic panels, The Production plant will acquire a cogeneration system. Looking for more eco-responsible suppliers must also be put in place, as well as finding raw materials manufactured locally to avoid long-distance transport as much as possible. An analysis of the plant's carbon footprint, which is currently being carried out, should identify areas for improvement and find solutions to achieve the goal of zero carbon.

## 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 0.05m<sup>2</sup>/m<sup>3</sup> (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 clearly below the limit values. For all samples below 100mg/m<sup>3</sup> TVOC

after 28 days. Certificates are available on request. 7.1 VOC emissions  
For products used in indoor applications.  
Test procedure to AgBB diagram indicating the measuring agency, date and results as a range of values. At least the following must be declared:

### 7.2 Leaching

According to *EN 13468* the content of water-soluble chloride ions for flexen® PE-stabil is <20mg/kg

## 8. References

### EN 1602

EN 1602: 2013: Thermal insulating products for building applications - Determination of the apparent density

EN ISO 8497: Thermal insulation - Determination of steady-state thermal transmission properties of thermal insulation for circular pipes

### EN ISO 8497

### ISO 9001

ISO 9001: 2015: Quality management systems.



**EN 13472**

EN 13472: Thermal insulating products for building equipment and industrial installations - Determination of short term water absorption by partial immersion of preformed pipe insulation

**EN 13468**

EN 13468: Thermal insulating products for building equipment and industrial installations - Determination of trace quantities of water-soluble chloride, fluoride, silicate, and sodium ions and pH

**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

**ISO 14001**

ISO 14001: 2015 Environmental management systems.

**EN ISO 14025**

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

**ISO 14040**

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

**ISO 14044**

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

**EN 14707**

EN 14707: 2012: Thermal insulating products for building equipment and industrial installations. Determination of maximum service temperature for preformed pipe insulation

**EN 15804**

EN 15804: 2012-04 + A1 2014: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

**CEN/TR 15941**

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

**CEN TS 16516**

CEN TS 16516: AgBB, ISO 16000-3, /ISO 16000-6/, /ISO16000-9/, /ISO 16000-11/ Construction products - Assessment of release of dangerous substances. Determination of emissions into indoor air

**EN 16783: 2017**

EN 16783: 2017 Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations

**Candidate List Substances of Very High Concern**

SVCH: date: 08.07.2021) exceeding 0.1 percentage by mass

**CEFEP**

CEFEP: European group of PEF and FEF manufacturers

**Eurostat**

European Statistics: Recovery rates for packaging waste Paper and cardboard packaging for the European Union 27 countries 2014  
<http://ec.europa.eu/eurostat/home>

**Eurofins**

Eurofins: Eurofins Scientific is a group of international life sciences companies which provide a unique range of analytical testing services to clients across multiple industries,  
<http://www.eurofins.com>

**European Waste Catalogue**

European Waste Catalogue: waste code 07 02 13 waste Plastic "Low Density Polyethylene"

**Gabi ts**

GaBi 10 GaBi Software-System and Database for Life Cycle Engineering Copyright © 1992-2021 Sphera Solutions Gmbh Version: 10.5.0.78 DB Schema 8007

**Institut Bauen und Umwelt**

Institut Bauen und Umwelt e.V., Berlin(pub.): General Instructions for the EPD Programme of Institut Bauen und Umwelt e.V., Version 2.0 2021.

**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 1.7

**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  
Version 1.6 (Template) Version 1.2 (PCR specific)

**REACH**

According the European Chemicals Regulation REACH manufacturers, importers and downstream users must register their chemicals and are responsible for their safe use.

**Sphera**

Sphera Solutions Gmbh. GaBi 10 LCI documentation. GaBi Databases (sphera.com) Stuttgart  
The literature referred to in the Environmental Product Declaration must be listed in full. Standards already fully quoted in the EPD do not need to be listed here again.  
The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

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