

ENVIRONMENTAL PRODUCT DECLARATION

BEHR PRO™ PRE-CATALYZED WATERBORNE EPOXY

INTERIOR PAINT



Masco Coatings Group, 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. Masco Coatings Group'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 (EPD) 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 PRO™ Pre-Catalyzed Waterborne Epoxy is a high performance, single-component acrylic epoxy coating designed for interior use.

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 PRO™ Pre-Catalyzed Waterborne Epoxy

According to ISO 14025 and ISO 21930:2007

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 Environment
DECLARATION HOLDER	Behr
DECLARATION NUMBER	4787851154.106.1
DECLARED PRODUCT	BEHR PRO™ Pre-Catalyzed Waterborne Epoxy
REFERENCE PCR	PCR for architectural coating: NAICS 325510, NSF 2015
DATE OF ISSUE	March 29, 2018
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:	Review Panel Chair: Tomas P. Gloria ncss@nsf.org
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	<i>Grant R. Martin</i> Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	<i>Thomas Gloria</i> Thomas Gloria, Industrial Ecology Consultants

This EPD conforms with ISO 21930:2007



Product Definition

This Environmental Product Declaration covers Behr Process Corporation BEHR PRO™ Pre-Catalyzed Waterborne Epoxy, which delivers superior adhesion and surface sealing. BEHR PRO™ Pre-Cat Epoxy can be applied to high-traffic areas in commercial, institutional and light industrial interior settings.

Declared Product Description

The BEHR PRO™ Pre-Catalyzed Waterborne Epoxy is a GREENGUARD® Gold certified, high performance, single-component acrylic epoxy coating. This product is designed for interior use in commercial, institutional and industrial facilities, such as hospitals, schools, and food and beverage processing plants. It provides exceptional adhesion and resistance to abrasion and stains. BEHR PRO™ Pre-Catalyzed Waterborne Epoxy exhibits benefits similar to the conventional two-component epoxy, but offers a low odor and convenient application. This product line includes the following sheens: HP140 BEHR PRO™ Pre-Cat Epoxy Eggshell and HP150 BEHR PRO™ Pre-Cat Epoxy Semi-Gloss, and is available in gallon and 5-gallon size containers. White and deep tint bases are offered for both sheens that allow custom tinting to any desired color.

Table 1: List of BEHR PRO™ Pre-Catalyzed Waterborne Epoxy Formulas

Product Number	Sheen	Base Type
HP140	Eggshell	White
HP143	Eggshell	Deep
HP150	Semi-gloss	White
HP153	Semi-gloss	Deep

Product Components Related to Life Cycle Assessment

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

Table 2: Material composition range in % by mass for the BEHR PRO™ Pre-Catalyzed Waterborne Epoxy product line

	Minimum [%]	Maximum [%]
Acrylic resin	42.0	79.5
Additive - wetting agent	0.0	0.4
Attapulgitte clay	0.4	1.2
Coalescent	0.3	0.9
Defoamer	0.1	0.6
Dispersant	0.0	0.3
Kaolin	0.0	0.568
Nepheline syenite	0.4	9.5



pH buffer	0.1	0.3
Preservative	0.7	10.0
Rheology modifier	1.2	4.0
Styrene acrylic resin	0.0	2.5
Surfactant	0.8	1.7
Titanium dioxide - slurry	0.0	28.9
Water	9.4	22.5

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 paints 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). Design life reference flow and colorant quantity for paint products are shown in Table 4 and market life reference flow and colorant quantity are shown in Table 5. Results were calculated for all base and sheen formulations. For further technical information on BEHR PRO™ Pre-Catalyzed Waterborne Epoxy, visit behr.com.

Table 3: 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 4: Design Life- Lifetime, reference flow, and quantity of colorant

	Lifetime (years)	Reference flow	Carbon black input
HP140	15	0.535	0.0358
HP143	15	0.463	0.124
HP150	15	0.46	0.0383
HP153	15	0.43	0.128

Table 5: Market Life- Lifetime, reference flow, and quantity of colorant

	Lifetime (years)	Reference flow	Carbon black input
HP140	5	1.6	0.0757
HP143	5	1.39	0.247
HP150	5	1.38	0.0779
HP153	5	1.29	0.25





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 PRO™ Pre-Cat Epoxy sold in the North American market for the reference year.

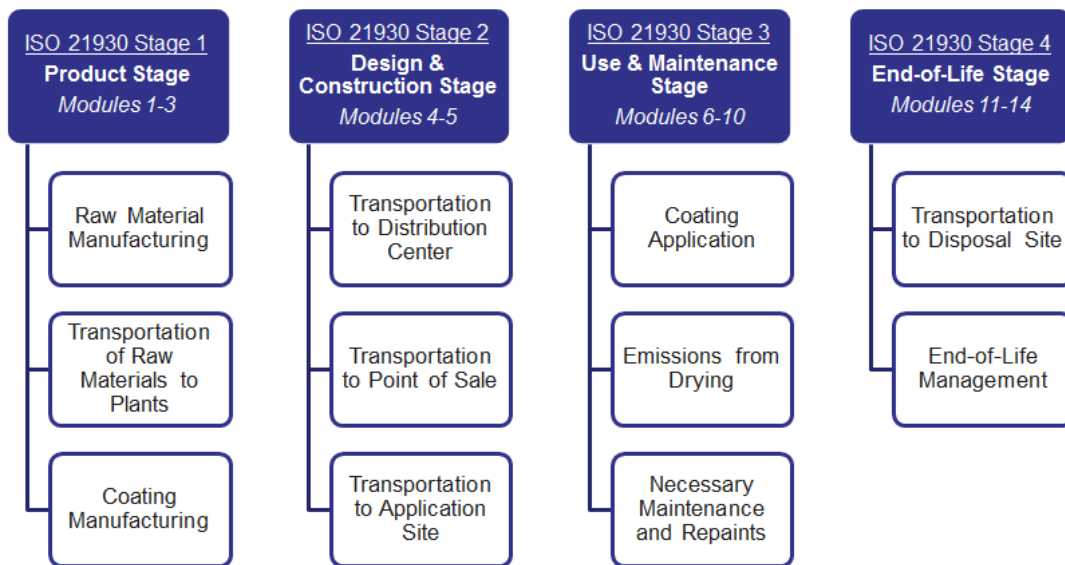


Figure 1: System boundaries for cradle to grave LCA

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 PRO™ Pre-Catalyzed Waterborne Epoxy are produced at Behr's production facilities according to the following processing steps.

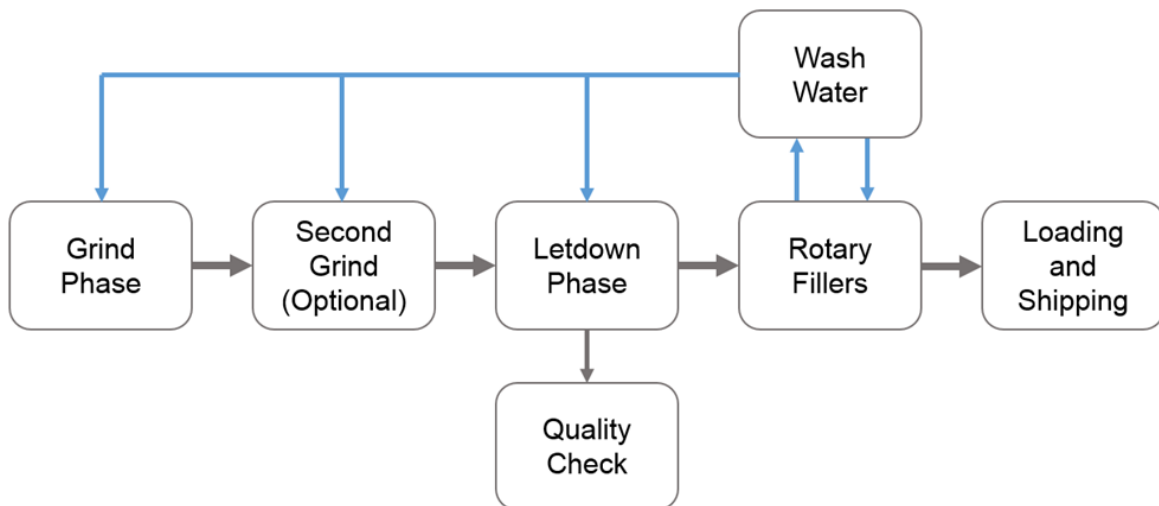


Figure 2: Behr process flow schematic



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. The BEHR PRO™ Pre-Catalyzed Waterborne Epoxy Coatings are low VOC paint products.

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 PRO™ Pre-Catalyzed Waterborne Epoxy is available in Gallon and 5-gallon size containers. BEHR PRO™ Pre-Catalyzed Waterborne Epoxy's plastic packaging is often made from 100% recycled 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

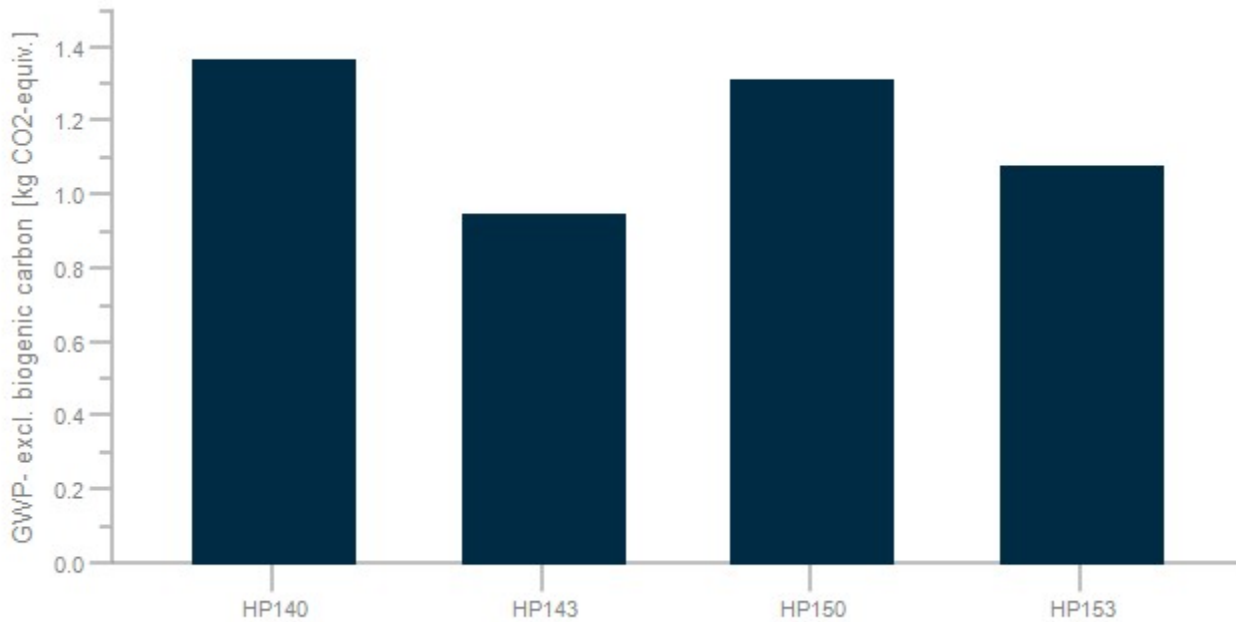


Figure 3: Global warming potential, excluding biogenic carbon for design lifetime

Table 6: Impact assessment results for design lifetime by PCR stages, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
GWP, excl. biogenic carbon [kg CO2-Equiv.]	1.17E00	1.69E-01		3.01E-02
GWP, incl. biogenic carbon [kg CO2-Equiv.]	1.17E00	1.66E-01		3.04E-02
Acidification [kg SO2-Equiv.]	2.33E-02	4.73E-04		4.23E-04
Eutrophication [kg N-Equiv.]	2.29E-04	4.18E-05		1.63E-04
Ozone depletion [kg CFC 11-Equiv.]	1.51E-09	4.70E-12		1.12E-10
Smog formation [kg O3-Equiv.]	5.05E-02	1.10E-02	2.48E-10	3.74E-03



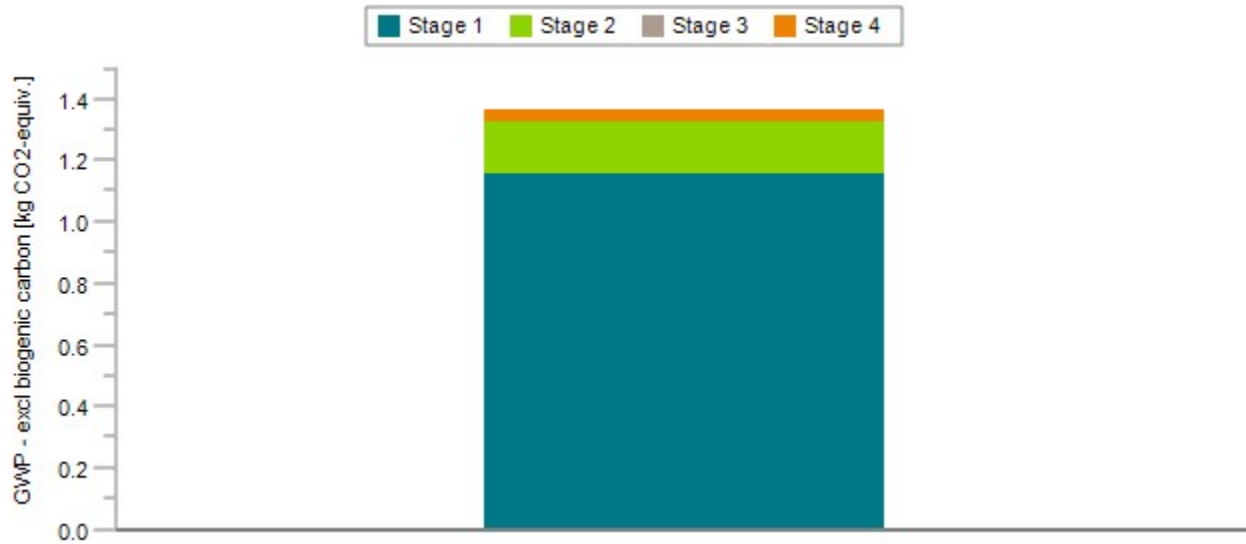


Figure 4: Global warming Potential, excluding biogenic carbon for design lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

Table 7: 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.]
HP140	1.36E00	1.36E00	2.42E-02	4.34E-04	1.63E-09	6.53E-02
HP143	9.47E-01	9.37E-01	2.86E-03	2.90E-04	1.39E-09	3.92E-02
HP150	1.31E00	1.31E00	2.04E-02	3.94E-04	1.83E-09	6.06E-02
HP153	1.08E00	1.07E00	3.19E-03	3.02E-04	1.96E-09	4.32E-02



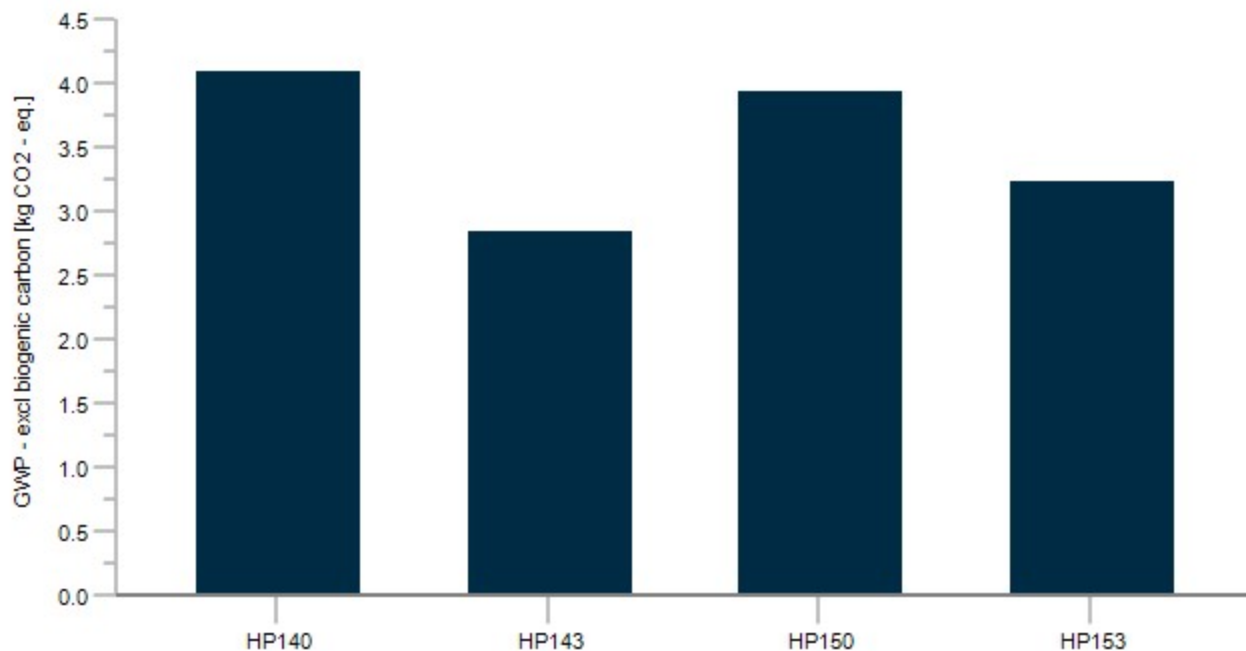


Figure 5: Global warming potential, excluding biogenic carbon for market lifetime

Table 8: Life cycle inventory data for market lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
GWP, excl. biogenic carbon [kg CO2-Equiv.]	3.50E00	5.08E-01		9.02E-02
GWP, incl. biogenic carbon [kg CO2-Equiv.]	3.50E00	4.99E-01		9.12E-02
Acidification [kg SO2-Equiv.]	6.98E-02	1.42E-03		1.27E-03
Eutrophication [kg N-Equiv.]	6.88E-04	1.25E-04		4.88E-04
Ozone depletion [kg CFC 11-Equiv.]	4.54E-09	1.41E-11		3.36E-10
Smog formation [kg O3-Equiv.]	1.52E-01	3.30E-02	7.45E-10	1.12E-02



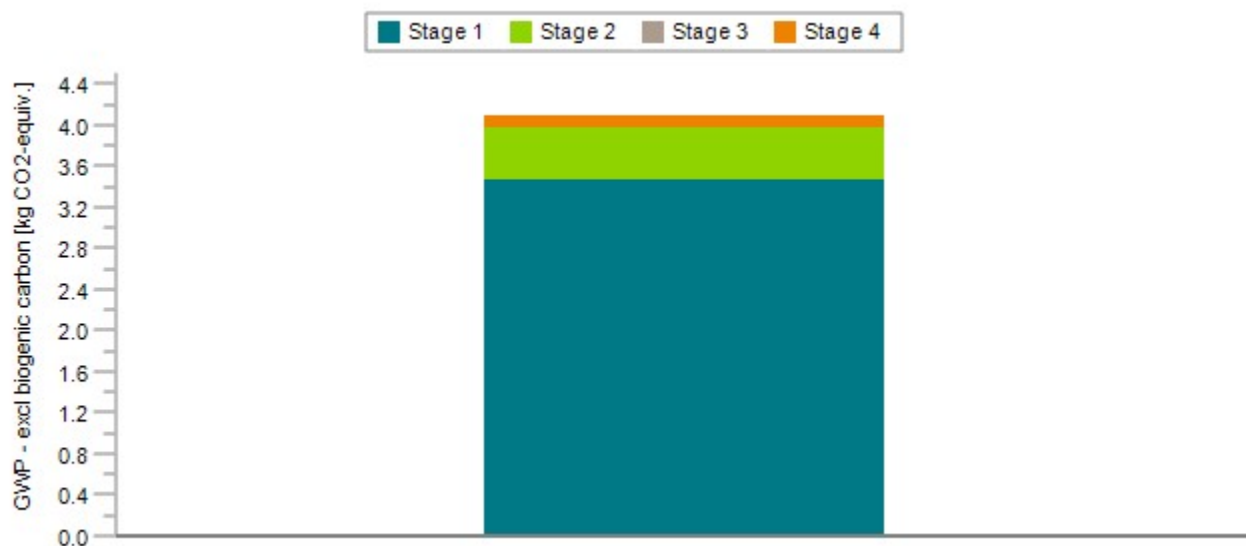


Figure 6: Global warming Potential, excluding biogenic carbon for market lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

Table 9: 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.]
HP140	4.09E00	4.09E00	7.25E-02	1.30E-03	4.89E-09	1.96E-01
HP143	2.84E00	2.81E00	8.57E-03	8.69E-04	4.18E-09	1.17E-01
HP150	3.94E00	3.93E00	6.11E-02	1.18E-03	5.50E-09	1.82E-01
HP153	3.23E00	3.20E00	9.58E-03	9.06E-04	5.89E-09	1.30E-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 10: Energy resources for design lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140) [MJ, net calorific value]

	Stage 1	Stage 2	Stage 3	Stage 4
Crude oil (resource)	6.64E00	2.72E00		2.34E-01
Hard coal (resource)	3.82E00	8.23E-02		-2.86E-02





Lignite (resource)	8.21E-01	9.21E-03		1.27E-02
Natural gas (resource)	1.04E01	1.23E-01		2.89E-02
Peat (resource)	9.52E-04	4.97E-06		-1.71E-07
Uranium (resource)	1.18E00	4.19E-02		4.30E-03
Primary energy from geothermics	3.10E-02	1.40E-03		-2.08E-04
Primary energy from hydro power	2.39E-01	9.45E-03		2.62E-03
Primary energy from solar energy	7.94E-01	9.31E-02		2.20E-02
Primary energy from waves	1.41E-08	4.05E-15		-2.88E-09
Primary energy from wind power	3.07E-01	7.50E-03		2.48E-03

Table 11: Material resources for design lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
Non renewable resources	2.34E00	2.89E-02		1.29E-01
Renewable resources	5.40E02	1.62E01		1.16E01

Water consumption constitutes the majority of renewable resource consumption.

Table 12: Other environmental information for design lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
Blue water consumption [kg]	5.94E00	6.96E-01		3.57E-02
Hazardous waste, deposited [kg]	5.12E-06	5.08E-07		1.84E-09
Non-hazardous waste, deposited [kg]	1.48E-02	2.69E-04		6.10E-01
Recycled materials [kg]				7.58E-03
Secondary raw material [kg]	5.35E-04			

Table 13: Energy resources for market lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy Behr HP140) [MJ, net calorific value]

	Stage 1	Stage 2	Stage 3	Stage 4
Crude oil (resource)	1.99E01	8.16E00		7.02E-01
Hard coal (resource)	1.15E01	2.47E-01		-8.59E-02
Lignite (resource)	2.46E00	2.76E-02		3.82E-02
Natural gas (resource)	3.11E01	3.69E-01		8.66E-02
Peat (resource)	2.85E-03	1.49E-05		-5.14E-07
Uranium (resource)	3.54E00	1.26E-01		1.29E-02
Primary energy from geothermics	9.31E-02	4.21E-03		-6.23E-04
Primary energy from hydro power	7.16E-01	2.84E-02		7.86E-03



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According to ISO 14025

Primary energy from solar energy	2.38E00	2.79E-01		6.59E-02
Primary energy from waves	4.23E-08	1.22E-14		-8.64E-09
Primary energy from wind power	9.20E-01	2.25E-02		7.44E-03

Table 14: Material resources for market lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
Non renewable resources	7.03E00	8.68E-02		3.87E-01
Renewable resources	1.62E03	4.87E01		3.47E01

Water consumption constitutes the majority of renewable resource consumption.

Table 15: Other environmental information for market lifetime, (representative product, BEHR PRO™ Pre-Cat Epoxy HP140)

	Stage 1	Stage 2	Stage 3	Stage 4
Blue water consumption [kg]	1.78E01	2.09E00		1.07E-01
Hazardous waste, deposited [kg]	1.54E-05	1.53E-06		5.51E-09
Non-hazardous waste, deposited [kg]	4.44E-02	8.06E-04		1.83E00
Recycled materials [kg]				2.27E-02
Secondary raw material [kg]	1.61E-03			

Impact Assessment Interpretation

For the BEHR PRO™ Pre-Catalyzed Waterborne Epoxy 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.



Other Environmental Information



GREENGUARD® Certification

BEHR PRO™ Pre-Cat Epoxy is GREENGUARD® and GREENGUARD® Gold Certified. This third-party certification assures our paints are low-emitting and contribute to healthy indoor environments.

GREENGUARD® Certification establishes acceptable indoor air standards for indoor products, environments, and buildings. GREENGUARD® Gold Certification offers stricter certification criteria, considers safety factors to account for sensitive individuals (such as children and the elderly), and ensures that a product is acceptable for use in environments such as schools and healthcare facilities.

GREENGUARD® certified products are referenced standards in numerous sustainable building initiatives including: Leadership in Energy and Environmental Design (LEED®), Collaborative for High Performance Schools (CHPS), Green Guide for Health Care (GGHC), Sustainable Building Industry Council (SBIC) and many others. For more information on the GREENGUARD® Certification Program emission standards visit greenguard.org.



MPI Extreme Green Performance™ Standard (MPI GPS-2-12)

BEHR PRO™ Pre-Cat Epoxy is certified with the MPI Extreme Green Performance™ (X-Green) Standard, a three-pronged standard that has requirements on indoor air quality, durability, and environmental safety of paint products.

MPI's Green Performance™ Standards were established to challenge the thinking that VOC level alone should determine a 'green' coating. MPI believes that performance and durability are critical to true sustainability, since premature failure and the frequent repainting that results inevitably leads to greater VOC emissions and non-sustainable and costly maintenance operations. Therefore, paints certified to MPI's Green Performance™ Standard:

- 1) Provide performance and durability equal to their 'conventional' counterparts;
- 2) Have eliminated or contain only trace quantities of various undesirable chemical compounds such as phthalates;
- 3) Have reduced VOC. MPI's GPS 2 -- the most stringent in North America when introduced in 2007 -- has a maximum allowable VOC of 50 g/l across the board for all paint types.

The Extreme Green Environmental Performance™ Standard, which complements MPI's Green Performance™ Standards includes the following additional requirements:

- 1) No carcinogenic ingredients;
- 2) Maximum 50 g/l VOC;
- 3) Submit a third-party test result verifying they meet CHPS (Collaborative for High Performance Schools) emissions requirements;
- 4) The certification of emissions compliance to CHPS must be within 2 years of testing.

The MPI Green Performance™ Standard is the only green paint/coatings certification required by both the US and Canadian governments, and referenced by the South Coast Air Quality Management District (SCAQMD).



References

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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
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