Environmental Product Declaration

In accordance with ISO 14025:2006 for:

Deoxidation briquette

from

FENEGA, s.r.o.

Programme:	The International EPD® System, www.environdec.com
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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 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)
PCR: PCR 2022:08 Basic aluminium products and special alloys, version 1.0 UN CPC: 415 Semi-finished products of copper, nickel, aluminium, lead zinc and tin and their alloys
PCR review was conducted by: Chair of the PCR review: Hüdai Kara PCR review panel: The Technical Commitee of the International EPD® System. A full list of members is available at www.environdec.com. The review panel may be contacted via info@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: ARPenviro, s.r.o.
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: Agnieszka Pikus, Greenwise, www.greenwise.com.pl Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier: ☐ Yes ☒ No [Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

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 must be based on the same PCR (including the same version number) 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. For further information about comparability, see ISO 14025.

Company information

Owner of the EPD: FENEGA, s.r.o

Contact: office@fenega.sk

Description of the organisation:
FENEGA, s.r.o. was established in 2005 as a family company focused on trading metal waste and non-ferrous metals.

Over time, new challenges in the field of recycling arose, where we strive to set an example. We began sharing our years of experience in waste management with steel companies. In accordance with their requirements, we modified the metal waste in terms of chemical composition, shape, and strength to ensure its suitability for various metallurgical processes such as deoxidation and desulfurization. This is how we became a partner in process optimization, cost savings, and ecological production improvements. We are very pleased to be able to give new life to metal waste and thus contribute to improving ecology on the planet. Most of the metal waste is processed into a final product in our company, where the legislation allows us, through a certified process, to end the state of waste (EOW). The company also provides, thanks to its unique know-how in cooperation with partners, ecological disposal and recycling of hazardous waste and electrical transformers "turnkey", ranging from low-voltage transformers to large transformers from power plants.

All the mentioned aspects make us a dynamically developing company, flexibly responding to market needs and adjusting our activities accordingly.

Product-related or management system-related certifications:
ISO 9001
ISO 14001
ISO 45001
Council Regulation (EU) No 333/2011
Council Regulation (EU) No 715/2013

Name and location of production site:
Kracunovce 51
087 01 Kracunovce
Slovak republic

Product information

Product name: Deoxidation briquette

Product identification: Deoxidation briquette from recycled aluminium

Product description: Deoxidation briquette is an aluminium product made from recycled aluminum by mechanical means without the use of thermal processes. The briquette serves as a deoxidizer in the steel production process and is a full replacement for Al pyramids or other deoxidizing additives.

The area of intended application of the briquette is the steel industry. Its primary function is to remove oxygen from molten metal to prevent oxidation and improve the overall quality of the material.

UN CPC code: 4153- Semi-finished products of aluminium or aluminium alloys

Geographical scope: Europe

LCA information

Functional unit / declared unit:
1 kg of deoxidation briquette

Reference service life: N.A.

Time representativeness:
LCA study was conducted in 2025, taking into consideration production data for the calendar year 2024

Database(s) and LCA software used:
The LCA results were calculated using One Click LCA and Ecoinvent 3.10.1 database

Description of system boundaries:
System boundary is cradle-to-gate as determined by the PCR. The following processes are included in the system boundary:

Upstream processes

- aluminium scrap sorting and pre-treatment,
- transport of aluminium scraps to the pre-treatment plant,
- transport of pre-treated aluminium scraps from the suppliers to the manufacturing site,
- production and transport of the packaging material (PP big bag) to the manufacturing site.

Core processes

- consumption of electricity, natural gas and water at the manufacturing site during the production process of aluminium deoxidation briquettes,
- treatment of wastewater,
- end-of-life treatment of packaging materials of the input materials used at the production plant.

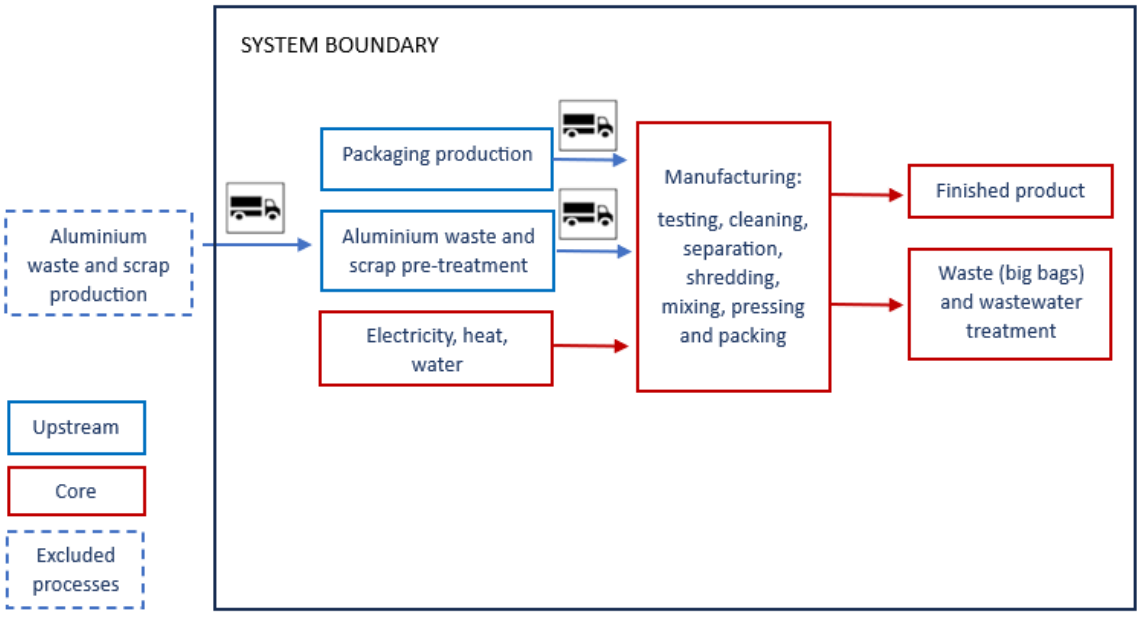
Excluded lifecycle stages:

- scrap production i.e. processes from previous lifecycle that generate (pre- and post-consumer) scraps,
- construction of buildings and machineries used at the plant,
- production of maintenance and machineries with more than 5 years estimated lifetime,
- activity and travels of employees,
- use and end-of-life of the product

No significant data were neglected. The considered cut-off is under the threshold of relevance (1% of total inputs), in accordance with the maximum percentage for exclusion, recommended by the PCR 2022:08 “Basic aluminium products and special alloys”.

Name and contact information of the organisation carrying out the underlying LCA study:
ARPenviro, s.r.o.
office@arpenviro.sk

System diagram:



Manufacturing process:

The recycled material (aluminium shavings, cans, foils, granules, and other similar aluminium materials) is first tested to verify its chemical and mechanical properties. It is then cleaned, separated, and processed (e.g., shredded) into a fraction suitable for further processing. Different types of recycled aluminium materials are mixed in specific proportions to achieve the desired mechanical, chemical, and other parameters according to customer requirements. The mixed material is then dosed into the hoppers of the pressing lines, where it undergoes homogenization and is subsequently dosed into the presses. In the presses, using only hydraulic pressure, the final product – the briquette – is created. The final product is sold in 1 t PP big bags or without packaging. Packaging weight per declared unit is 0.002 kg.

More information:

LCA has been performed in compliance with ISO 14040:2021 and ISO 14044:2021.

Foreground data used in this study have been collected in the production plant by a company representative or derived from registered company reports and documents. All quantities derive from primary data, as recommended by data quality requirements of reference PCR. The main data are referred to a specific monitoring period 2024), considered as representative period for all production processes. Ecoinvent 3.10.1 database was used as sources of background data.

Environmental impacts due to the use of energy (electricity, natural gas), and water were based on data registered in company reports. As the manufacturing takes place in Slovakia, the residual mix of Slovakia was used for the quantification of direct emissions from the consumed amount of electricity purchased from the supplier. The electricity data is sourced from the Ecoinvent 3.10.1 dataset, which represents medium-voltage electricity generation in Slovakia. This selected dataset has a GWP-GHG impact of 0.36 kg CO_2e/ kWh.

The dataset includes the following distribution of electricity generation sources: Nuclear 46.71 %, Coal 21.68%, Natural gas 21.05 %, Petroleum products 1.94 %, Other fossils 3.92%, Wind 0.03%, Hydro, 0.0%, Solar 1.86%, Biomass 2.76%, Geothermal 0.0%, Other renewables 0.05%

However, FENEGA generated 17.17% of the total electricity required for the production of briquettes at the Kracunovce plant with its own photovoltaic panels in 2024. Electricity produced from renewable sources has zero direct emissions.

No allocation was applied to raw materials, packaging materials, or manufacturing waste, as these inputs and outputs were directly assigned to the Deoxidation Briquette without the need for distribution among multiple products. However, in the production stage, mass allocation was used for electricity and natural gas consumption. This approach aligns with the requirements of the applicable PCR and ensures consistency in impact assessment.

Content declaration

Product

Material	%
Al	min. 95.00
Si	max. 2.00
Fe	max. 1.70
Cu	max. 1.00
Mg	max. 2.00

The reference product is 1 kg of deoxidation briquettes which are made from recycled aluminium through mechanical processes without the use of thermal processes. The briquette serves as a deoxidizer in the steel production process and is a full replacement for aluminium pyramids or other deoxidizing additives.

Aluminium briquettes consist of 95 – 100% of aluminium: the raw materials used in the production process come from the collection of aluminium scraps and waste materials that have finished their original function (end of life scraps). The raw materials used are sourced throughout. The remaining percentage is made up of corrective or alloying materials, such as silicon, iron, copper and magnesium. When aluminium products are made, the alloyed metals are mixed in, and these elements remain in the scrap material when it's recycled.

Packaging

Distribution packaging/consumer packaging:

The product is sold in 1 t PP (recycled polypropylene) big bags or without packaging. Packaging weight per declared unit is 0.002 kg.

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product:

The product is made of 100% recycled aluminium as the aluminium scrap comes respectively from companies that use aluminium as an input material in their production system and from companies that collect the material at the end of its life.

Results of the environmental performance indicators

Impact category indicators

PARAMETER		UNIT	Upstream	Core	TOTAL
Global warming potential (GWP)	Fossil	kg CO_2 eq.	1.85E-01	2.59E-02	2.10E-01
	Biogenic	kg CO_2 eq.	8.33E-03	3.11E-05	8.36E-03
	Land use and land transformation	kg CO_2 eq.	8.09E-05	1.15E-04	1.96E-04
	GWP-GHG[1)]	kg CO_2 eq.	1.93E-01	2.60E-02	2.19E-01
	TOTAL	kg CO_2 eq.	1.93E-01	2.60E-02	2.19E-01
Ozone layer depletion (ODP)		kg CFC 11 eq.	3.41E-09	3.54E-10	3.76E-09
Acidification potential (AP)		mol H^+ eq.	4.53E-04	1.46E-04	5.99E-04
Eutrophication potential (EP)	Aquatic freshwater	kg P eq.	1.96E-05	2.95E-05	4.91E-05
	Aquatic marine	kg N eq.	1.17E-04	2.43E-05	1.42E-04
	Aquatic terrestrial	mol N eq.	1.16E-03	1.86E-04	1.34E-03
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	6.49E-04	6.28E-05	7.11E-04
Abiotic depletion potential (ADP)*	Metals and minerals	kg Sb eq.	9.56E-07	3.87E-08	9.95E-07
	Fossil resources	MJ, net calorific value	2.65+00	7.10E-01	3.36E+00
Water deprivation potential (WDP)*		m^3 world eq. deprived	1.82E-02	1.33E-02	3.15E-02

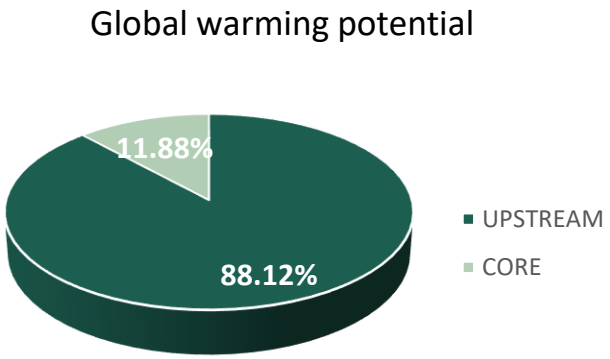
[1)] Supplementary indicator for climate impact, equals to GWP-total except that the characterisation factor for biogenic CO_2 is set to zero.

** 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.*

The GWP value for **1 kg Deoxidation briquette is 0,219 kg CO_2eq.**

Upstream processes account for 88.12% of total emissions, as presented by the following figure.

The transport of input materials is the main contributor to total emissions from the upstream processes (0.163 kg CO_2eq).



Resource use indicators

PARAMETER		UNIT	Upstream	Core	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	8.00E-02	5.36E-02	1.34E-01
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	8.00E-02	5.36E-02	1.34E-01
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	2.54E+00	6.87E-01	3.22E+00
	Used as raw materials	MJ, net calorific value	1.09E-01	2.35-02	1.33E-01
	TOTAL	MJ, net calorific value	2.65E+00	7.10E-01	3.36E+00
Secondary material (optional)		kg	1.41E-03	4.35E-05	1.45E-03
Renewable secondary fuels (optional)		MJ, net calorific value	1.18E-04	1.46E-07	1.18E-04
Non-renewable secondary fuels (optional)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (optional)		m^3	6.39E-02	5.12E-04	6.45E-02

Waste indicators (optional)

PARAMETER	UNIT	Upstream	Core	TOTAL
Hazardous waste disposed	kg	5.22E-03	1.27E-03	6.49E-03
Non-hazardous waste disposed	kg	1.58E-01	1.78E-01	3.36E-01
Radioactive waste disposed	kg	1.47E-06	5.64E-06	7.11E-06

Other environmental performance indicators

PARAMETER	UNIT	Upstream	Core	TOTAL
Particulate matter	Incidence	1.36E-08	3.78E-10	1.40E-08
Ionizing radiation[1)]	kBq U235e	5.92E-03	2.37E-02	2.96E-02
Ecotoxicity (freshwater)	CTUe	5.09E-01	6.91E-02	5.77E-01
Human toxicity, cancer	CTUh	4.50E-11	2.90E-10	4.98E-11
Human tox. non-cancer	CTUh	1.98E-09	2.24E-10	2.20E-09
SQP[2)]	-	2.25E+00	6.74E-02	2.32E+00

[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)] SQP = Land use related impacts/soil quality.

Additional information

In addition to the LCA analysis, a comparative study of the environmental performance of various deoxidizers was performed. The deoxidation aluminium briquette from recycled scrap demonstrates a GWP of 0.219 kg CO_2eq, which is markedly lower than that of an aluminium pyramid from scrap, at 1.45 kg CO_2eq, and significantly lower than an aluminium briquette produced from primary aluminium, which has a GWP of 8.47 kg CO_2eq. This comparison underscores the environmental benefits of using recycled scrap and non-thermal processing methods.

The benefits of utilizing the deoxidation aluminium briquette from recycled scrap in the steel production sector are multifaceted. Its lower GWP and reduced energy requirements contribute to lower greenhouse gas emissions, which supports the overall sustainability goals of steel manufacturers. Moreover, by decreasing dependence on primary aluminium, the briquette not only minimizes resource depletion but also enhances process efficiency and cost-effectiveness.

References

EcoInvent, 2024. The Ecoinvent® v3.10.1 database. The Swiss Centre for Life Cycle Inventories, Dübendorf (CH).
General Programme Instructions of the International EPD® System. Version 4.0.
ISO 14025:2006, Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. The content of this standard is equivalent to EN ISO 14025:2010.
ISO 14040:2006/Amd 1:2020 Environmental management – Life cycle assessment – Principles and frameworks
ISO 14044:2006/ Amd 2:2020 Environmental management – Life cycle assessment – Requirements and guidelines
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