ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Knauf Insulation**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KNA-20160201-CBB1-EN
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Issue date	05.12.2016
Valid to	04.12.2021

JetSpray System

Knauf Insulation

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

General Information

Knauf Insulation

Programme holder
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Germany

Declaration number
EPD-KNA-20160201-CBB1-EN

This Declaration is based on the Product Category Rules:
Mineral insulating materials, 07.2014
(PCR tested and approved by the SVR)

Issue date
05.12.2016

Valid to
04.12.2021

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

JetSpray System

Owner of the Declaration
Knauf Insulation
rue de Maestricht 95
4600 Vise
Belgium

Declared product / Declared unit
1 m³ of JetSpray System

Scope:
The JetSpray System is a complete blowing insulation solution composed of three components: the Primer, the Thermal blowing mineral wool and the Fix binder. The manufacturing company is Knauf Insulation – plants Visé (Belgium) and Lannemezan (France). 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Matthias Schulz
(Independent verifier appointed by SVR)

Product

Product description
The JetSpray System from Knauf Insulation is a complete blowing wool insulation solution, thermal and acoustical, specially designed and formulated for car parks and the crawl spaces under buildings.
The System is composed of three components. The first component is the JetSpray Primer used to pre-treat concrete surfaces. The Primer is applied using a paint gun.
The second component the JetSpray Thermal blowing wool is available in the form of loose-fill flocks, having a wooly consistency, compressed and packaged in bags. In terms of composition, blowing wool consists of about ≥ 99% inert material. The inert part is made of recycled glass (external cullet, up to 80% of the composition), sand and limestone. The remaining fraction is made of antistatic and anti-dust compounds. The additive content is typically about 0.5 % in weight.
The third component the JetSpray Fix organic binder is mixed with water to provide a strong adhesion. It then dries naturally.
After the treatment with JetSpray Primer, the surfaces are sprayed with a dedicated blowing machine with a mixture of JetSpray Thermal mineral blowing wool and JetSpray Fix organic binder to complete the insulation process.
The target installed density of the complete JetSpray System is 52 kg/m³.

For the placing on the market of construction products in the European Union and EFTA (with the exception of Switzerland) /Regulation (EU) No 305/2011/ applies.

Application
Main applications for the JetSpray System are insulation of ceilings of car parks and crawl spaces under buildings. For the application and use national regulations apply.

Technical Data
The JetSpray System and its technical characteristics meet a number of technical requirements. The most important ones are summarized in the table here below, which also includes references to testing methods.

Technical characteristics

Name	Value	Unit
Thermal conductivity /EN 12667/	0.036	W/(mK)
Water vapour diffusion resistance factor /EN 12572/	1	-
Water vapor diffusion equivalent air layer thickness	NA	m
Sound absorption coefficient /EN ISO 354/	100	%

Gross density /EN 1602/	47 - 57	kg/m^3
Compressive strength	NA	N/mm^2
Longit. air-diffusion resist. /EN 29053/	>=5	kNs/m^4
Reaction to fire /EN 13501-1/	A2S2d0	-
Specific heat capacity /EN ISO 10456/	1030	J/kgK

Base materials / Ancillary materials
JetSpray System is an insulation material of mostly inorganic origin intended for thermal and acoustic insulation, as well as for fire prevention in construction and industry. Raw materials used in the production of JetSpray Thermal Blowing Wool are sand, limestone, soda ash and a high level of recycled glass (up to 80%). The JetSpray Primer and JetSpray Fix binder are made of organic component.

Reference service life
The RSL or durability of JetSpray System is as long as the lifetime of the building in which it is used.

LCA: Calculation rules

Declared Unit
The declared unit is 1 m³ of JetSpray System. The density used for the calculation of the LCA is 52 kg/m³.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	52	kg/m^3
Conversion factor to 1 kg	0.0192	-

System boundary
The system boundary of the EPD follows the modular approach defined by /EN 15804/.

The type of EPD is cradle to gate - with options.
List and explanation of the modules declared in the EPD.

The product stage (A1-A3) includes:
- A1 - raw material extraction and processing, processing of secondary material input (e.g. recycling processes),
- A2 - transport to the manufacturer and
- A3 - manufacturing.

This includes provision of all materials, products and energy, packaging processing and their transport, as well as waste processing up to the end-of waste stage or disposal of final residues during the product stage. The LCA results are given in an aggregated form for the product stage, meaning that the modules A1, A2 and A3 are considered as a unique module A1-A3.

The construction process stage includes:
- A4 - transport to the construction site and
- A5 - installation into the building.

The transport to the building site (A4) is included in the LCA calculation. For JetSpray System, the average transport distance is assumed to be 600 km with a truck capacity utilization of 70%.
Module A5 has been included into this EPD as the blowing and spraying equipments request electricity to blow and spray the components. The treatment of the packaging waste after the installation of the product has also been considered. The product losses during the construction process have been taken into account into the LCA and represents maximum 2%.

The use stage.
Because they are specific for the building, its use and location, none of the modules related to the building fabric (B1-B5) nor the operation of the building (B6 and B7) have been taken into account in this EPD.

The end-of-life stage includes:
- C1 - de-construction, demolition,
- C2 - transport to waste processing,
- C3 - waste processing for reuse, recovery and/or recycling and
- C4 - disposal.

This includes provision of all transports, materials, products and related energy and water use, but only modules C2 and C4 are reported, as they are considered the most relevant scenarios for glass mineral wool products.
Although mineral wool products from Knauf Insulation are partly recycled at end-of-life, there is not yet an established collection system and as such the assumption chosen in this study,100% landfilled after the use phase, is the most conservative approach.

Module D includes re-use, recovery and/or recycling potentials.
According to /EN 15804/, any declared benefits and loads from net flows leaving the product system not allocated as co-products and having passed the end-of waste state shall be included in module D.
Benefits from packaging's incineration with energy recovery are considered in module D.

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.

LCA: Scenarios and additional technical information

The following technical information can be used for the development of specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0577	l/100km
Transport distance	600	km
Capacity utilisation (including empty runs)	70	%
Gross density of products transported	52	kg/m^3

Installation into the building (A5)

Name	Value	Unit
Water consumption	0.0975	m^3
Electricity consumption	2.39	kWh
Output substances following waste treatment on site (plastic and wooden packaging)	1.26	kg

Reference service life

Name	Value	Unit
Reference service life	50	a

End-of-life (C1 - C4)

Name	Value	Unit
Landfilling	52	kg
Transport distance	50	km
Capacity utilization	50	%

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	MND	MND	MND	MND	MND	MND	X	MND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ JetSpray System

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Global warming potential	[kg CO_2-Eq.]	50.50	2.30	8.20	0.45	4.47	-2.86
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	6.52E-8	1.06E-11	2.11E-9	2.06E-12	1.66E-11	-8.92E-10
Acidification potential of land and water	[kg SO_2-Eq.]	1.70E-1	5.75E-3	7.22E-3	1.19E-4	5.70E-3	-4.38E-3
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	2.26E-2	1.34E-3	9.53E-4	2.78E-4	4.22E-3	-4.47E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.55E-2	-1.64E-3	5.89E-4	-3.54E-4	1.39E-3	-4.78E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	3.10E-3	1.53E-7	6.25E-5	2.98E-8	3.15E-7	-4.67E-7
Abiotic depletion potential for fossil resources	[MJ]	867.00	31.60	31.40	6.17	13.20	-39.70

RESULTS OF THE LCA - RESOURCE USE: 1 m³ JetSpray System

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Renewable primary energy as energy carrier	[MJ]	101.00	1.80	7.66	0.35	1.43	-6.13
Renewable primary energy resources as material utilization	[MJ]	23.80	0.00	0.00	0.00	0.00	0.00
Total use of renewable primary energy resources	[MJ]	124.80	1.80	7.66	0.35	1.43	-6.13
Non-renewable primary energy as energy carrier	[MJ]	1230.00	31.70	46.10	6.20	13.70	-48.00
Non-renewable primary energy as material utilization	[MJ]	72.60	0.00	1.45	0.00	0.00	0.00
Total use of non-renewable primary energy resources	[MJ]	1302.60	31.70	48.20	6.20	13.70	-48.00
Use of secondary material	[kg]	43.30	0.00	0.87	0.00	0.00	0.00
Use of renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00
Use of non-renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00
Use of net fresh water	[m³]	3.64E-1	4.50E-3	1.27E-1	8.79E-4	2.65E-3	-9.53E-3

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ JetSpray System

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Hazardous waste disposed	[kg]	3.59E-5	2.40E-6	7.70E-7	4.69E-7	2.65E-7	-1.79E-8
Non-hazardous waste disposed	[kg]	2.84E+0	2.67E-3	1.14E+0	5.21E-4	5.24E+1	-1.61E-2
Radioactive waste disposed	[kg]	1.42E-1	4.54E-5	5.83E-3	8.86E-6	1.97E-4	-3.30E-3
Components for re-use	[kg]	IND	IND	IND	IND	IND	IND
Materials for recycling	[kg]	IND	IND	IND	IND	IND	IND
Materials for energy recovery	[kg]	IND	IND	IND	IND	IND	IND
Exported electrical energy	[MJ]	0.00	0.00	9.42	0.00	0.00	0.00
Exported thermal energy	[MJ]	0.00	0.00	21.80	0.00	0.00	0.00

INTERPRETATION

USE OF ENERGY RESOURCES

The primary energy from non-renewable resources is dominated by the production of glass mineral blowing wool (especially due to the energy consumption) and at a lower level the energy used for transport and installation (blowing and spraying) on construction site.
The renewable energy is dominated by the packaging (wood pallets) and the production (electricity mix).

ENVIRONMENTAL IMPACT

Mostly all impacts categories are dominated by the fabrication of the blowing wool in itself at plant level. This is due to the consumption of energy (electricity and thermal energy) during the production of blowing wool. The Fix product, the Binder product and the installation stage have relatively lower impacts.
The **Abiotic Depletion Potential elements (ADPe)** are dominated by the raw material consumption for the blowing wool.
The **Global Warming Potential (GWP)** is highly impacted by the blowing wool fabrication stage, mostly due to energy consumption (gas and electricity). The raw materials and transport to site have a limited impact. GWP is reduced by the use of a high percentage of glass cullet (about 80%). On construction site, the installation is requesting energy for spraying and blowing equipment and consecutively represents about 10% of GWP.
The **Ozone Depletion Potential (ODP)** is influenced by raw materials, production and packaging. This is mostly influenced by the consumption of electricity (about 90% of the impact).

The **Acidification Potential (AP)** is also dominated by the production of the blowing wool due to the emissions related to the processes of the glass furnace and the energy consumption. Mostly, the impact refers to emissions to air: sulphur dioxide and nitrogen oxides.
The **Euthrophication Potential (EP)** is significantly influenced by the blowing wool production due to emissions from the furnace and electricity consumption.
The **Potential Ozone Photochemical Oxidants (POCP)** is particularly dominated by the blowing wool production (electricity consumption and to lower extent raw materials). The results from the transport are negative due to the NO emissions; NO counteracts the POCP.

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