Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Iron Oxide Red

from

Oxerra

Programme:	The International EPD® System, www.environdec.com
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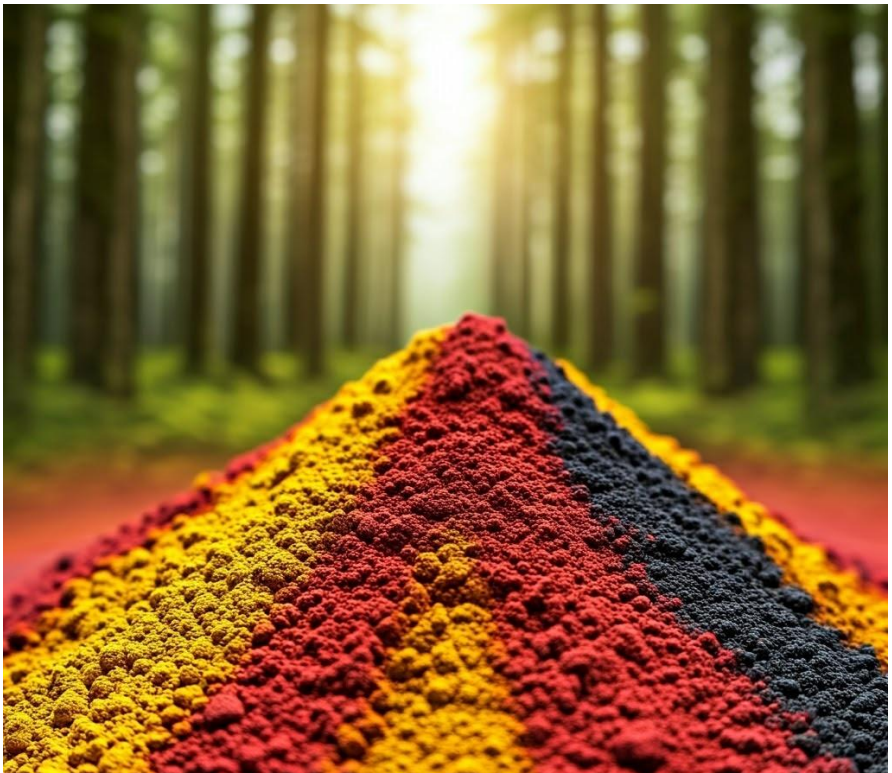


General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.3.4 Published on 2024.04.30 Based on CEN standard EN 15804. CEN standard EN 15804 serve as the core PCR. UN CPC code 3422
PCR review was conducted by: The Technical Committee of the International EPD®System. See https://www.environdec.com/about-us/the-international-epd-system-about-the-system for a list of members. Review chair: Claudia Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat https://www.environdec.com/contact-us.
Life Cycle Assessment (LCA)
LCA accountability: Dr. Raheel Afzal and Ellen Newman, Sphera Solutions GmbH
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Dr Matt Fishwick, Fishwick Environmental Ltd Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

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

EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same version number up to the first two digits) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

Company information

Owner of the EPD: Oxerra
Address of EPD Owner: Liverpool Rd E, Kidsgrove, Stoke-on-Trent ST7 3AA, United Kingdom

Contact: Mark Booth, Mark.Booth@oxerra.com

Description of the organisation: Oxerra is one of the world's leading manufacturers of synthetic iron oxide pigments for the construction industry, highly technological grades for coatings and plastics, as well as the highest purity iron oxides for specialties applications.

Name and location of production site(s):

Site 1:
Tongling Ruitai Pigment Company Limited
Tongguan Avenue (No. 868), Tongling City, Anhui Province, China

Site 2:
Cathay Advanced Technology (Yixing) Ltd
No. 1, Zhuqiao East Road, Economic and Technological Development Area, Yixing City, Jiangsu Province, P.R. China

Product information

Product name: Iron Oxide Red

Product identification: Red Pigment

Product description: Iron Oxide Red is a sustainable pigment with excellent weathering and light fastness. It is produced with strict quality tolerances and reliable performance, which offer outstanding resistance, durability and compatibility. This makes them suitable for wide range of demanding applications. Typical applications include different kinds of coating, plastic, paper, colourants, concrete, asphalt, cement type product and special applications, e.g. catalysts, batteries etc.

EINECS no: 215-168-2

UN-CPC Code: 3422

Geographical scope: China (modules A1-A3, A5)

LCA information

Declared unit: 1kg Iron Oxide Red pigment

Time representativeness: The collection of foreground data refers to the year 2023. Site specific data was used for the 1-year average process data, for reference year 2023. For background data the time frame was no more than four years old with a reference year of 2020.

Database(s) and LCA software used: The background data has been taken from the latest available Sphera Managed LCA Content (MLC) 2024.1 and the LCA model was created using Sphera's LCA for Experts (LCA FE) software, version 10.7.

Description of system boundaries:
The system boundaries are cradle to gate with options A1-A3, and additional modules A5.
As there is a wide range of products that the product is used in, transport module A4 is not included.

Reference package used: As specified in EN 15804:2012+A2:2019 and the PCR 2019:14 v1.3.4, the environmental impacts are declared and reported using the baseline characterisation factors from the EC-JRC using EN 15804 reference package based on EF 3.1.

Module A1 to A3:
The product stage includes provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage
These modules consider the manufacturing of raw materials. All are in module A1.

The raw materials undergo transport to the production site via a diesel driven truck (module A2). From there they are processed to produce the powdered pigment.

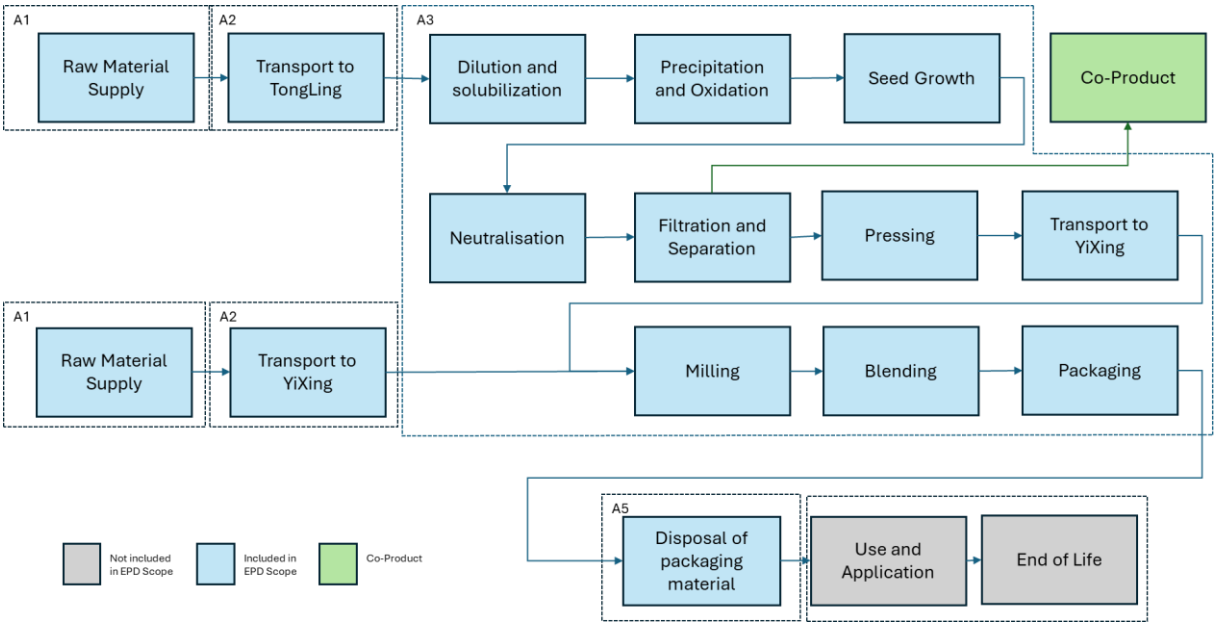
The provision and use of electrical and heat energy sources, water consumption, production waste, off-gas emissions to air and wastewater treatment are considered, along with the impact of packaging (module A3).

Red iron oxide is produced via a seed-growth process known as the modified Penniman-Zoph process. This involves the iron rich raw material being dissolved or solubilised, oxidised via the addition of oxygen and then precipitated to form the pigment. It is then neutralised in order to remove any residual iron sulphate. From there it is washed and filtered, before being dried to less than 1% moisture and stored, ready for packaging. The electricity source used within the Oxerra's manufacturing facilities in China, both TongLing and YiXing, has been modelled based on the energy sourced from the Chinese electricity grid mix, for the year 2023. The corresponding emission factor for the production of electricity using the Chinese grid mix is 0.786 kgCO_2-eq/ kWh.

Note that the Guarantees of Origin market in China represents an extremely small proportion of production and consumption, and therefore the consumption mix is effectively the same as the residual mix.

Module A5:
Treatment and disposal of packaging material. Credits for potential avoided burdens due to energy substitution of electricity and thermal energy generation are not declared.

System diagram:



More information:

Excluded life cycle stages: End of life chemical product and use phases are excluded. In accordance with the PCR, the end-of-life treatment of the iron oxide red is excluded because all the following criteria are fulfilled:

- The product is physically integrated with other products in subsequent life-cycle process so they cannot be physically separated from them at end of life
- The product or material is no longer identifiable at end-of-life as a result of a physical or chemical transformation process
- The product or material does not contain biogenic carbon

Disposal of packaging and recovery is included due to the biogenic carbon content of the packaging.

Name and contact information of LCA practitioner: Sphera Solutions GmbH, 70771 Leinfelden-Echterdingen, Germany, www.sphera.com

Cut-off criteria and exclusions
In the assessment, all available data from production process are considered, i.e., all raw materials used, utilised thermal energy, and electric power consumption using best available LCI datasets. Thus, material and energy flows contributing less than 1% of mass or energy are considered.
The sum of the excluded material flows does not exceed 5% of mass, energy, or environmental relevance.

- The cut-off criteria is applied to the production waste as the majority is sent to incineration and no benefit from the energy is generated.

- The packaging of the pre-products / raw materials from the suppliers and its disposal at the production site is not considered in the scope of this study.

- Production of capital equipment, facilities and infrastructure required for manufacture are outside the scope of this assessment.

- All reported material and energy inputs are representative of the typical Iron Oxide Red pigment produced by Oxerra in China.

Data quality and sources

Data quality is compliant with ISO 14025:2006. All primary data were collected for the year 2023. All background data comes from the Sphera MLC 2024.1.

Allocation Procedures

Background data:

Information about allocation procedure of single datasets is documented in:
https://lcadtabase.sphera.com/

Foreground Data:

No allocation was used as there was only one product produced within this production system. In accordance with the PCR Construction products section 4.5.1 to avoid allocation taking place, the production plant was divided into sub units specific to the red iron oxide being produced, and LCI data was collected for each sub unit. This data has been calculated and scaled based on the annual production mass of the red iron oxide product (total tonnes) for the year 2023.

The system diagram shows that co-products are produced alongside an intermediate iron oxide product. To divide the environmental impacts between them, EN15804 suggests using an allocation or system sub-division approach.

In this context, choosing the right allocation method is crucial. System sub-division was unsuitable because the co-product and main product are generated simultaneously and cannot be separated. Mass allocation was also unsuitable as it would underestimate the impacts of pigment production and is only appropriate when the revenue difference between co-products and the main product is low. Therefore, economic allocation, as per EN15804, was the most suitable method for the iron oxide pigments and co-products.

For economic allocation, the co-product has a selling price, but the intermediate iron oxide product does not, as it requires further processing before it can be sold. Thus, the final selling price of the iron oxide pigment was used for the economic allocation of the intermediate iron oxide products.

Waste materials:

Most of the production waste is sent to an incineration plant, the cut-off method was applied and no benefits from the resulting electrical and thermal energies were generated. Following a conservative allocation approach, all production burdens are assigned to iron oxide.
The environmental burden of incinerating packaging and the product in the end-of-life scenario is assigned to the system (A5).

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	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	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	CN	CN	CN	-	CN	-	-	-	-	-	-	-	-	-	-	-	-
Specific data used	80.34%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites[1]	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = Declared, ND = Not Declared

[1] Whilst multiple manufacturing sites are used to product the product, the final sellable iron oxide pigment is only produced at the YiXing site, and so there is no site variation.

Content Declaration

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

Product components	Weight, kg/ declared unit	Post-consumer material, weight-%	Biogenic material, kg C/ declared unit
Iron Oxide Red	1.00	0%	0.00E+00
TOTAL	1.00	0%	0.00E+00
Packaging materials	**Weight, kg/ declared unit**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/declared unit**
Bags (paper)	8.00E-03	0.78%	3.44E-03
Supersacs	1.60E-03	0.16%	0.00E+00
Plastic foil	5.00E-04	0.05%	0.00E+00
Carton board	4.00E-03	0.39%	1.72E-03
Total	1.41E-02	1.37%	5.16E-03

The pigments produced contain no biogenic carbon. The packaging materials contain more than 5% biogenic carbon, so have been accounted for within this EPD.

Results of the environmental performance indicators

The environmental performance of the declared unit of 1kg of Red Iron Oxide are reported below using the parameters and units as specified in PCR 2019:14 v1.3.4. These life cycle impact assessment results and other environmental results are presented in the tables below per declared unit, broken down by module.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Mandatory impact category indicators according to EN 15804+A2:2019

Results per kg iron oxide red			
Indicator	**Unit**	**A1-A3**	**A5**
GWP-fossil	kg CO_2 eq.	2.48E+00	6.95E-03
GWP-biogenic	kg CO_2 eq.	-3.71E-03	1.87E-02
GWP-luluc	kg CO_2 eq.	1.39E-03	3.11E-07
GWP-total	kg CO_2 eq.	2.48E+00	2.56E-02
ODP	kg CFC 11 eq.	4.58E-12	4.09E-15
AP	mol H^+ eq.	1.06E-02	6.38E-06
EP-freshwater	kg P eq.	1.43E-05	1.04E-09
EP- marine	kg N eq.	3.58E-03	1.98E-06
EP-terrestrial	mol N eq.	3.79E-02	2.95E-05
POCP	kg NMVOC eq.	9.40E-03	5.18E-06
ADP-minerals&metals*	kg Sb eq.	1.13E-07	4.03E-11
ADP-fossil*	MJ	2.43E+01	6.50E-03
WDP*	m^3	4.46E-01	2.67E-03
Acronyms	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, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption		

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Additional mandatory and voluntary impact category indicators according to EN 15804+A2:2019

Results per kg iron oxide red			
Indicator	**Unit**	**A1-A3**	**A5**
GWP-GHG[2]	kg CO_2 eq.	2.48E+00	6.95E-03
Additional voluntary indicators e.g. the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017			

Resource use indicators according to EN 15804+A2:2019

Results per kg iron oxide red			
Indicator	**Unit**	**A1-A3**	**A5**
PERE	MJ	3.06E+00	2.18E-01
PERM	MJ	2.16E-01	-2.16E-01
PERT	MJ	3.28E+00	2.02E-03
PENRE	MJ	2.42E+01	1.03E-01
PENRM	MJ	9.66E-02	-9.66E-02
PENRT	MJ	2.43E+01	6.50E-03
SM	kg	4.52E-01	0.00E+00
RSF	MJ	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00
FW	m^3	1.12E-02	6.27E-05
Acronyms	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; 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water		

The methodology followed for calculating the PERM and PENRM follow option A, as declared in Annex 3 in the PCR 2019.4 Construction products.

[2] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste indicators according to EN 15804+A2:2019

Results per kg iron oxide red			
Indicator	**Unit**	**A1-A3**	**A5**
Hazardous waste disposed	kg	8.39E-09	4.68E-12
Non-hazardous waste disposed	kg	2.96E-02	3.80E-04
Radioactive waste disposed	kg	2.50E-04	2.06E-07

Output flow and Waste Indicators according to EN 15804+A2:2019

Results per kg iron oxide red			
Indicator	**Unit**	**A1-A3**	**A5**
Components for re-use	kg	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00
Exported energy, electricity	MJ	1.50E-03	3.83E-02
Exported energy, thermal	MJ	2.70E-03	6.63E-02

References

CEN, 2013. EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

CEN, 2019. EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

EPD International, 2019. PCR 2019:14 Construction products and construction services, version 1.3.4 (2025-06-20).

EPD International, 2019: General Programme Instructions for the International EPD System. Version 4.0, dated 2021-03-29. www.environdec.com

ISO, 2006. ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO, 2006. ISO 14040:2006/Amd 1:2020, Environmental management – Life cycle assessment – Principles and framework

ISO, 2020. ISO 14044:2006/Amd 1:2020, Environmental management – Life cycle assessment – Requirements and guidelines

Sphera LCA for Experts, LCA FE, software-system and databases, Managed LCA content MLC (fka GaBi database), University of Stuttgart and Sphera Solutions GmbH, 2024, CUP Version: 2024.1, MLC data set documentation under https://lcadatabase.sphera.com/ (Sep 2024)

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