



Environmental Product Declaration

NEOKEM S.A. – PP101 Architectural Pure Polyester Powder Coatings (Class 1)

In accordance with ISO 14025 and EN 15804 + A1

EPD Registration Number	S-P-03999
Program	The International EPD® System www.environdec.com
Program operator	EPD International AB
Publication Date	01/09/2021
Date of Validity	31/08/2026
CPC	351 – Paints and varnishes and related products; artists' colours; ink



Program Information

Program




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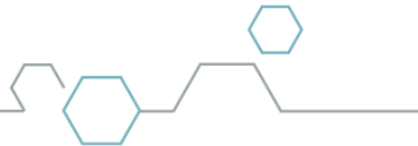
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Product category rules (PCR):	PCR 2012:01 Construction products and construction services
PCR review was conducted by:	The Technical Committee of the International EPD System Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:	<input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification (external)
Verified by:	Dr-Ing. Nikolay Minkov Greenzero.me GmbH nikolay.minkov@greenzero.me
Technical support:	SustChem Consulting S.A.  www.sustchem.gr

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.





Company Profile

Established in **1972** , NEOKEM started the development and production of **high-quality coatings** that matched and even exceeded the expectations of our customers.

In **1987**, in a demanding environment for advanced high-tech products, we were **the first Greek company** to implement the production of **powder coatings** for aluminum architectural systems, industrial and other uses.

In **2006**, inspired by the market trends and motivated by our customers' particular needs, we produced **super durable powder coatings** with excellent resistance to adverse outdoor conditions.

Today, our business continues to grow along with our goals and expectations. We are a powder coating manufacturer with products that are internationally recognized and distributed.

50 years
Quality & Innovation in the Coatings
Industry

Further information on www.neokem.eu



Powder Coatings Our Core Business

Powder coatings represents 95% of our turnover.

We make environmentally friendly powder coatings that reflect the current market needs for superior quality, appearance, utility and durability.

We offer the best solutions through our extensive product ranges, and we ensure the high quality of our products through Certifications.

Most of NEOKEM powder coatings series are approved according to **Qualicoat**, **Qualideco** by the European Aluminium Association, **GSB International**, and **Qualisteelcoat**.



Aesthetics Built to Last

Architectural Applications

For over **30 years**, all our powder coatings have been produced in our state-of-the-art manufacturing facilities, consistently guaranteeing their high quality.

We draw inspiration from the market, designing and developing Powder Coatings which meet high standards in **Quality** and **Aesthetics**, in cooperation with well-known architects and interior designers.

The NEOKEM **Super Durable** powder coatings have been specially designed to withstand the high intensity solar radiation prevalent in Mediterranean Region.

Our Architectural Collections:

Prisma, Ammos, RAL Metallic and RAL Matt Polyester have been designed to meet the demands and preferences of contemporary architecture.

Main Applications:

Facades, Doors, Windows, Blinds, Pergolas, Rails, Fences, Garage Doors.

Since 1972



PP101 Architectural Pure Polyester Powder Coatings

Product description

PP101 is a series of thermosetting powder coatings, based on polyester resins specifically selected for their excellent resistance to atmospheric ageing and UV radiation. These characteristics, combined with high mechanical properties, result in high performance coating films with very good outdoor durability and excellent decorative properties. PP101 is designed for architectural use, on aluminum and galvanized steel. It is recommended for architectural aluminum profiles, panels, railings, outdoor machinery and equipment, automotive parts etc. All PP101 products are heavy metal and TGIC free. PP101 is approved by Qualicoat for Class 1 (12 months Florida testing) - Category 3 (Approval number: P-0369), and by GSB International for Standard Aluminum Coating Material (License number: 148a).

NEOKEM S.A. PP101 Powder Coatings conforms to Qualicoat and GSB specifications.

Colour	RAL
Gloss (ISO 2816/60)	83 ± 10
Density (ISO 8130-3)	1.45 ± 0.20 gr/cm ³ (Depending on shade)
Curing Conditions	15 minutes at 180 °C



Technical Data

Indicatively, some physicochemical performance data of PP101 Powder Coating will be presented.

Mechanical Property	Value
Adhesion (EN ISO 2409, 2mm)	Pass, 0
Bend Test (EN ISO 1519)	Pass 5 mm
Erichsen Cupping (EN ISO 1520)	> 5 mm
Reverse Impact (EN ISO 6272-1, EN ISO 6272-2, ASTM D2794)	> 2.5 Nm
Indentation Buchholz (EN ISO 2815)	> 80

Corrosion Test – Chemical Properties	Value
Sulfur dioxide test in a humid atmosphere (ISO 22479)	Pass 24 cycles
Acetic Acid salt spray (EN ISO 9227)	Pass 1000 hours
Resistance to mortar (ASTM D3260, EN12206-1)	Pass 24 hours
Condensation water test (EN ISO 6270-2)	1000 hours, no blistering
Water spot test (GSB AL631)	Pass

Weathering Test	Value
Natural weathering 12 months Florida 5 South (ISO 2810)	> 50% gloss retention
Accelerated Weathering test EN ISO 16474-2 (Qualicoat cycle)	> 50% gloss retention after 1000 hours

PP101 Architectural Pure Polyester Powder Coatings

Base materials

The composition within ranges of the reference product of each PP101 Powder Coating sub-category is reported in the following tables. No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulation that exceed 0.1% of the total weight.

The products covered by this EPD represent the 26.5% of total Powder Coating production during the reference period.



PP101 / 9010	
Contribution (% in weight) of materials to the declared unit – 1 kg of Powder Coating	
TiO2	25-30
Pigments	0.5
Binders	60-65
Fillers	5-10
Additives	2-5

PP101 / 9005	
Contribution (% in weight) of materials to the declared unit – 1 kg of Powder Coating	
Pigments	0.5-2
Binders	73-78
Fillers	18-23
Additives	2-5

PP101 / 8014	
Contribution (% in weight) of materials to the declared unit – 1 kg of Powder Coating	
TiO2	0.1-0.5
Pigments	3-5
Binders	70-75
Fillers	20-25
Additives	2-5

Manufacturing Process

PP101 Architectural Pure Polyester Powder Coatings – Class 1

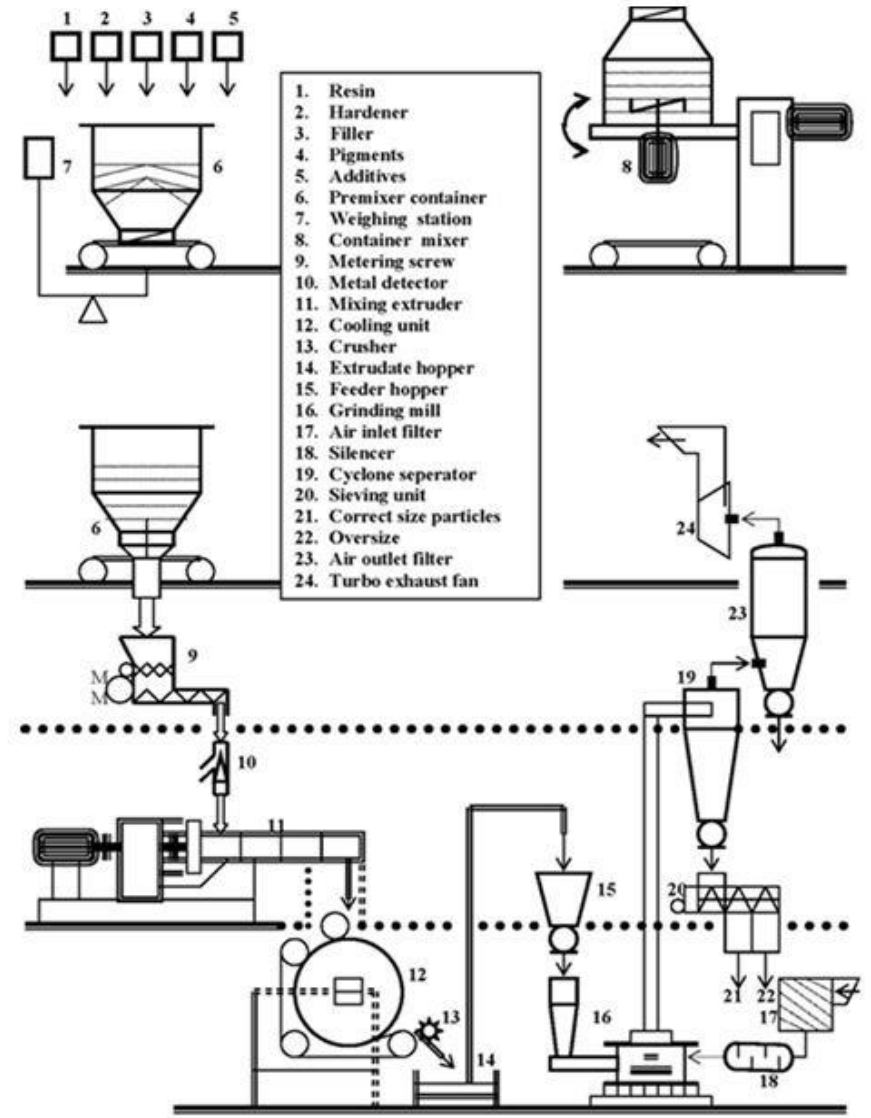
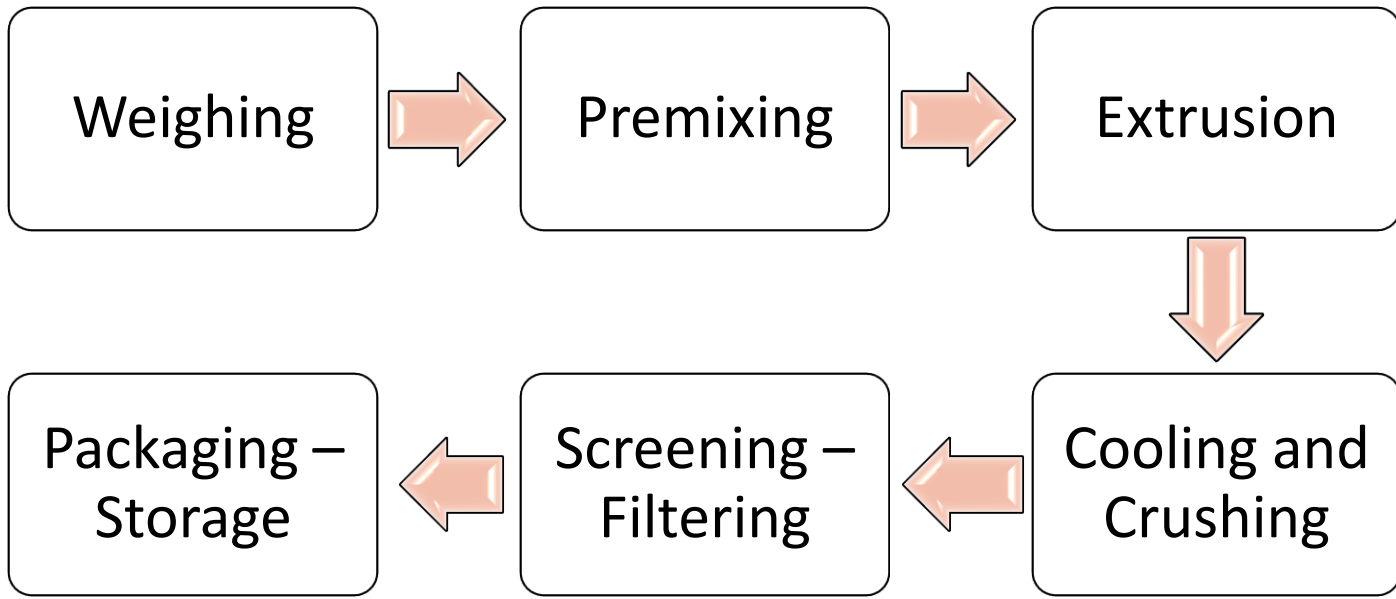


Figure 1.



Life Cycle Assessment (LCA)

Declared Unit

The declared unit is 1 kg PP101 Powder Coating (Class 1) including packaging material. This LCA study is associated with the manufacturing of three sub-categories of Powder Coatings, used to represent the various types of Class 1 Powder Coatings produced.

System boundary

This EPD only covers the **Cradle-to-gate**, because the rest of the Life Cycle stages are very dependent on the development of particular scenarios. Therefore, the system boundaries include raw material production and supply (A1), transportation (A2) and manufacturing (A3).

Similar products of a product group

Due to several similar products within each PP101 product sub-category (9010, 8014 & 9005) modelling needs, it is judged that there is no significant differentiation among the environmental performance of each product. Therefore, a representative product and the respective content declaration is chosen to effectively present the aggregated environmental impacts of the product sub-category.

Product Stage			Construction Process Stage	Use Stage								End of Life Stage				Resource Recovery Stage		
Raw material	Transport	Manufacturing	Transport	Construction installation	Use			Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, recycling, or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
✓	✓	✓	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	

EPD TYPE: Specific, only for PP101 Powder Coatings produced at NEOKEM's site

MND: Module Not Declared

SOFTWARE: GaBi ts version 10.5.0.78

DATABASES: A compilation of Ecoinvent v.3.7 and Professional 2021 databases were used

REFERENCE PERIOD CONSIDERED: January 2020 – December 2020



Life Cycle Assessment (LCA)

Cut-off criteria

All raw materials and consumable item inputs, associated transportations as well as process energy and water use, are included in the LCA study. It is assumed, that the total neglected input flows are much less than 1% of total energy, area, area-time activities and mass. All associated processes specific data are determined and modelled by the use of generic data provided by the integrated GaBi databases. Disposal of production wastes is considered within the scope of the study. Packaging material is included in the LCA study as well.

Assumptions, Allocation, and Estimates

- Regarding the exclusion of product life cycle stages and processes, the use, end-of-life, and reuse stage have not been accounted for. Also, the capital goods (construction of the site) are not included in this LCA study.
- Producer specific data used for environmental impacts calculations refer to the inventory of one full calendar year and more specifically, data from January 2020 to December 2020 were used as reference.
- An uncertainty regarding the packaging materials was raised due to the complex variation of packaging. Thus, an assumption that the product is packed in a carton box, using a PE film and a MDPE plastic bag, was made.
- Pigments were assumed to consist of carbon black exclusively.
- A default mean of road transportation “Truck Euro 6 – 9.3t payload – 12-14t gross weight” was assumed. Weighted average of the distance covered, and times needed were taken into account. Regarding ship transportation, “Average ship, 3.500t payload capacity” was assumed due to lack of actual data.
- It was assumed that production volumes of PP101 9010, 9005 and 8014 follow a ratio of 1:1:1.

- Regarding the energy, water and raw material consumption, an allocation based on the mass of the finished product has been applied, using site-specific data. PP101 Powder Coatings included in the EPD are accounted for the 26.5% of the total powder coatings production. Energy and mass apportionments made are based on this share.

Background data and data quality

For all processes primary data was collected and provided by **NEOKEM SA**. Data related to material and energy flows of the defined system, are acquired from the company developing the EPD and data related to life cycle impacts result from calculations based on databases and characterization factors. The primary data refers to January 2020 to December 2020 as reference period. For the data, which are not influenced by the manufacturer, generic data is used.

The LCA software GaBi ts version 10.5.0.78 was used for inventory and impact assessment calculations based on data entry of the developed model. A compilation of Ecoinvent v.3.7 and Professional 2021 databases was used.

Comparability

- EPDs within the same product category but from different programs may not be comparable.
- EPDs of construction products may not be comparable if they do not comply with EN 15084.
- This EPD and PCR 2012:01 Construction products and construction services” are available on the website of The International EPD® System (www.environdec.com).


Life Cycle Assessment (LCA) - Results




Parameters describing the environmental impacts

The following tables present the environmental impact potentials for different parameters, for the material flows as well as for the waste and other outputs. The results refer to 1 kg of PP101/ 9010 Powder Coating.

PP101/ 9010 Powder Coating:


 Environmental Impact Categories		Impact/ 1 kg of PP101/ 9010			
	Unit	A1	A2	A3	Total
Depletion of abiotic resources (elements)	kg Sb eq.	1.447E-05	2.577E-09	9.888E-08	1.457E-05
Depletion of abiotic resources (fossil)	MJ net calorific value	73.120	0.448	0.061	73.628
Acidification Potential	kg SO ₂ eq.	0.011	1.996E-04	1.447E-05	0.011
Eutrophication Potential	kg PO ₄ ⁻³ eq.	0.0034	2.681E-05	1.822E-05	0.0034
Global Warming Potential (GWP100)	kg CO ₂ eq.	3.715	0.033	0.017	3.765
Ozone Layer Depletion Potential	kg R-11 eq.	3.588E-09	5.759E-18	4.816E-15	3.588E-09
Photochemical Ozone Creation Potential	kg C ₂ H ₄ eq.	0.0013	8.193E-05	3.744E-06	0.0013

 Impact Category – Waste categories		Impact/ 1 kg of PP101/ 9010			
	Unit	A1	A2	A3	Total
Hazardous waste disposed	kg	4.726E-05	2.271E-11	1.111E-10	4.726E-05
Non-hazardous waste disposed	kg	0.022	6.694E-05	0.018	0.041
Radioactive waste disposed	kg	3.615E-04	5.451E-07	1.330E-06	3.634E-04

Life Cycle Assessment (LCA) - Results



PP101/ 9010 Powder Coating:

 Impact Category – Use of resources	Impact/ 1 kg of PP101/ 9010				
	Unit	A1	A2	A3	Total
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	4.437	0.025	3.972	8.435
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	4.437	0.025	3.972	8.435
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	75.642	0.451	0.065	76.158
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	75.642	0.451	0.065	76.158
Use of secondary material	kg	-	-	-	-
Use of renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of non-renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of net fresh water	m ³	0.039	2.875E-05	5.500E-05	0.039


Life Cycle Assessment (LCA) - Results




Parameters describing the environmental impacts

The following tables present the environmental impact potentials for different parameters, for the material flows as well as for the waste and other outputs. The results refer to 1 kg of PP101/ 9005 Powder Coating.

PP101/ 9005 Powder Coating:

 Environmental Impact Categories		Impact/ 1 kg of PP101/ 9005			
	Unit	A1	A2	A3	Total
Depletion of abiotic resources (elements)	kg Sb eq.	1.251E-05	3.579E-09	9.888E-08	1.261E-05
Depletion of abiotic resources (fossil)	MJ net calorific value	60.335	0.622	0.061	61.018
Acidification Potential	kg SO ₂ eq.	0.0037	1.585E-04	1.447E-05	0.0039
Eutrophication Potential	kg PO ₄ ⁻³ eq.	7.169E-04	3.902E-05	1.822E-05	7.741E-04
Global Warming Potential (GWP100)	kg CO ₂ eq.	2.240	0.043	0.017	2.301
Ozone Layer Depletion Potential	kg R-11 eq.	4.259E-09	7.999E-18	4.816E-15	4.259E-09
Photochemical Ozone Creation Potential	kg C ₂ H ₄ eq.	0.0010	1.518E-05	3.744E-06	0.0010


 Impact Category – Waste categories		Impact/ 1 kg of PP101/ 9005			
	Unit	A1	A2	A3	Total
Hazardous waste disposed	kg	5.588E-05	3.154E-11	1.111E-10	5.588E-05
Non-hazardous waste disposed	kg	0.027	9.298E-05	0.018	0.045
Radioactive waste disposed	kg	4.260E-04	7.571E-07	1.330E-06	4.280E-04

Life Cycle Assessment (LCA) - Results

Since 1972



PP101/ 9005 Powder Coating:

 Impact Category – Use of resources	Impact/ 1 kg of PP101/ 9005				
	Unit	A1	A2	A3	Total
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	3.583	0.035	3.972	7.590
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	3.583	0.035	3.972	7.590
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	61.557	0.626	0.065	62.248
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	61.557	0.626	0.065	62.248
Use of secondary material	kg	-	-	-	-
Use of renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of non-renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of net fresh water	m ³	0.016	3.993E-05	5.500E-05	0.016


Life Cycle Assessment (LCA) - Results




Parameters describing the environmental impacts

The following tables present the environmental impact potentials for different parameters, for the material flows as well as for the waste and other outputs. The results refer to 1 kg of PP101/ 8014 Powder Coating.

PP101/ 8014 Powder Coating:

 Environmental Impact Categories		Impact/ 1 kg of PP101/ 8014			
	Unit	A1	A2	A3	Total
Depletion of abiotic resources (elements)	kg Sb eq.	1.255E-05	3.241E-09	9.888E-08	1.266E-05
Depletion of abiotic resources (fossil)	MJ net calorific value	59.063	0.561	0.061	59.685
Acidification Potential	kg SO ₂ eq.	0.0036	1.398E-04	1.447E-05	0.0038
Eutrophication Potential	kg PO ₄ ⁻³ eq.	7.305E-04	3.053E-05	1.822E-05	7.792E-04
Global Warming Potential (GWP100)	kg CO ₂ eq.	2.190	0.038	0.017	2.245
Ozone Layer Depletion Potential	kg R-11 eq.	3.979E-09	7.222E-18	4.816E-15	3.979E-09
Photochemical Ozone Creation Potential	kg C ₂ H ₄ eq.	9.351E-04	1.256E-05	3.744E-06	9.514E-04


 Impact Category – Waste categories		Impact/ 1 kg of PP101/ 8014			
	Unit	A1	A2	A3	Total
Hazardous waste disposed	kg	5.229E-05	2.575E-11	1.111E-10	5.229E-05
Non-hazardous waste disposed	kg	0.025	7.589E-05	0.018	0.043
Radioactive waste disposed	kg	3.991E-04	6.180E-07	1.330E-06	4.010E-04

Life Cycle Assessment (LCA) - Results

Since 1972



PP101/ 8014 Powder Coating:

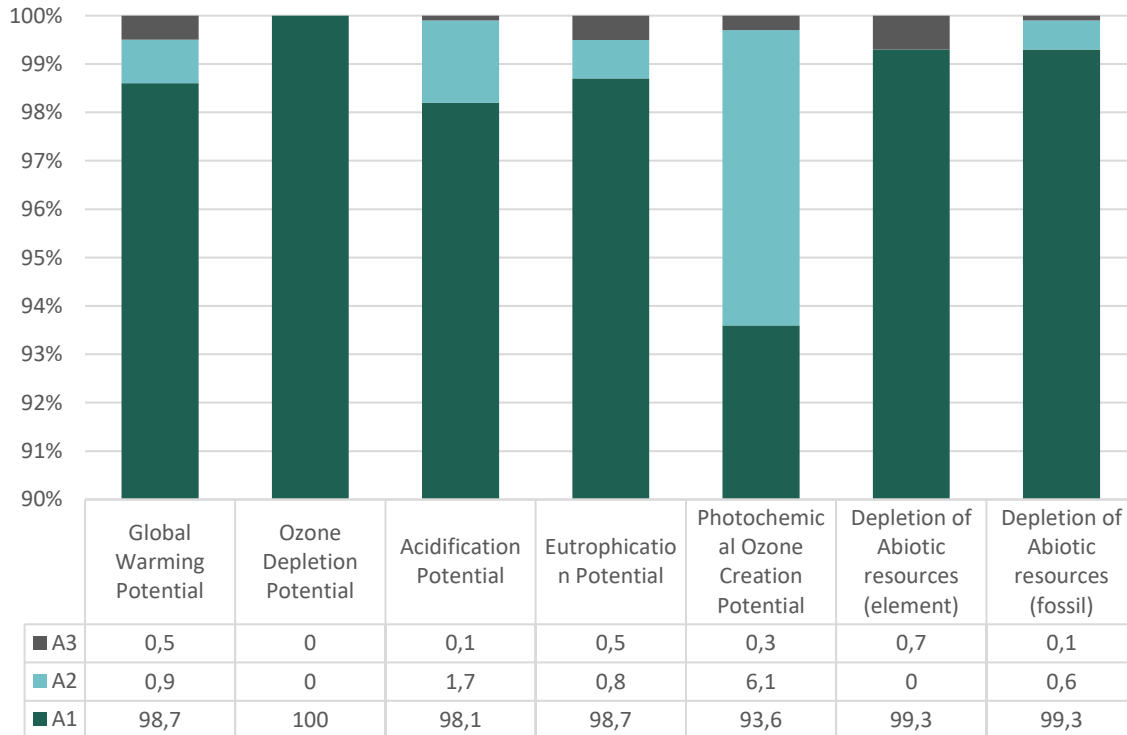
 Impact Category – Use of resources	Impact/ 1 kg of PP101/ 8014				
	Unit	A1	A2	A3	Total
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	3.381	0.028	3.972	7.382
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	3.381	0.028	3.972	7.382
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	60.215	0.511	0.065	60.791
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	60.215	0.511	0.065	60.791
Use of secondary material	kg	-	-	-	-
Use of renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of non-renewable secondary fuels	MJ, net calorific value	-	-	-	-
Use of net fresh water	m ³	0.017	3.257E-05	5.500E-05	0.017

Interpretation

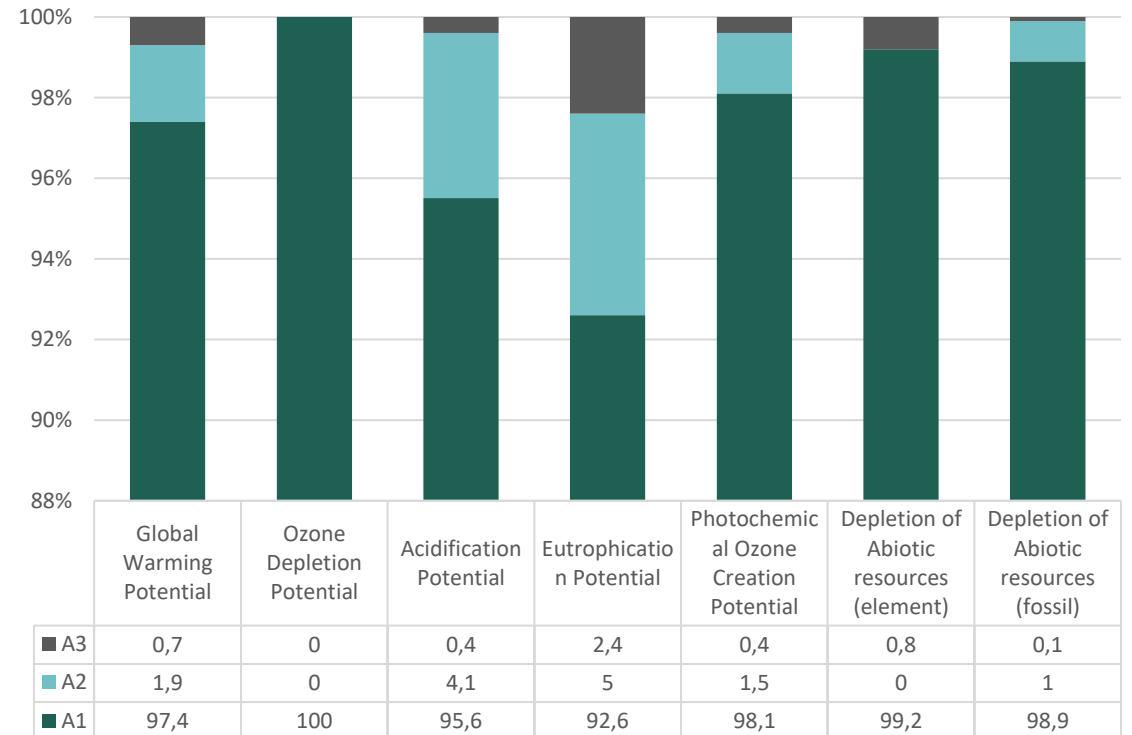
None core environmental impact indicator is affected more than $\pm 3\%$ (approximately) due to the deviation of the product's formulation. Therefore, a representative product can efficiently present the environmental performance of each product sub-category.

The following figures present the influence of the Life Cycle stages A1, A2, and A3 on the environmental impact indicators. It can be clearly noticed that the analyzed impact categories are mainly influenced by the raw material supply stage (A1). It should be noted that many of the impact category indicators differ more than $\pm 10\%$ between the three representative product sub-categories of PP101 Powder Coatings. Thus, the results of the environmental impacts are presented in separate tables and charts.

Environmental Impacts – PP101/ 9010

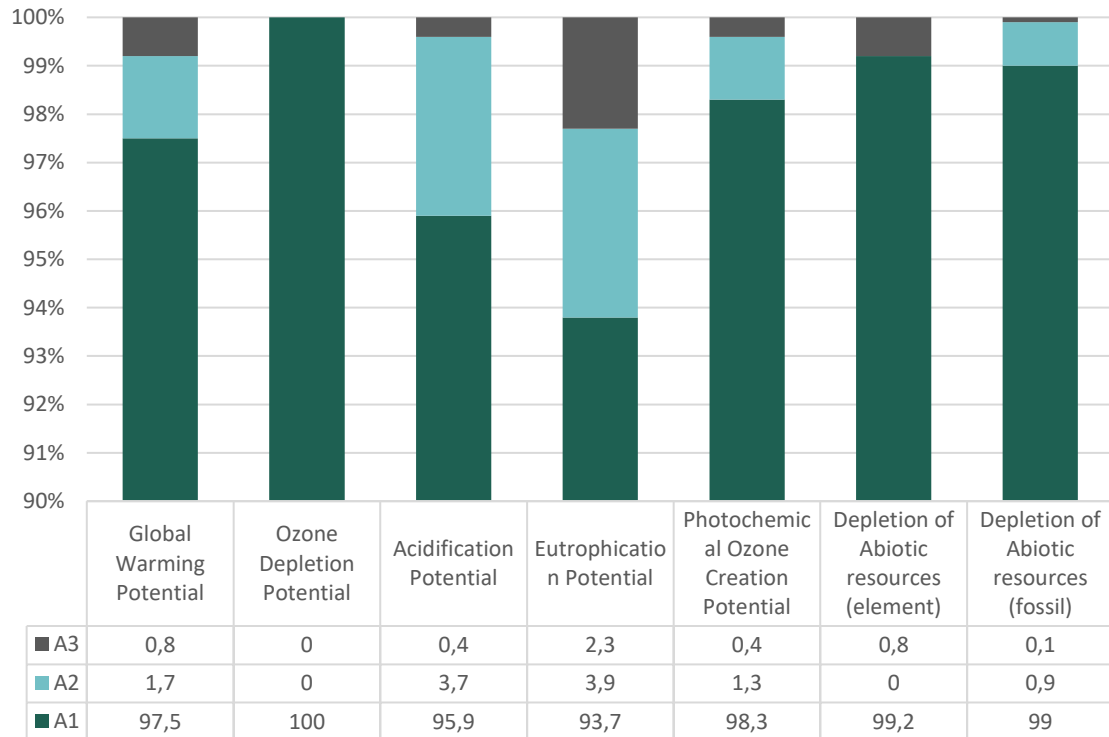


Environmental Impacts – PP101/ 9005



Interpretation

Environmental Impacts – PP101/ 8014

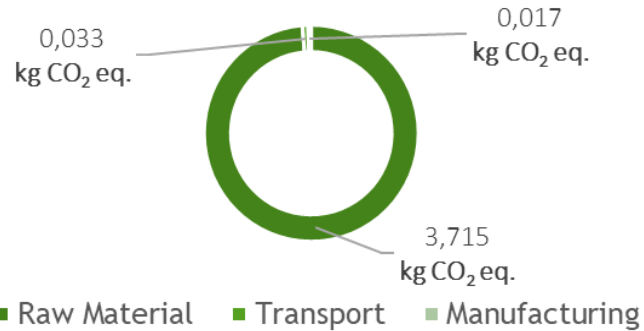


- Specifically, almost every impact category is largely dominant by raw material supply stage, whereas ODP is exclusively influenced by raw material extraction and production stage.
- The Global Warming Potential (GWP) of 1 kg of PP101 Powder Coating is dominated by approximately 98% by the information module A1 – Raw material supply. Module A2 – Transportation contributes slightly to the impact category. Unlikely, Module A3 – Manufacturing stage has less than 1% influence in the formation of the GWP impact.
- Acidification Potential is mainly influenced by Raw material supply stage. More specifically, Stage A1 is accounted for the 95-98% of the impact, whereas Stage A2 is only responsible for the rest 2-4%.
- A slightly similar pattern is followed regarding the formation of Eutrophication Potential. Stage A2 is responsible for the contribution of 0.8-5% of the total impact, where contributions from raw material extraction and production stage (A1) still are the most dominant.
- Manufacturing stage (A3) holds a small share on each impact indicator, due to the fact that the electricity used is totally renewable, derived from 100% wind power. Thus, there is no significant emissions or fossil resources depletion.

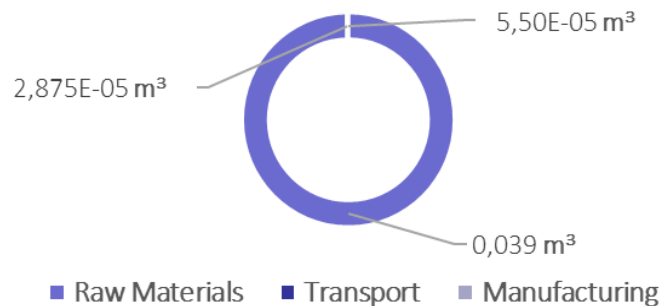
Interpretation

PP101/ 9010 Powder Coatings

Global Warming Potential
kg CO₂ eq. per kg of product

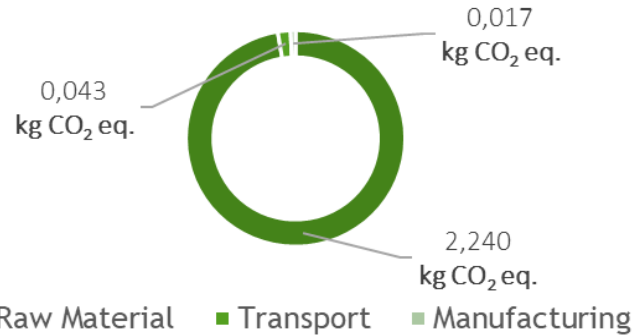


Use of Water
m³ per kg of product

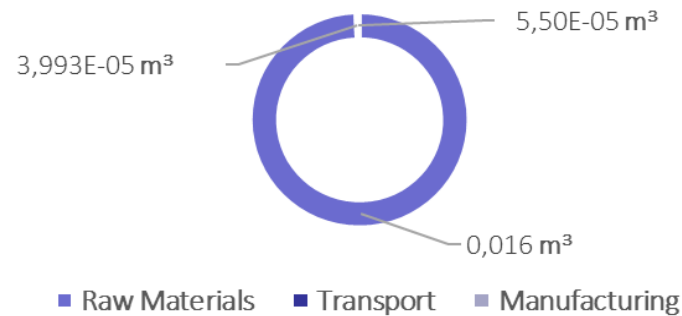


PP101/ 9005 Powder Coatings

Global Warming Potential
kg CO₂ eq. per kg of product

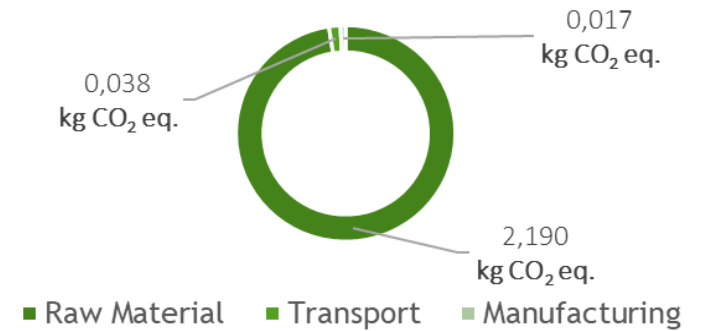


Use of Water
m³ per kg of product

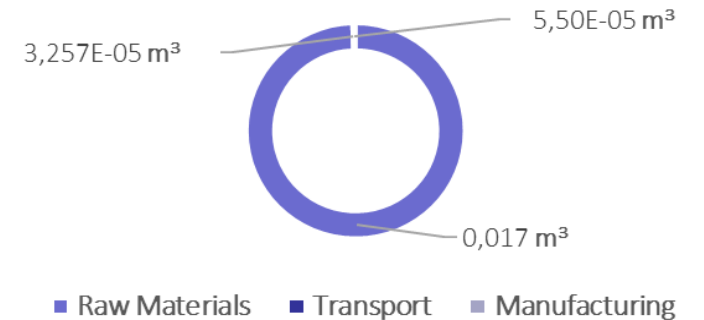


PP101/ 8014 Powder Coatings

Global Warming Potential
kg CO₂ eq. per kg of product



Use of Water
m³ per kg of product





References

- EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- International EPD® System, General Program Instructions for the International EPD System, version 3.1
- International EPD® System, PCR 2012:01 Construction products and construction services, version 2.33
- International Organization for Standardization (ISO), Environmental labels and declarations – Type III environmental declarations – Principles and procedures. ISO 14025:2006
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Requirements and guidelines. ISO 14044:2006
- The International EPD® System – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. www.environdec.com
- EN ISO 14001 – Environmental Management Systems – Requirements
- ISO 14020 – Environmental Labels and Declarations – General Principles
- Sphera – GaBi Life Cycle Assessment (LCA) software – www.sphera.com

For further information, details and/ or explanation, please contact info@neokem.gr