

SARAY® | ENVIRONMENTAL PRODUCT DECLARATION

In Accordance with ISO14025 and EN15804 for
PVC Profiles

The environmental impacts of this product have been assessed over its whole life cycle. Environmental Product Declaration has been verified by an independent third party.

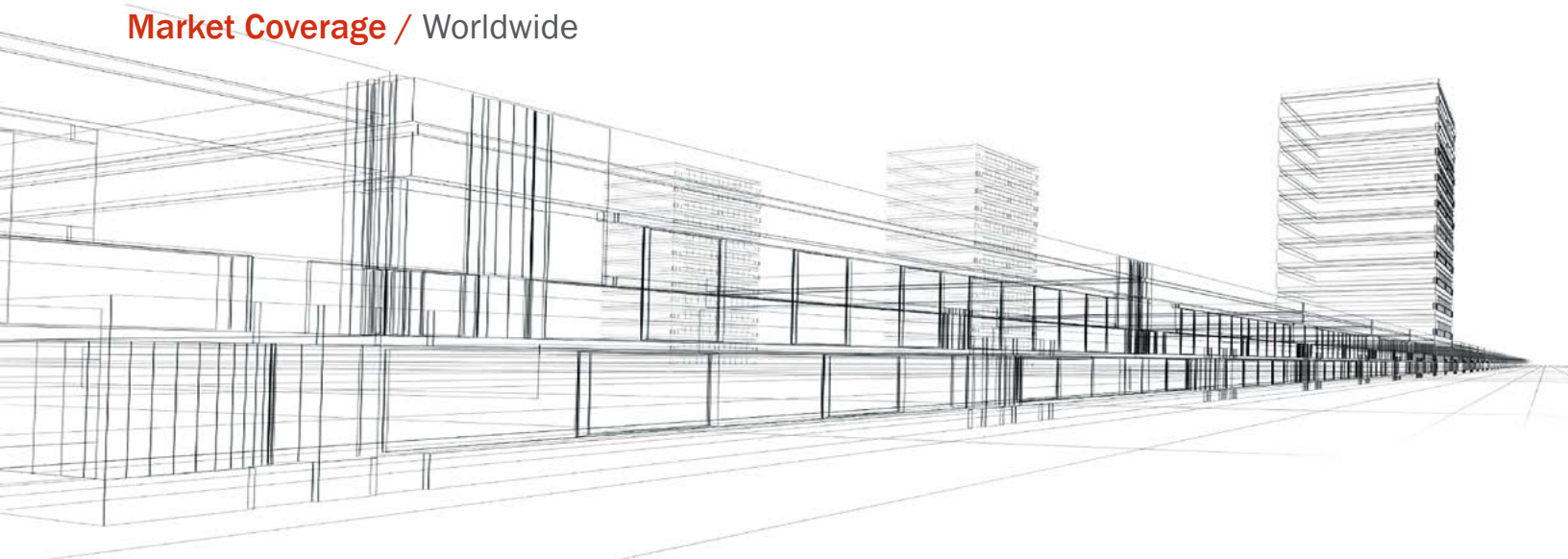
CPC Code / 363 Semi-manufactures of Plastics

Declaration Number / S-P-00832

EPD Valid from / 13 June 2016

EPD Expire on / 12 June 2021

Market Coverage / Worldwide



INFORMATION

EPD Programme	The International EPD® System
EPD Programme Operator	EPD Turkey, Istanbul - Turkey www.epdturkey.org
EPD Owner	SARAY Döküm ve Madeni Aksam San.Turizm A.Ş., İstanbul, Turkey, http://www.saray.com
Declared Unit	1 kg of PVC profile
EPD Based on Product Category Rules (PCR)	The CEN standard EN 15804 serves as the core PCR The International EPD® System's PCR 2012:01 Construction products and Construction services, Version 2.01, 2016-03-09
PCR Review Conducted by	Technical Committee of the International EPD® System www.environdec.com info@environdec.com
Independent Verification and data, according to ISO 14025:2006	<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External <input type="checkbox"/> EPD® Process Certification
System Boundaries	<input type="checkbox"/> Cradle to Gate <input checked="" type="checkbox"/> Cradle to Gate with Option <input type="checkbox"/> Cradle to Grave
Approved and Verified by	Third Party Verifier Vladimir Koci, PhD, Czech Republic
EPD Prepared by	Metsims Sustainability Consulting, İstanbul, Turkey www.metsims.com

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 more information about this Environmental Product Declaration or its contents, contact process owner Hanifi İctüzer, hanifiictuzer@saray.com.

STATEMENT

This study is conducted according to the guidelines of ISO 14040/44 and the requirements given in the Product Category Rules (PCR) document for Construction Products and CPC 54 Construction Services (Version 2.0, 2015 03 03) with reference to EN 15804 and the general program guidelines by The International EPD System.

The inventory for the LCA study is based on the 2015 production figures for PVC Profiles manufactured by Saray in their production plant located in Cerkezkoy, Tekirdag, Turkey.

This LCA was modelled with SimaPro 8.2 LCA software using the impact factors and the latest version of the Ecoinvent database V3.2 for secondary data and Turkish Life Cycle Inventory Database (TLCID) developed by Turkish Centre for Sustainable Production Research and Design (SÜRATAM) for local data.

The EPD certificate, its background data and the results will be used for business-to-business communications and is expected to be a reliable document for green building designers, architectures, manufacturers of construction products and the other stakeholders in the construction sector to understand the potential environmental impacts caused by PVC profiles.



COMPANY

With over 36 years experience in Aluminium extrusion and surface finishing industry, Saray is one of the leading companies in Turkey for production of aluminium extrusions used in manufacturing window/door systems, facade and curtain walling, winter gardens, solar energy collectors, balustrade and hand railings for stairs and balcony, and various industrial extrusions for engineering applications. Saray started producing of PVC with 3 lines of Austrian molds and machines in 2004 and today continues annual capacity of 18,000 tons with 17 extruders.

The company has two production sites, in Gunesli (Istanbul) and Cerkezkoy (Tekirdag), under a total of 90,000 sq.m. covered area. Saray is ranked as the 217th among industrial companies in Turkey and exports 55% of production to 45 countries.

Saray utilizes system in their production. All processes are under control from order intake to delivery. The company has been certified to CE, QUALICOAT, QUALANOD, IFT-ROSENHEIM, GOST-R quality labels, ISO 9001 management system, and TS EN 755-1, TS EN 12020-1, TS 1164 product standards.

Saray supports customers in all phases of a project from start to successful completion. Consultancy for manufacturing windows/doors/facades, preparation of material lists including aluminium profiles and glass and calculation of costs and optimisation are cooperated by expert architects and engineers.

Saray, being aware of its environmental responsibilities, takes necessary measures in all stages from planning, production and delivery to protect the environment.



PRODUCT SPECIFICATIONS

LCA Study presented in this report assesses the potential environmental impacts of PVC Profiles process during their life cycle from raw material supply to disposal.

PVC Profiles are mainly made of Polyvinyl Chloride (PVC) known as the most valuable raw material within the chemical industry. Products may also contain other raw materials such as calcite, titanium, stambran, impact, and stabilizers.

Average Composition of PVC Profiles

Composition	%
PVC granule	75- 80
Calcite	8.0 - 14
Titanium	2 - 6
Stabran	2 - 6
Impact Modifiers and Stabilizers	2 - 6

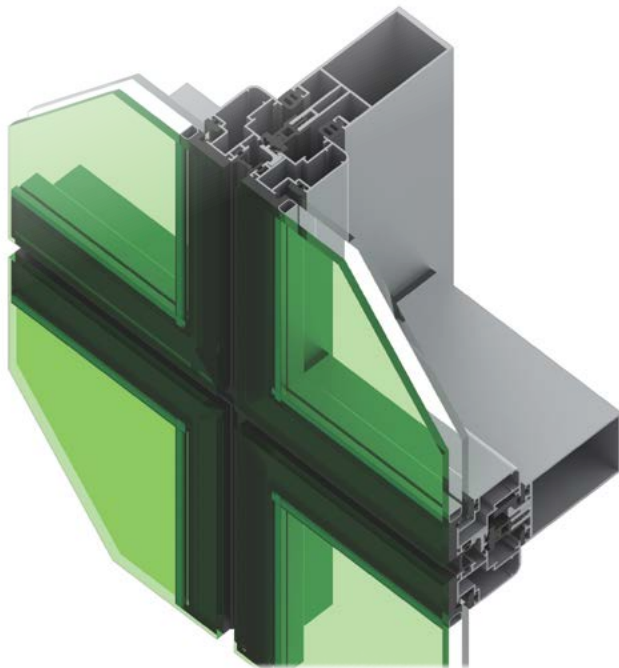
The production of PVC profiles begins with mixing the raw materials. A certain percentage depending on the formulation of raw materials are fed into the extruder hopper by an automation system mixer. Raw materials are moved to the moulding section with screws and heated up to the melting temperature with heating elements simultaneously. The melting temperature differs according to the raw materials and the products.

Desired shapes are obtained by moulding the melted raw materials. The products that are melted physically and moulded in fully enclosed system come into the cooling pond. Completely cooled products are cut into the desired length by saw and packaged for dispatch.

SARAY[®] | PVC

Technical Specifications

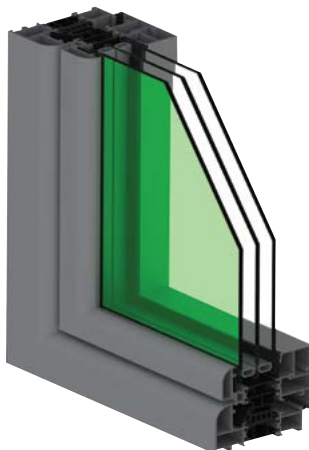
Density, gr/cm ³	Air Diffusion Ability (m ³ /h cm)	Sound Isolation (db)	Profile Heat Isolation Coefficient (W/m 20 K)
1.3 - 1.4	4	34	1.4



Saray PVC is a long-lasting material regarding to its high quality and right amount of raw materials composition. It preserves its color and brightness even after years of its installation. Profiles are durable for changes on extreme outside temperature.

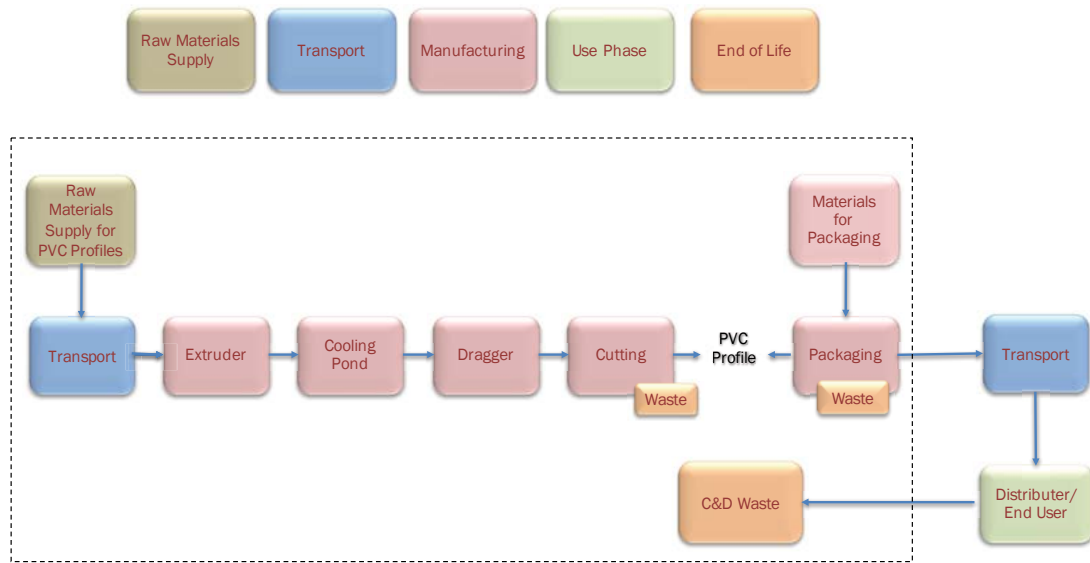
PVC Profiles manufactured in the production plant of Saray are used as window & door frames and sliding systems.

Saray certified its top-level production quality with domestic and international certificates, it leads export operations to Europa, Russia, Middle East, Africa, Balkans and Central Asia.



Saray PVC carries out a solution to energy problem with its perfect insulation systems, also made homemakers' job easier by preventing noise, dust and air pollution from interior.

SYSTEM BOUNDRY



System Boundary of the LCA study conducted on PVC Profiles

Upstream Processes (A1: Raw Material Supply)

Production for product starts with mainly locally sourced but some transported from other parts of the world. 'Raw material supply' includes raw material extraction and pre-treatment processes before production.

Core Processes (A2:Transportation and A3:Manufacturing)

Transport is relevant for delivery of raw materials to the plant and the transport of materials within the plant.

Production stage for PVC profile production starts with extrusion of PVC and continue with cooling, dragging and continues with cutting for the desired length. Only electricity is consumed during the manufacturing of PVC Profiles, no natural gas is consumed for the production .

Downstream Processes (C4: Disposal)

In Turkey, about 11%of PVC Products are collected for recycling and the rest of is sent to the landfill for their final fate as such modelled in the LCA.

Benefits and loads beyond the product system boundary in information Module D:

No potential benefits of recycling and re-use were taken into account in the current LCA report.

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

Functional Unit/ Declared Unit	The declared unit is the production of 1 kg of PVC profile.
Goal and Scope	This EPD evaluates the environmental impacts of 1 kg PVC Profile products from cradle to gate with option (Disposal).
System Boundary	The system boundary covers A1 - A3 product stages referred as 'Raw material supply', 'Transport' and 'Manufacturing' , C4 as Disposal.
Estimates and Assumptions	Packaging waste for panels are modelled based on the collection rates enforced by the relevant regulation in Turkey.
Cut-Off Rules	There has been no cut-off conducted within this LCA study.
Background Data	For local data, specific for Turkey, Turkish Life Cycle Inventory Database (TLCID) developed by Turkish Centre for Sustainable Production Research and Design (SÜRATAM) was used. For any other background data, the latest version of the Ecoinvent database was used.
Data Quality	Raw materials, electricity and water use and waste data collected from Saray. Localized data especially on energy and other relevant processes were taken from TLCID.
Period Under Review	All primary data collected from Saray's plant is for the period year of 2015.
Allocations	There are no co-products in the production of PVC Profiles manufactured by Saray. Hence, there was no need for co-product allocation. Transport was allocated according to tonnages for almost all raw materials bought by Saray.

All the waste resulting from the main production and related processes of Saray is managed in accordance with valid legal requirements.

PRODUCT STAGE			CONSTRUCTION PROCESS		USE STAGE							END OF LIFE STAGE			BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES	
Raw Materials Supply	Transport	Manufacturing	Transport from the gate to the	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse-Recycling-Recovery Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	X	MNA

Description of the system boundary (X = Included in LCA, MNA = Module Not Assessed)

The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1, A2, A3) and the loads beyond the system boundaries (C4). The system boundaries in tabular form for all modules are shown in the table above.

All energy calculations were obtained using Cumulative Energy Demand V1.09 methodology, while environmental impacts are calculated with the CML-IA baseline V4.2 within SimaPro LCA Software.

ENVIRONMENTAL IMPACTS FOR 1 KG OF SARAY PVC PROFILE

Parameter	Unit	A1-A3	C4	Total
GWP	[kg CO2 eq.]	4.71E+00	4.39E-01	5.15E+00
ODP	[kg CFC11 eq.]	8.79E-08	2.79E-09	9.07E-08
AP	[kg SO2 eq.]	1.65E-03	1.18E-04	1.76E-03
EP	[kg PO43- eq.]	2.95E-02	1.36E-04	2.96E-02
POCP	[kg ethene eq.]	4.23E-03	2.37E-03	6.60E-03
ADPE	[kg Sb eq.]	1.64E-04	1.93E-08	1.65E-04
ADPF	[MJ eq.]	6.26E+01	3.08E-01	6.29E+01

Legend

GWP: Global Warming Potential, ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation potential of tropospheric ozone photochemical oxidants ADPE: Abiotic depletion potential for non-fossil resources, ADPF: Abiotic depletion potential for fossil resources

RESOURCE USE FOR FOR 1 KG OF SARAY PVC PROFILE

Parameter	Unit	A1-A3	C4	Total
PERE	[MJ]	3.58E+00	1.61E-02	3.59E+00
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00
PERT	[MJ]	3.58E+00	1.61E-02	3.59E+00
PENRE	[MJ]	6.26E+01	3.08E-01	6.29E+01
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00
PENRT	[MJ]	6.26E+01	3.08E-01	6.29E+01
SM	[kg]	0.00E+00	0.00E+00	0.00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00
FW	[m³]	2.80E-02	2.79E-04	2.82E-02

Legend

PERE: Use of renewable primary energy excluding 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 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, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES FOR 1 KG OF SARAY PVC PROFILE

Parameter	Unit	A1-A3	C4	Total
HWD	[kg]	0.00E+00	0.00E+00	0.00E+00
NHWD	[kg]	1.46E-03	8.90E-01	8.91E-01
RWD	[kg]	0.00E+00	0.00E+00	0.00E+00
CRU	[kg]	-	-	-
MFR	[kg]	0.00E+00	1.10E-01	1.10E-01
MER	[kg]	-	-	-
EE [Typ]	[MJ]	-	-	-

Legend

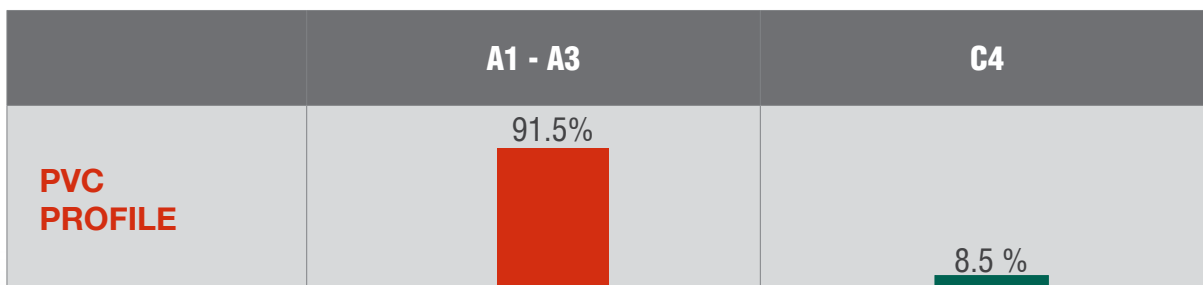
HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for re-use, MFR: Materials for recycling, MER: Materials for energy recovery, EE: Exported Energy

ENVIRONMENTAL INTERPRETATION

When the results of the LCA study analysed for PVC profiles, raw materials appeared to be the dominant life cycle stage.

When the energy consumption at each stage of life cycle by source was examined, it was concluded that fossil energy sources are the most prominent at each life cycle stage for the declared products.

GWP INTERPRETATION OF PVC PROFILES



REFERENCES

/EN 15804/ EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations – Core rules for the product category of construction products

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations – Principles and procedures

/ISO 14040-44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)

/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 2.0, DATE 2015-03-03

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025.www.environdec.com

/Ecoinvent / Ecoinvent Centre, www.Eco-invent.org

/SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

/TLCID/ Turkish Life Cycle Inventory Database, Turkish Center for Sustainable Production Research and Design (SÜRATAM), www.surdurulebiliruretimmerkezi.org

VERIFICATION AND REGISTRATION

Programme Holder



THE INTERNATIONAL EPD® SYSTEM

The International EPD System

EPD International AB, Box 210 60
SE- 100 31 Stockholm / Sweden

www.environdec.com

Programme Operator



THE INTERNATIONAL EPD® SYSTEM

EPD Turkey

Veko Giz Plaza, Meydan Sok.
No 3 Kat 13 Maslak,
Istanbul/Turkey

www.epdturkey.org

Third Party Verifier



LCAsudio

Mr Vladimir Koci, PhD
Šarecka 5, 16000 Prague 6,
Czech Republic

www.lcastudio.cz

Owner of the Declaration

SARAY®

SARAY Döküm ve Madeni Aksam San.Turizm A.Ş.

Veliköy Sanayi Bölgesi Sanayi Bulvarı No:29
Cerkezkoy / Tekirdag
Turkey

www.saray.com

LCA Author and EPD Graphic Design



Metsims Sustainability Consulting

Elmas Studio Levent
Lalegul Sok. No:7/18
34415 4.Levent - Istanbul
Turkey

www.metsims.com

SARAY®

www.saray.com
saray@saray.com

FACTORY - Cerkezkoy:
Veliköy Sanayi Bölgesi Sanayi Bulvarı No:29 Çerkezköy / Tekirdağ
TURKEY
+90 282 746 11 43

