Environmental Product Declaration

Ingevity
Engineered Additive for Recycled Asphalt Materials, Enhances Coating, Helps Control Age-Related Hardening of Virgin Binders, Improves Block Cracking Resistance, coating and workability with High RAP mixtures.

Product
EVOFLEX CA-9

Third party verified EPD based on the EN15804:2012 + A2

Issue Date	03/15/2023
Valid until	03/13/2028
Collection period	2021
Version	1.2

Company
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DEMONSTRATION OF VERIFICATION

EN15804:2012+A2 serves as core PCR
Third party verification of the declaration, according to ISO 14025

☐ Internal Third party verifier
☑ External Lead reviewer Brad McAllister, WAP Sustainability & co-lead reviewer Amlan Mukherjee, PhD, PE, Michigan Technological University

Data on this certificate have been generated by The Right Environment, Ltd using SimaPro. Primary data has been collected for the processes controlled by Ingevity for the year 2020. Background data for energy, electricity and transportation are based on the NAPA PCR v2.

As a general rule, a comparison or evaluation of EPD data is only possible when all of the data records to be compared have been drawn up in accordance with EN 15804 and the building context and/or product-specific performance features are taken into consideration. EPDs of construction products may not be comparable if the requirements in EN 15804 section 5.3 are not met, the EPDs are not seen in a building context, and other requirements (e.g. background LCI data, assumptions around onsite emission measurements, type of EPD, reference service life, boundary conditions and functionality) are not equivalent.

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Declared unit
1 metric ton (1000 kg)

Representative market
Ingevity EVOFLEX CA-9 product is produced in N. Charleston, SC (U.S.A.) for North American Markets.

Product description and intended use
The main application of this product is an additive which efficiently mobilizes recycled asphalt at lower production temperatures.for recycled asphalt mixtures. Additionally, it can maintain the overall low temperature binder chracteristics of the asphalt. This products constitutes typically 0.5%wt to 2.5%wt of the asphalt binder in a paving mixture. ***To assess the contribution of this product within the asphalt paving mixture, the declared results need to be scaled accordingly.***

The comparison of products on the basis of their EPD is defined by the contribution they have to the environmental performance on asphalt mixture manufacture and asphalt pavement construction. Consequently, comparison of the environmental performance of construction products using the EPD information shall be based on the product's use in and its impacts on the construction materials and works, and shall consider the complete life cycle (all information modules), meaning cradle-to-grave. In addition to the environmental impacts covered in a cradle-to-grave LCA, the durability of a product's performance in the application needs to be evaluated.

Declaration of material content

Density	0.97 kg/l
Water	0% wt.

Reference
All information related to the content and safety of our products can be obtained by contacting Ingevity Pavement Technologies technical support at +1 843-746-8464 or evotherm@ingevity.com.

Safety data sheet
EVOFLEX CA-9 is manufactureed using common, industrial-scale specialty chemicals manufacturing processes compliant with ISO 9001:2015 quality management requirements. Ingevity EVOFLEX CA-9 is neither a PBT (persistent, bioaccumulative, and toxic) sustance nor does not contain substances of very high concern that are as listed by the European Chemicals Agency. Ingevity EVOFLEX CA-9 is safe to use and carries the sensitizer and aquatic hazard labels. If more information is required, please contact Ingevity at +1 843-746-8464 or evotherm@ingevity.com.

Substances considered under European Chemicals Regulation REACH
All information related to the content and safety of our products can be obtained by contacting our technical support. Ingevity EVOFLEX CA-9 does not contain substances of very high concern.

Life-Cycle Assessment: Calculation Rules

System boundaries and flow diagram

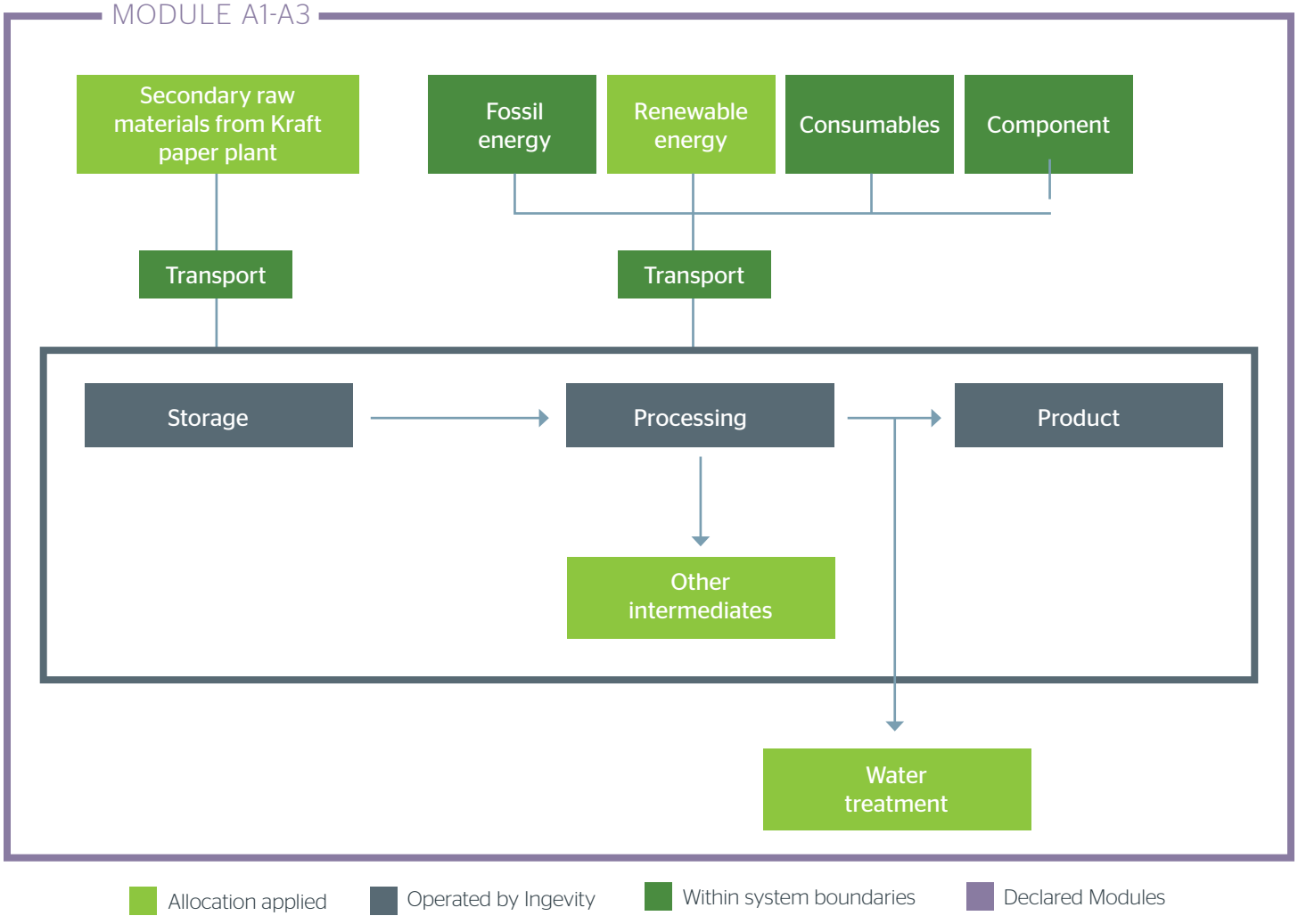
The process tree for the declared product (material and energy inputs smaller than 1% excluded from flow chart). The fate of this product in the use phase is not modeled and hence not included in this EPD.

Other rules

The biogenic carbon content and both renewable and fossil feedstock energy content of EEVOFLEX CA-9 are declared. Economic allocation has been used for the use of a by-product of the kraft paper industry. Mass allocation has been used for the processing at Ingevity. Suppliers have been contacted but literature data has been used for some of the components of EVOFLEX CA-9. Packaging has been excluded.

EDP type

Cradle-to-gate	Ingevity admixtures are used in an asphalt mix. Only module A1, A2 and A3 are declared.



Life-Cycle Assessment

Limitations

Results can be considered to be conservative and worst case. Carbon offsetting is not allowed in the EN 15804 and hence are not considered in the calculations. No benefits and load beyond the system boundaries have been declared. Results calculated without long-term emissions (>100 year) and without infrastructure processes.

Life cycle stages

(MND = Module not accessed/declared)

Product stage	Delivery	Installation	Use and maintenance	End-of-life				Module D
A1, A2, A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
X	MND	MND	MND	MND	MND	MND	MND	MND

[1] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

[2] The results shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Resource input (use of) (EN15804:2021+A2)

		Product stage	Delivery	Installation	Use and maintenance	End-of-life				Moldule D
Parameter	Unit	A1, A2, A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
Renewable primary energy, excluding renewable resources used as raw materials	MJ, ncv	3.63E + 03	MND	MND	MND	MND	MND	MND	MND	MND
Renewable primary energy resources used as raw materials	MJ, ncv	3.48E + 04	MND	MND	MND	MND	MND	MND	MND	MND
Non renewable primary energy, excluding resources used as materials	MJ, ncv	3.94E + 04	MND	MND	MND	MND	MND	MND	MND	MND
Non renewable primary energy used as raw materials	MJ, ncv	5.40E + 03	MND	MND	MND	MND	MND	MND	MND	MND
Secondary material	kg	0.00E + 00	MND	MND	MND	MND	MND	MND	MND	MND
Renewable secondary fuels	MJ	0.00E + 00	MND	MND	MND	MND	MND	MND	MND	MND
Non renewable secondary fuels	MJ	0.00E + 00	MND	MND	MND	MND	MND	MND	MND	MND
Recovered energy	MJ	0.00E + 00	MND	MND	MND	MND	MND	MND	MND	MND
Resource use, fossils	MJ	3.65E + 04	MND	MND	MND	MND	MND	MND	MND	MND

ncv = net calorific value

Waste categories (disposed) (EN 15804:2021+A2)

		Product stage	Delivery	Use and maintenance	End-of-life				Moldule D
Parameter	Unit	A1, A2, A3	A4	B1 - B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0.00E + 00	MND	MND	MND	MND	MND	MND	MND
Non hazardous waste disposed	kg	8.86E + 00	MND	MND	MND	MND	MND	MND	MND

Environmental profile (TRACI 2.1)

		Product stage	Delivery	Installation	Use and maintenance	End-of-life				Moldule D
Parameter	Unit	A1, A2, A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
Ozone Depletion	kg CFK-11	1.36E - 04	MND	MND	MND	MND	MND	MND	MND	MND
Global Warming	kg CO2	2.06E + 03	MND	MND	MND	MND	MND	MND	MND	MND
Smog	kg 03	1.60E + 02	MND	MND	MND	MND	MND	MND	MND	MND
Acidification	kg SO2	1.42E + 01	MND	MND	MND	MND	MND	MND	MND	MND
Eutrophication	kg N eq	2..13E + 00	MND	MND	MND	MND	MND	MND	MND	MND

*This does not include biogenic emissions and sequestration or land use and land use change. A more detailed and complete breakdown and total for the product is shown under "Climate Change (EN15804:2021+A2)". The total listed in that breakdown can be considered the carbon footprint of the product

Biogenic carbon (in product)

		Product stage
Parameter	Unit	A1, A2, A3
Biogenic carbon (in product)	ton	6.07E-01

Climate Change (EN 15804:2021+A2)

		Product stage
Parameter	Unit	A1, A2, A3
Climate Change - Total	kg CO2 eq	-4.58E + 01
Climate Change - Fossil	kg CO2 eq	2.17E + 03
Climate Change - Biogenic	kg CO2 eq	-2.22E + 03
Climate Change - Land use and LU change	kg CO2 eq	1.14E - 04

Other information

Emissions

There are no indoor air health quality related concerns for the use of the products declared as the application is outdoors. There are no emissions to soil and water during the use stage.

Normative references

- ASTM D803-15 (2020) Standard Test Methods for Testing Tall Oil
- ASTM D6816-11 (2016) Standard Practice for Determining Low-Temperature Performance Grade (PG) of Asphalt Binders (equivalent to AASHTO R49)
- ASTM D7643-16 Standard Practice for Determining the Continuous Grading Temperatures and Continuous Grades for PG Graded Asphalt Binders (equivalent to AASHTO M320)
- ASTM D6373-21 Standard Specification for Performance-Graded Asphalt Binder (equivalent to AASHTO M332)
- ASTM D2726/D2726M-19 Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures (equivalent to AASHTO T166)

Standards that apply to methodology and rules for this EPD:

- ISO 14040:2006: Environmental Management-Life Cycle Assessment-Principles and framework
- ISO 14044:2006: Environmental Management-Life Cycle Assessment-Requirements and guidelines
- ISO 14025:2006: Environmental labels and Declarations-Type III Environmental Declarations-Principles and procedures
- EN 15804+A2:2019

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