ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO14025 and EN15804+A2:2019 for

PPRC Pipes

Manufactured by Fırat Plastik

Programme:
The International EPD® System

Programme Operator:
EPD International AB

Local Operator:
EPD Turkey

S-P Code:
S-P-06756

Publication Date:
2022-12-02

Validity Date:
2027-12-01

Geographical Scope:
Turkey

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

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ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR):

2019:14 Version 1.11, 2021-02-05, Construction Products and Construction Services, EN 15804:2012 + A2:2019 Sustainability of Construction Works

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PCR review was conducted by:

The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile

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Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification EPD verification ✓

Third party verifier: Prof. Ing. Vladimír Kočí, Ph.D., MBA LCA Studio Šárecká 5,16000 Prague 6 - Czech Republic

Approved by: The International EPD® System Technical Committee, supported by the Secretariat

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Procedure for follow-up of data during EPD validity involves third party verifier:

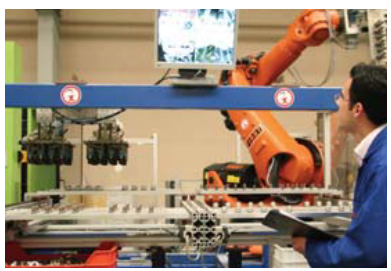
Yes No ✓

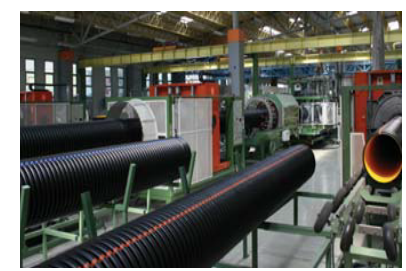
The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

ABOUT FIRAT PLASTİK

FIRAT was established in 1972 to make production in the field of plastic construction materials FIRAT, who has always followed its principle of "Quality Production at All Times" and "quality product diversity", has managed to become "the leader of sector" as well as "the export leader of sector" as a result of the serious enterprises.

With its plastic-based products, FIRAT makes production for various sectors like construction, agriculture, automotive, medical and white goods. It carries out its manufacturing process for these sectors in its factories of 750.000 m² in total in Istanbul-Buyukcekmece and Ankara-Sincan. FIRAT owns one of the five biggest manufacturing complexes of Europe.





Product Range and Groups

Product diversity of FIRAT is over 4500. For our customers to obtain the optimum benefit and satisfaction out of these products, FIRAT makes production as integrated [completing one another] systems.

Thousands of FIRAT products like PVC Door and Window Profiles, PVC Rain Gutters and Fittings, PVC Drinking Water Pipes, PVC Waste Water Pipes, PVC Hose Groups, Rubber and PE Based Hoses, PPRC Sanitary Installation Pipes and Fittings, HDPE Pipes, EF Fittings, PE Fittings, PE 80 Natural gas Pipes, Tunnel Type Drainage Pipes, Drainage Pipes, Telecommunication Cable Protection Pipes, EPDM Sealing Manufacturing, TPE Sealing Manufacturing, Metal Injection Production [hinge and window connection components], PEX Mobile System and Floor Heating Pipes, PEX Pipe Metal Fittings, Pex Al Pex Pipe, Irrigation Pipes and Fittings, Medical Products render service in numerous parts of Turkey and the world.

Quality and Control

Quality Control Process employed in laboratories consists of three phases:

1. Incoming Quality Control
2. Process Quality Control
3. Output-Final Quality Control

Incoming Quality Control

All types of raw materials and auxiliary materials from our suppliers are subjected to Input Quality Control tests according to the qualityproduction standards set out by FIRAT. Samples randomly chosen from each lot of raw materials and auxiliary materials supplied in lots by our suppliers have to pass through Appearance Marking Compliance, Physical Compliance, Chemical Compliance and Functional Compliance tests in GKK Laboratories and obtain “Suitable for Production” approval.

Process Quality Control

In the production process implemented with raw materials and auxiliary materials bearing “Suitable for Production approval, samples taken on production lines during or soon after production are passed through Process Quality Control tests in FIRAT laboratories determined by national [TSE] and international [DVGW, SKZ, EN, DIN, etc.] standard institutions and recorded regularly. Main Process Quality Control tests are as follows:

- Blow Strength Test
- Hydrostatic Compression Test (for products to operate in pressurized lines]
- Longitudinal Variation [resistance against heat]
- Density Test
- Homogeneity Test
- Melt Flow Speed Test

At the phase of Process Quality Control; diameter, thickness and ovality measurements are conducted by ultrasonic measurement devices on all production lines in fully automated manner simultaneously with the production process and faulty production is not allowed upon activation of sound and light warning system under out of standard cases.

The products have to pass through all tests conducted in accordance with the control frequency and numbers set out in the standards and obtain "Suitable for Sale" approval.

Output - Final Quality Control

The products which obtained "Suitable for Sale" approval also have to get "Suitable for Output" approval passing through Packaging Compliance, Pack Compliance, Description and Label Compliance checks soon after automatic packaging and wrapping processes.

In addition to the quality control tests conducted in FIRAT laboratories, all the products are sampled from the production lines regularly twice a year and subjected to quality and sanitary compliance tests by international test and certification institutions such as DVGW, SKZ, AENOR, TUV and SEPRO.
Our products which passed through all these tests and met the required quality conditions are offered to our customers.

ABOUT THE PRODUCTS

This EPD is an average EPD consisting of three similar PPRC pipes manufactured by Fırat Plastik at Büyükçekmece plant. Products that are investigated are listed below.

- PP-RC pipe
- PP-RC Aluminium Foiled Pipe
- PP-RC Composite Pipe

The main raw material used for all three products are polypropylene random copolymer. PPRC is the only raw material consumed during the production of PP-RC pipe. Two other similar products are manufactured by decreasing the amount of PP-RC used and adding either aluminum or glass fiber to the recipe. According to the manufacturer, aluminum/glass fiber substitutes around 20% of PP-RC. LCA results in this EPD are for PP-RC pipe as this product has the largest sales volume among the three.

The environmental performances of PP-RC pipe and PP-RC Composite Pipe are very close to each other (differ mostly around 2% for most of the indicators). Additionally, the environmental performance of PP-RC pipe and aluminum PP-RC Aluminium Foiled Pipe differs around 10%. The use of aluminum was seen as the limiting condition since its impact is higher than PP and glass fiber.

Aluminum use in the product was supplier specific and it contains 57% of recycled aluminum. With this consideration, the upper and lower boundaries for these three products do not exceed 10% variance in terms of environmental performance.

Packaging content of the products are given below.

Packaging material	% (by weight for packaging)
Nylon	35
Polypropylene	60
Printed paper	5

ABOUT PPRC PIPES

PRODUCT SPECIFICATIONS

Based on their advantages such as lightness and smoothness, luminous and slippy interior faces, calcification-free and stain-free nature, hygienic and easy-to-fit structure; FIRAT PPRC Pipes are produced from the raw material of PP-R (Polypropylene Random Copolymer) in compliance with TS 9937, TS EN ISO 15874, DIN 8077, DIN 8078, DVGW W544 standards superseded galvanized pipes and became an indispensable solution in today's interior building cold and hot water installations.

The most important characteristic of this raw material is the high resistance against heat and chemical effects. Thanks to this resistance, FIRAT PPRC Pipes and Fittings made of raw material of PP-R are successfully utilized in cold and hot water instillations.

Since monomer structure of the raw material PP-R forms a haphazard chain, it does not allow any biological material to settle inside its structure and thus, FIRAT PPRC Pipes and Fittings made of raw material PP-R achieve color, taste and smell-free superior qualities.

FIRAT PPRC Pipes and Fittings with aluminium foil are designed particularly for installations with water passage. Since aluminium folio used in FIRAT PPRC Pipes and Fittings five-fold reduces the thermo-expansion coefficient of pipe, it impedes heat-based expansion and sag. Additionally, it also restricts oxygen passage thanks to its non-porous surface.

ABOUT PPRC PIPES

TECHNICAL SPECIFICATIONS

Mechanical Properties

Hydrostatic Strength (MPa)	Test Temperature (°C)	Test Period (Hour)	Test Pressure (Bar)
16	20	1	65
4.3	95	22	18
3.8	95	165	15
3.5	95	1000	14

Physical and Chemical Properties

	Necessity	Parameter	Duration (Hour)
Longitudal Consistency	≤2%	135°C	en ≤ 8 mm -> 1 8 mm < en ≤ 16 mm -> 2 en > 16 mm -> 4
Hydrostatic Compression Test **No explosion should occur**	Thermo-Cons, by Inter. throughout the test	110°C - 1.9 MPa	8760
Impact Strength	<10%	0°C - 10 Pieces	en ≤ 8.6 mm -> 1 8.6 mm < en ≤ 14.1 mm -> 2 en > 14.1 mm -> 4
MFI (Raw material)	≤0.5 gr/10 min.	230°C - 2.16 kg	
MFI (Pipe)	Not exceed 20% when compared to the raw material	230°C - 2.16 kg	

ADVANTAGES

- Operating life is 50 years at 20°C and 25 bar pressure.
- Available to use within the range of -20°C and +95°C (Isolation should be employed taking into consideration the freezing degree of fluid inside the pipe).
- Offers high strength against chemical materials.
- Corrosion-resistant. No calcification and oxidation.
- Does not downgrade the color, smell and taste of water.
- Has slippy and luminous interior faces.
- No diameter-shrinkage at welding points. Offers high welding performance.
- Offers 70% saving in assembly and no assembly waste.
- Provides heat and voice insulation.
- Hardly deflagrates (Ref: DIN 19560 and DIN 4102)

ABOUT COMPOSITE PPRC PIPES

PRODUCT SPECIFICATIONS

FIRAT Composite Pipes are manufactured through combining the PP-R (Polypropylene Random Copolymer) with glass fibre reinforced polypropylene raw materials); become an indispensable solution in cold and hot waterworks today thanks to the advantageous features such as slippery and glossy inner surface, resistance to calcification and corrosion, being hygienic and the ease of assembling.

FIRAT Composite Pipes and Fittings that is being used in all kinds of indoor hot and cold waterworks are manufactured from Type 3 raw material that is called as PP-R (Polypropylene Random Copolymer).

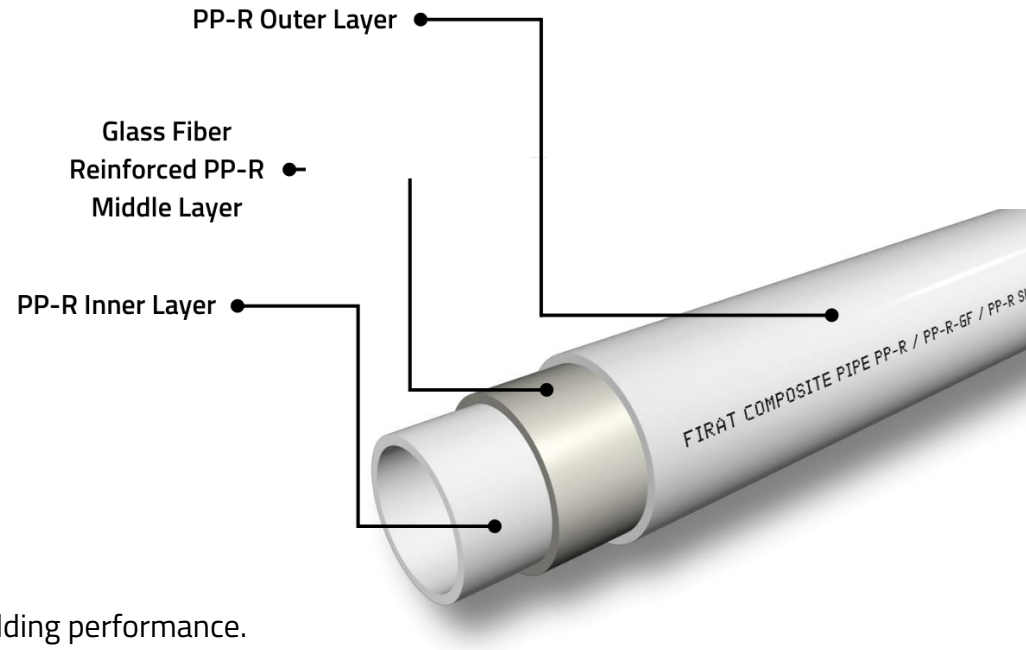
The most important feature of the raw material PP-R is its high resistance to heat and chemical effects. FIRAT Composite Pipes and Fittings that are manufactured from the raw material PP-R due to this resistance are being used in cold and hot water installations successfully. As the monomer structure of the raw material PP-R constitutes a random chain, it does not keep any biological materials within and this provides superior properties which do not give color, odor or flavor to the Fittings that are derived FIRAT Composite Pipes and from the raw material PP-R.

FIRAT Composite is specifically designed for the installations that feature hot water passage. The middle layer with its high isolation feature that is used in Composite Pipes and Fittings prevents the expansion and sagging of the pipe.

FIRAT Composite Pipes and Fittings are a pressure pipe system that is used in indoor cold hot water systems. It has a multi-layer structure, Middle layer is composed of glass fiber reinforced PP-R (polypropylene random copolymer), outer and inner layer of the raw material PP R. Application clow is 1 and 10 bar according to EN ISO 15874-1. It is designed to serve at 20°C under the pressure of 20 bar for 50 years.

ABOUT COMPOSITE PPRC PIPES

ADVANTAGES



- Service Life is 50 years at 20°C and 20 bar pressure.
- As the Composite Pipes have low expansion coefficients, they are fit for use within the range of -20°C and +90°C. (Isolation should be applied considering the freezing degree of the fluid in the pipe).
- According to the DIN 4102 standard it is within the B2 class.
- Composite Pipes do not create perspiration and stretching problem in systems where heating and cooling is used together.
- Highly resistant to chemical agents.
- Resistant to corrosion. Does not cause calcify and corrode.
- Does not change the color, odor or flavor of the water.
- Has slippery and glossy inner surfaces.
- No diameter narrowing in the welding places occurs. It shows high welding performance.
- As there is no clear cut in composite pipes, this provides the opportunity of quick and serial assembly.
- Can be used in surface applications with its aesthetical view.
- No assembling loss.

SYSTEM BOUNDARIES & DESCRIPTION

A1: Raw Material Supply

Production starts with acquiring needed raw materials. 'Raw material supply' also includes pre-treatment processes before the production. The main raw material used in the PPRC pipes is PP-R (Polypropylene Random Copolymer). Additionally, for multilayer PP-R pipes, aluminum and glass fibers are used.

A2: Transportation

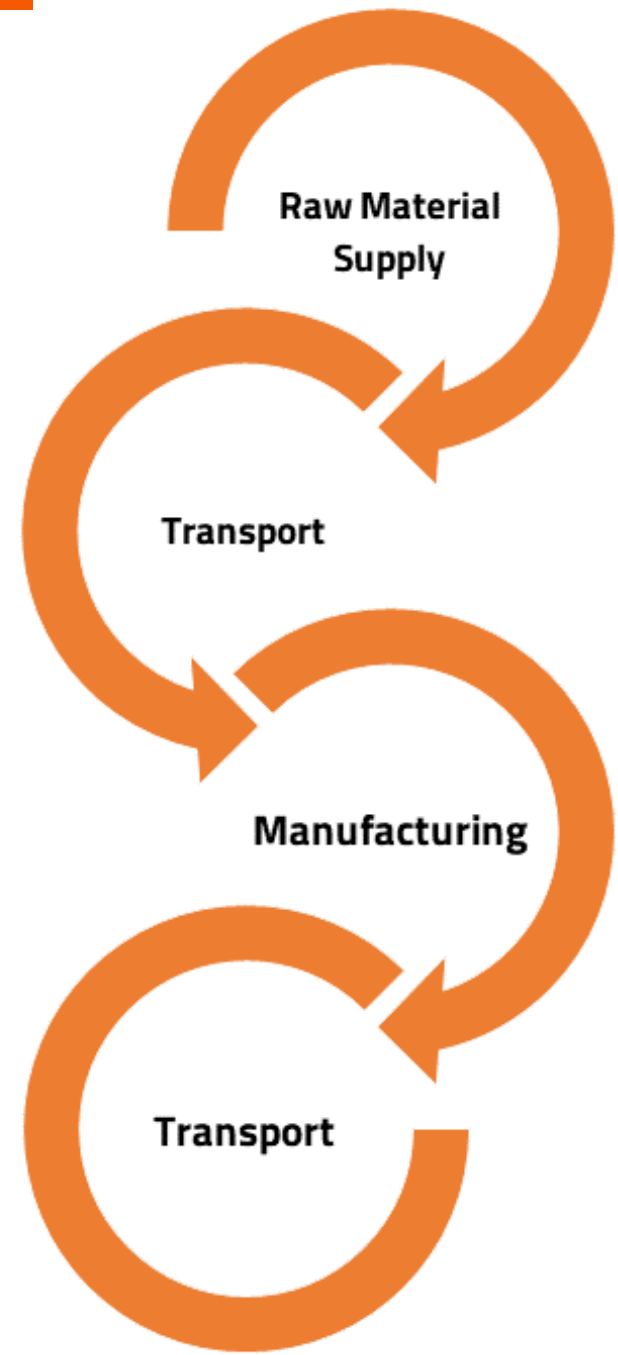
Transport is relevant for delivery of raw materials and other materials to the plant and the transport of materials within the plant. The transport distances and routes are calculated based on the given information from the manufacturer for 2021.

A3: Manufacturing

Following production processes are included: raw material + color masterbatch, mixing, vacuum feeding, raw material drying, single screw extruder, co-extruder, mold, calibrator, vacuum tank, cooling water, tank, inkjet printer, haul-off, cutter, and stacker.

A4: Transport

Transport of final product to customers are considered and the routes and distances are calculated accordingly. Transport routes were provided by the manufacturer for 2021.



SYSTEM BOUNDARIES & DESCRIPTION

C1: Demolition

Based on the information given by the manufacturer, no energy is needed for the demolition of the considered product after its reaches end-of-life.

C2: Transport

25 km distance is considered for the transport of final products to the waste processing area.

C3: Waste Processing

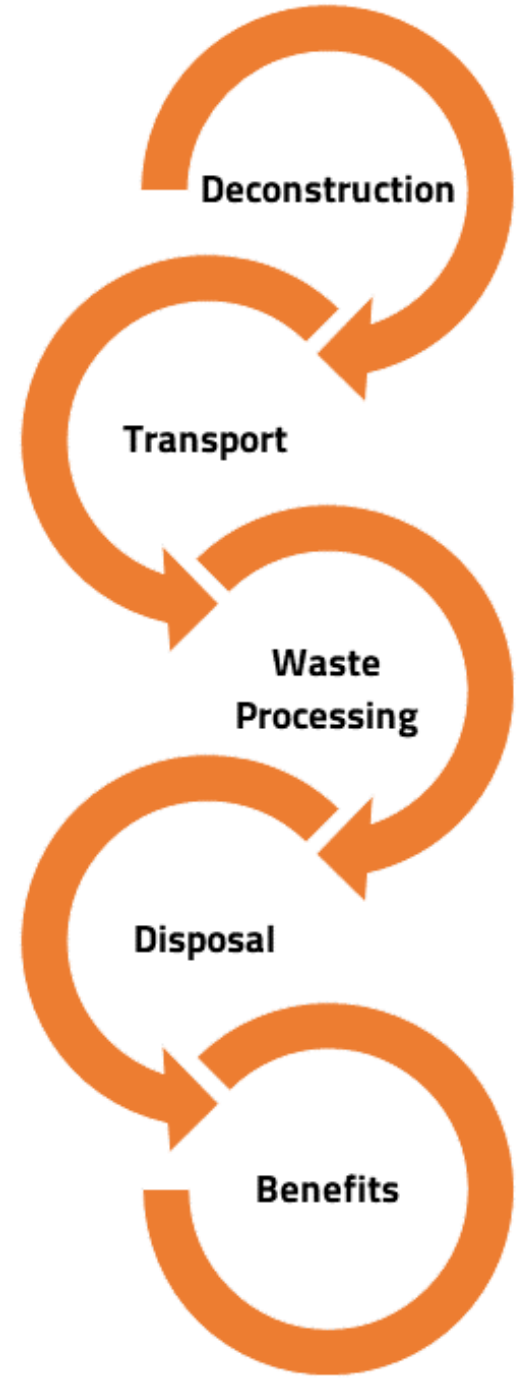
It is assumed that 3% of the product is lost during collection after reaching end-of-life. 60% of the rest is assumed to be incinerated with energy recovery and 30% of the rest is assumed to be recycled.

C4: Disposal

9.7% of the total product is assumed to be landfilled.

D: Future reuse, recycling or energy recovery potentials

The energy recovery in the form of heat from the incineration plant and the recycled PP content is considered as benefits in forms of energy recovery and raw material.



LCA INFORMATION

Declared Unit	1 kg PP-R Pipe
Time Representativeness	2021
Database(s) and LCA Software	Ecoinvent 3.8 and SimaPro 9.3
System Boundaries	Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and A4 modules).

	Product Stage			**Construction Process Stage**		**Use Stage**							**End of Life Stage**				**Benefits and Loads**
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / demolition	Transport	Waste Processing	Disposal	Future reuse, recycling or energy recovery potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	TR	GLO	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific Data Used	>90%	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	<10%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	NR					-	-	-	-	-	-	-	-	-	-	-	-

(X = Included in LCA, NR= Not relevant, ND= Not declared)

LCA INFORMATION

The inventory for the LCA study is based on the 2021 production figures. This EPD's system boundary is cradle to gate with options, modules C1-C4, and module D. (A1–A3 + C + D and A4 modules).

Allocations

Water consumption, energy consumption and raw material transportation were weighted according to 2021 production figures. In addition, hazardous and nonhazardous waste amounts were also allocated from the 2021 total waste generation.

Cut-Off Criteria

1% cut-off is applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The regional energy datasets were used for all energy calculations.

LCA RESULTS

Impact Category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP - Fossil	kg CO_2 eq	2.25	0.238	0.578	3.07	0.088	0	0.002	1.47	0.012	-1.44
GWP - Biogenic	kg CO_2 eq	0.008	202E-6	0.005	0.014	83.7E-6	0	4.39E-6	89.1E-6	13.2E-6	-0.005
GWP - Luluc	kg CO_2 eq	0.001	150E-6	0.004	0.005	51.3E-6	0	874E-9	3.38E-6	1.08E-6	-199E-6
GWP - Total	kg CO_2 eq	2.26	0.239	0.587	3.08	0.088	0	0.002	1.47	0.012	-1.45
ODP	kg CFC-11 eq	28.9E-9	50.8E-9	29.1E-9	109E-9	18.8E-9	0	529E-12	1.13E-9	311E-12	-99.2E-9
AP	mol H+ eq	0.009	0.006	0.004	0.018	0.002	0	7.33E-6	189E-6	8.82E-6	-0.003
*EP - Freshwater	kg P eq	365E-6	10.0E-6	0.001	0.001	4.45E-6	0	169E-9	1.58E-6	151E-9	-81.1E-6
EP - Freshwater	kg (PO_4) eq	0.001	30.6E-6	0.002	0.003	13.6E-6	0	518E-9	4.82E-6	463E-9	-248E-6
EP - Marine	kg N eq	0.002	0.001	0.001	0.004	431E-6	0	1.64E-6	92.6E-6	39.6E-6	-0.001
EP - Terrestrial	mol N eq	0.016	0.016	0.006	0.038	0.005	0	17.9E-6	0.001	32.7E-6	-0.007
POCP	kg NMVOC	0.004	0.004	0.002	0.010	0.001	0	4.55E-6	226E-6	10.7E-6	-0.002
ADPE	kg Sb eq	13.7E-6	396E-9	1.21E-6	15.3E-6	157E-9	0	5.35E-9	32.7E-9	3.42E-9	-4.52E-6
ADPF	MJ	73.9	3.29	6.65	83.8	1.24	0	0.036	0.073	0.024	-34.3
WDP	m^3 depriv.	1.01	0.007	2.77	3.78	0.003	0	134E-6	0.002	0.001	-0.438
PM	disease inc.	71.4E-9	11.1E-9	17.4E-9	99.9E-9	4.73E-9	0	194E-12	1.48E-9	170E-12	-21.2E-9
IR	kBq U-235 eq	0.061	0.015	0.015	0.091	0.006	0	169E-6	351E-6	115E-6	-0.032
ETP - FW	CTUe	21.0	2.20	6.76	30.0	0.891	0	0.030	0.355	0.024	-6.11
HTTP - C	CTUh	583E-12	126E-12	276E-12	985E-12	43.1E-12	0	771E-15	204E-12	778E-15	-219E-12
HTTP - NC	CTUh	14.9E-9	1.76E-9	6.99E-9	23.7E-9	746E-12	0	29.7E-12	1.37E-9	14.5E-12	-5.4E-9
SQP	Pt	2.44	1.61	0.854	4.90	0.782	0	0.042	0.030	0.059	-1.07

Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A4: Transport, C1: Deconstruction / demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Future reuse. recycling or energy recovery potentials
Disclaimer 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.
Disclaimer 2	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
*Disclaimer 3	EP-freshwater: This indicator is calculated both in kg PO_4 eq and kg P eq as required in the charactarization model. (EUTREND model, Struijs et al, 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)

Resource use

Impact Category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	0.880	0.029	1.26	2.172	0.011	0	397E-6	0.004	440E-6	-0.317
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	0.880	0.029	1.26	2.172	0.011	0	397E-6	0.004	440E-6	-0.317
PENRE	MJ	73.9	3.3	6.65	83.8	1.24	0	0.036	0.073	0.024	-34.3
PENRM	MJ	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	73.9	3.3	6.65	83.8	1.24	0	0.036	0.073	0.024	-34.3
SM	kg	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.005	426E-6	0.135	0.140	181E-6	0	7.39E-6	0.001	27.2E-6	-0.004
Acronyms	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, 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.										

Waste & Output Flows

Impact Category	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	0	0	37.4E-6	37.4E-6	0	0	0	0	0	0
NHWD	kg	0	0	818E-6	818E-6	0	0	0	0	0	0
RWD	kg	0	0	0	0	0	0	0	0	0	0
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0.291	0	0
MER	kg	0	0	0	0	0	0	0	0.582	0	0
EE (Electrical)	MJ	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.										

Climate impact

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
*GHG-GWP	kg CO_2 eq	2.17	0.237	0.576	2.98	0.087	0	0.002	1.47	0.011	-1.40

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology
* The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013

REFERENCES

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/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 (ISO14040:2006) 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, 2019:14 Version 1.11 DATE 2019-12-20

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/Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

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Owner of the declaration	FIRAT	**Fırat Plastik Kauçuk San. ve Tic. A.S.** Türkoba Mah.Fırat Plastik Cad. No:23 34537 Büyükçekmece/İstanbul/Türkiye www.firat.com
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