HYDROMX
Energy Saving Solution

ENVIRONMENTAL PRODUCT DECLARATION

Hydromx Heat
Transfer Nano-Fluid

Certified Environmental Product Declaration
www.nsf.org

This EPD is has been developed in compliance with the International EPD System PCR for Efficient Heat Transfer Fluids for Heating and Cooling (2017), as well as the NSF Addendum to the PCR for North America (2019).

This EPD is based on an LCA that has been conducted in compliance with ISO 14040/44

Program Operator	NSF Certification, LLC. 789 N. Dixboro, Ann Arbor, MI 48105 sustainability@nsf.org
Manufacturer Name and Address	Hydromx, Inc. 58-75 57th Road, Maspeth, NY 11378. Product manufactured onsite.
Additional Information	Contact info@ hydromx.com or call +1 (844) 449-3766
Declaration Number	EPD10329
Date of Issue	2020-02-14
Period of Validity	3 Years
Product's Intended Application and Use	Heat trasfer fluid for climate control system
Product Category /CPC Code	Heat transfer fluid. UN CPC 35490
Declared Unit Functional Unit	1 m^2 of temperature controlled space
Product RSL	20 year
Markets of Applicability	North America
EPD Type	Product-specific
EPD Scope	Cradle-to-Grave
Year of Reported Manufacturer Primary Data	2018
LCIA Methodology and Version Number	TRACI 2.1
LCA Software and LCI Database Version Number	GaBi 9.2, Service Pack 39
Intended Audience	Business-to-business
Reference LCA Study	Comparative LCA of Hydromx, Propylene Glycol and Inhibited Water Heat Transfer Fluids. Ecoform, 2019. Comparative study of multiple heat fluids under various scenarios.
Reference PCR and Version Number	International EPD System PCR : Efficient Heat Transfer Fluids for Heating and Cooling 2017:04 Version 1.01. 2018-01-30. NSF Addendum to Environdec Heat Transfer Fluid PCR -- North America. 2019-02-23
The sub-category PCR review was conducted by:	Thomas Gloria, PhD (chair) Brad McAllister Bill Stough
This declaration was independently verified in accordance with ISO 14040/44, International EPD System PCR : Efficient Heat Transfer Fluids for Heating and Cooling and the NSF Addendum to Environdec Heat Transfer Fluid PCR -- North America ☐ **Internal** ☒ **External**	Brad McAllister WAP Sustainability Consulting brad@wapsustainability.com
This life cycle assessment was conducted in accordance with ISO 14044, and the reference PCR by:	Jack Geibig, Ecoform, LLC
This EPD was independently verified in accordance with ISO 14025 and the reference PCR by: ☐ **Internal** ☒ **External**	Brad McAllister WAP Sustainability Consulting brad@wapsustainability.com

Limitations:
Environmental declarations within the same product category from different programs may not be comparable.
Comparison of the environmental performance of products 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 this PCR.

Company Description

Hydromx, Inc. is a leading manufacturer of an innovative, nano-technology based heat transfer fluid (HTF) for closed circuit heating and cooling systems. Utilizing a proprietary nano-technology based formula, HydromxPG® (Hydromx) makes use of proprietary nano-particles to increase the overall surface area available for heat transfer, resulting in higher heat transmission and an overall decrease in system energy consumption. Hydromx is a drop in replacement for typical water- and glycol -based fluid systems.

Product Description

Hydromx is a revolutionary heat transfer nanofluid that utilizes Nano-Thermo™ technology. Hydromx uses nano-particles that are suspended in a stable state to increase the speed of heat transfer, by heating up (or removing heat from) the fluid and transferring energy in a shorter amount of time when compared to traditional water-based systems, thereby requiring significantly less energy. Product service life is 20 years before replacement. Yearly testing and rebalancing of the chemical composition through small additions is recommended.

No matter what the energy source, or how efficient the boiler or chiller is, Hydromx improves the efficiency of the whole system by transferring energy more effectively. Furthermore, Hydromx is formulated with inhibitors that prevent corrosion, calcification and algae in the systems. It is certified under the NSF International Inhibitor Approval Scheme to inhibit corrosion of metallic and plastic parts, and prevent scaling up of the system, particularly the boiler.

Manufacturing Location

Hydromx is manufactured in Queens Village, New York.

Additional Information

The underlying LCA is available from NSF. Additional product information can be found at www.hydromx.com.

Technical Specifications

Hydromx is designed to be diluted by 50% with water prior to use in all applications. Technical specifications for the diluted solution are given below.

Specification	Hydromx (50%) [a]
Color	Blue
pH	8.2-8.8
Freezing Point (°C)	-34 C
Boiling Point (°C)	120 C
Density (kg/L)	1.065
Dissolved Oxygen (mg/L)	8.46
Electrical Conductivity (µS)	570
Kinematic Viscosity at 20C (cP)	6.76
Dynamic Viscosity at 20C (cP)	7.2

[a] Hydromx product brochure. www. Hydromx.com

Application

Hydromx heat transfer fluid is suitable for use in closed-loop heating and cooling systems designed to control the interior temperature of buildings. Examples include residential and commercial buildings, as well as interior spaces with strict temperature control tolerances such as data centers, medical facilities, and dedicated spaces for senior care.

Figure 1. Hydromx 250 Gal IBC Tote (945 L)

Product Composition

Hydromx is sold as a concentrate. The composition of the concentrate is given below. The concentrate is diluted prior to its use in closed-loop heating applications. Hydromx concentrate does not contain any federally required reportable substances.

Concentrate	Weight (%)
Propylene Glycol	60-90
Glycerine	<10
Sodium Molybdate	<4
Triazole	<10
Nano Additives	<5

Installation

Hydromx concentrate is diluted with water to a 50% concentration when installed, for all but very unique conditions.

Packaging

Hydromx concentrate is packaged and sold in a variety of volumes ranging from recyclable 5-gallon HDPE bottles to reusable 250-gallon HDPE and galvanized metal totes.

Functional Unit

The functional unit is given as 1 square meter of temperature-controlled space.

Reference Service Life

Hydromx has a reference service life of 20 years.

Cut-Off Rules

All product materials are included in the analysis, so no cut-off rules were required. This meets the PCR requirement for inclusion of greater than 99% of the total inflows.

Allocation

Allocation was performed on a mass basis. No additional allocation was required or applied.

Unit Process Flows

Unit process flows are reported for 1 m2 temperature controlled space by scenario in the table.

Process Flows	Residential/Office	Data Center
Materials [a]		
Water		
- Concentrate	0.135	1.34
- Dilution	0.349	3.4
Propylene glycol	0.194	1.9
Glycerine	0.022	0.219
Sodium molybdate	0.004	0.037
Triazole	0.004	0.037
Nano additives	0.037	0.365
Packaging		
- HDPE	0.0138	0.135
- Galvanized steel	0.0069	0.067
Total Mass (kg)	0.766	7.51
Energy (kWh)		
- Manufacturing	0.000338	0.000338
- Use Stage – 20 years	1,031	6,980

[a] Includes make-up materials at 0.1 percent per year over RSL.

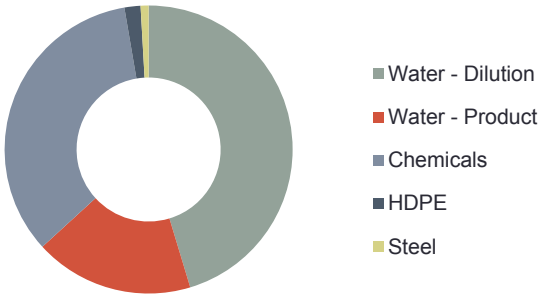
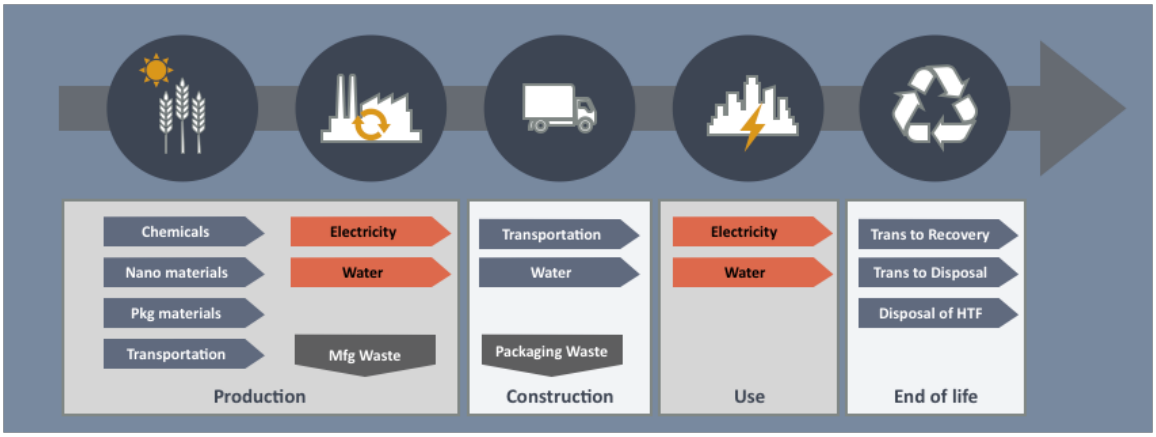


Figure 2. Material content breakdown, per unit flow

Product Maintenance

Yearly testing and rebalancing, when needed, through small additions of concentrate, is recommended. No other maintenance is required.

System Boundaries



Life Cycle Scope

Cradle-to-grave including two distinct use scenarios. This EPD accounts for all significant environmental aspects.

Raw Material Extraction

Extraction and processing of all raw materials, including packaging and transportation to the product manufacturing site are considered.

Manufacturing

Manufacturing of the product, including product packaging and use of all ancillary materials. Disposal of any production waste is included.

Installation and Use

Transportation of the product to the customer site and subsequent product installation are included in this stage. Hydromx products are manufactured and stored onsite, and ship directly from the plant to the customer. Tap water required for dilution of Hydromx concentrate is included in analysis. Use of the product is assessed through two scenarios.

		Product Use Scenarios	
Parameter	**Units**	**Office/Residential [a]**	**Data Center [b]**
Size of space	m^2	200	350
Energy use	kWh/yr	10,300	122,300
Volume of system	liters	140	2,400
System operation	hrs/day	8	24
Period of operation	yr	20	20

[a] Scenario based on profile of typical US home consumption, US Energy Information Administration, 2016.
[b] Data center scenario based on HBO Case study, which can be accessed at www.hydromx.com/hydromx-case-studies/

End of life

When regularly maintained through periodic adjustments to rebalance product chemistry or restore fluid levels, Hydromx does not typically require replacement or disposal. However, if deemed at end-of-life Hydromx must be disposed at a proper treatment facility, as is modeled here. Product can also be returned directly to the manufacturer for reclamation at end-of-life by contacting Hydromx, Inc. at info@hydromx.com.

Data Sources

Dataset/Geography	Source	Precision	Representativeness
Propylene glycol - US	GaBi DB - 2018	Excellent	Excellent
Tap water - EU	GaBi DB - 2018	Excellent	Good
Electricity grid mix - US	GaBi DB - 2018	Good	Excellent
Electricity grid mix - NYUP	GaBi DB - 2018	Good	Excellent
HTF mixing - US	Hydromx, 2018	Excellent	Excellent
Glycerin, at plant - RNA	GaBi DB - 2018	Excellent	Good
Diesel mix at filling station - US	GaBi DB - 2018	Excellent	Excellent
Carbon Black (Nano Tech Proxy) - Ger	GaBi DB - 2018	Low	Fair
Potassium phosphate (Sodium molybdate proxy) - US	Modeled	Good	Fair
Truck – TL/Dry van - US	GaBi DB - 2018	Excellent	Excellent
Steel hot dip, galvanized - Glo	ILCD - 2017	Excellent	Good
Polyethylene high density granulate - EU	GaBi DB - 2018	Excellent	Good
Water deionized - US	GaBi DB - 2018	Good	Excellent
Haz waste in waste incineration plant - US	GaBi DB - 2018	Good	Good

Data Quality Assessment

Data Metric	Data Quality Assessment
Time Coverage	Primary manufacturing data for processes controlled directly by Hydromx, USA were reported for 2018. Secondary data were sourced from the most recent releases of the GaBi Professional databases, all released within the past 3 years. Overall the data are very representative of the relevant time period.
Geographic Coverage	The geographical scope of the manufacturing data for the production of Hydromx, is New York. Manufacturing energy data is sourced from New York regional grid, while use stage energy is sourced from national grid. Other materials with few exceptions are based on US production, as is transportation. Overall the geographic coverage is considered very good.
Technology Coverage	Hydromx is manufactured using a simple mixing and packaging process. Data used in the modeling were all derived from processes considered representative of current technology. Secondary data representing the production of locally distributed water required during the installation are recent and represent currently used technologies. Overall the data are representative of the technology used.
Precision	Primary data used for this study were measured directly from manufacturing processes. Secondary data were sourced from GaBi LCI database. Precision of individual LCI data sets are assessed and reported in table of data sources. Overall precision of data used in this LCI is high
Completeness	All relevant material input and output flows are evaluated in this study. Use phase energy consumption is derived from a series of case studies deemed reliable by peer review. Overall, no input or output flows are excluded thus the completeness of the study is considered good.
Representativeness	Representativeness of data reflects the degree to which individual data sets reflect the true population of interest. LCI data sets for each HTF are assessed individually for representativeness in table of data sources. While surrogate or proxy chemicals were used for three HTF constituents lacking available LCI data, the overall influence of the use of these surrogate chemicals to the study was demonstrated to be very low. Overall, the representativeness of data used for this study is considered high.
Consistency	To ensure consistency, assumptions and methods concerning modeling and data selection were applied uniformly during the analysis.
Reproducibility	Internal reproducibility is possible since the data and the models are stored and available in the Gabi modeling software toolkit used by Ecoform. External reproducibility is also possible, informed by the high level of transparency provided throughout the background report, available on request.
Transparency	LCI datasets are provided in this EPD, while modeling details are transparently disclosed in the background project report.
Uncertainty	Surrogate data for a small number of chemicals were used to represent product content for which data did not exist. In all cases the contribution of the chemical to the overall composition is small, with minimal impact on overall results. Case studies used to quantify the expected energy efficiency of Hydromx also introduced an element of uncertainty related to the use of empirical data. While the case study approach has merit and observed results are reasonably grouped, the influence of this data on the overall outcomes of this study is substantial, and thus the overall assessment for uncertainty is medium to high.

Selection of Impact Parameters

Environmental impacts were calculated using the GaBi software platform. Impact results have been calculated using TRACI 2.1 characterization factors. Results presented in this report are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

	Impact Category	Description	Unit
	Acidification potential	Human-derived releases of acidifying substances to air that may be subsequently deposited in soil and water ecosystems.	kg SO_2 eq.
	Eutrophication potential	Over-fertilization of soil and aquatic ecosystems that results in increased growth of biomass	kg N eq.
	Global warming potential	Relative measure of the amount of heat trapped in the atmosphere resulting from the emission of greenhouse gasses	kg CO_2 eq.
	Ozone depletion Potential	Depletion of the planet's ozone layer due to the man made release of chlorofluorocarbons	kg CFC 11 eq.
	Photochemical ozone creation potential	Formation of smog resulting from the breakdown of anthropogenic VOC and nitrogen emissions to the environment	kg O_3 eq.

LCA Results

All results are given per functional unit, which is 1 m^2 of temperature-controlled space.

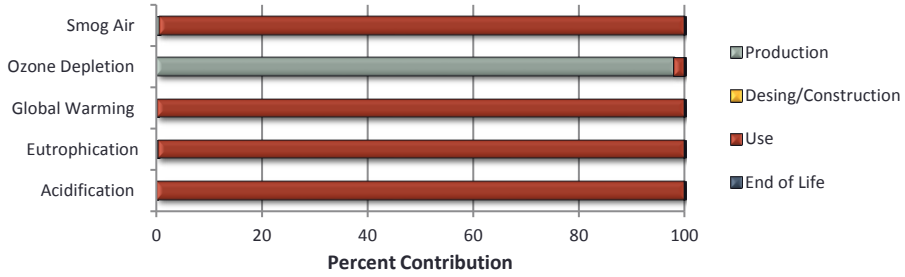
Product Stage			Construction Stage		Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundary
Raw material extraction	Transport	Manufacturing	Transportation to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operation energy use	Operation water use	De-construction	Transport	Waste processing	Disposal	Reuse/Recycle
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	X	MND	X	MND	X	MND	MND	X	X	MND	X

TRACI Impact Results [1]

Impact Category	Unit	Total	Production	Design/ Construction	Use	End-of-life
Acidification Potential	kg SO_2-eq	1.69E+00	2.30E-03	1.64E-04	1.69E+00	5.18E-06
Eutrophication Potential	kg N-eq	7.13E-02	2.82E-04	1.32E-05	7.10E-02	1.26E-05
Global Warming Potential	kg CO2-eq	5.99E+02	1.44E+00	2.84E-02	5.98E+02	1.01E-03
Ozone Depletion Potential	kg CFC-11 eq	2.01E-10	2.28E-10	-1.63E-16	-2.74E-11	-3.81E-17
Photochemical Ozone Creation Potential	kg O_3 eq	1.40E+01	3.97E-02	3.86E-03	1.40E+01	1.89E-05

[1] Results presented per m^2 of temperature-controlled space.

Dominance Analysis



Office/ Residential

LCI Indicators [1]

	Unit	Total	Production	Design/ Construction	Use	End-of-life
Resource Use						
Renewable resources materials	kg	1.32E+03	2.14E+00	1.31E-02	1.32E+03	6.94E-04
Renewable resources energy	MJ	1.32E+03	2.14E+00	1.31E-02	1.32E+03	6.94E-04
Non-renewable resources materials	kg	9.66E+03	3.07E+01	4.23E-01	9.63E+03	7.41E-03
Non-renewable resources energy	kg	9.66E+03	3.07E+01	4.23E-01	9.63E+03	7.41E-03
Secondary material resources	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Abiotic depletion potential, fossil.	MJ	5.89E+02	3.95E+00	5.63E-02	5.85E+02	6.97E-04
Abiotic depletion potential, element[2]	kg Sb Eq	1.48E-04	3.49E-06	2.55E-11	1.44E-04	6.18E-10
Energy						
Fossil energy	MJ	9.66E+03	3.07E+01	4.23E-01	9.63E+03	7.41E-03
Bio energy	MJ	7.03E-07	6.89E-07	0.00E+00	1.38E-08	4.01E-23
Other energy	MJ	1.32E+03	2.14E+00	1.31E-02	1.32E+03	6.94E-04
Secondary recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water /Land						
Net fresh water	m3	3.38E+00	5.79E-03	4.01E-04	3.37E+00	-7.50E-04
Direct water to core processes	m3	4.85E-04	1.35E-04	3.49E-04	6.98E-07	0.00E+00
Land Use	acre	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste /Output Flows						
Hazardous waste	kg	4.26E-06	2.33E-08	3.42E-09	4.23E-06	8.56E-12
Non-hazardous waste	kg	3.05E+00	2.02E-02	6.20E-05	3.03E+00	8.48E-04
Radioactive waste	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Releases to ground/ surface water	m3	1.46E+02	2.47E-01	1.57E-02	1.46E+02	9.71E-04
Releases to Indoor Air	kg	2.07E-02	0.00E+00	2.07E-02	0.00E+00	0.00E+00
Materials for recycling	kg	2.07E-02	0.00E+00	2.07E-02	0.00E+00	0.00E+00

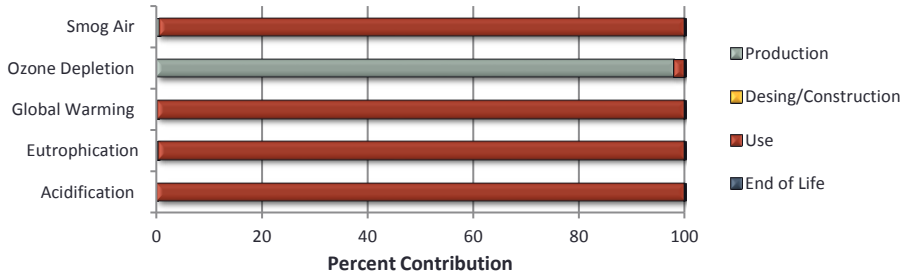
[1] Results presented per m^2 of temperature-controlled space.
[2] CML 2002 methodology

TRACI Impact Results [1]

Impact Category	Unit	Total	Production	Design/ Construction	Use	End-of-life
Acidification Potential	kg SO_2-eq	1.14E+01	2.26E-02	1.61E-03	1.14E+01	5.08E-05
Eutrophication Potential	kg N-eq	4.84E-01	2.76E-03	1.30E-04	4.81E-01	1.24E-04
Global Warming Potential	kg CO2-eq	4.07E+03	1.41E+01	2.79E-01	4.06E+03	9.94E-03
Ozone Depletion Potential	kg CFC-11 eq	2.06E-09	2.23E-09	-1.59E-15	-1.72E-10	-3.73E-16
Photochemical Ozone Creation Potential	kg O_3 eq	9.54E+01	3.89E-01	3.78E-02	9.50E+01	1.85E-04

[1] Results presented per m^2 of temperature-controlled space.

Dominance Analysis



LCI Indicators [1]

	Unit	Total	Production	Design/ Construction	Use	End-of-life
Resource Use						
Renewable resources materials	kg	8.95E+03	2.10E+01	1.28E-01	8.93E+03	6.80E-03
Renewable resources energy	MJ	8.95E+03	2.10E+01	1.28E-01	8.93E+03	6.81E-03
Non-renewable resources materials	kg	6.56E+04	3.01E+02	4.14E+00	6.53E+04	7.26E-02
Non-renewable resources energy	kg	6.56E+04	3.01E+02	4.14E+00	6.53E+04	7.26E-02
Secondary resources materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Abiotic depletion potential, fossil.	MJ	4.00E+03	3.87E+01	5.51E-01	3.96E+03	6.83E-03
Abiotic depletion potential, element[2]	kg Sb Eq	1.01E-03	3.92E-05	2.50E-10	9.74E-04	6.05E-09
Energy						
Fossil Energy	MJ	6.56E+04	3.01E+02	4.14E+00	6.53E+04	7.26E-02
Bio Energy	MJ	6.89E-06	6.75E-06	3.39E-07	1.35E-07	3.93E-22
Other Energy	MJ	8.95E+03	2.10E+01	1.28E-01	8.93E+03	6.80E-03
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water /Land						
Net fresh water	m3	2.30+01	5.68E-02	3.93E-03	2.29E+01	-7.35E-03
Direct water to core processes	m3	4.85E-03	1.35E-04	3.49E-04	6.98E-07	0.00E+00
Land Use	acre	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste /Output Flows						
Hazardous waste	kg	2.89E-05	2.29E-07	3.35E-08	2.86E-05	8.39E-11
Non-hazardous waste	kg	2.07E+01	1.98E-01	6.08E-04	2.05+01	8.31E-03
Radioactive waste	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Releases to ground/ surface water	m3	9.92E+02	2.42E+00	1.53E-01	9.90E+02	9.52E-03
Releases to Indoor Air	kg	2.02E-01	0.00E+00	2.02E-01	2.02E-01	0.00E+00
Materials for recycling	kg	2.02E-01	0.00E+00	2.02E-01	2.02E-01	0.00E+00

[1] Results presented per m^2 of temperature-controlled space.
[2] CML 2002 methodology.

Additional Environmental Information

Hydromx is manufactured to International standard ISO 9001:2015.

Disclaimers

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. Comparability of EPDs is limited to those applying a functional unit. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

Verification

This EPD and the underlying LCA have been verified to be compliant to both the PCR and ISO 14040/44 by NSF Certification, LLC.

NSF Certified Environmental Product Declaration www.nsf.org

References

TRACI 2.1: the tool for the reduction and assessment of chemical and other environmental impacts 2.1 Clean Technologies and Environmental Policy, 2011, Vol 13/5, p. 687.

International EPD Program, PCR for Heat Transfer Fluids for Heating and Cooling, 2017. Available at https://www.environdec.com/PCR/Detail/?Pcr=11291

ISO 9001:2008/ Quality Management System

ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

ISO 14040:2006 Environmental management - Life cycle assessment – Principles and framework.

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

ISO 21930:2007 Sustainability in building construction – Environmental declaration of building products.

NSF International, Addendum to Environdec Heat Transfer Fluid PCR – North America, Version 1.2. 2019

OHSAS 18001:2007/ Occupational Health and Safety System