KNAUF INSULATION
FOR THE WORLD WE LIVE IN

JetSpray™

JetSpray Thermal Insulation is a high-performance, spray-on insulation system with an adhesive added. Knauf Insulation's stabilized fiber technology allows the JetSpray spray-on insulation system to be applied in a net-less, side wall application—creating a custom insulation solution for every project.

Performance dashboard

Features & functionality

Easy installation – quickly and consistently applied with no gaps or voids

Thermal efficiency – delivers maximum of R-15 in a 2 x 4 cavity and R-23 in a 2 x 6 cavity

Acoustical benefits – improves Sound Transmission Class (STC) ratings by 4-10 points

Visit Knauf for more product information

Environment & materials

Improved by:
Utilization of recycled glass

Optimized compression packaging

Certification & rating systems:
Declare, Red List Free

UL GREENGUARD Gold certified

UL Validated recycled content

UL Validated formaldehyde-free

Audited, European Certification Board for Mineral Wool Products exoneration process

ASTM C1014

CSI MasterFormat® #MF 07 21 26

Thermal Insulation Guide Specification
For spec help, contact us or call 317 421 8727

See LCA, interpretation & rating systems

See materials, interpretation & rating systems

SM Transparency Report™ + Material Health Overview™

VERIFICATION	LCA
3rd party reviewed	✓ NSF
	Transparency Report
3rd party verified	✓ NSF
	Material evaluation
Self-declared	✓

Validity: 12/03/18 – 12/03/23
KNA – 12032018 – 002

This declaration was independently verified by NSF to ISO 21930:2017, EN 15804, the UL Environment PCR, and ISO 14025:2006.

NSF International
P.O Box 130140
789 N.Dixboro Road
Ann Arbor, MI 48105, USA
www.nsf.org
734 769 8010

Knauf Insulation, Inc.
One Knauf Drive
Shelbyville, IN 46176
www.knaufinsulation.us
317 398 4434

Contact us

LCA & material health results & interpretation

JetSpray™ 2018

Life cycle assessment | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ● **Cradle to grave**

Application
Spray-on insulation system installed in North America using a blowing wool machine and water pump, used to activate the powdered adhesive. It is sprayed onto exterior and interior cavity walls for thermal and acoustical performance. Insulation is delivered to the installation site as one packaged bag containing varying amounts of product.

Functional unit
Reference service life: 75 years. One square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of R_{SI}=1m^2·K/W over a period of 75 years.
Reference flow: 1.02 kg of product with no facing option, at a thickness of 0.0366 m to achieve the functional unit. (ASTM C518)

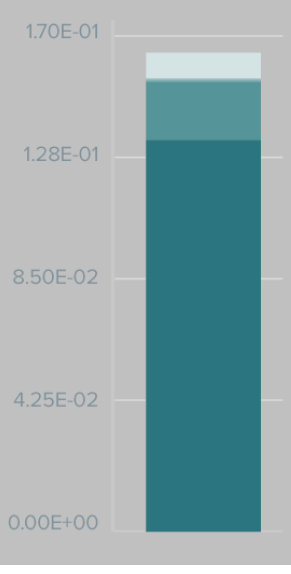
Manufacturing data
Reporting period: October 2015 – September 2016
Location: Shelbyville, IN and Shasta Lake, CA

Default installation, packaging, and disposal scenarios
At the installation site, insulation products are unpackaged and installed. For loosefill products, an insulation blower is typically used to install the product. No material is lost or wasted because scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (15% to recycling, 68% to landfill, and 17% to incineration), and no maintenance or replacement is required to achieve the product's life span. After removal, the insulation is assumed to be landfilled.

Material composition greater than 1% by weight

PART	MATERIAL	AVG % WT.
Batch	Post-consumer cullet	58.0%
Batch	Sand	17.0%
Batch	Borax	9.0%
Batch	Soda ash	5.0%
Batch	Quicklime	3.6%
Batch	In-house cullet	2.4%
Adhesive	Starch adhesive	<5.0%
Packaging	Plastic film	1.3%
	Other	<5.0%

Total impacts by life cycle stages [mPts/func unit]



LIFE CYCLE STAGE	MPTS/FUNC UNIT
Raw material acquisition	1.31E-01
Manufacturing	1.95E-02
Transportation	7.45E-04
Installation and maintenance	4.14E-04
Disposal/reuse/recycling	8.66E-03

Total impacts = 1.61E-01 mPts
per 75 years installed

What's causing the greatest impacts

All life cycle stages
The manufacturing stage dominates the results for the acidification, global warming, ozone depletion, carcinogens, smog, and fossil fuel depletion impact categories. The remaining impact categories are dominated by the raw materials acquisition stage. Following these two stages, the next highest impacts come from transportation and disposal, which have a similar contribution. However, for ozone depletion, carcinogenics, and non-carcinogenics, the installation and maintenance stage is the third highest contributor due to packaging disposal. The impact of the raw material acquisition stage is mostly due to the borax, manganese oxide, and soda ash in the batch and the dextrose in the binder. Since sand and borax are melted in the oven, they are not released into the air as fine particulates and therefore likely actually contribute less than what is calculated in the results tables below. Quicklime production is associated with global warming impacts due to carbon dioxide emissions from its manufacturing process. The manufacturing stage shows major contributions to all impact categories. The contributions to outbound transportation are caused by the use of trucks and rail transport. The landfilling of the discarded product contributes to the disposal stage. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is the smallest contributor of all the stages except for ozone depletion, carcinogenics, and non-carcinogenics.

Manufacturing stage
The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage for all impact categories.

Characterized vs. single score results
Due to normalization and weighting, different stages can dominate the characterized and single score results. The batch ingredients sand and borax contribute significantly to the respiratory effects category, causing the raw materials acquisition stage to dominate the mPt results, but not the characterized results. However, they are not released into the air as fine particulates and therefore likely actually contribute less than what is calculated in the raw material acquisition stage. What this means is that the manufacturing stage may have a larger share of the impact than what is displayed in the total impacts by life cycle stage.

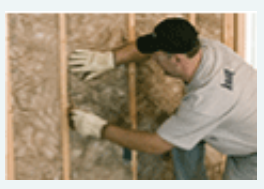
Sensitivity analysis
There are no sensitivity results that lead to variations greater than 10% in the LCA results.

How we're making it greener
Knauf is committed to providing products that conserve energy and preserve natural resources.

- JetSpray contains a high degree of recycled content, which translates to 20% less glass melting energy and a 25% reduction in embodied carbon.
- Our utilization of recycled content reduces mining impacts by 60%. In fact, Knauf and Manson products combined use 10 railcars of recycled glass a day.
- A gentle food grade anti-microbial is added to the adhesive system for greener security.
- JetSpray™'s glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORATION	INSTALLATION AND MAINTENANCE	DISPOSAL/REUSE/ RECYCLING
Information modules: Included | Excluded* *In the installation and maintenance phase, packaging waste in module A5 is the only contributor to the potential impacts.	**A1 Raw Materials**	**A3 Manufacturing**	**A4 Transporation/ Delivery**	**A5 Construction/ Installation**	**C1 Deconstruction/ Demolition**
	A2 Transportation			**B1 Use**	**C2 Transporation**
				B2 Maintenance	**C3 Waste Processing**
				B3 Repair	**C4 Disposal**
				B4 Replacement	
				B5 Refurbishment	
				B6 Operational energy use	
				B7 Operational water use	
					

SM 2013 Learn about SM Single Score results

Impacts per 75 years of service	1.31E-01 mPts	1.95E-02 mPts	7.45E-04 mPts	4.14E-04 mPts	8.66E-03 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to disposal and disposing of packaging materials.	Transportation to landfill and landfilling of product.

See the additional EPD content required by the UL Environment PCR on page 4 of the Transparency Report PDF.

TRACI v2.1 results per functional unit

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/REUSE/ RECYCLING

Ecological damage

Impact category	Unit					
Acidification	**kg SO_2 eq**	2.01E-03	3.28E-03	1.20E-04	7.82E-05	1.87E-04
Eutrophication	**kg N eq**	2.39E-04	1.86E-04	7.61E-06	4.29E-06	2.65E-05
Global warming	**kg CO_2 eq**	3.52E-01	1.58E+00	9.36E-02	4.30E-02	4.73E-02
Ozone depletion	**kg CFC-11 eq**	5.66E-11	3.89E-10	2.74E-12	1.07E-08	5.49E-12

Human health damage

Impact category	Unit					
Carcinogenics	**CTU_h**	2.32E-11	7.45E-11	1.31E-13	8.48E-13	6.19E-13
Non-carcinogenics	**CTU_h**	5.71E-10	3.76E-12	5.80E-14	5.63E-13	3.91E-14
Respiratory effects	**kg $PM_{2.5}$ eq**	2.28E-03	2.45E-04	7.39E-06	4.69E-06	1.49E-04
Smog	**kg O_3 eq**	2.37E-02	4.40E-02	2.00E-03	6.88E-04	2.92E-03

Additional environmental information

Impact category	Unit					
Ecotoxicity	**CTU_e**	8.59E-03	2.01E-04	5.02E-05	1.37E-06	1.65E-05
Fossil fuel depletion	**MJ, LHV**	4.03E-01	2.20E+00	1.90E-01	9.18E-03	9.38E-02

See the additional EPD content required by the UL Environment PCR on page 4 of the Transparency Report PDF.

References

LCA Background Report
Knauf Insulation and Manson Insulation Products LCA Background Report (public version), Knauf 2018. GaBi 7, GaBi 2017 database.

PCRs
ISO 21930:2017 serves as the core PCR along with EN 15804 and UL Part A.

ULE PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements v3.1
May 2, 2018. Technical Advisory Panel members reviewed and provided feedback on content written by UL Environment and USGBC. Past and present members of the Technical Advisory Panel are listed in the PCR.

ULE PCR Part B: Building Envelope Thermal Insulation
Version 2.0, April 2018. PCR review conducted by Thomas Gloria, PhD (chair, t.gloria@industrial-ecology.com); Andre Desjarlais; and Christoph Koffler, PhD.

ULE General Program Instructions v2.1, April 2017

ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services", ISO21930:2017

Download PDF SM Transparency Report/Material Health Overview, which includes the additional EPD content required by the UL Environment PCR.

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. TRs/EPDs of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore, cannot be used as comparative assertions unless the conditions defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied. Comparison of the environmental performance of building envelope thermal insulation using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under the PCR. Full conformance with the PCR for building envelope thermal insulation allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category PCR, and use equivalent scenarios with respect to construction works. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI data sets may lead to different results upstream or downstream of the life cycle stages declared.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization
Environmental product declarations

○ Industry-wide (generic) EPD	½ product
✓ Product-specific Type III EPD	1 product

Green Globes for New Construction and Sustainable Interiors
Materials and resources

✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell	
✓ C 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs	

Collaborative for High Performance Schools National Criteria
MW 7.1 – Environmental Product Declarations

✓ Third-party certified type III EPD	2 points

SM Transparency Report™ + Material Health Overview™

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NSF International
P.O Box 130140
789 N.Dixboro Road
Ann Arbor, MI 48105, USA
www.nsf.org
734 769 8010

Knauf Insulation, Inc.
One Knauf Drive
Shelbyville, IN 46176
www.knaufinsulation.us
317 398 4434

Contact us

LCA & material health results & interpretation

JetSpray™ 2018

Life cycle assessment | Material health

Evaluation program

Declare
Declare labels are issued to products disclosing ingredient inventory, sourcing and end of life options. Declare labels are based on the Manufacturers Guide to Declare, administered by the International Living Future Institute.

How it works
Material ingredients are inventoried and screened against the Living Building Challenge (LBC) Red List which represents the 'worst in class' materials, chemicals, and elements known to pose serious risks to human health and the greater ecosystem.

Assessment scope and results

Declare™

Inventory threshold: 100 ppm

Declare level:

The Declare product database and label are used to select products that meet the LBC's stringent materials requirements, streamlining the materials specification and certification process.

- LBC Red List Free
- LBC Compliant
- Declared

Red List Free

Click the label to see the full declaration.

Knauf Insulation JetSpray™

What's in this product and why

Declare level
JetSpray™ contains no Red List chemicals. The Red List is a list of chemicals that are not allowed in Living Building Challenge buildings. Being Red List free is our design benchmark at Knauf.

Jet Spray is designed to be blown into walls and is stabilized using a small amount of bio-based adhesive. The product meets GreenGuard Gold criteria and is validated to be formaldehyde-free.

What's in the product and why
This product is designed to be blown into walls without netting. The ingredients include: approximately 98% virgin glass fiber, 2% bio-based adhesive for stability, and a small amount of food-grade anti-microbials to prevent the mold growth within the adhesive. This product works well in interiors, as it is virgin glass with a small amount of adhesive.

What's been done in the design and manufacture in consideration of the potential human health impacts in the use stage
This product is formaldehyde-free and Red List free by design. Food grade anti-microbials were selected to guard the bio-based adhesive against mold growth.

Where it goes at the end of its life
At this time, the product is landfilled at end of life. We take extended producer responsibility very seriously and have active programs to address end of life. There is no option other than landfills at this time.

How we're making it healthier
Knauf engages very closely with its vendors to eliminate and avoid chemicals of concern. No competitor has as many Red List free products as Knauf Insulation. We continually reduce our environmental impacts through recycled content and optimize our products by designing them to be transformative.

See how we make it greener

References

Declare
Knauf Insulation JetSpray™

Manufacturer's Guide to Declare
A comprehensive guide providing information about the program, the assessment methodology, how to submit material data to obtain a Declare label and how they are used to meet the Health & Happiness and Materials Petals of the Living Building Challenge.

Rating systems

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization
Material Ingredients

Credit value options — 1 product each

- ☑ 1. Reporting
- ○ 2. Optimization
- ○ 3. Supply Chain Optimization

Living Building Challenge 3.0
Materials petals imperatives

- ☑ 10. Red List Free
- ○ 12. Responsible Industry
- ○ 13. Living Economy Sourcing

Well Building Standard®
Air and Mind Features

- ○ **Air**, 26. Enhanced Material Safety
- ☑ **Mind**, 97. Material Transparency
- ○ **Mind**, 98. Organizational Transparency

Collaborative for High Performance Schools National Criteria
MW 10.1 — Building Product Health Related Information Reporting

- ☑ Product Health Related Information Report — 1 point

SM Transparency Report™ + Material Health Overview™

VERIFICATION	Material evaluation
Self-declared	☑

KNA – 12032018 – 002

The material health evaluation is self-declared and done in accordance with the Manufacturers Guide to Declare.

International Living Future Institute
501 East Madison St.
Seattle, WA 98122
www.living-future.org
206 223 2028

INTERNATIONAL LIVING FUTURE INSTITUTE™

Knauf Insulation, Inc.
One Knauf Drive
Shelbyville, IN 46176
www.knaufinsulation.us
317 398 4434

Contact us

How we make it greener

JetSpray™ 2018

Collapse all

See LCA results by life cycle stage

RAW MATERIAL ACQUISITION

Utilize recycled content

Our plants use 60 – 80% recycled content – which translates to about 10 railcars of recycled glass cullet a day. By leveraging so much recycled content, we reduce the energy required to form glass fibers by 20%. If we use even 60% recycled content, then mining impacts are reduced proportionately.

Pursue sequestration potential

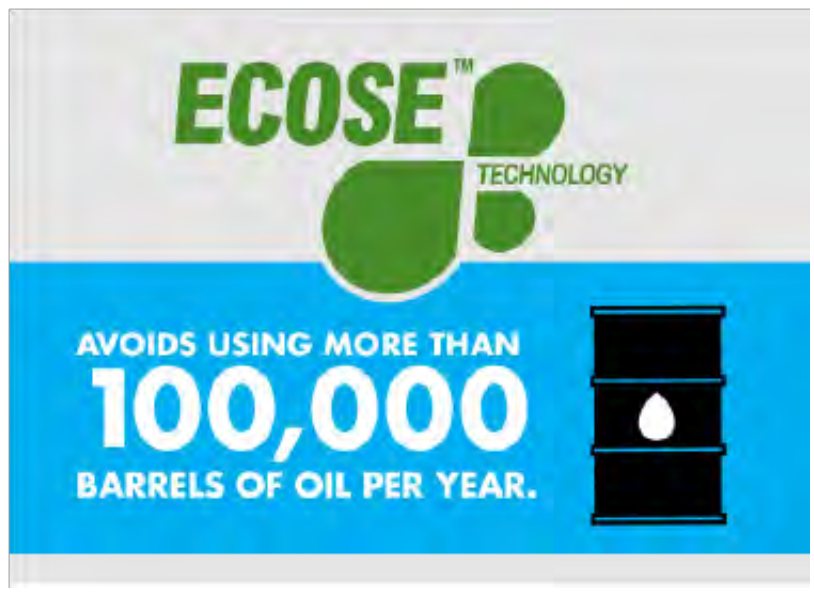
Manson and Knauf's bio-based ECOSE Technology is derived from corn. On average, the Knauf Family Farm produces one half the amount of corn we use to make our products on an annual basis, which is equal to 5,000 acres. While we don't grow the corn used in our products, the use of corn has a significant carbon sequestration impact on our processes. For instance, the use of corn actually offsets the carbon impact of some of the ancillary facers used on our products.

MANUFACTURING

Develop bio-based formaldehyde-free binder

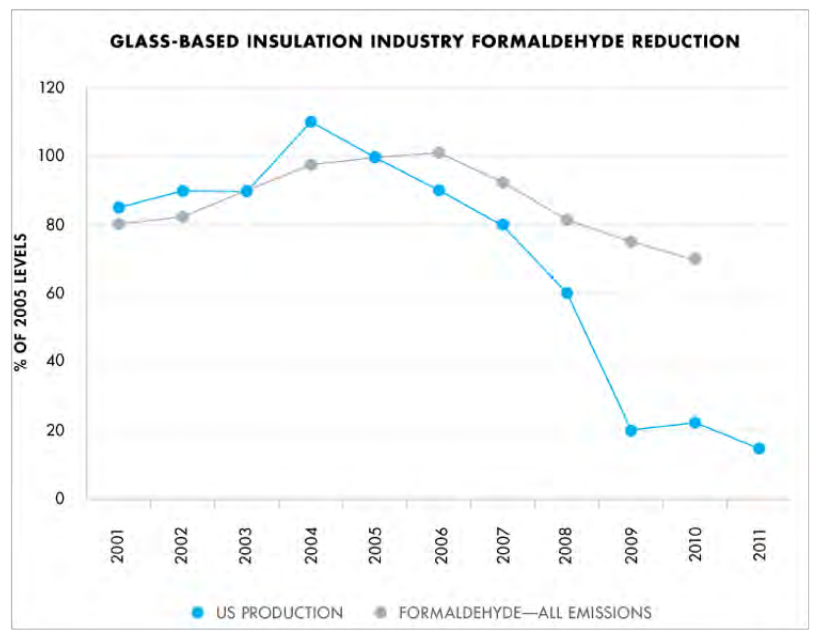
In 2008, Manson and Knauf Insulation launched perhaps the nation's largest formaldehyde-free green chemistry initiative called ECOSE Technology. Offering this into the building materials marketplace quickly transformed the entire glass mineral fiber industry toward bio-based chemistries. Today phenol-formaldehyde (PF) based resins are largely a thing of the past with regard to large volume mineral fiber based insulation products. Manson and Knauf have also launched a new business venture to assist other industries in accessing ECOSE Technology for their processes.

In a given year, using corn-based ECOSE Technology instead of phenol & formaldehyde avoids the equivalent of more than 100,000 barrels of oil in North America alone.



Lead green chemistry efforts

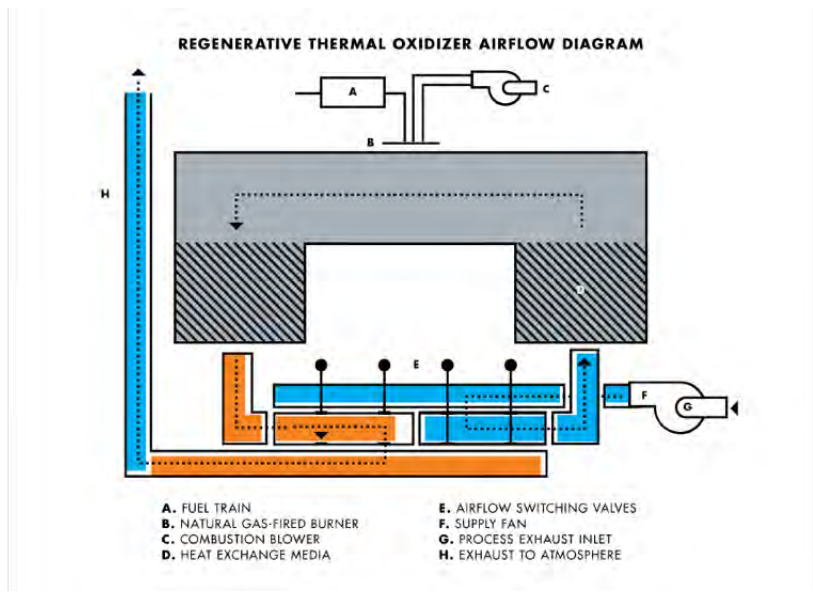
Following the launch of our ECOSE Technology in 2009, we had transformed all of our products and processes to this new technology. Using our bio-based ECOSE Technology has removed phenol and formaldehyde from our stack emissions. By 2012, the entire industry had followed our lead. This initiative not only established Manson and Knauf Insulation in a leadership position, but it had a transformative impact on our industry in general.

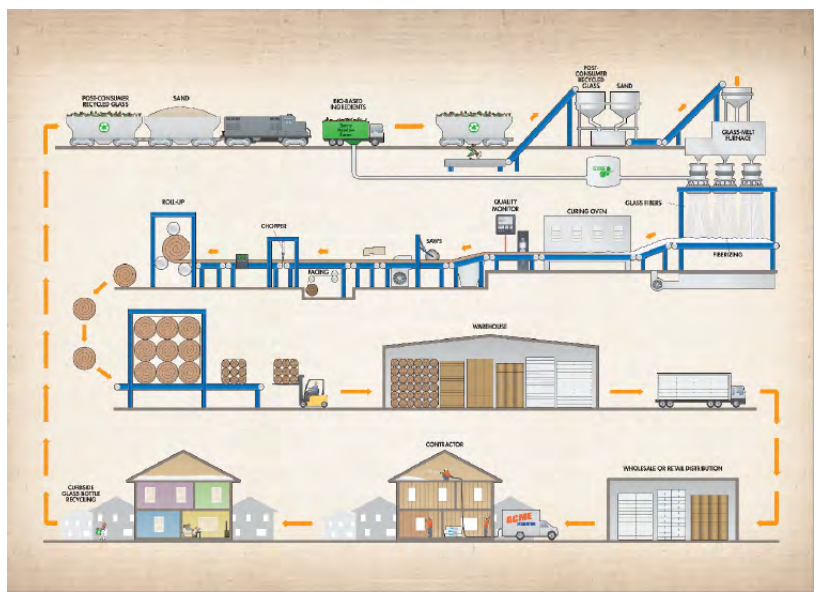


Green manufacturing Processes

1. Regenerative thermal oxidizers Manson and Knauf Insulation use regenerative thermal oxidizers (RTO) to capture and recycle much of the energy we used to cure our products. RTO is equipment used for the treatment of exhaust air. Our ovens exhaust into a ceramic heat exchange media to capture and reuse the heat in the exhausted air. Therefore, the amount of energy required to cure our product is reduced substantially.

2. Recycling As you can see below, everything we do starts with recycling. Our plant uses as much as 80% recycled content. While our only option is to landfill our products at end of life, that doesn't stop us from encouraging consumers to recycle other products, particularly glass bottles.





Continuous Improvement

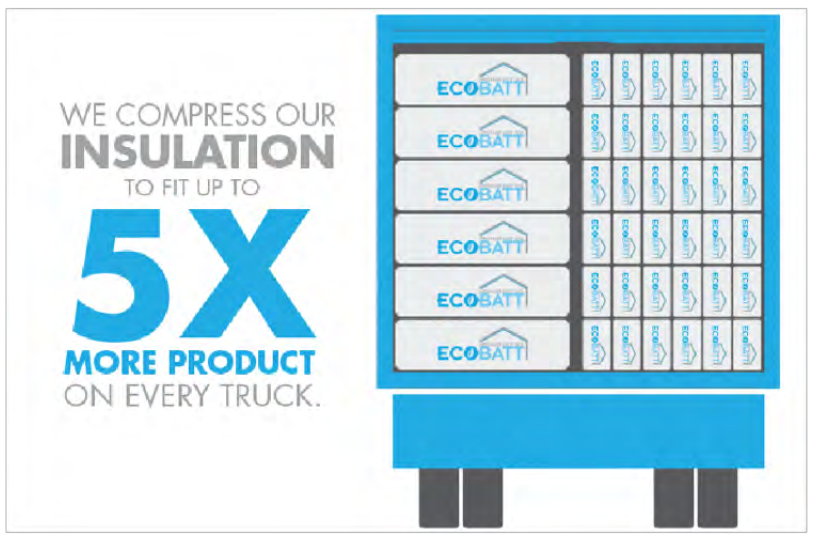
Continuous improvement is key to our sustainable development. Globally, we maintain the following Bureau Veritas certifications: ISO 9000, 14000, and 50001. These certifications relate to quality management systems, energy management and environmental management efforts. For more information on our current continuous improvement efforts, please review our global sustainability report.

TRANSPORTATION

Leverage compression packaging

Glass is a high modulus material, which helps to facilitate compression packaging. We compress our insulation to fit up to five times more product on every truck. This compression means:

- More material can fit on one truck when compared to other insulation materials
- Fewer packages on a job
- Fewer deliveries needed



INSTALLATION AND MAINTENANCE

Be confident in glass mineral wool's safety

In the past, a label regarding the carcinogenic potential of insulation made from glass fibers was required on all packaging. Following forty years of research, glass mineral wool has been exonerated entirely. Glass mineral wool is comprised of fibers that are biosoluble, meaning that the fibers dissolve in the body in a short period of time and exit the body with normal bodily functions. The scrutiny glass mineral wool has undergone is now seen as proof of its safety.

Meet and exceed green standards

GREENGUARD certified On the forefront of indoor air quality, Knauf Insulation was the first GREENGUARD certified product in 2002. This achievement led us to understand the impact our formaldehyde-free products could have on the indoor environment. The formaldehyde-free claim is third party validated by UL Environment.

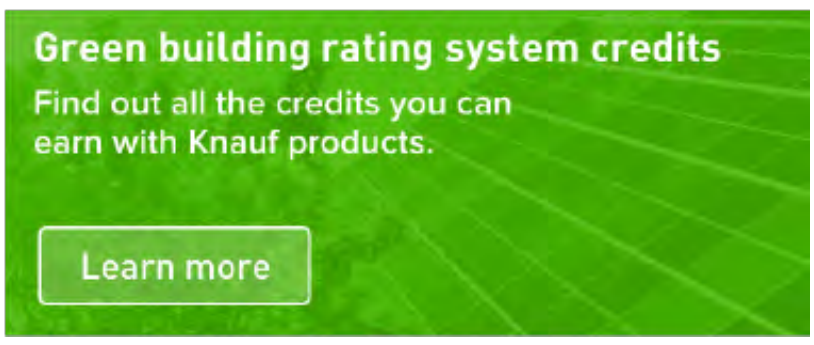
Red List Free Since 2012, Knauf Insulation North America used the Living Building Challenge (LBC) Red List as its developmental benchmark. The Red List is a list of chemicals that are avoided in material imperative for the construction of LBC buildings. Formaldehyde is just one of about 800 chemicals on the Red List. Manson Insulation has chosen the Health Product Declaration® (HPD) Collaborative as its standard for reporting building product content and associated health information.

EUCEB tested Glass fiber is perhaps the most widely studied building material available today. All of our processes and formulations are voluntarily third-party audited for compliance with the health and safety exoneration criteria for glass and rock based fiber through the European Certification Board for Mineral Wool Products (EUCEB) exoneration process. This guarantees the formulations are biosoluble and pose no health concerns. Having 35 years of research behind its safety, perhaps no other building material has been as thoroughly evaluated as fiberglass products. We believe a safe product is one that has been thoroughly evaluated.

Green building rating systems

Our products offer a vast array of potential credits for major green building rating systems, including: WELL, LEED v4, International Green Construction Code, Green Guide for Heath Care, NAHB Green Building Standard and more.

Visit the green building rating systems page to see all the credits you can earn using Manson and Knauf Insulation products.



DISPOSAL

Promote Recycling

Manson and Knauf are recycling advocates. We take every opportunity to advocate for recycling and financially support the Glass Recycling Coalition (GRC). We feel that a comprehensive understanding of the benefits of recycling will lead to greater recycling adoption and more promotion by state and local governments. While our only option is to landfill our products at end of life, that doesn't stop us from encouraging consumers to recycle other products, particularly glass bottles.

SM Transparency Report™ + Material Health Overview™

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Knauf Insulation, Inc.
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Shelbyville, IN 46176
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317 398 4434

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Additional EPD content required by: ULE PCR Parts A and B for Building Envelope Thermal Insulation

JetSpray™

Data

Background This company-specific product/product group specific declaration was created by collecting product data over the course of a year for each line at each location the product was manufactured. For products with multiple manufacturing locations, data are a weighted average by production volume at each location. For average products, which are products that have more than one facing option, data are a weighted average of the mass of each functional unit. The reference service life applies for the reference in-use conditions only.

Allocation Since only facility-level data were available, allocation among a facility's co-products was used to determine the input and output flows associated with each product. Allocation of materials and energy was done on a mass basis for all products except for the facing, which was allocated based on product area. Allocation of transportation was based on either weight or volume, depending on which was found to greater restrict the amount of cargo. Glass cullet is assumed to enter the system burden-free in that burden associated with the production of virgin glass is not allocated to the fiberglass life cycle. Likewise, the system boundary was drawn to include landfilling of fiberglass at end-of-life (following the polluter pays principle), but exclude any credits from recovery.

Cut-off criteria For the inclusion of mass and energy flows are 1% of renewable primary resource (energy), 1% nonrenewable primary resource (energy) usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exception to these criteria is substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. No known flows are deliberately excluded from this declaration.

Scenarios and additional technical information

PARAMETER	VALUE	UNIT
Transport to the building site [A4]		
Vehicle type	Truck	
Average distance from Shelbyville to installation site	680	mi
Average distance from Shasta Lake to installation site	884	mi
Capacity utilization by mass	27	%
Installation into the building [A5]		
Distance from installation site to disposal	100	mi
Mass of plastic packaging waste to disposal	0.0055	kg
Biogenic carbon contained in plastic packaging	0	kg CO_2
GWP based in biogenic carbon content of plastic packaging	0	kg CO_2e
Disposal/reuse/recycling [C1-C4]		
Distance from installation site to disposal	100	mi
Mass of product waste to disposal	1.02	kg
Removals of biogenic carbon (excluding packaging)	2.14E-03	kg CO_2

Resource use, output and waste flows, and carbon emissions and removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Total
Resource use indicators																
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	2.91E+00	7.54E-03	2.61E-03	0	0	0	0	0	0	0	0	3.07E-03	0	2.47E-02	**2.94E+00**
Renewable primary resources with energy content used as material	MJ, LHV	1.39E-12	0	8.06E-08	0	0	0	0	0	0	0	0	0	0	0	**8.06E-08**
Total use of renewable primary resources with energy content	MJ, LHV	2.91E+00	7.54E-03	2.61E-03	0	0	0	0	0	0	0	0	3.07E-03	0	2.47E-02	**2.94E+00**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.84E+01	1.38E+00	1.98E-01	0	0	0	0	0	0	0	0	1.72E-01	0	5.71E-01	**3.07E+01**
Non-renewable primary resources with energy content used as material	MJ, LHV	1.539E-08	0	0	0	0	0	0	0	0	0	0	0	0	0	**1.54E-08**
Total use of non-renewable primary resources with energy content	MJ, LHV	2.84E+01	1.38E+00	1.98E-01	0	0	0	0	0	0	0	0	1.72E-01	0	5.71E-01	**3.07E+01**
Secondary materials	kg	5.97E-01	0	0	0	0	0	0	0	0	0	0	0	0	0	**5.97E-01**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Use of net fresh water resources	m3	1.16E+03	2.78E+00	7.33E+00	0	0	0	0	0	0	0	0	5.93E-01	0	2.15E+01	**1.20E+03**

Output flows and waste category indicators

Hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-hazardous waste disposed	kg	0	0	5.50E-03	0	0	0	0	0	0	0	0	0	0	1.02E+00	**1.03E+00**
High-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Carbon emissions and removals

Biogenic Carbon Removal from Product	kg CO_2	5.43E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	**5.43E-03**
Biogenic Carbon Emission from Product	kg CO_2	1.42E-01	0	0	0	0	0	0	0	0	0	0	0	0	2.14E-03	**1.44E-01**
Biogenic Carbon Removal from Packaging	kg CO_2	5.41E-04	0	0	0	0	0	0	0	0	0	0	0	0	0	**5.41E-04**
Biogenic Carbon Emission from Packaging	kg CO_2	0	0	5.67E-04	0	0	0	0	0	0	0	0	0	0	0	**5.67E-04**
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Calcination Carbon Emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbonation Carbon Removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TRACI v2.1 disaggregated results per functional unit

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories required by the PCR are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development; however, the EPD users shall not use additional measures for comparative purposes. Impact categories which were not required by the PCR are included in part to allow for the calculation of millipoints using the SM2013 Methodology, but it should be noted that there are known limitations related to these impact categories due to their high degree of uncertainty. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Acidification	kg SO_2 eq	5.28E-03	1.20E-04	7.82E-05	0	0	0	0	0	0	0	0	4.75E-05	0	1.39E-04
Eutrophication	kg N eq	4.25E-04	7.61E-06	4.29E-06	0	0	0	0	0	0	0	0	9.52E-06	0	1.69E-05
Global warming	kg SO_2 eq	1.93E+00	9.36E-02	4.30E-02	0	0	0	0	0	0	0	0	1.27E-02	0	3.47E-02
Ozone depletion	kg CFC-11 eq	4.46E-10	2.74E-12	1.07E-08	0	0	0	0	0	0	0	0	7.65E-13	0	4.73E-12
Smog	kg O_3 eq	6.77E-02	2.00E-03	6.88E-04	0	0	0	0	0	0	0	0	1.06E-03	0	1.86E-03
Fossil fuel depletion	MJ, LHV	2.61E+00	1.90E-01	9.18E-03	0	0	0	0	0	0	0	0	2.41E-02	0	6.97E-02

Additional environmental information per functional unit

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Ecotoxicity	CTUe	8.79E-03	5.02E-05	1.37E-06	0	0	0	0	0	0	0	0	5.64E-06	0	1.09E-05
Carcinogenics	CTUh	9.77E-11	1.31E-13	8.48E-13	0	0	0	0	0	0	0	0	2.63E-14	0	5.92E-13
Non-carcinogenics	CTUh	5.74E-10	5.80E-14	5.63E-13	0	0	0	0	0	0	0	0	1.10E-15	0	3.80E-14
Respiratory effects	kg PM2.5 eq	2.52E-03	7.39E-06	4.69E-06	0	0	0	0	0	0	0	0	3.63E-06	0	1.45E-04

The product does not contain substances that are identified as hazardous according to standards or regulations of the Resource Conservation and Recovery Act (RCRA), Subtitle C, nor does it (or its associated processes) release dangerous, regulated substances that affect health and environment, including indoor air emissions, gamma or ionizing radiation emissions, or chemicals released to the air or leached to water and soil.