ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

RAVEMUL PC2 F

EPD®
THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

An EPD should provide current information and may be updated if conditions change. The stated validity is, therefore, subject to the continued registration and publication at www.environdec.com.

Programme:	Programme operator:	EPD registration number:	Publication date:	Valid until:	Geographical scope:
The International EPD® System; www.environdec.com	**EPD International AB**	**S-P-06011**	**2022-05-06**	**2027-05-05**	**International**

VINAVIL®
YOUR PARTNER IN POLYMERS

1. COMPANY DESCRIPTION / GOAL & SCOPE

Vinavil S.p.A. was born in 1994 with the acquisition by Mapei Group of the polymer production business Acetovinyls from EniChem Synthesis. Market leader in Italy and with a relevant position in the international market in dispersion polymers and solid, Vinavil has factories in Italy, Egypt, the United States and Canada. Thanks to a widespread sales network all over the world, it guarantees its presence in the 5 continents. Vinavil progressively continues to invest in his production sites in terms of environment and employee safety. Research & Development is the core of the company, with 3 centers coordinated by central R&D department of Villadossola, Italy.

VINAVIL is a familiar name of Italian people daily life. Since the 1950's Vinavil's most well-known product has been the legendary Vinavil universal adhesive made from polyvinyl acetate contained in the classic red and white bottle.
VINAVIL also offers solutions for more specialized applications, such as solid polymers for the chewing-gum industry or binders which have the acronym PVA (polyvinyl acetate) on their label.

We can find the VINAVIL brand in numerous objects that are around us every day, such as furniture, textiles, cardboard boxes, books, newspapers, packaging, pressure-sensitive adhesives, wooden frames, abrasive cleaning sponges, varnishes for wood and metal, paints used to decorate the walls and structures of our homes. In addition to that, Vinavil polymers are used as a component in numerous chemical products for the building industry.

The goal of the study is to provide necessary data and documentation to produce an EPD according to the requirements of PCR Environdec (Version 1.11, 2021-02-05) under EN 15804:2012+A2:2019 and to have more comprehension about the environmental impacts related to **RAVEMUL PC2 F** manufactured in Vinavil SpA located in Ravenna (IT), in year 2018, including packaging of the finished products.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of **RAVEMUL PC2 F**.

This analysis shall not support comparative assertions intended to be disclosed to the public.

2. PRODUCT DESCRIPTION

RAVEMUL PC2 F is a water-based dispersion of 51% solid content of vinyl acetate-VEOVA copolymer, free from alkylphenol ethoxylates (APEO-FREE).

The main uses are in the formulation of water-based paints for indoor and outdoor, wall textured coatings, and primers.

RAVEMUL PC2 F is characterized by several properties which improve products performances in building
industry such as:

- binding power
- rheological behaviour
- good water resistance
- good alkali resistance
- excellent compatibility with fillers and additives
- resistance to exterior weathering conditions.

The products are available in 1000 liter IBC tanks and in bulk.
For more information see the TDS (Technical Data Sheet) on Vinavil SpA website.
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3. CONTENT DECLARATION

The main components and ancillary materials of the product included in this EPD are the following:

Table 1: Composition referred to 1 kg of finished product with packaging

Materials	Percentage (%) by mass
Vinylic compounds	< 50%
Biocides	< 0,5%
Additives	< 30%
Water	< 25%

The product does not contain a concentration higher than 0,1% (by unit weight) of either carcinogenic substances or substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency.

4. DECLARED UNIT AND REFERENCE SERVICE LIFE

The declared unit is 1 kg of finished product delivered in bulk.

Due to the selected system boundary, the reference service life of the products is not specified.

5. SYSTEM BOUNDARIES AND ADDITIONAL TECHNICAL INFORMATION

The approach is “cradle to gate” (A1–A3);

- A1, A2, A3 (Product stage): extraction and processing of raw materials and packaging (A1), transportation up to the factory gate (A2), manufacturing of the finished product (A3)

Table 2: System boundaries

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND
Geography	EU, IT	EU	IT, NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data	> 90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not-relevant					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not-relevant					-	-	-	-	-	-	-	-	-	-	-	-

MND: Module Not Declared

A brief description of production process is the following:

RAVEMUL PC2 F is a water based vinylic copolymer dispersion produced via Emulsion polymerization. A dispersion of monomers in water is obtained in a reactor by means of surfactants and protective colloids and then polymerized with small amounts of initiators. A certain number of activities are counted i.e., charge of reactor, reaction phase, cooling with vacuum stripping, post adds, discharge, washing. The polymerization reaction is exothermic, so the reaction is spread over a certain number of hours (feedings of monomers and initiators), to better control the Temperature. The heat of reaction is removed both with cooling water and with absorption of heat of evaporation of a mix of water and Vinyl acetate.

6. CUT-OFF RULES AND ALLOCATION

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA, information modules and any additional information are intended to support an efficient calculation procedure. They are not applied in order to hide data. Cut-off criteria, where applied, are described in Table 3.

Table 3: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	Less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%
A3: particle emission	Less than 10^{-5} kg/kg of finished product	Sensitivity study demonstrates a relative contribution lower than 0,5%

For the allocation procedure and principles consider the following table (Table 4):

Table 4: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1 kg of product A1: electricity is allocated to the specific production line
A3	All data are referred to 1 kg of packaged product A3-wastes: all data are allocated to the whole production plant

7. ENVIRONMENTAL PERFORMANCE AND INTERPRETATION

GWP

Climate change
GWPtotal - Global Warming Potential refers to the emission/presence of GHGs (greenhouse gases) in the atmosphere (mainly CO_2, N_2O, CH_4) which contribute to the increase in the temperature of the planet.
GWP-total considers:
- GWP-fossil
- GWP-biogenic
- GWP-luluc (land use and land use change)

ODP

Ozone Depletion
Ozone Depletion Potential refers to the degradation of the stratospheric layer of the ozone involved in blocking the UV component of sunrays. Depletion is due to particularly reactive components that originate from chlorofluorocarbon (CFC) or chlorofluoromethane (CFM).

AP

Acidification
Acidification Potential refers to the emission of specific acidifying substances (i.e. NOx, SOx) in the air. These substances decrease the pH of the rainfall with predictable damages to the ecosystem.

EP

Eutrophication
Eutrophication Potential refers to the nutrient enrichment, which determines unbalance in ecosystems and causes the death of the fauna and decreased biodiversity in flora.
It considers:
- EP-freshwater: acquatic freshwater
- EP-marine: acquatic marine
- EP-terrestrial

POCP

Photochemical ozone formation
The Photochemical Ozone Creation Potential is the ozone formation in low atmosphere. This is quite common in the cities where a great amount of pollutants (like VOC and NOx) are emitted every day (industrial emissions and vehicles). It is mainly diffused during the summertime.

ADP minerals&metals

Depletion of abiotic resources – minerals and metals
Abiotic Depletion Potential elements refers to the depletion of the mineral resources.

ADP - fossil

Depletion of abiotic resources – fossil fuel
Abiotic Depletion Potential fossil fuel refers to the depletion of the fossil fuel resources.

WDP

Water use
It expresses the potential deprivation of water, that consists in not having the water needs satisfied.

The following tables show the environmental impacts for the products considered according to the requirements of EN15804:2012+A2:2019. The results are referred to the declared unit (see § 4). The additional environmental indicators are not declared.

RAVEMUL PC2 F

(1 kg product in bulk)

Table 5: RAVEMUL PC2 F: Potential environmental impact – mandatory indicators according to EN 15804 referred to 1 kg of product in bulk

Indicator	Unit	A1-A3
GWP_{TOTAL}	(kg CO_2 eq.)	1,12E+00
GWP_{FOSSIL}	(kg CO_2 eq.)	1,19E+00
$GWP_{BIOGENIC}$	(kg CO_2 eq.)	-8,57E-02
GWP_{LULUC}	(kg CO_2 eq.)	1,22E-02
ODP	(kg CFC 11 eq.)	1,14E-06
AP	(mol H^+ eq.)	6,70E-03
$EP_{FRESHWATER}$	(kg P eq.)	3,44E-04
$EP_{FRESHWATER}$	(kg $(PO_4)^{3-}$ eq.)	1,05E-03
EP_{MARINE}	(kg N eq.)	1,34E-03
$EP_{TERRESTRIAL}$	(mol N eq.)	1,43E-02
POCP	(kg NMVOC eq.)	4,53E-03
$ADP_{MINERALS\&METALS}$*	(kg Sb eq.)	2,34E-05
ADP_{FOSSIL}*	(MJ)	2,85E+01
WDP*	(m^3 world eq.)	1,24E+00

GWP_{TOTAL}: Global Warming Potential total; **GWP_{FOSSIL}**: Global Warming Potential fossil fuels; **$GWP_{BIOGENIC}$**: Global Warming Potential biogenic; **GWP_{LULUC}**: Global Warming Potential land use and land use change; **ODP**: Depletion Potential of the stratospheric Ozone layer; **AP**: Acidification Potential; **$EP_{FRESHWATER}$**: Eutrophication Potential, freshwater; **EP_{MARINE}**: Eutrophication Potential, marine; **$EP_{TERRESTRIAL}$**: Eutrophication Potential, terrestrial; **POCP**: Formation potential of tropospheric ozone; **$ADP_{MINERALS\&METALS}$**: Abiotic Depletion Potential for non-fossil resources; **ADP_{FOSSIL}**: Abiotic Depletion Potential for fossil resources; **WDP**: Water Deprivation Potential.

** The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is a limited experienced with the indicator*

Table 6: RAVEMUL PC2 F: Potential environmental impact – additional mandatory and voluntary indicators referred to 1 kg of product in bulk

Indicator	Unit	A1-A3
GWP-GHG	(kg CO_2 eq.)	1,03E+00

GWP-GHG: The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Table 7: RAVEMUL PC2 F: Use of resources referred to 1 kg of product in bulk

Indicator	Unit	A1-A3
PERE	MJ	2,71E+00
PERM	MJ	0,00E+00
PERT	MJ	2,71E+00
PENRE	MJ	2,85E+01
PENRM	MJ	0,00E+00
PENRT	MJ	2,85E+01
SM*	kg	0,00E+00
RSF	MJ	0,00E+00
NRSF	MJ	0,00E+00
FW	m^3	2,89E-02

PERE: Use of renewable primary energy excluding renewable primary energy resources used as raw materials; **PERM**: Use of renewable primary energy resources used as raw materials; **PERT**: Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); **PENRE**: Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; **PENRM**: Use of non-renewable primary energy resources used as raw materials; **PENRT**: Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); **SM**: Use of secondary material; **RSF**: Use of renewable secondary fuels; **NRSF**: Use of non-renewable secondary fuels; **FW**: Net use of fresh water.

** Referred only to 1 kg of product without packaging*

Table 8: RAVEMUL PC2 F: Waste production and output flows referred to 1 kg of product in bulkflows referred to 1 kg of product with packaging

Indicator	Unit	A1-A3
HWD	kg	1,06E-03
NHWD	kg	6,89E-03
RWD	kg	8,20E-05
Components for re-use	kg	0,00E+00
Materials for recycling	kg	2,44E-03
Materials for energy recovery	kg	0,00E+00
Exported energy, electricity	MJ	0,00E+00
Exported energy, thermal	MJ	0,00E+00

HWD: Hazardous waste disposed; **NHWD**: Non-Hazardous waste disposed; **RWD**: Radioactive waste disposed

Table 9: RAVEMUL PC2 F: Information on biogenic carbon content at the factory gate referred to 1 kg of product in bulk

Biogenic Carbon Content	Unit	Quantity
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in packaging	kg C	0,00E+00

Tables from 5 to 9 show absolute results for all the environmental categories considered.

The main contribution to the environmental impacts in the products life cycle come from extraction and processing of raw materials (**module A1**). The Product stage (**module A3**) doesn't affect considerably the results for products in bulk;. the contribution of the transport of raw materials (**module A2**) is visible in GWP_{LULUC} and Eutrophications impact categories.

More details about electrical mix used in this EPD, is shown below:

	Data source	GWP_{TOTAL}	Unit
Residual electricity grid mix (IT) – 2020	AIB	0,531*	kg CO_2-eqv/kWh

** According to CML2001 - Aug. 2016*

8. DATA QUALITY

Table 10: Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1; A3		
Vinylic compounds	Sphera Database; ecoinvent 3.7; supplier	2020
Water	Sphera Database;	2020
Additives (EU)	Sphera Database; ecoinvent 3.7	2020
Residual electricity grid mix (IT)	Sphera Database;	2020
A2		
Truck, Euro 4, 27t payload (GLO)	Sphera Database	2020
Light train, gross tonne weight 500t / 363t payload (GLO)	Sphera database	2020
Oceanic ship (27500 DWT – GLO)	Sphera database	2020
Diesel for transport (EU)	Sphera database	2017
Heavy Fuel Oil (EU)	Sphera database	2017
Electricity grid mix (EU)	Sphera database	2017

All data included in table above refer to a period between 2017 and 2020; the most relevant ones are specific from supplier, while the others (i.e. transport and minor contribution dataset), come from European and global databases.

All dataset are not more than 10 years old according to EN 15804 §6.3.8.2 "Data quality requirements".

The Quality level concerning datasets used in the EPD can be considered as "very good" or "good" according to Annex E of the EN 15804 (current version).

Primary data concern the year 2018 and represent the whole annual production.

9. REQUISITE EVIDENCE

9.1 Indication for the calculation of Module A4 (Transport from the factory to the jobsite)

In order to calculate the impact related to the transport of 1 kg of product from the factory gate (Ravenna) to the jobsite, you can use the following formula:

*Transport Impact = EF (kg/DU) * distance (km)*

Table 11: The EFs are related to 1 kg of product transported with truck, train and ship

Impact Category	Unit	Truck	train	ship
GWP_{TOTAL}	(kg CO_2 eq.)/km	4,79E-05	2,15E-05	1,39E-05
GWP_{FOSSIL}	(kg CO_2 eq.)/km	4,81E-05	2,13E-05	1,38E-05
$GWP_{BIOGENIC}$	(kg CO_2 eq.)/km	-4,70E-07	8,52E-08	1,66E-08
GWP_{LULUC}	(kg CO_2 eq.)/km	3,24E-07	4,17E-08	1,53E-10
ODP	(kg CFC 11 eq.) /km	4,72E-18	2,30E-16	7,95E-19
AP	(mol H^+ eq.) /km	1,46E-07	9,11E-08	5,28E-07
$EP_{FRESHWATER}$	(kg P eq.) /km	1,72E-10	6,61E-11	3,08E-12
$EP_{FRESHWATER}$	(kg $(PO_4)^{3-}$ eq.) /km	5,28E-10	2,03E-10	9,46E-12
EP_{MARINE}	(kg N eq.) /km	6,58E-08	3,63E-08	1,34E-07
$EP_{TERRESTRIAL}$	(mol N eq.) /km	7,39E-07	3,96E-07	1,47E-06
POCP	(kg NMVOC eq.) /km	1,31E-07	1,02E-07	3,77E-07
$ADP_{MINERALS\&METALS}$	(kg Sb eq.) /km	4,84E-12	4,85E-12	5,06E-13
ADP_{FOSSIL}	(MJ) /km	6,31E-04	3,59E-04	1,67E-04
WDP	(m^3 world eq.) /km	5,38E-07	3,64E-06	2,48E-08

10. VERIFICATION AND REGISTRATION

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

CEN standard EN15804 served as the Core Product Category Rules (PCR)	
PCR:	PCR 2019:14 Construction products (EN 15804:A2), Version 1.11, 2021-02-05, UN CPC code 54
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☒ EPD Process Certification ☐ EPD Verification
Third party verifier:	Certiquality S.r.l. Number of accreditation: 003H rev15
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	☒ Yes ☐ No

11. REFERENCES

- EN 15804: SUSTAINABILITY OF CONSTRUCTION WORKS - ENVIRONMENTAL PRODUCT DECLARATIONS - CORE RULES FOR THE PRODUCT CATEGORY OF CONSTRUCTION PRODUCTS
- EUROPEAN RESIDUAL MIXES VERSION 1.0, 2021-05-31 (AIB: ASSOCIATION OF ISSUING BODIES)
- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD® SYSTEM. VERSION 3.01
- ISO 14025 ENVIRONMENTAL LABELS AND DECLARATIONS - TYPE III ENVIRONMENTAL DECLARATIONS - PRINCIPLES AND PROCEDURES
- ISO 14044 ENVIRONMENTAL MANAGEMENT – LIFE CYCLE ASSESSMENT – REQUIREMENTS AND GUIDELINES
- PCR 2019:14 CONSTRUCTION PRODUCTS (EN 15804: A2), UN CPC CODE 54; VERSION 1.11

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