Environmental Product Declaration

In accordance with ISO 14025:2006 for:

Polyethylene PE, granulate (HDPE and LLDPE)

from

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

Programme:	The International EPD® System
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
PCR: 2010:16 Plastics in primary forms, version 3.0.2 Product category classification: UN CPC 347
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.
Life Cycle Assessment (LCA)
LCA accountability: LCA and the EPD prepared by CIS Center LCA team: (*Dmitrii Vadivasov, Valentina Luzanova, Olga Reshetar)*
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 Hüdai Kara, Metsims Sustainability Consulting (www.metsims.com)* 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 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:
SIBUR LLC is the managing organization of PJSC «SIBUR Holding»
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Description of the organisation:
SIBUR is one of the most dynamically developing companies in the global petrochemical industry, a Russian leader in the production of polymers and rubbers.
SIBUR produces popular products for society and uses advanced technologies to create new opportunities, invests in social infrastructure, improving the quality of life of people. SIBUR develops through partnership and exchange of experience, constant growth, movement towards ambitious goals and commitment to the principles of sustainable development.
The company's products are used in many sectors of the economy around the world: construction, food industry, medicine and pharmaceuticals, agriculture, automotive industry and others.

ZAPSIBNEFTEKHIM LLC is a petrochemical plant of the SIBUR group located in Tobolsk. It is the largest petrochemical complex in Russia since 1991. The site is specializing in the processing of a wide fraction of light hydrocarbons, producing monomers, as well as polymers based on them, such as polyethylene (PE) and polypropylene (PP). The main activity of ZAPSIBNEFTEKHIM: production of polyethylene and polypropylene granulate for use in the production of PE and PP products for various purposes.

Name and location of production site:
ZAPSIBNEFTEKHIM LLC
Eastern Industrial District, block 9, building 1/1, Tobolsk, 626150, Tyumen region

Product information

Product name:
Polyethylene PE, granulate (HDPE and LLDPE)

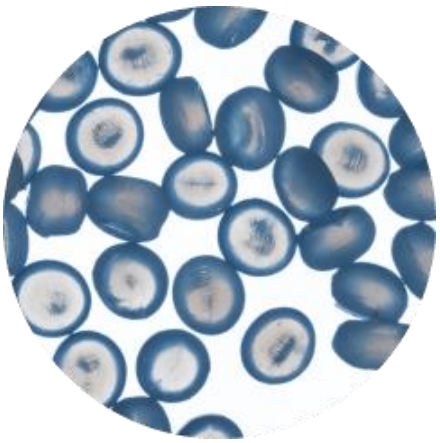
Product identification:
Polyethylene is produced in accordance with the following basic technical specifications:

- Starting and transition grades of polyethylene. technical grades of polyethylene 20.16.10-005-81060768-2019;
- Polyethylene 20.16.10-006-81060768-2018;
- High density polyethylene for pipe production 20.16.10-014-81060768-2018;
- Insulating polyethylene 2211-183-05766801-2014

A complete list of technical specifications and product standards can be requested directly from the manufacturer.

Product description:

Polyethylene is a thermoplastic polymer of ethylene. The material is produced by gas phase polymerization of ethylene. The main raw materials are ethylene, as well as hexene, isobutane, butene-1 and dyes.
To produce PE, ZAPSIBNEFTEKHIM LLC uses ethylene of its own production from pyrolysis production.



Product specification:
PE is usually white, when stretched and thinned, it becomes transparent. It is characterized by chemical and frost resistance. PE is an insulator, shock absorber, softens when heated (80-120°C), hardens when cooled, adhesion (sticking) is extremely low. The material can be sawed, drilled, milled.

Resistant to water, does not react with alkalis of any concentration, with solutions of neutral, acidic and basic salts, organic and inorganic acids, even with concentrated sulfuric acid, but is destroyed by the action of 50% nitric acid at room temperature and under the influence of liquid and gaseous chlorine and fluorine.

The reaction of polyethylene with halogens produces many useful products for the national economy, so this reaction can be used to recycle polyethylene waste.
At room temperature it is insoluble and does not swell in any known solvent.

UN CPC code: 347

Geographical scope: Russia, Global
The structure of electricity generation sources used in Core process of averaged PE corresponds to the structure of generation sources in Russia for 2022.

LCA information

Functional unit / declared unit:
The declared unit used for the EPD is one ton of averaged PE (HDPE and LLDPE) of ZABSIBNEFTEKHIM LLC.

Reference service life:
The Reference service life of PE is from two to five years from the date of manufacture.

Time representativeness:
2022

Database(s) and LCA software used:
OpenLCA version 1.9.0 and secondary datasets from the current versions of the "Environmental Footprint" and Ecoinvent databases.

Description of system boundaries:
In accordance with PCR, the product life cycle can be divided into three life cycle stages (PE product system):

- Upstream processes (from "cradle to gate"),
- Core process (from gate to gate),
- Downstream processes (from "gate to grave").

The collection of upstream, core and downstream processes related to the PE life cycle constitute the boundaries of the PE product system.

Assumptions and excluded lifecycle stages
The following assumptions were made in this study:

- To model the life cycle of PE, only the main inputs and outputs are considered. The mass of flows excluded from the modelling does not exceed 5% of the total mass of PE products and 1% of the mass of flows of the main production process. The contribution to the environmental impacts of excluded flows does not exceed 1% of the total life cycle impacts of PE.
- It was assumed that datasets with a representative year (the year for which the data was collected) different from the representative year for the primary data would be suitable for PE life cycle modelling and would not significantly impact the final study results.

Allocation:
At the production site, primary data for PE production was collected.
Impacts from hydrocarbon feedstock supply were allocated to pyrolysis output fractions based on their net calorific value (allocation by net calorific value).
Emissions of pollutants, generated production waste and consumed energy resources were distributed between the material flows at the output of the corresponding technological process and distributed among the products at the output of this process based on the volume (mass) of their production (allocation by mass).

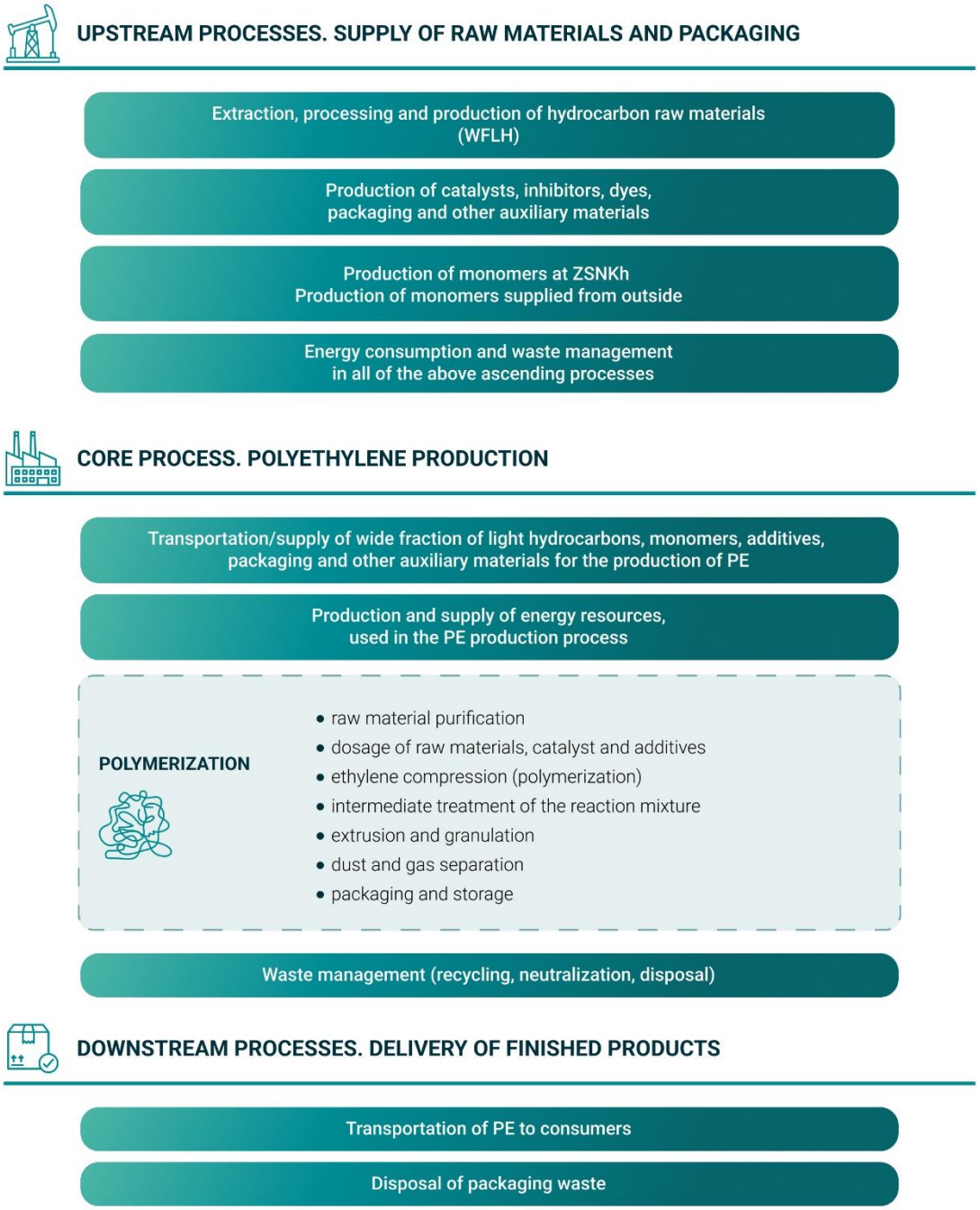
Content declaration

Product components	kg	%	Environmental / hazardous properties
Polyethylene	1000	100	Non-Hazardous
TOTAL	1000		

Packaging

PE granules are supplied to consumers in plastic stretch film and PE bags, stored on wooden and plastic pallets. The impacts from disposal of the plastic stretch film and PE bags were taken into account in the life cycle assessment of PE granulates. For wooden and plastic pallets, the multiple reuse scenario was taken as the base case.

System Diagram:



Results of the environmental performance indicators

Impact category indicators for 1 tonne of Polyethylene (HDPE and LLDPE)

PARAMETER		UNIT	Upstream	Core	Downstream		TOTAL
					Lorry, 500 km	Rail, 500 km	
Global warming potential (GWP)	Fossil	kg CO2 eq.	1.97E+03	3.84E+02	2.71E+01	6.79E+00	2.38E+03
	Biogenic	kg CO2 eq.	4.05E-01	1.67E-01	1.83E-04	6.04E-03	5.72E-01
	Land use and land transformation	kg CO2 eq.	5.00E-01	7.54E-01	6.91E-04	6.82E+00	1.25E+00
	TOTAL	kg CO2 eq.	1.97E+03	3.85E+02	2.71E+01	1.36E+01	2.38E+03
Ozone layer depletion (ODP)		kg CFC 11 eq.	7.49E-06	2.43E-05	7.79E-11	2.57E-09	3.18E-05
Acidification potential (AP)		mol H+ eq.	4.23E+00	1.29E+00	7.76E-07	1.45E-07	5.52E+00
Eutrophication potential (EP)	Aquatic freshwater	kg P eq.	1.10E-01	1.84E-01	3.67E-06	1.42E-05	2.94E-01
	Aquatic marine	kg N eq.	5.70E-01	2.31E-01	4.07E-02	3.88E-03	8.42E-01
	Aquatic terrestrial	mol N eq.	6.67E+00	2.67E+00	4.48E-01	4.10E-02	9.79E+00
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	3.66E+00	1.09E+00	7.85E-02	1.10E-02	4.83E+00
Abiotic depletion potential (ADP)*	Metals and minerals	kg Sb eq.	7.35E-04	1.15E-04	1.68E-06	2.11E-06	8.52E-04
	Fossil resources	MJ, net calorific value	8.46E+04	5.89E+03	3.21E+02	1.17E+02	9.08E+04
Water deprivation potential (WDP)*		m3 world eq. deprived	1.44E+03	8.63E+01	2.01E-02	9.48E-01	1.53E+03

** 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.*

Resource use indicators for 1 tonne of Polyethylene (HDPE and LLDPE)

PARAMETER		UNIT	Upstream	Core	Downstream		TOTAL
					Lorry, 500 km	Rail, 500 km	
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	9.09E+03	1.46E+03	5.50E+02	1.17E+02	1.11E+04
	Used as raw materials	MJ, net calorific value	2.47E+02	0.00E+00	6.51E+03	0.00E+00	6.76E+03
	TOTAL	MJ, net calorific value	9.33E+03	1.46E+03	7.06E+05	0.00E+00	1.79E+04
Secondary material (optional)		kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels (optional)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (optional)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (optional)		m3	9.29E+01	1.45E+00	6.46E-01	0.00E+00	9.50E+01

Waste indicators for 1 tonne of Polyethylene (HDPE and LLDPE)

PARAMETER	UNIT	Upstream	Core	Downstream		TOTAL
				Lorry, 500 km	Rail, 500 km	
Hazardous waste disposed	kg	4.75E-05	1.09E-05	2.15E-06	7.56E-08	6.06E-05
Non-hazardous waste disposed	kg	8.22E+00	2.75E-01	8.36E-01	2.23E-01	9.33E+00
Radioactive waste disposed	kg	5.60E-02	5.84E-03	3.76E-03	1.79E-02	6.56E-02

Additional environmental information

ZAPSIBNEFTEKHIM LLC has an integrated management system for quality, occupational safety and health, and environmental protection. The plant is certified for compliance with management systems according to ISO 9001, ISO 14001, ISO 45001.

References

General Programme Instructions of the International EPD® System. Version 4.0.
PCR 2010:16. Plastics in primary forms. 3.0.2

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