

Environmental Product Declaration



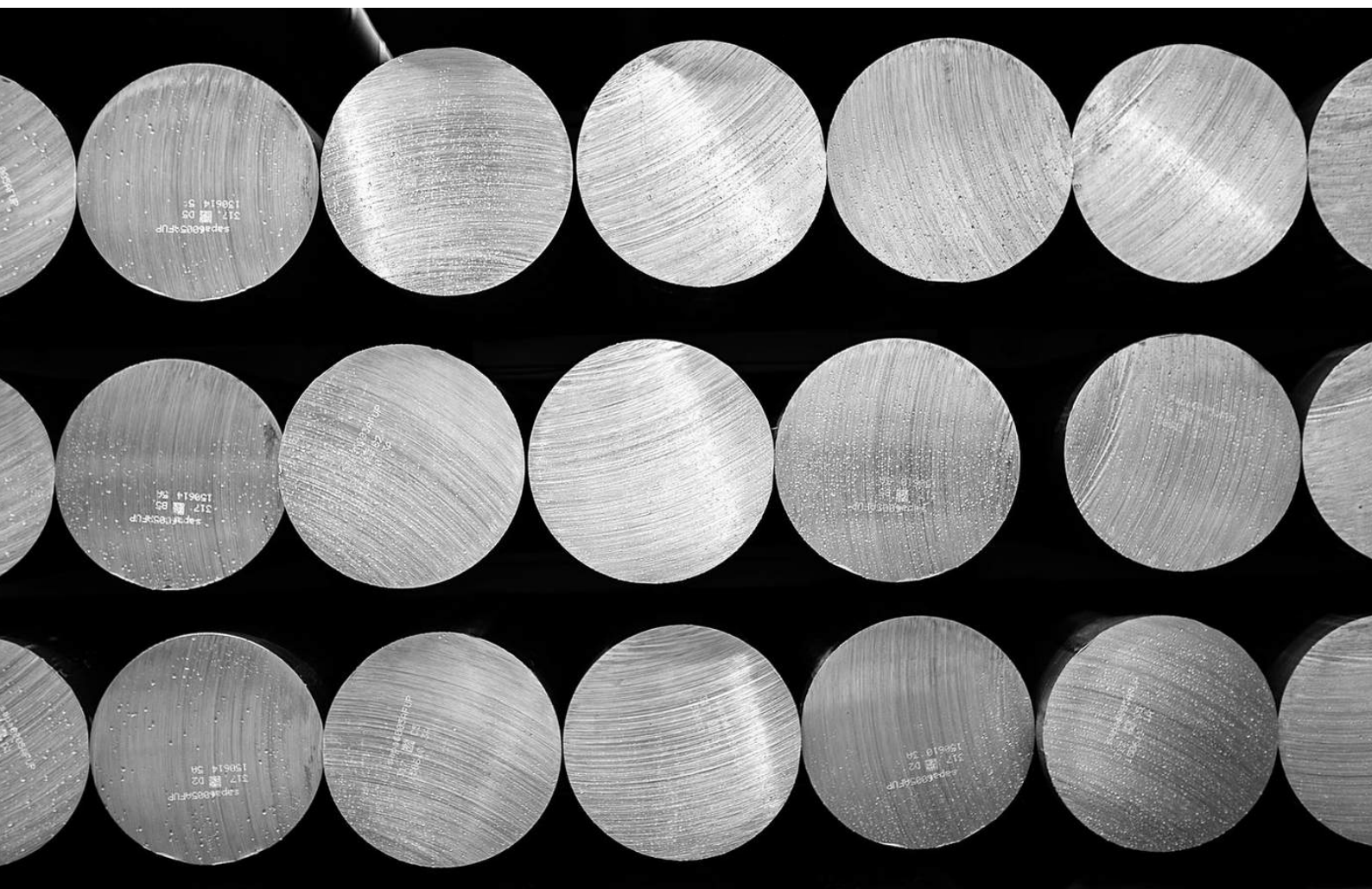
S-P-02317

FOR ALUMINIUM EXTRUSION BILLET PRODUCED BY
HYDRO EXTRUSION SPAIN S.A.U.
NAVARRA



Hydro

In accordance with ISO 14025 and EN 15804:2012+A1:2013



EPD Program	The International EPD® System
Programme operator	EPD International AB
CPC Code	415 Semi-finished products of copper, nickel, aluminium, lead, zinc and tin or their alloys
Based on	PCR 2012:01 v2.3 Construction products and construction services
Declaration number	S-P-02317
Publication date	2020-12-10
Valid until	2025-12-10
Market coverage	Europe

Hydro

Hydro is a fully integrated aluminium company with 35,000 employees in 40 countries on all continents, combining local expertise, worldwide reach and unmatched capabilities in R&D. Hydro is present within all market segments for aluminium, with sales and trading activities throughout the value chain serving more than 30,000 customers.

Our purpose and core values

The *Hydro Way* is our way of doing what we do; it expresses who we are and aspire to be. It has been forged and shaped through more than 100 years of continually finding new and better ways of working. And this is how we will continue to develop innovative products and solutions that benefit our customers and society, now and in the future. We are constantly evolving. But the essence of everything we do remains the same, even though the way we express it may change.

Our purpose is to create a more viable society by developing natural resources into products and solutions in innovative and efficient ways. And these are the values we build on:

- Care: we act with respect for people and the environment and place safety at the heart of our operations.
- Courage: we break new ground and take measured risks with agility, accountability and foresight.
- Collaboration: we work as partners internally and externally to unite competencies and create win-win opportunities.

Products and services

Hydro produces primary aluminium, rolled and extruded products and recycling. In addition, Hydro extracts bauxite, refines alumina and generates energy also offer a variety of services to be the only 360° company of the global aluminium industry.

Hydro provides products and services in industries such as the automobile, transportation, building & construction, infrastructure, industrial design, electronics, Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC), solar and energy or general engineering.

Extruded solutions

In the area of extrusion, Hydro performs both custom high-quality extrusions and ready-made aluminium products and systems.

For the first one, we provide custom extrusion design and manufacturing including:

- Product development support
- Solutions that are energy-efficient
- Solutions that meet environmental requirements and reduce environmental impact
- Solutions that utilize the strengths of aluminium
- Solutions that satisfy and surpass your expectations

For the last one, we offer all kinds of finished products, from pedestrian bridges and window profiles to conduit products and wheelchair ramps.

For all cases, our products can be delivered with several surface treatment that strengthen the advantages of aluminium and add a beautiful finish to products.

Hydro Extrusion Spain S.A.U.

In Navarra, Hydro manufactures and markets extruded aluminium profiles, and offers surface treatment and added-value operations to transform the profiles into the solutions according to requested requirements. With extensive experience in complex product development, Hydro in Navarra knows how to produce profiles with stable, controlled and reliable processes delivering solutions for transportation, automotive, and general industry applications.

The production processes occurring in the site include the production of billets in aluminium alloys and the production of profiles through the extrusion of billets in two presses.

Facilities in Navarra are certified ISO 9001, ISO 14001, ISO 50001, IATF 16949, Alu+C- label and ASI Performance Standard that covers critical issues for the entire aluminum value chain, including greenhouse gas emissions, waste management, material stewardship, biodiversity and human rights.

Product information

Product description

This EPD covers a wide range of aluminum extrusion billets that are intermediate products which feed other processing steps for the production of other products.

The production process includes the remelting of process and post-consumer scrap and primary ingots and the following casting process. During the process, impurities are removed and alloying elements are added, if needed, to adjust the chemical composition and to reach the quality standard. Billets are stored to be sold externally or to be used internally as input in the extrusion process for profiles production.

The results declared in this EPD are an average representative of all aluminium billets produced for Hydro in its plant in Navarra. Averages are obtained through the production and total consumption in Navarra facilities.

Aluminium billet is a semi-finished product (UN CPC Code: 415) used to produce extrusion profiles mainly for the building & construction sector but also in sectors such as automobile, transportation, infrastructure, industrial design, electronics, HVAC, solar and energy or general engineering. Tailored and finished products are applied in windows, doors, curtain walls, electronics, transportation and thousands of product areas in between.

Composition

6000 series aluminium alloys is the predominant production at Hydro. Composition are reported in the table below. The product does not contain any substance included in the list of Substances of Very High Concern with concentrations higher than 0.1% in weight.

Packaging

Billets are binded together by means of plastic straps and wood bars. All packaging materials are recyclable or reusable following delivery to the customer. Packaging materials for billets are included in the scope of this EPD. The disposal of raw materials packaging is also included.

Reference service life and use phase

Service life for products will vary depending on the final application, but is typically long due to aluminium's high corrosion resistance. For construction sector can be accepted a service life of 50 years according to bibliography.

Recycling and disposal

Aluminium products are highly recyclable. During aluminium profile production, all process scrap (extrusion drop-offs from cutting, unfit material and discards, etc.) is fed back into the billet production process.

When an aluminium product reaches the end of its life (post-consumer scrap), it is systematically and selectively collected and sent to recycling facilities for secondary billet production. For example a collection rate for aluminium products next to 95% is well documented in construction sector.

Hence, aluminium supply at the beginning of the product system has a content of recycled material with the consequent reduction of environmental burdens. In module D are reported only the net benefits of recycling, i.e. the recycling benefits at the end of life minus the benefits already considered in the module A1 due to post-consumer scrap content. In this EPD, the scrap not collected at the end of life is sent to landfill.

Alloy	Mg	Mn	Fe	Si	Cu	Zn	Cr	Ti	Other	Al
6005A	0.4-0.7	≤0.50	≤0.35	0.5-0.9	≤0.30	≤0.20	≤0.30	≤0.10	≤0.05	Rest
6060	0.35-0.6	≤0.10	0.10-0.30	0.3-0.6	≤0.10	≤0.15	≤0.05	≤0.10	≤0.05	Rest
6061	0.8-1.2	≤0.15	≤0.7	0.4-0.8	0.15-0.40	≤0.25	0.04-0.35	≤0.15	≤0.05	Rest
6063	0.45-0.9	≤0.10	≤0.35	0.2-0.40	≤0.10	≤0.10	≤0.10	≤0.10	≤0.05	Rest
6082	0.6-1.2	0.4-1.0	≤0.50	0.7-1.3	≤0.10	≤0.20	≤0.25	≤0.10	≤0.05	Rest
6106	0.4-0.8	0.05-0.2	≤0.35	0.3-0.6	≤0.25	≤0.15	≤0.20	≤0.10	≤0.05	Rest

Aluminium Billet

1 kg

Primary aluminium ingot	19.7 %
Process scrap (pre-consumer)	46.1 %
Post-consumer scrap	33.4 %
Alloying	0.76 %
Packaging	0.024 kg
Wood	0.022 kg
Polyester strap	0.002 kg



LCA Information

Declared unit

The declared unit is the production of 1 kg of aluminium billet and its packaging.

Goal and scope

This EPD evaluates the environmental impacts of 1 kg aluminium billet from cradle to gate with option (disposal). This EPD is the basis for B2B communication. Intended use clients and relevant stakeholders within several sectors.

System boundaries

This EPD provides information on the production stage of the aluminium billets (raw material supply, transport to plants and manufacturing) and their end-of-life. Recycling potential of aluminium with burdens saving due to use in a second product systems is also reported. The information is presented in a modular way separated in the following stages.

A1-3 - Cradle to gate

This module represents the extraction and processing of raw materials and aluminium scrap, the transport to production site and the manufacture of billets. The billets are delivered with a diameter between 6 and 10 inches, and long, from 6 m to 7.4 m. Wood and plastic strap are adjusted to the quantity of billet delivery.

The aggregation of the modules A1, A2 and A3 is allowed by EN 15804. This rule is applied in this EPD and denoted by A1-3.

A4 - Transport to clients

For the transport towards clients a weighted distance, based on Hydro's clients location, has been considered.

C1 - Dismantling

No information was found in the life cycle databases consulted for the dismantling operations of elements such as windows, external doors or curtain walls, nor was there

a bibliography regarding the inputs or residues generated during these operations in building sector or in any other. Then, no contribution on impact categories of this module is declared.

C2 - Transport to waste processing

A distance of 200 km has been assumed for the transport to scrap dealers. Transport is calculated on the basis of a scenario with the parameters described in the attached table.

C3 - Waste processing for reuse, recovery and/or recycling

It has been assumed that during the scrapping operations the same electricity is consumed as during the assembly of a window of 1.23 m x 1.48 m with a profile thickness between 45 and 70 mm.

C4 - Final disposal

Recovery rates for aluminium during building dismantling are modelled based on figures reported by the European Aluminium Association (see references). It was assumed a 95% for recovery rate while the remaining 5% goes to landfill. Similar or even higher figures can be achieved in other sectors.

D - Allocation by reuse, recovery or recycling

In order to obtain the net post-consumer scrap output from the product system, the input of post-consumer scrap is subtracted from post-consumer scrap to be recycled at end of life. Module D reports the burdens and benefits of the recycling of this remaining net scrap. Benefits are assessed at the point of functional equivalence, i.e. where the substitution of primary aluminium takes place. In the recycling process, smelting yield for post-consumer scrap was also taken into account.

In order to make the results tables lighter, will be shown only declared modules with a non-zero contribution to the impact categories declared in this EPD.

Stage	Production			Construction		Use							End-of-life				Resource recovery
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module	Raw materials supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Dismantling	Transport	Waste processing	Disposal	Reuse, recovery or recycling potentials
Declared module	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	EU	EU	-	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data (*)	95.54%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

(*) For Climatic change - kg CO₂ eq. ND - Not declared

Time representativeness

All primary data used in this EPD are based on the 2019 production data for aluminium profiles manufactured by Hydro in their facilities in Navarra.

Database(s) and LCA software used

The data for primary aluminium consumed in Europe and for post-consumer scrap remelting are based on LCI dataset published by European Aluminium in February 2018 and are the best available. These datasets have been used to characterize the average of environmental burdens for process scrap and for processes involved in module D. Ecoinvent v3.3 database has been consulted for primary aluminium consumed in Navarra plant. Data were adapted to specific aluminium provider of Hydro. For transport processes the ELCD 3.2 database was consulted. Other LCI datasets were also sourced from Ecoinvent v3.3.

The LCA study was performed using an excel-based model. The impact assessment results were calculated using characterization factors published by the University of Leiden's Centre of Environmental Sciences (CML 2001) obtained from Simapro software.

Data Quality

In order to achieve precision, consistency and representativeness and to ensure reliable results, first-hand industry data were used. All foreground data were collected from Hydro for its facility in Navarra using customized data collection templates. It was created representative production inventories. These inventories are intended to represent average of aluminium billets production by Hydro in Navarra. The age of these data is less than three years. As for bibliographic data, none has been used with a year of publication lower than 2011.

Regionally specific datasets were used to model the energy consumption (electricity, natural gas or diesel). For the processes of transport, production of raw materials or end-of-life, datasets were chosen according to their technological and geographical representation of the actual process. The technological and geographical representativeness of the processes included in the LCA is guaranteed among which are the most contributing to final results (for example, 95.54% of climate change impact is obtained by specific data). For the rest of the processes, proxy datasets were used to address the lack of data for a specific process or for a specific geographical region.

Estimates and Assumptions

Post-consumer scrap was modeled as burden free when entering the system although it was included transport to plant. Process scrap is considered as aluminium that has never fulfilled its purpose as a product and is remelted once more. So that process scrap is given the same burdens of aluminium mix consumed in Europe. In order to calculate them, LCI dataset published by European Aluminium for primary (European production and imports) and secondary aluminium have been used.

In module D are reported only the burdens and benefits of the net output flow of post-consumer scrap. These figures are based on LCI dataset published by European Aluminium for remelting scrap and the substitution of aluminium consumed in Europe

Disposal and recovery rates are modelled based on figures reported by the European Aluminium (see references) for building & construction sector. It was assumed a 95% for recovery rate while the remaining 5% goes to landfill.

Allocation

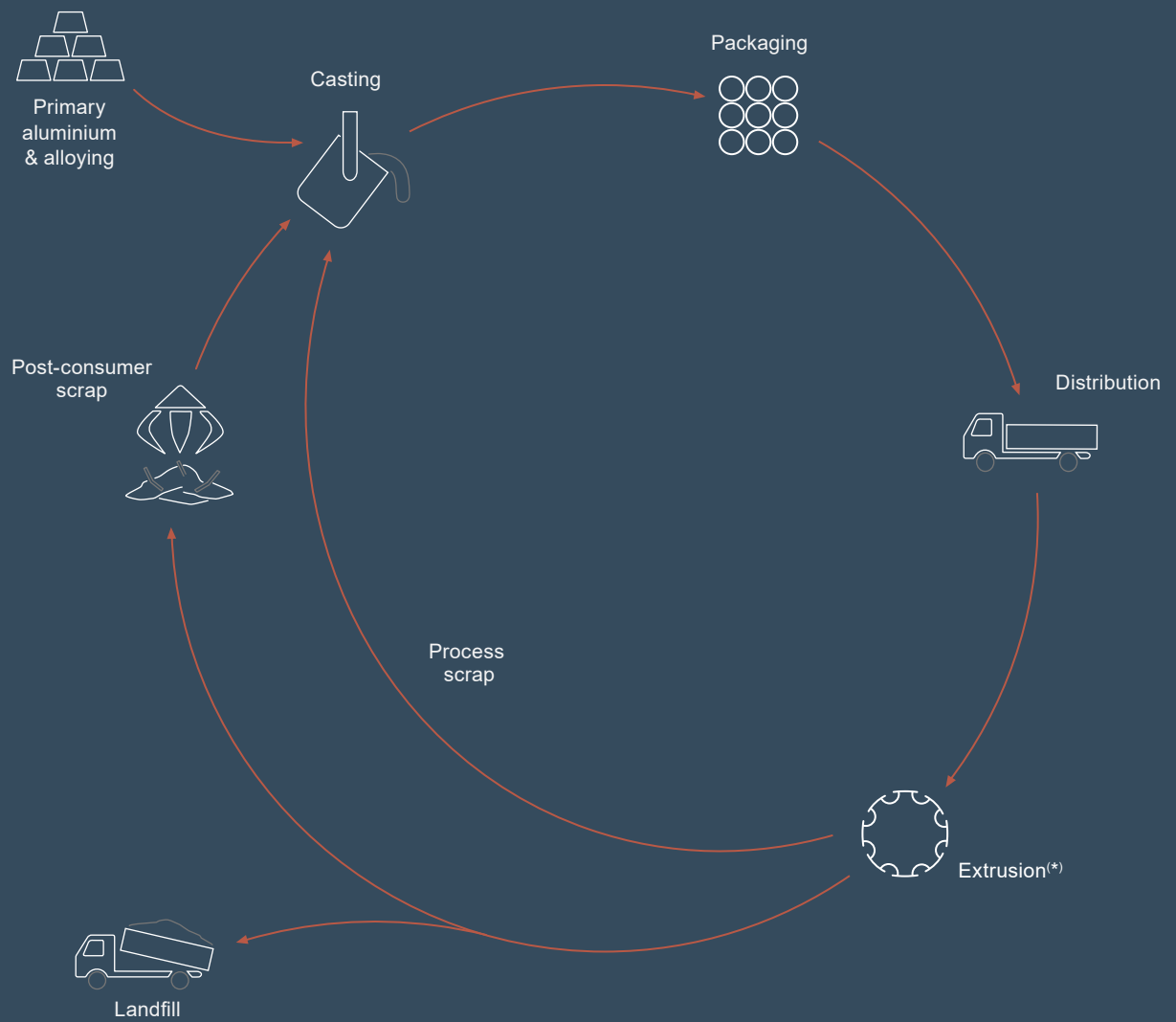
It was not possible to distinguish the consumption of electricity and natural gas between the production stages developed in Navarra (billets, extrusion, etc.). Based on the total energy consumption in the plant, electricity and natural gas used in billet manufacturing was estimated according to the ISO 50001 energy management system implemented in Navarra facilities.

Once the energy consumption was attributed to billet production, it was allocated to total production thus using a mass-based criterion. It has proceeded in the same way for raw materials and waste generation.

Cut-off criteria

All raw materials and packaging are included in the analysis as well as the energy for manufacturing. In the same way, all manufacturing waste (including hazardous waste) and air emissions are accounted for.

The construction of the manufacturing site (capital goods) is not included. The modules A4, A5, and from B1 to B7 are excluded as they are dependent of the specific product application.



A4 module parameters

Transport by road ⁽¹⁾	Articulated lorry, 27 t max payload
Diesel consumption (l/km)	0.35
Weighted distance (km)	450
Mass capacity utilisation	68%

C2 module parameters

Transport by road ⁽¹⁾	Lorry, 17.3 t max payload
Diesel consumption (l/km)	0.221
Distance (km)	200
Mass capacity utilisation	67%

C3 module parameters

Energy carrier	Electricity, low voltage {ES}
Consumption (kWh/kg)	0.0245
Waste (landfill)	0.05 kg

(*) Not included

(1) Technology mix, Euro 0, 1, 2, 3, 4

Results

Environmental Impacts	Units	A1-3	A4	C2	C3	C4	D
CC	kg CO ₂ eq	5.00	2.29E-02	1.31E-02	1.10E-02	8.88E-04	-4.33
OD	kg CFC-11 eq	1.56E-07	4.65E-11	2.66E-11	1.45E-09	1.58E-11	-2.14E-06
A	kg SO ₂ eq	2.80E-02	1.03E-04	6.22E-05	7.58E-05	3.20E-06	-2.20E-02
Eu	kg PO ₄ ⁻³ eq	3.06E-03	2.35E-05	1.43E-05	5.21E-06	2.02E-05	-1.46E-03
POF	kg C ₂ H ₂ eq	2.01E-03	7.32E-06	4.48E-06	2.98E-06	2.81E-07	-1.17E-03
AD-non fossil	kg Sb eq	4.20E-06	9.14E-10	5.24E-10	2.32E-08	4.04E-11	-2.14E-06
AD-fossil	MJ	54.4	3.24E-01	1.86E-01	2.60E-01	1.01E-02	-45.2
Resource use							
PERE	MJ	32.7	4.32E-04	0.248	2.92E-02	3.26E-03	-24.3
PERM	MJ	0	0	0	0	0	0
PERT	MJ	32.7	4.32E-04	0.248	2.92E-02	3.26E-03	-24.3
PENRE	MJ	1885	3.24E-01	186	0.264	2.33	-53.4
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	1885	3.24E-01	186	0.264	2.33	-53.4
SM	kg	0.466	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m ³ eq	2.00	0	0	1.03E-02	0	-0.190
Waste categories							
HWD	kg	0.201	2.85E-08	1.63E-05	0	2.24E-07	-0.281
NHWD	kg	1.01	1.29E-05	7.37E-03	0	1.79E-04	-1.31
RWD	kg	2.37E-03	0	0	0	0	-3.19E-03
Output Flows							
CRU	kg	0	0	0	0	0	0
MFR	kg	5,33E-02	0	0	0	0	0
MER	kg	0	0	0	0	0	0
EE	MJ	0	0	0	0	0	0

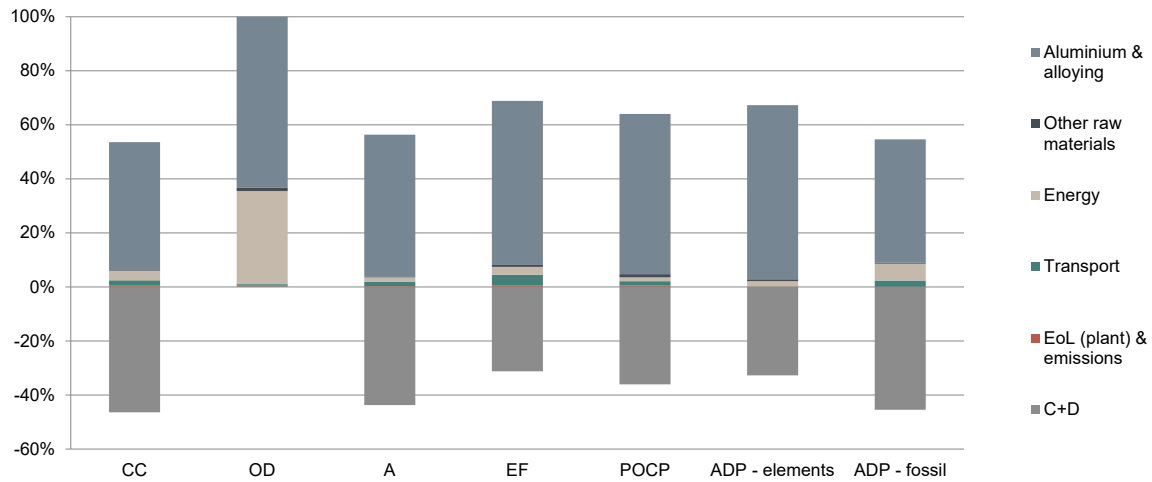
ENVIRONMENTAL IMPACTS - CC: Climatic Change; OD: Ozone depletion; A: Acidification ; Eu: Eutrophication; POF: Photochemical ozone formation; AD- non fossil: Abiotic resource depletion - minerals and metals; AD-fossil: Abiotic resource depletion - fossils.

RESOURCE USE - PERE: Renewable primary energy as energy carrier; PERM: Renewable primary energy resource as material utilization; PERT: Total use of renewable primary energy resources; PENRE: Non-renewable primary energy as energy carrier; PENRM: Non-renewable primary energy as material utilization; PENRT: Total use of non-renewable primary energy resources; SM: Use of secondary materials; RSF: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels; FW: Use of net fresh water.

WASTE CATEGORIES - HWD: Hazardous waste disposed; NHWD: Non-hazardous waste disposed; RWD: Radioactive waste disposed;

OUTPUT FLOWS - CRU: Components for re-use. MFR: Materials for recycling. MER: Materials for energy recovery; EE Exported energy per energy carrier.

Supplement information



The graph shows the contribution that impacts sources included in the study have on the results. It can be seen that aluminum inputs have a strong influence on the results followed by the energy used during the process. The avoided impacts declared in module D offset those generated during the first useful life of the aluminium

Additional relevant information

Processed scrap and post-consumer scrap are not matched in this EPD. Process scrap arises during processing of aluminium billets (such as e.g. extruded profiles, cullets, etc.) and it is considered as an aluminium flow that has never fulfilled its purpose as a product, and thus carries the same burdens of the original aluminium billet from which it is produced. Post-consumer scrap, on the other hand, has fulfilled its purpose in its first life cycle, is starting its second life cycle, and has thus no historical burdens attached to it.

Contacts

EPD Program

The International EPD® System
EPD International AB
Box 210 60
SE-100 31 Stockholm
Sweden



Third-Party Verifier

Eva Martínez Herrero
Centro Tecnológico de Miranda de Ebro
www.ctme.es
evamtz@ctme.es



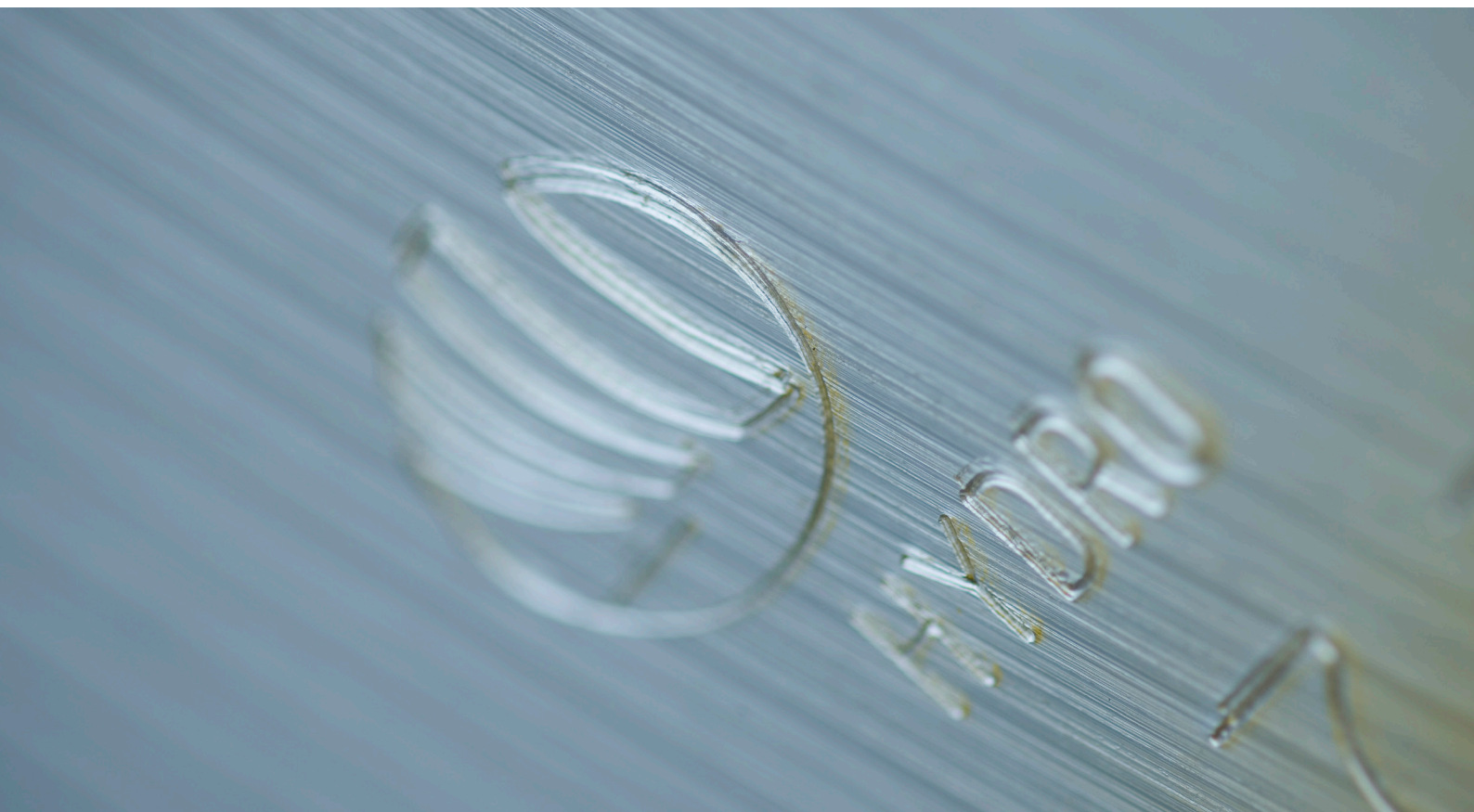
EPD Owner

Hydro Extrusion Spain S.A.U.
Orense 34, Planta 9
28020, Madrid Spain
www.hydro.com



EPD Author

IDNÓVAM
Innovación y desarrollo para el ambiente
Ferranz 56, Bajo
28008 Madrid, Spain
info@idnovam.com



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Verification

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and the requirements given in the product category rules document for Construction Products and Construction Services (EN 15804) and the general program guidelines by The International EPD® System. The results shown in this EPD are based on the LCA for HYDRO products according to standard 14044.

This EPD is not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages or are based on different Product Category Rules. EPDs of construction products may not be comparable if they do not comply with EN 15804. The EPD owner is responsible for its content, as well as to preserve supporting documentation during the period of validity that justifies the data and statements that are included.

EPD Program	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
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System boundaries	Cradle to gate with options
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Reference year for data	2019
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Product group classification	UN CPC Code: 415 Semi-finished products of copper, nickel, aluminium, lead, zinc and tin or their alloys
Product Category Rules	PCR 2012:01 Construction products and Construction services. Version 2.3. 2017-05-30. Based on CEN standard EN 15804
PCR review was conducted by	Technical Committee of The International EPD® System www.environdec.com info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:2006	<input checked="" type="checkbox"/> External <input type="checkbox"/> Internal <input type="checkbox"/> EPD Process
Third-party verifier	Eva Martinez Herrero Centro Tecnológico de Miranda de Ebro www.ctme.es evamtz@ctme.es



Hydro Extrusion Spain S.A.U.
Aralar Kalea 9
31860 Irurtzun Navarra
Spain

T +34 948 50 71 00
F +34 948 50 71 30
www.hydro.com

Hydro is a fully integrated aluminium company with 35,000 employees in 40 countries on all continents, combining local expertise, worldwide reach and unmatched capabilities in R&D. In addition to production of primary aluminium, rolled and extruded products and recycling, Hydro also extracts bauxite, refines alumina and generates energy to be the only 360° company of the global aluminium industry. Hydro is present within all market segments for aluminium, with sales and trading activities throughout the value chain serving more than 30,000 customers. Based in Norway and rooted in more than a century of experience in renewable energy, technology and innovation, Hydro is committed to strengthening the viability of its customers and communities, shaping a sustainable future through innovative aluminium solutions.