EPD Document

As per ISO 14025

Programme for EPD (Environmental Product Declarations)

ECI Ecologic Thermal & Acoustic Insulation

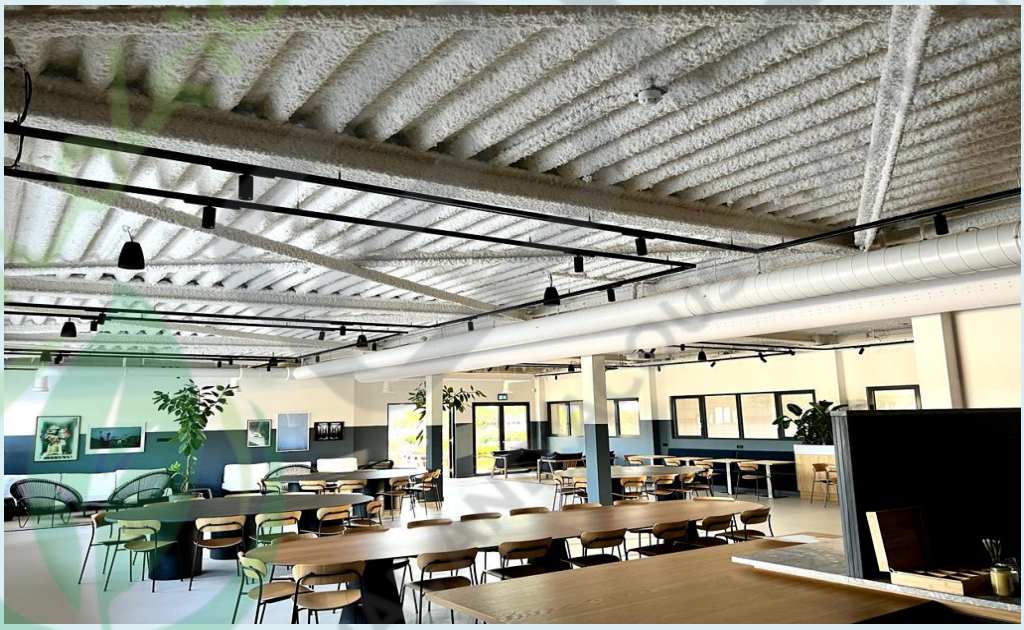
Prepared for: Mek İnşaat Sanayi ve Ticaret A.Ş.

Headquarters: Kültür Mah. 1375 Sokak No.9/5 Alsancak / İzmir - TURKEY

Factory: Akhisar Organize Sanayi Bölgesi 12. Cadde No.3 Akhisar / Manisa - TURKEY

Prepared by: CANSET Yazılım Çevre Enerji Danışmanlık Hizmetleri Ticaret A.Ş.

İTOB OSB Mahallesi 10032. Sokak No: 2 Menderes / İzmir - TÜRKİYE



Product Name: Spray Applied Thermal Acoustic Insulation

Date: 14.03.2023

Content of the project report

1 General information

Product name Spray Applied Thermal Acoustic Insulation	**Declared Product / Declared Unit** The product title is "Spray Applied Thermal Acoustic Insulation Material" made of cellulose fibers. The functional unit is 1 kg of packaged material. **Range of validity** The data for the LCA study was obtained directly from the manufacturer, which is located in Turkey.
Declaration data ☒ Specific data ☐ Average data	
The owner of the declaration is liable for the underlying information and evidence; CANSET A.Ş. is not liable with respect to manufacturer information, life cycle assessment data and evidence.	
Type of Declaration as per ISO 14025 From cradle to grave LCA-Method: CML 2001	**Database, Software, Version** Ecoinvent 3.6, GaBi, CCaLC
Author of the Life Cycle Assessment Assoc.Prof.Dr. F. Görkem Üçtuğ CANSET Yazılım Çevre Enerji Danışmanlık Hizmetleri Ticaret A.Ş. www.can-set.com	**Independent verification of the declaration according to ISO 14025:2010** ☐ internally ☐ externally **Verifier 1:** Name **Verifier 2:** Name
Owner of the Declaration Mek İnşaat Sanayi ve Ticaret A.Ş. Headquarters: Kültür Mah. 1375 Sokak No.9/5 Alsancak / İzmir - TURKEY Factory: Akhisar Organize Sanayi Bölgesi 12. Cadde No.3 Akhisar / Manisa - TURKEY	

Name
Verifier

Name
Verifier

Note: EPDs from similar product groups from different programmes might not be comparable.

Date of project report: Version 1, date: 14.03.2023

Scope of the study:

Creation of LCA calculation as on the basis of received inventory data for spray applied thermal acoustic insulation material made of cellulose fibers.

Description of the goals of the study:

„The LCA study serves as a basis for the preparation of an Environmental product declaration (EPD). It was calculated compliance with ISO 14025. The results are assigned to be published in an EPD document. The data is prospected for EPD business-to-business communication."

2 Product

2.1 General product description

The product is an acoustic spray system. It absorbs noise, which improves speech intelligibility and brings a natural feeling of well-being to a space as well as providing thermal insulation. It is applied directly on the substrate. It is used to insulate walls, roofs, attics and mezzanine floors.

2.2 Application field

The spray applied acoustical texture has been designed for a variety of project types. It provides high performance solution to acoustical and lighting design objectives in both new construction and renovation projects while providing thermal insulation for buildings such as public transportation areas, residential buildings, classrooms, restaurants, sports, auditoriums, nightlife, car parks, offices, living rooms, kitchens, swimming pools, care homes, conference rooms.

2.3 Technical data

Table 1: Technical data for the product

Characterization	Value	Unit
Technical approval	ETA/CE certified	-
Density	28-55	kg/m^3
Fire Class according to TS EN 13501-1	B-s2, d0	-
Thermal Conductivity according to TS EN 12667	0.038	W/(m.K)
Technical lifespan	50	years
Water vapour diffusion resistance factor according to TS EN 12086	2.6	N.s/g
Water absorption according to TS EN 1609	13.77	kg/m^2

2.4 Basic/auxiliary materials

Table 2: Base materials in mass %

Components:	Mass %
Recycled Cellulose Pulp	85
Boric Acid	7.5
Borax Decahydrate	7.5

2.5 Production

Energy required for the production of the product was measured as 0.125 kWh of electricity for 1 kg of product.

2.6 Packaging

1 kg of final product requires 9 grams of nylon packaging.

2.7 Conditions of delivery

The final product is delivered to the point of application in wooden crates. A single crate weighs 15 kg and can carry 375 kg of final product. Thus, the transportation of the declared amount of final product, that is 1 kg, requires 40 grams of wood.

2.8 Transport

The transportation distances for the materials involved in the life cycle stages are as follows:

- Recycled Cellulose Pulp: 118 km
- Boric acid and Borax Decahydrate: 208 km
- Nylon packaging: 85 km
- Wooden crate: 5 km

The transportation of all the items mentioned above take place via trucks running with diesel-powered internal combustion engines.

2.9 Processing/ installation/Use

At the installation site, insulation products are unpackaged and installed with a blowing machine. The insulation blower is used to spray on the fiber and adhesive, which contains polyvinylalcohol and water. The potential impact of the energy consumed by the blower is included in this study. All packaging waste is incinerated and no maintenance or replacement is required to achieve the product's life span. After removal, the insulation is assumed to be landfilled.

For each 50 m^2 surface area, 15 mm thick spray to be installed. 175 liters of clean water mixed with 25 liters of water-based adhesive (PVA) is required. With an approximate density of 45 kg/m^3, these figures show that 33.75 kg of final product requires 175 liters of water and 25 liters of adhesive, meaning that 1 kg of final product requires 5.185 liters of water and 0.741 liter of adhesive. With the former and latter having densities of approximately 1 kg/l and 0.96 kg/l, respectively, their amounts correspond to 5.185 kg and 0.711 kg, respectively.

The amount of energy that the blower consumes for applying 1 kg of product was measured as 0.415 kWh.

The point of use is assumed to be 50 km away from the point of manufacturing.

2.10 Reference service life (RSL)

If installed correctly according to the manufacturer's guidelines, cellulose fiber insulation products need no further maintenance, repair, replacement or refurbishment during the full life span of the product. If the product is applied and maintained following the installation and maintenance instructions the life span can be assumed to be 50 years.

2.11 Reuse and recycling

Reuse or recycling is not applicable to the product.

2.12 Disposal

The waste of the final product is assumed to be sent to landfill disposal at the end of its lifetime whereas the packaging materials (nylon and wood) are assumed to incinerated. Both disposal site and the incineration plant are assumed to be 50 km away from the point of installation. The waste is transported by truck.

3 LCA: Calculation rules

3.1 Declared unit/ Functional unit

Table 3. Declared unit/Functional unit

characterization	value	unit
declared unit	1	kg

3.2 System boundary

The LCA conducted in this work was done by employing a "cradle-to-grave" approach.

All declared life cycle stages (modules) are marked with „X" in Table 5. Modules not declared are marked with NA.

Table 4. Declared life cycle stages

PRODUCT STAGE			CON-STRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Construction, installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
X	X	NA	X	X	NA	NA	NA	NA	NA	X	X	NA	X	NA	X	NA

X = included in LCA; NA = Module not applicable

Justification for the exclusion of certain stages:

A3: The readily available database that was used in the analysis incorporates the impact associated with the supply and production of raw materials into a single value. Thus, impacts associated with stage A3 are embedded into those associated with stage A1.
B1: No material or energy supply is associated with the use stage.
B2: No maintenance is required for the product.
B3: No repair is required for the product.
B4: No replacement is required for the product during its life time.
B5: Refurbishment is not applicable.
C1: The energy used for the de-construction (removal) stage has not been included due to insignificance.
C3: Waste is assumed to be sent to landfill, thus stage C3 is not included.
D: Waste is assumed to be sent to landfill, thus stage D is not included.

Specific LCA calculation rules:
Required information has been provided in sections 2.5 to 2.9.

3.3 Flow chart of processes/stages in the life cycle

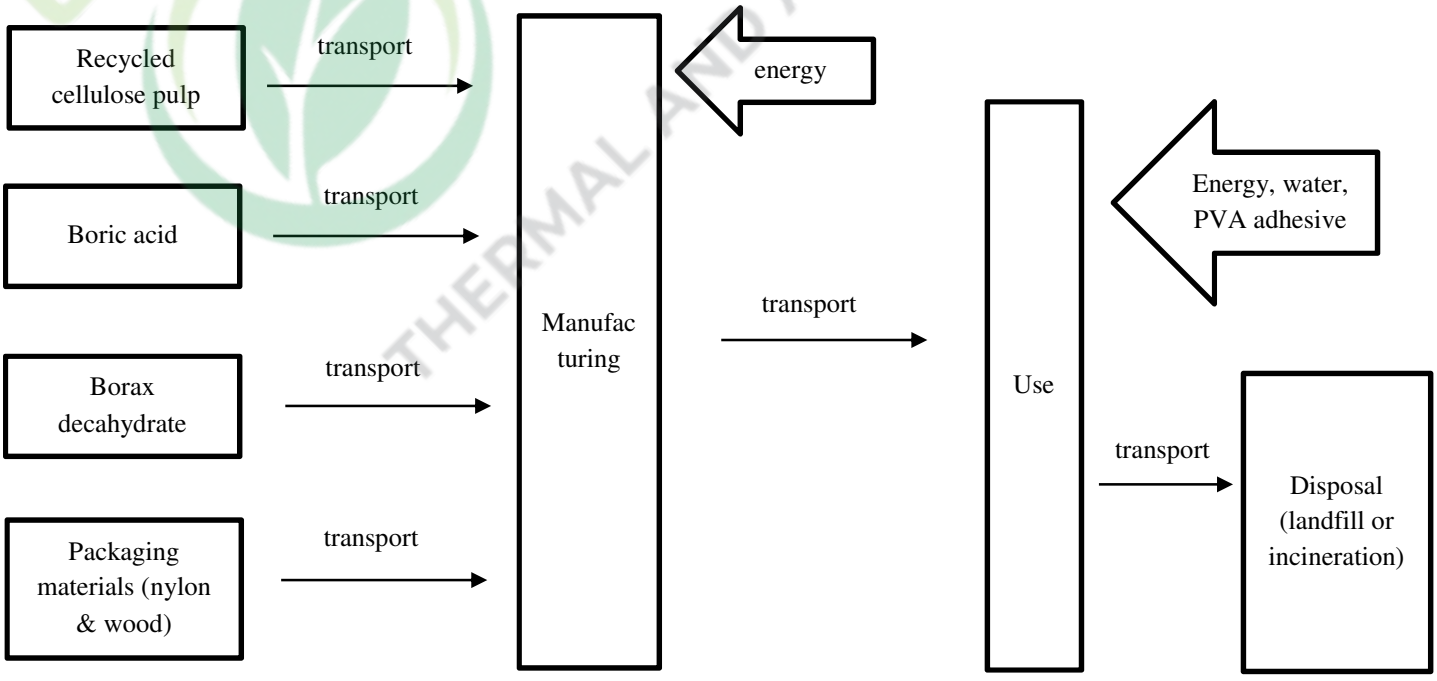


Figure 1: Flowchart showing the system boundaries

3.4 Estimations and assumptions

All the assumptions and estimations made during the analysis have been indicated in sections 2.5 to 2.12.

3.5 Cut-off criteria

Auxiliary inputs such as lubrication oil were not declared. The machines, facilities and other infrastructure required for manufacturing the insulation concerned were not taken into consideration in the life cycle assessment.

3.6 Data sources

All the data from the operating data acquisition for the Spray Applied Thermal Acoustic Insulation of MEK İNŞAAT SAN.TİC.A.Ş were taken into consideration. All raw materials used for the formula and the determined production waste were taken into consideration in the assessment.

3.7 Data quality

Data quality was assessed in terms of four parameters, as listed below:

- Reliability
- Temporal correlation
- Geographical correlation
- Technological correlation

In terms of reliability, data quality is considered to be very high as all the data is based on verified measurements from the production site. As far as temporal correlation is concerned, the data quality is again very high as all the data belongs to 2022. As far as geographical correlation is concerned, the data quality is medium, simply because the background data in the LCA software does not reflect the situation in Türkiye due to a lack of absence of a national life cycle database in Türkiye. Finally, the data quality score regarding technological correlation is very high as all the data was obtained from enterprises, processes and materials under study.

Overall, the data quality is considered to be between high to very high.

3.8 Reporting period

The period of observation ran from January to December 2022.

3.9 Allocation

No allocation was necessary in this project as the analysis does not involve any multi-functionality. No by-products are created. The complete treatment of the waste from manufacturing lies within the system limits and does not require any declaration.

3.10 Comparability

A comparison or evaluation of EPD data is only possible if all datasets are made following EN 15804 applying the same relevant product category rules and for the same modules.

4 LCA: results

The results of the analysis can be found in Table 4 below. The explanation of the abbreviations in Table 4 can be found in section 7.3.

Table 5. Parameters to describe the environmental impact

Parameter	unit	A1	A2	A4	A5	B6	B7	C2	C4
GWP	kg CO_2 eq.	6.29E-01	1.800E-2	0.701E-2	0.384E+1	1.82E-01	1.650E-3	0.701E-2	2.600E-2
AP	kg SO2 eq.	8.11E-03	9.580E-5	3.830E-5	0.000 (*)	1.17E-02	7.210E-6	3.790E-5	9.950E-5
EP	kg PO_4^{-3} eq.	9.22E-04	2.550E-5	1.000E-5	0.000 (*)	9.40E-05	4.520E-6	1.010E-5	2.170E-5
ODP	kg R11 eq.	5.89E-08	2.850E-9	1.120E-9	0.000 (*)	1.86E-08	8.360E-11	1.130E-9	2.740E-9
PSP	kg ethene eq.	2.16E-04	2.860E-6	1.140E-6	0.000 (*)	8.20E-05	3.930E-7	1.130E-6	4.180E-6
HTP	kg DCB eq.	3.18E-01	4.570E-3	1.800E-3	0.000 (*)	1.11E-01	9.580E-4	1.810E-3	3.980E-3
TED	MJ	1.262E+1	3.000E-1	1.180E-1	0.000 (*)	0.149E+1	3.200E-2	1.190E-1	0.000 (**)
NRED	MJ	1.034E+1	2.960E-1	1.170E-1	0.000 (*)	8.940E-1	2.900E-2	1.170E-1	0.000 (**)
RED	MJ	0.228E+1	3.690E-3	1.470E-3	0.000 (*)	5.960E-1	3.230E-3	1.460E-3	0.000 (**)

(*) the only input associated with this stage is the PVA-based adhesive. Since there was no available dataset in the Ecoinvent database for this particular input, data from the literature was obtained. However, no specific data regarding the impacts other than GWP could be found.
(**) data regarding the energy consumption of the waste management processes was not available in the Ecoinvent 3.6 database

The overall impact scores can be found in Figure 2 below.

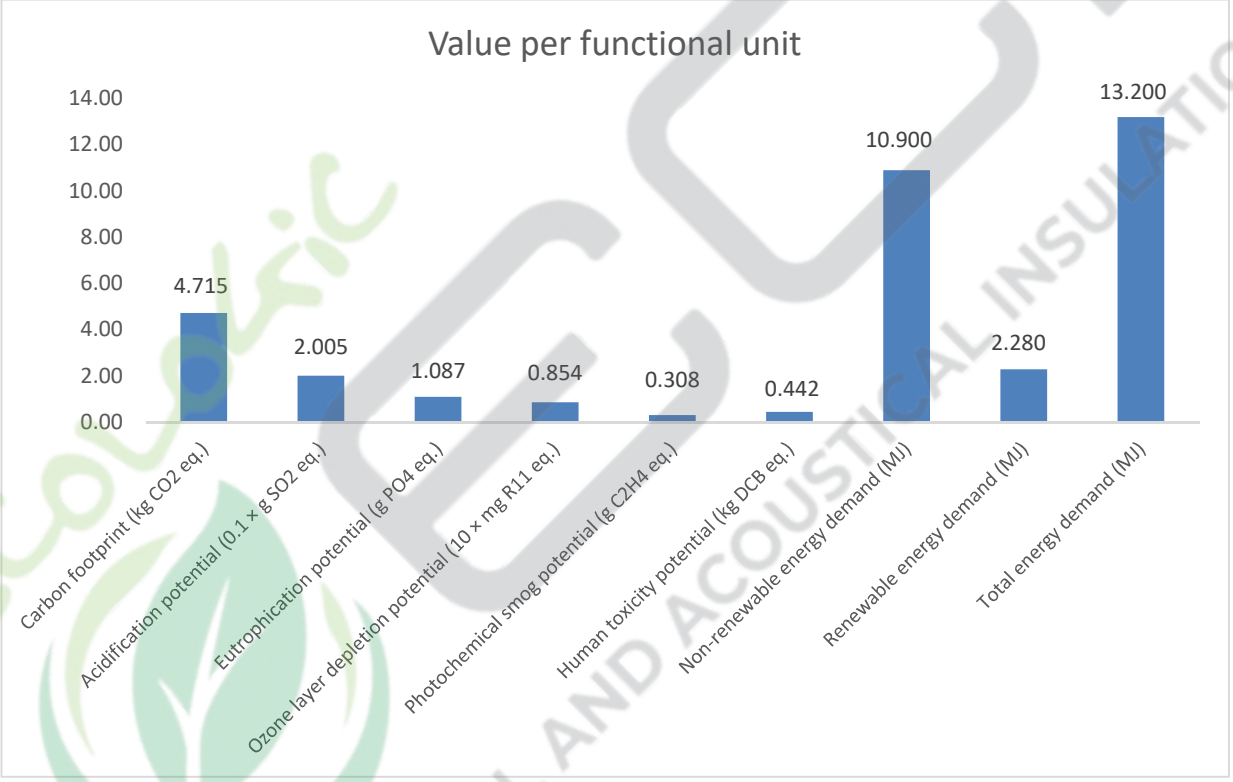


Figure 2: Overall LCIA results

5 LCA: Interpretation

Table 6 below provides a heat map of the results according to the life cycle stages as described in Table 4.

Table 6. Heat map of the results according to the life cycle stages

Parameter	unit	A1	A2	A4	A5	B6	B7	C2	C4
GWP	kg CO2 eq.	13.35%	0.38%	0.15%	81.52%	3.86%	0.04%	0.15%	0.55%
AP	kg SO2 eq.	40.37%	0.48%	0.19%	0.00%	58.24%	0.04%	0.19%	0.50%
EP	kg PO_4^{-3} eq.	84.76%	2.34%	0.92%	0.00%	8.64%	0.42%	0.93%	1.99%
ODP	kg R11 eq.	68.95%	3.34%	1.31%	0.00%	21.77%	0.10%	1.32%	3.21%
PSP	kg ethene eq.	70.20%	0.93%	0.37%	0.00%	26.65%	0.13%	0.37%	1.36%
HTP	kg DCB eq.	71.93%	1.03%	0.41%	0.00%	25.11%	0.22%	0.41%	0.90%
TED	MJ	85.97%	2.04%	0.80%	0.00%	10.15%	0.22%	0.81%	0.00%
NRED	MJ	87.68%	2.51%	0.99%	0.00%	7.58%	0.25%	0.99%	0.00%
RED	MJ	79.01%	0.13%	0.05%	0.00%	20.65%	0.11%	0.05%	0.00%

As can be seen in Table 6, with the exception of GWP, all the impacts are dominated by the raw material supply stage. In the case of GWP, PVA adhesive used during the construction/installation/use stage (A5) was found to have the highest contribution to the impact score. However, it should be noted that the lack of data on the PVA adhesive for impacts other than GWP might have introduced a considerable uncertainty on the results. As far as stage A1 is concerned, cellulose fibre and boric acid were found to be the main contributors to the impacts. Transportation stages (A2, A4, C2) combined were found to have almost negligible contributions on the product impact.

6 Literature

EN ISO 14040 Environmental management - Life cycle assessment -- Principles and framework

EN ISO 14044 Environmental management - Life cycle assessment -- Requirements and guidelines

EN ISO 14025 Environmental labels and declarations -Type III environmental declarations -- Principles and procedures

EN 15804 Sustainability of construction works - environmental product declarations. Core rules for the product category of construction products

EPiC Database (2019) Wood Glue (PVA), retrieved from https://melbourne.figshare.com/articles/dataset/EPiC_database_-_Wood_glue_PVA_/9979994

7 Directory and Glossary

7.1 List of figures

7.2 List of tables

7.3 Abbreviations

GWP: global warming potential
AP: acidification potential
EP: eutrophication potential
ODP: ozone layer depletion potential
PSP: photochemical smog potential
HTP: human toxicity potential
TED: total energy demand
NRED: non-renewable energy demand
RED: renewable energy demand
DCB: dichlorobenzene