EPD®
THE INTERNATIONAL EPD® SYSTEM

SMARTEX™

Environmental Product Declaration

In accordance with ISO 14025:2006 and ISO 14020:2022 for

Dope Dyed Polyester Knitted Fabric

Programme:	The International EPD® System www.environdec.com
Programme operator:	EPD International AB
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Publication date:	2019-04-29
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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:
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Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)
PCR: 2022:04 Fabrics, version 1.0.1 (valid until 2026-08-23)
PCR review was conducted by: Gorka Benito, who can be contacted via info@environdec.com.

Life Cycle Assessment (LCA)
LCA accountability: Yanjing ZHU from IVL Swedish Environmental Research Institute and Pinqiao REN from IVL Environmental Technologies Company Ltd.

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: Matthew Fishwick from Fishwick Environmental Ltd.

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.

About SMARTEX

As an e.dye® integrated system partner, SMARTEX exclusively converts solution-dyed polyester fabrics using the e.dye® process. We have transformed 1,500 fabrics, from high-performance textiles such as outdoor, indoor, athleisure, and soft goods to workwear, all meeting the highest global standards.

Utilizing e.dye® extruded yarn, SMARTEX leads in sustainable textile development, significantly reducing water, energy, and chemical usage. Our fabrics offer superior color performance, with up to four times the UV fade resistance of traditional dyes, verified by our exclusive “Weather Test” results.

With e.dye’s 10,000 color palette and advanced color development system, SMARTEX provides the best color matching and consistency. Founded in 1985, SMARTEX leverages over 40 years of expertise, serving manufacturers worldwide with offices in Taiwan, China, and active sales in the USA and Europe.

Our commitment to innovation is backed by rigorous R&D and world-class testing facilities, ensuring all products meet global brand standards.

Key Highlights:

- Exclusive Converter: 1,500 fabrics transformed using the e.dye® process.
- Sustainable Innovation: Reducing water, energy, and chemical use.
- Superior Color Performance: Up to 4x UV fade resistance.
- Industry-Leading Color Development: 10,000 colors and unmatched consistency.
- Global Reach: Offices in Taiwan and China, with active sales in the USA and Europe.
- R&D Excellence: World-class testing facilities ensuring top performance.

About e.dye®

With over 20 years of expertise, e.dye Ltd. leads the industry in R&D, delivering unparalleled support and value-added services that give our clients a competitive edge. By controlling the entire supply chain and producing our master batch entirely in-house, we guarantee the highest quality standards.

Our groundbreaking e.dye® Waterless Color System™ revolutionizes fabric dyeing with an eco-friendly, waterless process. Utilizing solution-dyed polyester, we integrate color directly into the yarn by adding it before polymer extrusion, ensuring superior color performance. e.dye® offers an extensive palette of over 10,000 colors and a sophisticated color-matching system for garment textiles and soft goods, etc., marking a paradigm shift in textile dyeing.

About ZTEX

Zhejiang ZhongFang Holding Group Co., Ltd (ZhongFang), established in 1996, is a large textile enterprise located in Hangzhou, Zhejiang Province, covering 130,000 square meters with nearly 2,000 employees. ZhongFang specializes in textile R&D, production, and sales, equipped with advanced dyeing and finishing machinery from Germany, Korea, Italy, Japan, and Taiwan. It operates various machines, including 43 over-flow dyeing machines, 52 air-flow dyeing machines, and 24 heat-setting machines.

In this project, the knitted fabric was dyed and heat set at ZhongFang before being sent back to SMARTEX warehouse for packaging.

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About EPD

An Environmental Product Declaration (EPD) is an independently verified and registered document that communicates transparent and comparable information about the life cycle environmental impact of products. The relevant standard for Environmental Product Declarations is ISO 14025, where they are referred to as “Type III environmental declarations”. A Type III environmental declaration is created and registered in the framework of a programmer, such as the International EPD® System.

The International EPD® System has, as a main objective, the ambition to enable and support organizations in any country to communicate quantified environmental information on the life cycle of their products in a credible, comparable, and understandable way.

All EPDs registered in the International EPD® System are publicly available and free to download on this website: www.environdec.com.

All EPDs are based on Product Category Rules providing rules, requirements, and guidelines for a defined product category. The overall goal of an EPD is to provide relevant and verified information to meet the communication needs in the various applications: procurement, eco-design or environmental management systems. An important aspect of EPD is to provide the basis of a fair comparison of products and services by its environmental performance. EPDs can reflect the continuous environmental improvement of products and services over time and are able to communicate and add up relevant environmental information along a product’s supply chain.

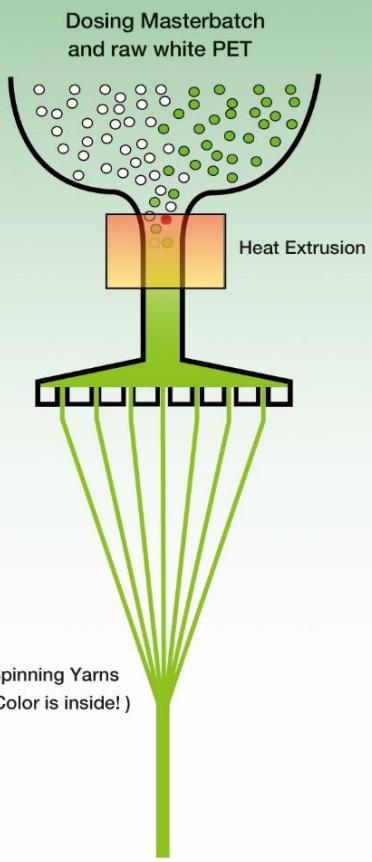
e.dye® Integrated™

e.dye is a solution dyed polyester color system with over 10,000 colors and a sophisticated color-matching process for textiles. Solution dyeing means putting color inside the masterbatch chips, melt spun and extruded into yarn in color, instead of extruding raw white yarn that is later dyed in traditional water dye process.

What is e.dye?

Raw stock PET or rPET
Lusters avaible: bright, semidull and full dull. Up to 95% recycled.
GRS Certified

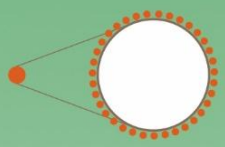
Masterbatch Colors- in stock
Made in-house by e.dye, according to a recipe tied to 10,000 colors in the e.dye Color Bank



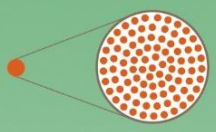
This process eliminates water consumption and reduces chemical use, energy comsumption and CO_2 emissions.

Why is e.dye better?

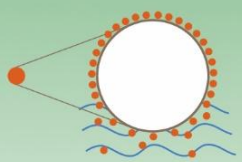
Traditional Piece Dye
Color is outside - of the **surface of the yarn filament.**

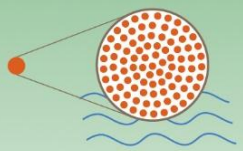


e.dye® Waterless Color System™
Color is inside - evenly dispersed throughout the **entire yarn filament.**

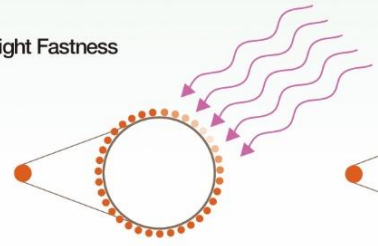


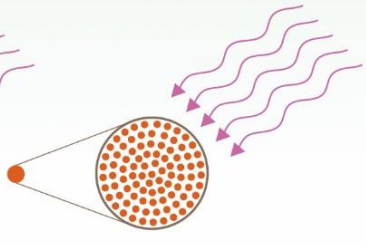
Wash Fastness





Light Fastness





Product Information

Product name: Dope Dyed Polyester Knitted Fabric

Product identification: DPK359-2SDDA

UN CPC code: 281

Geographical scope: Produced in China and end-of-life treatment of product in downstream in worldwide.

Figure 1: DPK359-2SDDA

Product sites:

The manufacturing site for production of Single Pigment Concentrates (SPC) masterbatch, Multi-Pigment Concentrates (MPC) masterbatch, yarn and fabric is Kunshan city, Jiangsu Province;

The scouring and heat setting for fabric was conducted in Hangzhou City, Zhejiang Province.

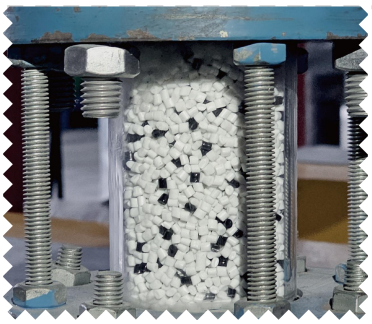
Product description:

The studied product is a black knitted fabric made of dope dyed polyester colored yarn (article number: DPK359-2SDDA, base weight 134 g/m², width 157 cm). The product has a mesh structure, making it suitable as a base layer in contact with the skin. It features characteristics such as breathability, quick drying, and high color fastness.

The primary production processes for fabric manufacturing begin with the masterbatch production (MPC) masterbatch, which includes mixtures of single pigment chips and PET chips. The masterbatch is then processed into partial oriented yarn (POY). Following texturing, drawn textured yarn (DTY) is produced. The DTY is subsequently sent to a subcontractor for knitting into fabric. The fabric is then sent to another subcontractor, Zhejiang ZhongFang Holding Group Co., Ltd., for finishing processes such as scouring, rinsing, and heat setting. After undergoing quality inspection, the finished fabric is packed and returned to SMARTEX's warehouse.

Product characteristics

Production characteristics		Followed standards
Article No.	DPK359-2SDDA	
Fabric Description	Dope dyed knit fabric	
Constructive characteristics		
Composition	100% polyester	
Weave	Knitted fabrics	
Mass per unit area (g/m²)	134	
Width (cm)	157	
Dyeing		
Colorant	Carbon Black/CAS: 1333-86-4. Pigment Violet 23/CAS: 6358-30-1. Pigment Blue 15:3/CAS: 147-14-8.	
Performance characteristics		
Martindale Pilling Test	4-5	EN ISO 12945-2002, Part 2 (2000rubs)
Martindale Abrasion Test	≧60,000 cycles	EN ISO 12947-2016, 9kpa
pH of water extract	5-7.5	EN ISO 3071-2020
Dimensional Change to Washing at 40℃,Tumble Dry 50℃,	+/-5%	EN ISO 6330:2021
Color fastness		
Colour fastness to Artificial light: Xenon arc fading lamp test	7	ISO 105 B02-2014, Cycle A1
Colour fastness to domestic and commercial laundering at 95℃	4-5	ISO 105 C06: 2010, Test number E1S
Colour fastness to domestic and commercial laundering at 60℃	4-5	ISO 105 C06:2010, Test number C1S
Colour fastness to water	4-5	ISO 105 E01:2013
Acid and alkaline perspiration	4-5	ISO 105 E04:2013
Colour fastness to rubbing	Dry 4-5; Wet 4-5	ISO 105 X12:2016

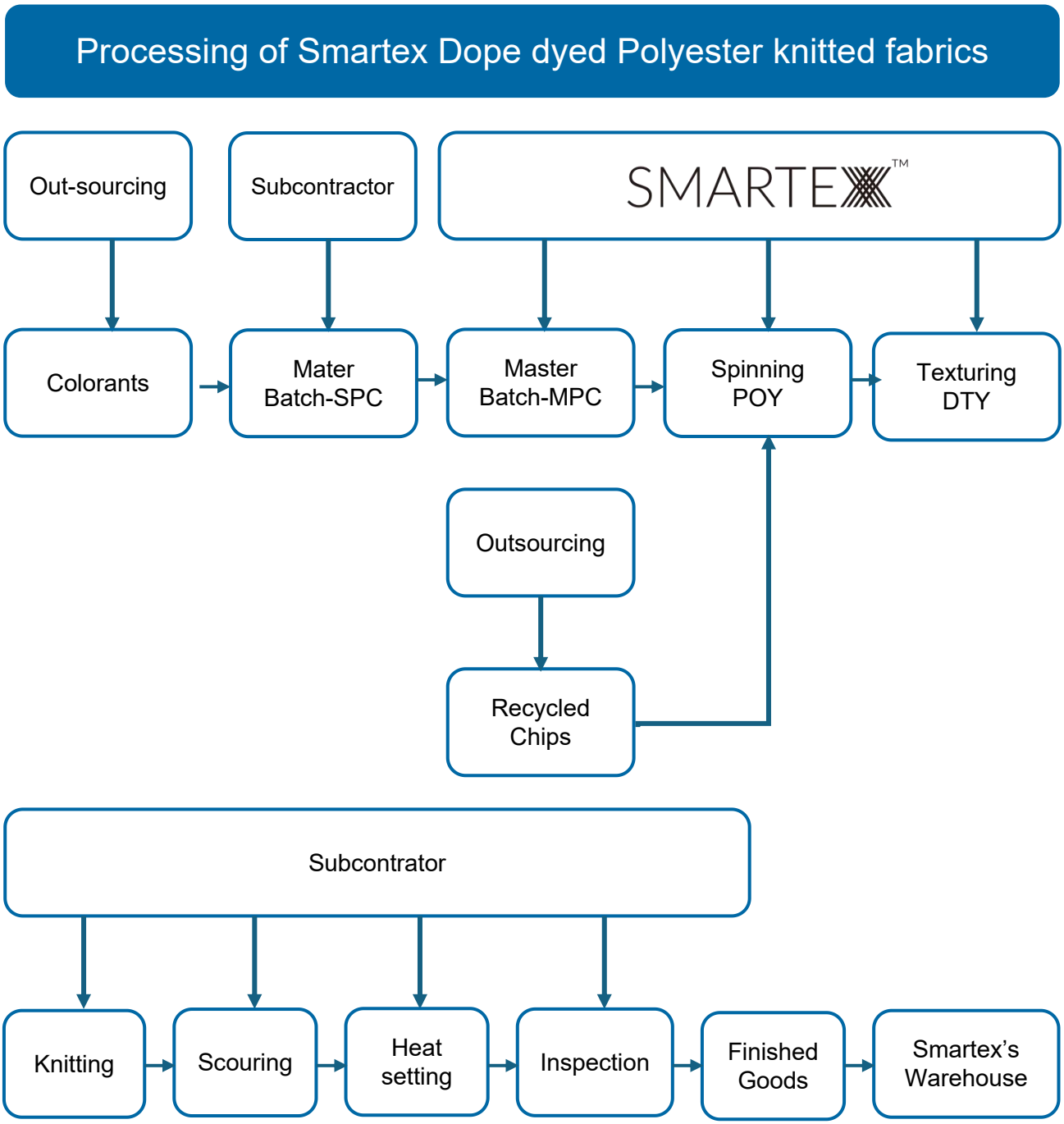
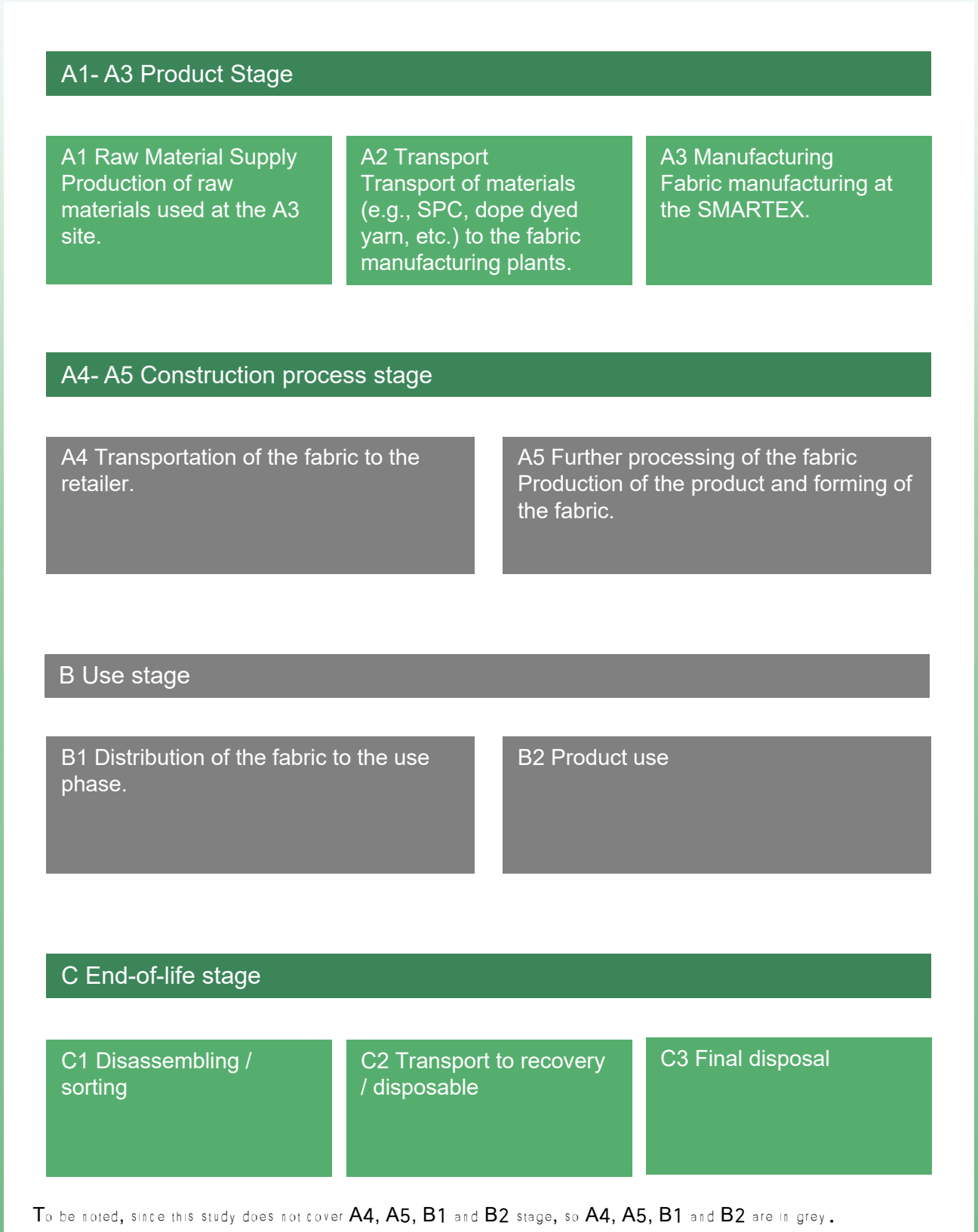



Figure 2 The main production process of studied product

System diagram:



To be noted, since this study does not cover A4, A5, B1 and B2 stage, so A4, A5, B1 and B2 are in grey.

LCA information

Declared unit: 1 m^2 of knitted dope dyed fabric and its packaging (the area of the packaging is not included in the 1 m^2).

Reference service life: Not applicable

Time representativeness: The calendar year of 2023

Database(s) and LCA software used: Managed LCA Content 2023.1 Databases and Ecoinvent 3.9.1 (allocation, cut-off by classification), LCA for Expert software (the former name is Gabi) 10.7

Description of system boundaries: Cradle-to-gate with module C1-C3

Excluded lifecycle stages: A4, A5, B1 and B2 modules are excluded. According to the PCR, these modules are optional.

Allocation: During the production of SPC, MPC, yarn and fabric, co-products are generated, and mass allocation was applied between the product and its co-products. The waste allocation was based on the polluter pays principle.

Specifically, for the recycled PET (rPET), the cut-off end-of-life approach was used. In detail, the rPET reaches the end-of-life stage when it gets the gate of the collection center. It means that before reaching the collection center, the environmental impact is allocated to the waste producer. However, the impact of the recycling process will be assigned to the user of the rPET. In this study, the recycling process mainly includes grinding, metal separation, washing and pelletization.

Cut-off criteria: According to the PCR, the cut-off rule of 1% shall be applied. In other words, the included inventory data shall together give rise to at least 99% of the results of any of the environmental impact categories. Also, 99% of the mass of the product content and 99% of the energy use of the product life cycle shall be accounted for. However, in this study, no cut-off criteria were applied in the study.

Scenarios and additional technical information:

The product is manufactured in China. All associated inputs and outputs of the manufacturing activities were included in the system boundary according to the PCR. However, the product is sold worldwide. Given that the studied product produced by SMARTEX is used in various end-user applications, A4, A5, and B modules are not declared in this study. The end-of-life stage (modules C1-C3) is modeled hypothetically. For C1, it is assumed that the disassembly of the product is done manually, with no additional materials or energy used. For the C2 module, conservative assumptions are made that all waste products are transported 100 km by truck. For C3, it is assumed that the waste products are incinerated with no energy recovery.

The models of electricity mix used in the manufacturing phase of this study are based on the electricity mix of specific provinces. For the manufacturing of SPC, MPC, yarn, and fabric, the manufacturing sites are located in Jiangsu Province, so the electricity model was built according to the electricity mix of Jiangsu Province. However, ZhongFang, which provides heat setting and finishing for the fabric, is located in Zhejiang Province. Therefore, an electricity model representing the electricity mix of Zhejiang Province was built. Both models are constructed based on the China Electricity Yearbook 2022, which provides the ratio of different types of electricity generation sources for each province.

Electricity generation sources	Dataset used in the model	GWP-GHG (CO_2 eq./kWh)
Electricity from fossil fuel	CN: Electricity from hard coal Sphera	1.11E+00
Electricity from hydro power	CN: Electricity from hydro power Sphera	7.45E-03
Electricity from nuclear power	CN: Electricity from nuclear power Sphera	4.46E-03
Electricity from wind power	CN: Electricity from wind power Sphera	1.71E-02
Electricity from photovoltaic	CN: Electricity from photovoltaic Sphera	2.88E-02

Table 1. Electricity structure of the Jiangsu and Zhejiang province and the dataset chosen

The GWP-GHG of electricity mix for Jiangsu province is 0.91 kg CO_2 eq./kWh.

The GWP-GHG of electricity mix for Zhejiang province is 0.81 kg CO_2 eq./kWh.

Content declaration

Components		Weight, kg	Average composition (%)	Post-consumer recycled material, weight-% of product	Biogenic material, kg C/product or declared unit
Fabric	Polyester	0.15	98%	94%	0.00
Packaging	PE bag	0.001	0.34%	0%	0.00
	Paper tube	0.002	1.2%	0%	0.0008
Total		0.15	100%	94%	0.0008

At the time of data collection, no substance included in the Candidate List of Substances of Very High Concern (SVHC) for authorization under the REACH Regulations is present in the products covered by this EPD either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

Packaging

Distribution packaging: PE bag for keeping the yarn clean during distribution

Consumer packaging: Paper tube for fabric wrinkle prevention

Recycled material

The solution dyed polyester fabric covers over 98% of recycled polyester from total post-consumer wastes such as drinking bottles and certified via Global Recycle Standard (GRS) system.

Results of the environmental performance indicators

The environmental performance of 1m² of Dope Dyed Polyester Kitted Fabric is declared and reported below using the baseline characterization factors from the EC-JRC using EN 15804 reference package based on EF 3.1.

Impact category indicators

PARAMETER		UNIT	Upstream	Core	Downstream	TOTAL
Global warming potential (GWP)	Fossil	kg CO_2 eq.	1.04E-01	1.63E+00	3.07E-01	2.04E+00
	Biogenic	kg CO_2 eq.	2.21E-04	7.04E-04	1.53E-05	9.40E-04
	Land use and land transformation	kg CO_2 eq.	6.57E-05	1.70E-03	8.01E-06	1.77E-03
	TOTAL	kg CO_2 eq.	1.05E-01	1.64E+00	3.07E-01	2.05E+00
Ozone layer depletion (ODP)		kg CFC 11 eq.	2.50E-11	1.26E-10	1.96E-14	1.51E-10
Acidification potential (AP)		mol H^+ eq.	6.08E-04	4.38E-03	3.23E-05	5.02E-03
Eutrophication potential (EP)	Aquatic freshwater	kg P eq.	3.09E-06	9.17E-07	7.40E-09	4.01E-06
	Aquatic marine	kg N eq.	2.10E-04	1.10E-03	9.68E-06	1.32E-03
	Aquatic terrestrial	mol N eq.	2.27E-03	1.16E-02	1.57E-04	1.40E-02
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	5.86E-04	3.17E-03	2.59E-05	3.78E-03
Abiotic depletion potential (ADP)*	Metals and minerals	kg Sb eq.	7.40E-08	1.31E-07	2.54E-10	2.06E-07
	Fossil resources	MJ, net calorific value	1.66E+00	2.27E+01	6.19E-02	2.44E+01
Water deprivation potential (WDP)*		m^3 world eq. deprived	2.61E-02	3.90E-01	2.72E-02	4.44E-01

* 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

PARAMETER		UNIT	Upstream	Core	Downstream	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	4.23E-01	4.71E+00	1.33E-02	5.15E+00
	Used as raw materials	MJ, net calorific value	1.36E-02	0.00E+00	0.00E+00	1.36E-02
	TOTAL	MJ, net calorific value	4.37E-01	4.71E+00	1.33E-02	5.16E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	1.27E+00	2.27E+01	6.19E-02	2.40E+01
	Used as raw materials	MJ, net calorific value	5.16E+00	0.00E+00	0.00E+00	5.16E+00
	TOTAL	MJ, net calorific value	6.43E+00	2.27E+01	6.19E-02	2.92E+01
Secondary material (optional)		kg	1.21E-01	0.00E+00	0.00E+00	1.21E-01
Renewable secondary fuels (optional)		MJ, net calorific value	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
Net use of fresh water (optional)		m^3	7.27E-04	7.82E-03	6.40E-04	9.18E-03

Differences versus previous versions

Difference:

1. PCR versions are different. The previously EPD was prepared based on PCR 2012-14 v2.0 Woven knitted or crocheted fabrics which has expired. The current one is based on the PCR 2022:04 Fabric version 1.01.

2. The boundaries are different. The previously EPD is cradle-to-gate. The current one is cradle-to-gate with C1-C3 module.

3. The supporting software is different. The previously EPD used SimaPro (version 8.5.0.0) and the current one uses LCA for expert (Gabi) to support the model building and calculation. Correspondingly, the supporting databases are different.

Comparison results from two versions:

GWP total of the previously EPD fabric (cradle-to-gate) is 2.05 kg CO_2 eq. per DU.

GWP total (cradle-to-gate) of the current EPD is 1.74 kg CO_2 eq. per DU.

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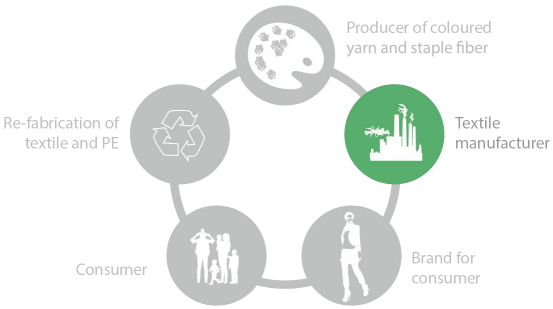

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