

ENVIRONMENTAL PRODUCT DECLARATION

BEHR® URETHANE ALKYD ENAMEL

INTERIOR/EXTERIOR PAINT



BEHR  | Paint Company

The Behr Paint Company, home to Behr Process Corporation and Masterchem Industries LLC, the makers of BEHR® and KILZ® Brands respectively, is one of the largest manufacturers and suppliers of paint, primers, stains and surface finish products to Do-it-Yourselfers and Professionals. Sustainability is the core concept of our business strategy and culture ensuring top economic, social and environmental performance. The Behr Paint Company's commitment to sustainability, quality, value and performance has driven our desire for innovation and transparency. The creation of a Life Cycle Assessment (LCA) report and Environmental Product Declarations (EDP) allows us to continually improve our operations and illustrate a complete story behind our products.

To learn more, visit behr.com and kilz.com.



Shown above: BEHR® Urethane Alkyd Semi-Gloss Enamel Interior/Exterior Paint Collection is great for a variety of surfaces and provides a durable finish.

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, such 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, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 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.



BEHR® Urethane Alkyd Enamel

According to ISO 14025

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Provided
DECLARATION HOLDER	UL Provided
DECLARATION NUMBER	UL Provided
DECLARED PRODUCT	BEHR® Urethane Alkyd Enamel Interior/Exterior Paint
REFERENCE PCR	UL Provided
DATE OF ISSUE	UL Provided
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	UL Provided
	UL Provided
	UL Provided
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	
	UL Provided
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
	UL Provided



Product Definition

This Environmental Product Declaration covers Behr Process Corporation BEHR® Urethane Alkyd Enamel Interior/Exterior Paint Collection, which delivers a durable finish that provides great flow and leveling. BEHR® Urethane Alkyd Enamel can be applied to both interior and exterior surfaces including plaster, wallpaper, aluminum, wrought iron, wood, and more.

Declared Product Description

BEHR® Urethane Alkyd Enamel Interior/Exterior Paints combine the performance and durability of an oil-based paint with ease and convenience of a water-based paint. These paints are versatile, easy to use, and ideal for a variety of surfaces including doors, trim, molding, cabinetry, plaster, masonry, metal and more. BEHR® Urethane Alkyd Enamel includes the following sheens: 3900 BEHR® Urethane Alkyd Semi-Gloss Enamel and 7900 BEHR® Urethane Alkyd Satin Enamel, and is available in quart, one and five gallon containers. White and deep tint bases are offered for both sheens which allows custom tinting to any desired color.

Product Components Related to Life Cycle Assessment

The material composition of the paints are in the following range:

Table 1: Material composition range in % by mass for the BEHR® Urethane Alkyd Enamel Collection

	Minimum [%]	Maximum [%]
Additive	0.1	4.0
Clay	0.1	0.5
Calcium carbonate	0.0	15
Colorant	0.0	0.01
Nepheline syenite	3.0	18
pH buffer	0.1	0.5
Polyurethane alkyd	40	55
Preservative	1.0	2.0
Resin	0.0	4.0
Rheology modifier	2.0	5.0
Solvent	0.4	1.5
Titanium dioxide	25	30
Zinc	0.1	2.0
Water	10	20



The functional unit for the study was covering and protecting 1m² of substrate for a period of 60 years (the assumed lifetime of a building), exhibiting 97% opacity after drying. The functional unit and reference flow required for the functional unit were calculated for both the market life and design life as prescribed by the PCR. Market life for interior paint is 5 years and design life is based on the quality determined by ASTM test methods for scrub resistance (ASTM D2486 - 06(2012)e1), burnish (ASTM D6736 - 08(2013)), and washability (ASTM D4828 - 94(2012)e1). Market life for exterior paint is 10 years and design life is based on the quality determined by the ASTM test methods for blistering (ASTM D714-02(2007)), erosion (ASTM D662-93(2011)), flaking/peeling (ASTM D772-86(2011)), biologic growth (ASTM D3274-95 or -09(2013)). Design life, reference flow and colorant quantity for paint products are shown in Table 3 and market life reference flow and colorant quantity are shown in Table 4. Results were calculated for all base and sheen formulations. For further technical information on BEHR® Urethane Alkyd Enamel, visit behr.com.

Table 2: Design life by coating type and quality designation

Coating Type	Low Quality	Mid Quality	High Quality	Alternative
Interior Paint	3 years	7 years	15 years	N/A
Exterior Paint	5 years	10 years	20 years	Warranty

Table 3: Design Life- Lifetime, reference flow, and quantity of colorant

	Lifetime (years)	Reference flow	Carbon black input
3900 - Interior	7	1.12	0.0601
3900 - Exterior	20	0.393	0.0316
3930 - Interior	7	1.03	0.196
7930 - Exterior	20	0.362	0.108
7900 - Interior	7	1.14	0.0598
7900 - Exterior	20	0.398	0.0313
7930 - Interior	7	1.06	0.195
7930 - Exterior	20	0.373	0.106

Table 4: Market Life- Lifetime, reference flow, and quantity of colorant

	Lifetime (years)	Reference flow	Carbon black input
3900 - Interior	5	1.57	0.0776
3900 - Exterior	10	0.786	0.0469
3930 - Interior	5	1.45	0.251
7930 - Exterior	10	0.723	0.155
7900 - Interior	5	1.59	0.0773
7900 - Exterior	10	0.797	0.0467
7930 - Interior	5	1.49	0.25
7930 - Exterior	10	0.745	0.154





Scope and Boundaries of the Life Cycle Assessment

System Boundaries

The LCA was performed according to ISO 14040 standards. The system is a cradle-to-grave LCA and includes the following modules as defined in the PCR. The declaration covers the full range of BEHR® Urethane Alkyd Enamel sold in the North American market for the reference year.

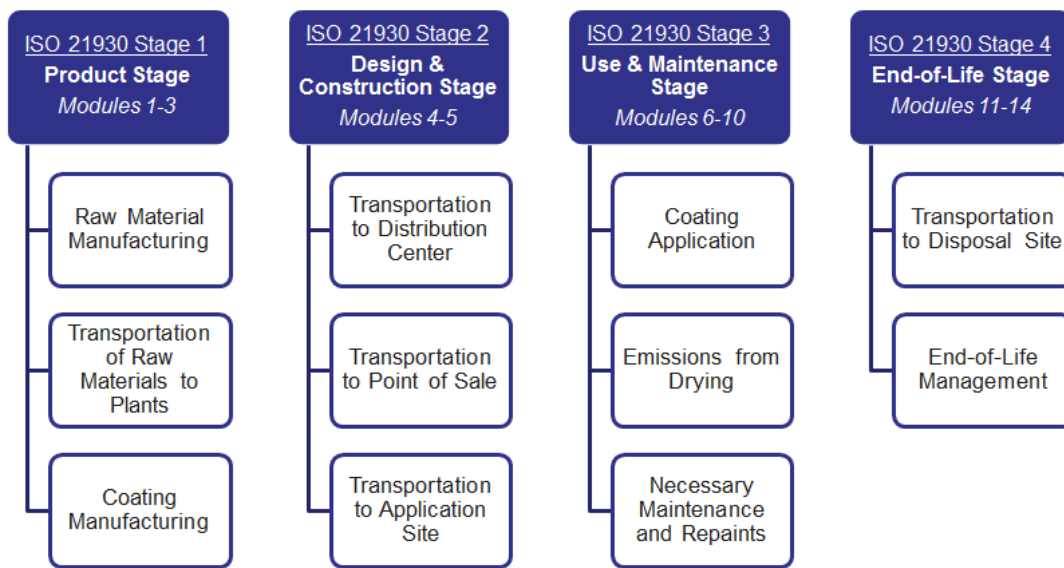


Figure 1: System boundaries for cradle to grave LCA

Assumptions

The described modeling approach makes assumptions in order to represent the cradle-to-grave environmental performance of Behr paint products. These assumptions include those that are prescribed by the PCR, such as in packaging disposal and recovery treatment, as well as transportation distances and use phase assumptions.

Cut-off Criteria



No cut-off criteria are defined by this study. For processes within the system boundary, all available energy and material flow data have been included in the model.

Data Quality

Primary data were obtained from Behr's eight facilities, one each in Chicago Heights, IL; Allentown, PA; St. Louis, MO; Roanoke, TX; and Atlanta, GA; and three in Santa Ana, CA for the 2016 reference year. Background data were obtained from the GaBi 2017 database and are representative of the years 2007-2016. Overall, both primary and background data are representative of the product system and have been deemed very good quality.

Allocation

Manufacturing inputs for the eight facilities were allocated to each paint product by mass.

Product Stage

BEHR® Urethane Alkyd Enamel is produced at The Behr Paint Company's production facilities according to the following processing steps.

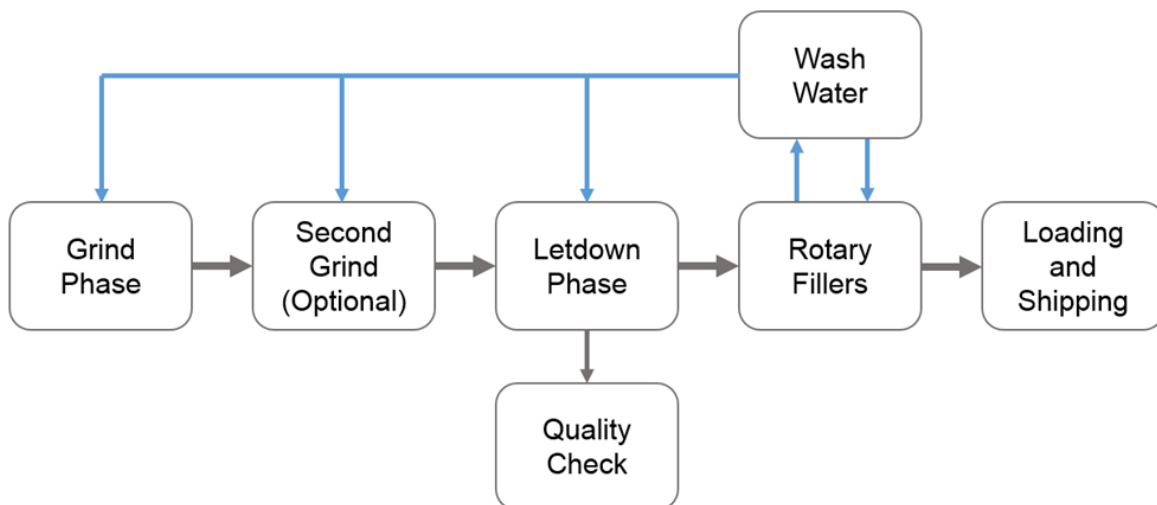


Figure 2: The Behr Paint Company process flow schematic



Design and Construction Stage

The design and construction stage begins with the packaged paint product leaving the production site and ends with the coating being delivered to the point of application. Within this stage, the paint product is modeled as distributed to a warehouse and from there to Home Depot stores. At the stores, it is purchased and transported to the point of application. This stage also includes the addition of colorant, represented by carbon black, at the point of sale, per the PCR.

Use and Maintenance Stage

Application and Use

The use stage begins when the user applies the product to a substrate. Environmental burdens associated with repaints are attributed to the original stage in which they occurred (e.g. production of the coating for the repaint is attributed to Stage 1 - Product). This stage does not require any energy or additional cleaning inputs, but includes the VOCs emitted during application.

Health, Safety, and Environmental Aspects during Installation

Customers obtain material from a store or have the store deliver it. The customer or their contractor applies the coating to substrate(s) at customer site(s). The coating remains on the substrate material until the substrate is disposed of. This may include up to a 60 year life time, with additional /subsequent protective coatings. If the coating is handled and applied using the recommendations in the safety data sheet and technical data sheet, minimal health and environmental impacts should occur, and maximum product and substrate life should be expected.

Waste

Disposal of any leftover coating and discarded packaging is categorized under the end-of-life stage. A 10% paint loss rate during application was included per the PCR.

Packaging

BEHR® Urethane Alkyd Enamel is available quart, one and five gallon containers. The quart and one gallon containers are made from 100% post-consumer plastic material.



End of Life Stage

Recycling or Reuse

Home Depot stores encourage customers to use PaintCare or local paint recycling programs.

Unused Materials

The manufacturing facilities recycle materials and by-products. The Chicago Heights, Atlanta, Garry, and Roanoke facilities also send off-spec products to GDB International, an organization that recycles paint waste into paint products.

Disposal

Product end-of-life occurs with the disposal of the substrate material. 100% of the waste is disposed of in a landfill at the end-of-life stage, and cannot be separated from the substrate before disposal. Packaging is recovered at a rate of 9.5% for plastics, 33% for metals, and 65% for paper and corrugate material. Recovery rates represent the average fraction of generated waste that is recovered in the US.



Life Cycle Impact Assessment

In accordance to the guiding PCR, TRACI 2.1 impact characterization methodology is used to calculate the declared environmental impacts, except for global warming potential results, which follow the methodology in the IPCC 5th assessment report. Additional inventory metrics are also calculated per the guiding PCR. The declared impacts and inventory metrics are summarized in this section.

Key Environmental Parameters

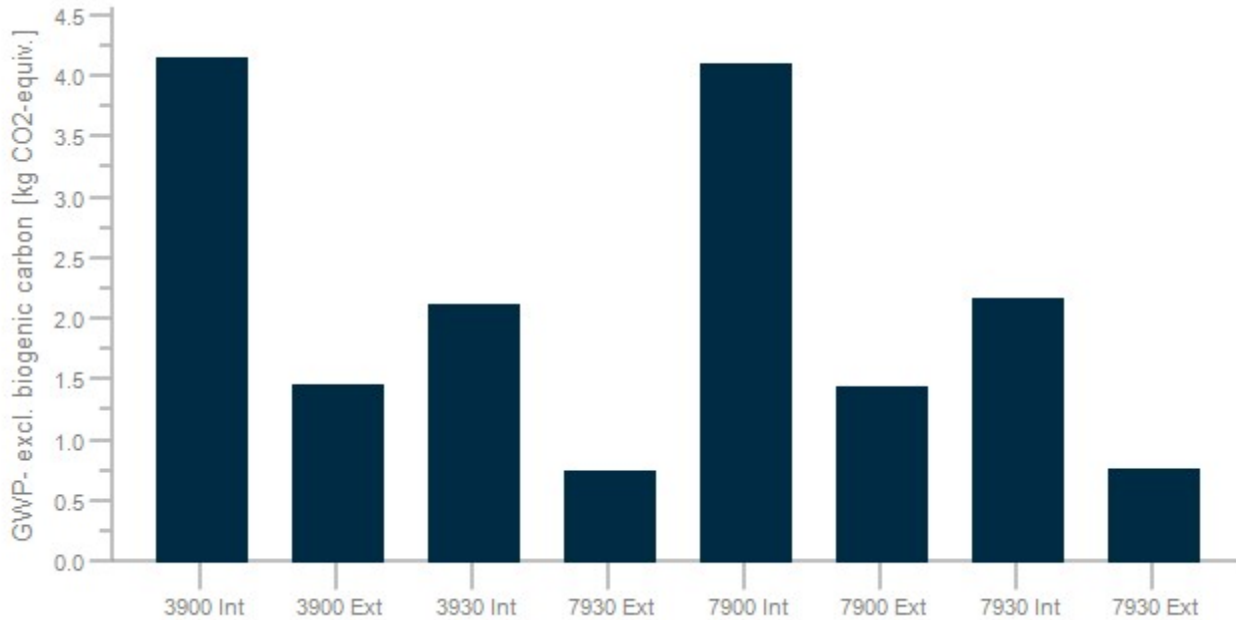


Figure 3: Global warming potential, excluding biogenic carbon for design lifetime

Table 5: Impact assessment results for design lifetime by PCR stages, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
GWP, excl. biogenic carbon [kg CO2-Equiv.]	3.69E00	4.01E-01		6.34E-02
GWP, incl. biogenic carbon [kg CO2-Equiv.]	3.73E00	3.95E-01		6.42E-02
Acidification [kg SO2-Equiv.]	1.88E-02	1.18E-03		8.89E-04
Eutrophication [kg N-Equiv.]	7.00E-04	1.03E-04		3.42E-04
Ozone depletion [kg CFC 11-Equiv.]	1.80E-09	1.06E-11		2.47E-10
Smog formation [kg O3-Equiv.]	2.00E-01	2.90E-02	9.55E-02	7.88E-03



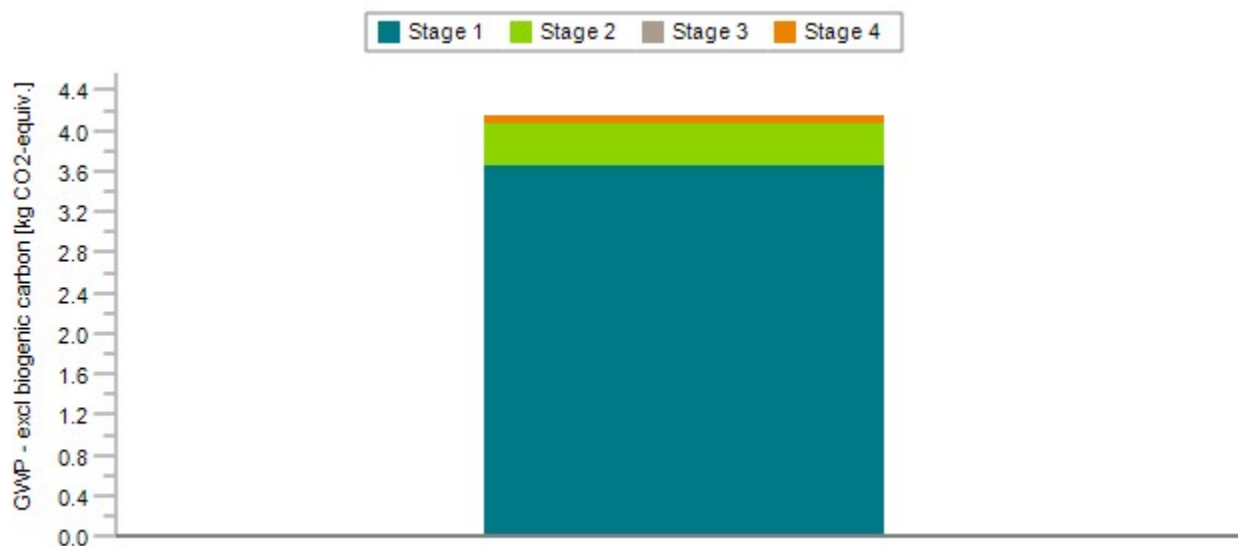


Figure 4: Global warming Potential, excluding biogenic carbon for design lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

Table 6: Impact assessment results for design lifetime

	GWP, excl. biogenic carbon [kg CO2-Equiv.]	GWP, incl. biogenic carbon [kg CO2-Equiv.]	Acidification [kg SO2-Equiv.]	Eutrophication [kg N-Equiv.]	Ozone depletion [kg CFC 11-Equiv.]	Smog formation [kg O3-Equiv.]
3900 Int	4.15E00	4.19E00	2.09E-02	1.15E-03	2.06E-09	3.33E-01
3900 Ext	1.45E00	1.47E00	7.31E-03	4.01E-04	7.20E-10	1.16E-01
3930 Int	2.12E00	2.11E00	8.21E-03	6.84E-04	1.63E-09	1.91E-01
7930 Ext	7.41E-01	7.39E-01	2.85E-03	2.37E-04	5.69E-10	6.60E-02
7900 Int	4.11E00	4.14E00	2.06E-02	1.14E-03	1.92E-09	3.27E-01
7900 Ext	1.44E00	1.45E00	7.22E-03	4.00E-04	6.74E-10	1.15E-01
7930 Int	2.17E00	2.17E00	7.39E-03	7.04E-04	1.42E-09	1.98E-01
7930 Ext	7.60E-01	7.59E-01	2.59E-03	2.47E-04	4.98E-10	6.93E-02



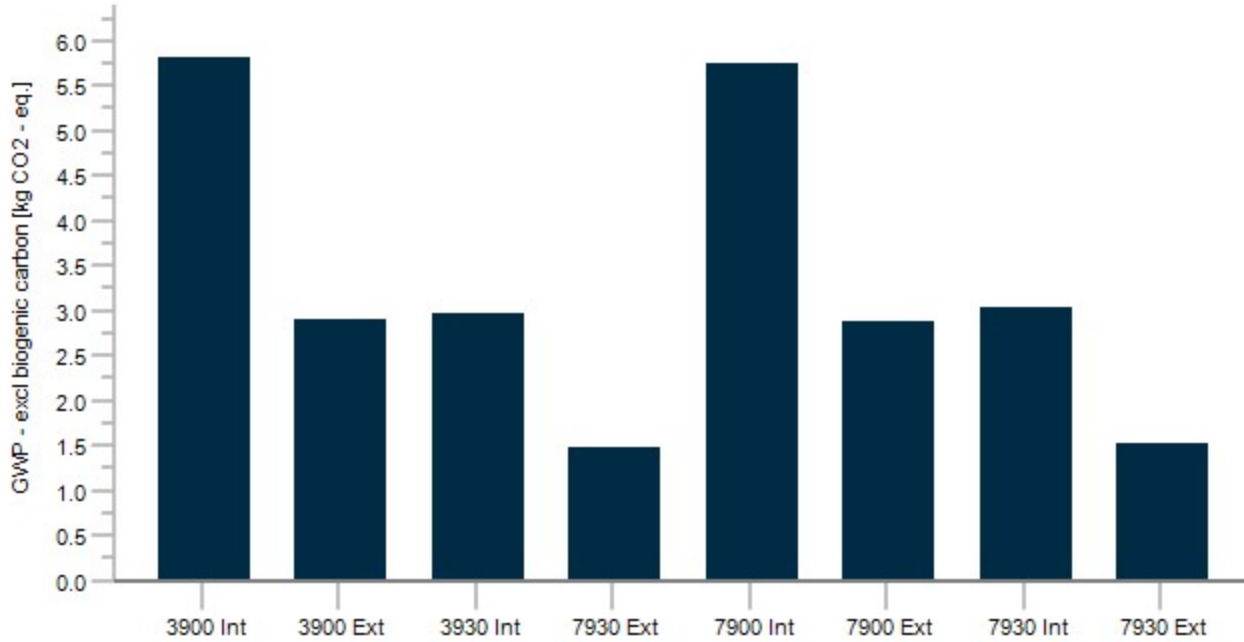


Figure 5: Global warming potential, excluding biogenic carbon for market lifetime

Table 7: Life cycle inventory data for market lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
GWP, excl. biogenic carbon [kg CO2-Equiv.]	5.16E00	5.62E-01		8.88E-02
GWP, incl. biogenic carbon [kg CO2-Equiv.]	5.22E00	5.54E-01		8.99E-02
Acidification [kg SO2-Equiv.]	2.63E-02	1.66E-03		1.25E-03
Eutrophication [kg N-Equiv.]	9.80E-04	1.45E-04		4.79E-04
Ozone depletion [kg CFC 11-Equiv.]	2.52E-09	1.48E-11		3.45E-10
Smog formation [kg O3-Equiv.]	2.81E-01	4.06E-02	1.34E-01	1.10E-02



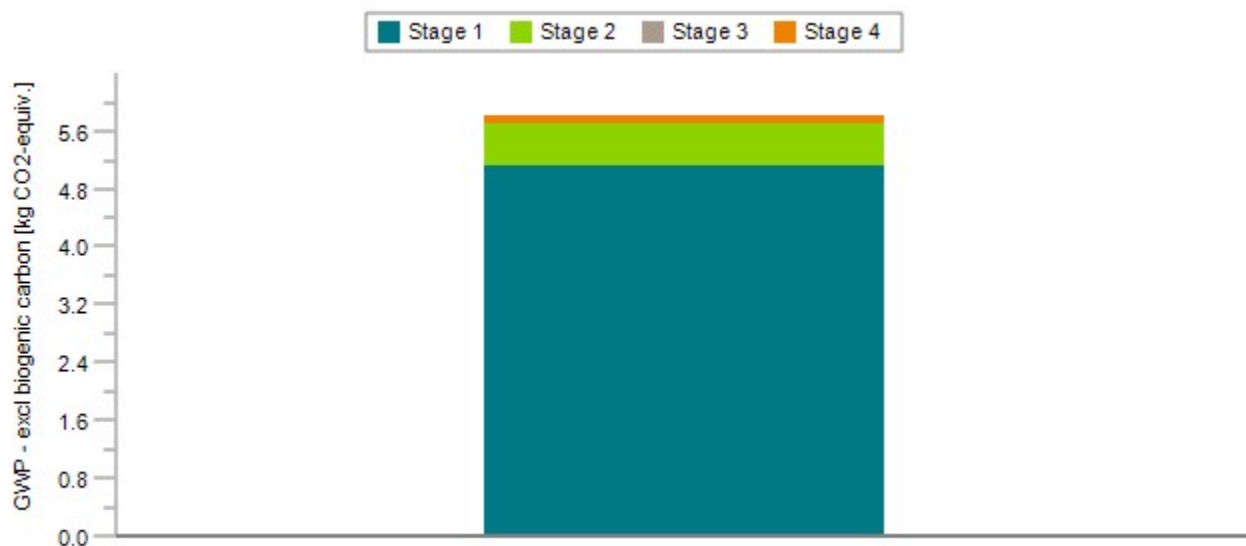


Figure 6: Global warming Potential, excluding biogenic carbon for market lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

Table 8: Impact assessment results for market lifetime

	GWP, excl. biogenic carbon [kg CO2-Equiv.]	GWP, incl. biogenic carbon [kg CO2-Equiv.]	Acidification [kg SO2-Equiv.]	Eutrophication [kg N-Equiv.]	Ozone depletion [kg CFC 11-Equiv.]	Smog formation [kg O3-Equiv.]
3900 Int	5.81E00	5.86E00	2.92E-02	1.60E-03	2.88E-09	4.66E-01
3900 Ext	2.90E00	2.93E00	1.46E-02	8.02E-04	1.44E-09	2.33E-01
3930 Int	2.97E00	2.96E00	1.15E-02	9.58E-04	2.28E-09	2.67E-01
7930 Ext	1.48E00	1.48E00	5.70E-03	4.75E-04	1.14E-09	1.32E-01
7900 Int	5.75E00	5.80E00	2.89E-02	1.60E-03	2.69E-09	4.58E-01
7900 Ext	2.87E00	2.90E00	1.44E-02	8.00E-04	1.35E-09	2.29E-01
7930 Int	3.04E00	3.04E00	1.03E-02	9.86E-04	1.99E-09	2.77E-01
7930 Ext	1.52E00	1.52E00	5.17E-03	4.93E-04	9.96E-10	1.39E-01

Material and Energy Resources, Emissions, and Wastes

The additional inventory results required by the PCR for each product are shown in the tables below.





Table 9: Energy resources for design lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application) [MJ, net calorific value]

	Stage 1	Stage 2	Stage 3	Stage 4
Crude oil (resource)	1.71E01	6.36E00		4.91E-01
Hard coal (resource)	1.22E01	1.86E-01		-6.62E-02
Lignite (resource)	2.85E00	2.07E-02		2.68E-02
Natural gas (resource)	3.52E01	3.04E-01		4.92E-02
Peat (resource)	6.72E-04	1.16E-05		-5.23E-07
Uranium (resource)	4.39E00	9.45E-02		8.38E-03
Primary energy from geothermics	1.34E-01	3.17E-03		-4.71E-04
Primary energy from hydro power	9.42E-01	2.15E-02		5.49E-03
Primary energy from solar energy	2.21E00	2.12E-01		4.61E-02
Primary energy from waves	3.11E-08	9.07E-15		-6.35E-09
Primary energy from wind power	1.10E00	1.69E-02		5.07E-03

Table 10: Material resources for design lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
Non renewable resources	9.26E00	6.56E-02		2.70E-01
Renewable resources	1.71E03	3.70E01		2.41E01

Water consumption constitutes the majority of renewable resource consumption.

Table 11: Other environmental information for design lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
Blue water consumption [kg]	1.70E01	1.57E00		7.32E-02
Hazardous waste, deposited [kg]	2.55E-06	1.10E-06		3.88E-09
Non-hazardous waste, deposited [kg]	1.25E00	6.02E-04		1.28E00
Recycled materials [kg]				1.67E-02
Secondary raw material [kg]	1.18E-03			

Table 12: Energy resources for market lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application) [MJ, net calorific value]

	Stage 1	Stage 2	Stage 3	Stage 4
Crude oil (resource)	2.39E01	8.90E00		6.87E-01
Hard coal (resource)	1.70E01	2.60E-01		-9.27E-02



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BEHR® Urethane Alkyd Enamel

According to ISO 14025

Lignite (resource)	3.99E00	2.90E-02		3.75E-02
Natural gas (resource)	4.93E01	4.26E-01		6.89E-02
Peat (resource)	9.41E-04	1.62E-05		-7.32E-07
Uranium (resource)	6.15E00	1.32E-01		1.17E-02
Primary energy from geothermics	1.87E-01	4.44E-03		-6.59E-04
Primary energy from hydro power	1.32E00	3.01E-02		7.69E-03
Primary energy from solar energy	3.10E00	2.96E-01		6.46E-02
Primary energy from waves	4.35E-08	1.27E-14		-8.89E-09
Primary energy from wind power	1.54E00	2.37E-02		7.10E-03

Table 13: Material resources for market lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
Non renewable resources	1.30E01	9.18E-02		3.78E-01
Renewable resources	2.40E03	5.17E01		3.37E01

Water consumption constitutes the majority of renewable resource consumption.

Table 14: Other environmental information for market lifetime, (representative product, BEHR® Urethane Alkyd Enamel 3900, in an Interior Application)

	Stage 1	Stage 2	Stage 3	Stage 4
Blue water consumption [kg]	2.38E01	2.20E00		1.02E-01
Hazardous waste, deposited [kg]	3.57E-06	1.54E-06		5.44E-09
Non-hazardous waste, deposited [kg]	1.75E00	8.42E-04		1.80E00
Recycled materials [kg]				2.34E-02
Secondary raw material [kg]	1.65E-03			

Impact Assessment Interpretation

For the BEHR® Urethane Alkyd Enamel products, raw materials and manufacturing (Stage 1) are the highest contributors to all impact categories. The impact from the design and construction stage is small but not insignificant and can be mostly attributed to transportation. There is a significant portion of smog formation potential from emissions of VOCs during the use stage.



References

- GABI TS 2017 thinkstep AG; GaBi ts: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2016.
- IPCC 2013 IPCC. (2013). *Climate Change 2013: The Physical Science Basis*. Genf, Schweiz: IPCC.
- ISO 14025 ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040 ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- ISO 14044 ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines
- NSF 2015 NSF. (2015). *Product Category Rule (PCR) for Architectural Coatings*. USA: NSF.
- USEPA 2012 NUS Environmental Protection Agency. (2012). *Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI) – User's Manual*. Washington, D.C.: U.S. EPA.
- USEPA 2015 US Environmental Protection Agency. (2015, June). *Advancing Sustainable Materials Management: 2013 Fact Sheet. Assessing Trends in Material Generation, Recycling and Disposal in the United States*. Retrieved from US EPA: https://www.epa.gov/sites/production/files/2015-09/documents/2013_advncng_smm_fs.pdf

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