TECAWORK™ Ecogreen

EPD®

ENVIRONMENTAL PRODUCT DECLARATION (EPD®)

In accordance with ISO 14025 for: Tecawork™ Ecogreen workwear fabrics: EG 225, EG 260 and EG 310

FROM TENCATE PROTECTIVE FABRICS

Program:	The International EPD® System www.environdec.com
Program operator:	EPD® International AB
EPD® registration number:	S-P-01703
Publication date:	2019-10-28
Validity date:	2024-10-28
Geographical scope:	Europe
EPD® prepared with:	The assistance of RISE IVF AB (Sweden)

TENCATE protectivefabrics | made for life

OWNER OF THE EPD®:

TenCate Protective Fabrics
G. van der Muelenweg 2
7443 RE Nijverdal, The Netherlands

Contact:
Support TenCate Protective Fabrics
support@tencatefabrics.com

Name and location of production site:
Nijverdal

ABOUT TENCATE PROTECTIVE FABRICS

TenCate Protective Fabrics is enabling millions of people world-wide to be great at what they do. Generations of professionals in firefighting, emergency response, military, light and heavy industry, energy, oil and gas have been relying on our fabrics for safety, comfort and confidence. From the harshest working conditions to the welcoming sight of home. Because we recognize that the people we're protecting are unique individuals whose lives extend beyond work. Supporting their evolving needs, our innovations lead the way in user-centered design, technology and sustainability. At TenCate Protective Fabrics, we are proud to carry on our long-standing manufacturing tradition into the future as we continue to design, develop and produce fabrics that bring out the best in professionals. In work as well as in life.

GREATER RESPONSIBILITY FOR PEOPLE AND PLANET

It is our aim to ensure a safe working environment, minimize environmental pollution and create good social conditions for all parties involved in the production process of products supplied to TenCate Protective Fabrics.

We have developed our own independent procedures and standards for waste management, handling and disposal of chemicals and other dangerous materials, emissions and effluent treatment. The procedures and standards must meet the minimum legal requirements and are continuously in development for further improvement.

Our fabrics are fully compliant with European legislation and standards, including OEKO-TEX® and European Union REACH Regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

TenCate Protective Fabrics is certified to ISO 9001, ISO 14001 and CSR Performance Ladder (level 3) standards. We apply a strict management system for the development and monitoring of CSR (Corporate Social Responsibility) within our company, and maintain regular engagement with our stakeholders.

We are an active member of the European Textile Service Association (ETSA). We aim for the highest ETSA classification by developing high quality fabrics that ensure excellent washing performances and maintain great after wash appearances, even after multiple industrial washes. To further develop this quality, we work closely together with end users, test institutes, industrial laundries and garment makers.

TenCate Protect BV is certified according:

WHY AN EPD®?

AN ENVIRONMENTAL PRODUCT DECLARATION (EPD®) DOCUMENT FOR GREATER TRANSPARENCY ON ENVIRONMENTAL PERFORMANCES OF WORKWEAR FABRICS.

Verified LCA-based information to design environmentally friendly workwear with Tecawork™ Ecogreen fabrics.

EPD®

THE SMALLEST ENVIRONMENTAL FOOTPRINT POSSIBLE

The highest quality and most comfortable workwear with the smallest environmental footprint possible: this is the ambitious objective we've set for ourselves with Tecawork™ Ecogreen. Mechanical recycled polyester fibers made of PET-bottles and mixed with TENCEL™ Lyocell fibers made of sustainable sourced wood[1] are at the very source of our range of sustainable fabrics.

THE HIGHEST POSSIBLE TRANSPARENCY

It's our absolute obligation and promise to substantiate the claims we make around our products. In order to achieve the highest possible transparency we strongly believe that the environmental impact of the entire manufacturing chain needs to be thoroughly scanned and analyzed in the smallest detail. From production of raw materials to producing finished fabrics. To establish the most honest environmental impact assessment possible we have compared Tecawork™ Ecogreen fabrics with conventional workwear fabrics typically made of a blend of cotton fibers and virgin polyester fibers.

SUBSTANTIATING OUR CLAIMS

To clearly and evincible substantiate our claims we created this Environmental Product Declaration document (EPD®). An EPD® – also referred to as a type III Declaration – is an independently verified and registered document which provides transparent and comparable information about the environmental performance of a product. It includes for example the impacts associated with the production, such as raw material acquisition, energy use and efficiency, the content of materials and chemical substances, emissions to air, soil and water and waste generation.

PROACTIVELY LEADING THE WAY

Our EPD® is the next level of reporting and an autonomous step forward for TenCate Protective Fabrics. The relevant standard for Environmental Product Declarations is ISO 14025. We are already certified within this same ISO-fourteen thousand series for environmental and quality management systems. Product Category Rules provide a basic structure for all EPD®s. They give exact rules, requirements, and guidelines for each specific product category. EPD® documents are also always verified by external experts. Because of this extreme scrutiny our declaration provides the trust and transparency needed by procurement professionals, product designers and others to avoid any form of greenwashing. With our EPD® we now proactively lead the way towards a clear and controllable decrease of the environmental footprint of products.

LET'S WORK TOGETHER ON A BETTER ECOLOGICAL FOOTPRINT. IF YOU CAN'T MEASURE IT, YOU CAN'T IMPROVE IT!

All registered EPD® documents in the international EPD® system are publicly available and free to download on: www.environdec.com.

Spinning

Weaving

Finishing

Fabric

Quality inspection

TECAWORK™
Ecogreen

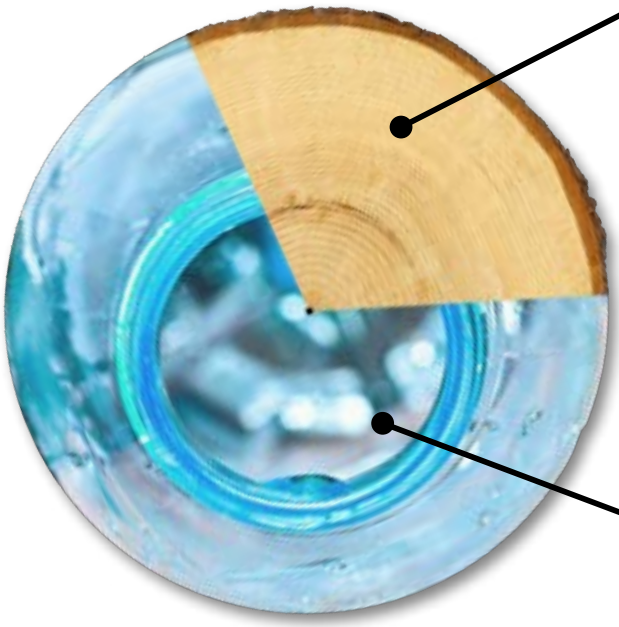
PRODUCT INFORMATION

TECAWORK™ ECOGREEN

To meet the demand for environmentally friendly workwear, TenCate Protective Fabrics has developed a portfolio of comfortable and sustainable fabrics with a low environmental impact: Tecawork™ Ecogreen.

GOODBYE COTTON AND VIRGIN POLYESTER, HELLO TENCEL™ LYOCELL AND RECYCLED POLYESTER

The fabrics are made from 100% green fibers, a blend of TENCEL™ Lyocell fibers from sustainable sourced wood and mechanically recycled polyester fibers from PET bottles. TENCEL™ Lyocell is produced in a closed loop process where more than 99% of the solvent is recovered and reused. All TENCEL™ Lyocell fibers are harvested from natural forests and sustainably sourced plantations without the use of chemical pesticides.



35%
TENCEL™ Lyocell from sustainably sourced wood

65%
Polyester from recycled PET bottles

COMFORTABLE WORKWEAR

When it comes to comfort, TENCEL™ Lyocell absorbs up to 50% more moisture and dissipates it quicker, making it cooler and drier. TENCEL™ Lyocell is also silky smooth to the skin compared to stiffer cotton.

TENCEL™ LYOCELL REDUCES WATER USAGE

The water scarcity impact of TENCEL™ Lyocell fibers is reduced from 994 L/kg for cotton fiber to 46 L/kg for TENCEL™ Lyocell fiber.

POLYESTER UPCYCLING

With Tecawork™ Ecogreen, TenCate Protective Fabrics has achieved 100% polyester upcycling while creating fabrics that equal traditional poly-cotton blends in withstanding heavy usage and industrial laundering. Each strand of recycled polyester used in Tecawork™ Ecogreen can be traced back to its PET bottle origins, 100% guaranteed.

RECYCLED POLYESTER REDUCES ENERGY CONSUMPTION

Mechanically recycled polyester reduces energy consumption by 45%, water consumption by nearly 20% and greenhouse gas emissions by over 30% in comparison to virgin polyester.

SUITABLE FOR INDUSTRIAL LAUNDRY

Tecawork™ Ecogreen fabrics and colours are developed and tested according to ISO 15797 to meet the most stringent laundering requirements at high temperatures (75°C). The fabrics are suitable for tumble drying as well as tunnel drying. Energy-efficient processes can be realized by shortening drying times and/or lowering drying temperatures. Tecawork™ Ecogreen fabrics will dry faster due to the use of TENCEL™ Lyocell fibers that absorb better and dissipate moisture quicker.

THE LIFE CYCLE WE CARE ABOUT

At TenCate Protective Fabrics, developing long-lasting sustainable solutions is part of our mission. It is our way to support professional end users making that sustainable choice, to positively influence the textile industry, to really work together in the workwear value chain and be a valuable partner to garment makers and industrial laundries. With our sustainable fabrics, we want to make that difference to the planet we call home.

TECHNICAL SPECIFICATIONS

FABRICS

Tecawork™ Ecogreen fabrics are used for workwear in a variety of industries, offering ultimate comfort, protection and colour performance to repeated washes. Market segments include healthcare, food & drink industries, automotive, construction, retail and catering, facility management, cleaning and maintenance all over Europe. To answer the diversity of requirements expressed by this variety of end users we have expanded our offering in three fabric weights.

225 g/m²

260 g/m²

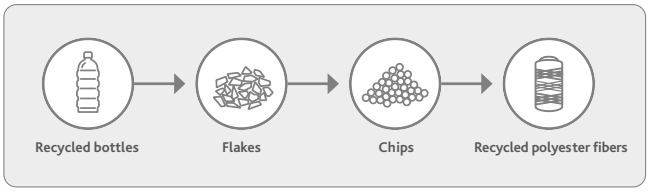
310 g/m²

Find the technical specifications of this range in Table 1, including the benchmark we have captured with standard workwear fabric solutions containing virgin polyester blended with cotton.

CONTENT DECLARATION

RECYCLED MATERIAL

The claim that the mechanical recycled polyester fiber is made with recycled materials (80% post-consumer and 20% pre-consumer recycled polyester) is certified by third parties: Scientific Certification Systems (SCS Certification) as well as the Global Recycled Standard. Certifications are available upon request.



Thanks to a tracer technology (embedded in the fiber) our fabrics can be analysed by the fiber supplier to verify recycled polyester is in there, and in the right amounts.

CHEMICAL SELECTION

All workwear styles are developed in the same production process from spinning the yarn and weaving to dyeing and finishing the fabric (see Figure 1: system boundary process, page 11). Throughout this process, the use of harmful substances is regulated and controlled by OEKO-TEX® standard 100 certification, which ensures that the final fabrics represent no risk to human health and will ensure 'skin friendly' workwear uniforms.

REACH COMPLIANT

TenCate Protective Fabrics is also REACH compliant. REACH is a regulation of the European Union. This regulation is adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals.

All workwear fabrics are finished with an Easy-Care finish to provide crease-resistant properties and minimizing shrinkage. The chemistry used is REACH and OEKO-TEX® 100 compliant.

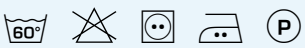
	TECAWORK™ ECOGREEN			BENCHMARK STANDARD WORKWEAR FABRICS			
QUALITY	**EG 225**	**EG 260**	**EG 310**	**PC 215**	**PC 245**	**CP 255**	**TEST METHOD**
Width	153 cm (+2/-1 cm)	153 cm (+2/-1 cm)	153 cm (+2/-1 cm)	153 cm (+2/-1 cm)	153 cm (+2/-1 cm)	153 cm (+2/-1 cm)	ISO 22198: 2006
Weight	225 g/m² (± 5%)	260 g/m² (± 5%)	310 g/m² (± 5%)	215 g/m²	245 g/m² (± 5%)	255 g/m² (± 5%)	ISO 3801: 1977
Composition	65/35% rPet/ TENCEL™ Lyocell	65/35% rPet/ TENCEL™ Lyocell	65/35% rPet/ TENCEL™ Lyocell	65/35% polyester/cotton	65/35% polyester/cotton	65/35% cotton/ polyester	ISO 1833: 1977
Construction	2/1 Twill S	2/1 Twill S	2/1 Twill S	2/1 Twill S	2/1 Twill S	2/1 Twill S	ISO 3572: 1976
Finish	Easy-Care	Easy-Care	Easy-Care	Easy-Care	Easy-Care	Easy-Care	
PHYSICAL PERFORMANCE	**EG 225**	**EG 260**	**EG 310**	**PC215**	**PC 245**	**CP 255**	**TEST METHOD**
Tensile strength	1200 N x 800 N (± 10%)	1300 N x 900 N (± 10%)	1700 N x 1100 N (± 10%)	1200 N x 800 N (± 10%)	1500 N x 900 N (± 10%)	1000 N x 500 N (± 10%)	ISO 13934-1: 1999
Tear strength	35 N x 30 N (± 10%)*	35 N x 30 N (± 10%)**	35 N x 30 N (± 10%)*	35 N x 30 N (± 10%)*	50 N x 40 N (± 10%)**	40 N x 30 N (± 10%)**	*ISO 13937-2: 2000 ** ISO 13937-1: 2000
Pilling	4	4	4	4	2-3	2	ISO 12945-2: 2000 (5000 rubs) After 5x cleaning cycles at 75°C ISO 15797: 2018
Dimensional stability	<2%	<2%	<2%	<3%	<3%	<3%	ISO 5077: 2007 After 5x cleaning cycles at 75 °C ISO 15797: 2018
pH value	4 - 7.5	4 - 7.5	4 - 7.5	4 - 7.5	4 - 7.5	4 - 7.5	NEN-EN-ISO 3071: 2006
COLOUR PERFORMANCE	**EG 225**	**EG 260**	**EG 310**	**PC215**	**PC 245**	**CP 255**	**TEST METHOD**
ROYAL BLUE*	**65634**	**65634**	**65634**	**60624**	**60624**	**60662**	
Laundering 60 °C	Change 4-5 Stain 4-5	Change 4-5 Stain 4	Change 4-5 Stain 4-5	Change 4-5 Stain 4	Change 4-5 Stain 4	Change 4-5 Stain 4-5	ISO 105 C06 C2S: 1997
Laundering 75 °C	Change 4 Stain 4	Change 4 Stain 4	Change 4 Stain 4	Change 4 Stain 3-4	Change 4 Stain 4	Change 4 Stain 4	ISO 105 C06 D2S: 1997
Perspiration Alkaline	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	ISO 105 E04: 2008
Perspiration Acid	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	Change 4-5 Stain 4-5	ISO 105 E04: 2008
Bleaching	Change 4-5	Change 4-5	Change 4-5	Change 4	Change 4	Change 3	ISO 105 N01: 1993
Rubbing Dry Wet	Stain 4-5 Stain 3	Stain 4 Stain 3-4	Stain 4 Stain 3	Stain 4 Stain 3	Stain 4 Stain 3	Stain 4-5 Stain 3-4	ISO 105 X12: 2001 ISO 105 X12: 2001
Artificial light	Change 4	Change 5	Change 4	Change 5	Change 5	Change 5	ISO 105 B02: 2013
CARE LABELLING	**EG 225**	**EG 260**	**EG 310**	**PC215**	**PC 245**	**CP 255**	**TEST METHOD**
Domestic laundering							NEN-EN-ISO 6330, 6N 60 °C: 2013
Industrial laundering	White:  Colour:  75 °C - ISO 15797						Laundering recommendations: www.tencatefabrics.com Qualification label: ISO 30023
CERTIFICATION	**EG 225**	**EG 260**	**EG 310**	**PC215**	**PC 245**	**CP 255**	**TEST METHOD**
	OEKO-TEX® Standard 100, class 2*	OEKO-TEX® Standard 100, class 2*	OEKO-TEX® Standard 100, class 2*	OEKO-TEX® Standard 100, class 2**	OEKO-TEX® Standard 100, class 2**	OEKO-TEX® Standard 100, class 2**	Centexbel, *no. 1803034 ** no. 11-43863

Table 1:

* *For this EPD® – colour Royal Blue has been chosen as the standard for all workwear fabrics. Chemistry will divers slightly per colour recipe.*

LIFE CYCLE ASSESSMENT

CALCULATING ENVIRONMENTAL IMPACT VALUES

Life Cycle Assessment (LCA) is a method for analyzing the environmental impact of a product throughout its life cycle, from the extraction of raw materials (the cradle) to handling the waste (grave). The scope of this particular study is cradle-to-gate and includes all processes up until the fabric is manufactured.

A LCA study has been conducted in accordance with ISO 14044 and the requirements stated in the General Program Instructions by The International EPD® System[1].

GOAL OF THE STUDY

The goal of the LCA study is to calculate environmental impact values for TenCate Protective Fabrics' Tecawork™ Ecogreen – sustainable fabric collection to create this EPD®. The EPD® is used for communicating environmental performance to stakeholders like garment makers, industrial laundries and professional end users.

SCOPE OF THE STUDY

The scope of this study is cradle-to-gate and includes all processes up until the fabric is manufactured and available for sale at TenCate Protective Fabrics (Figure 1). All material and resource consumption is tracked back to the point of raw material extraction, mainly by using cradle-to-gate data[2] from the Ecoinvent database. The functional unit of the study is 1 m^2 of workwear fabric, in accordance with the Product Category Rules (PCR)[3] for woven, knitted or crocheted fabrics (Product category classification: UN CPC 267, 28)

DATA COLLECTION

The inventory for the LCA study was collected for 2018 and carried out of specific data during 2019. This covered all manufacturing processes:

- Spinning yarns and weaving grey cloth
- Finishing of workwear fabric (pre-treatment, dyeing, finishing and quality inspection)*

ALLOCATION

Whenever it has been necessary to partition the system inputs and outputs, mass criteria have been used in accordance with the PCR. Such situations have for example been when the share of energy and water consumption of an entire production plant has been allocated to the specific fiber use or grey cloth based on the total production volume (mass) of the plant.

CUT-OFF RULES

The PCR states that life cycle inventory data for a minimum of 99% of total inflows to the three life cycle stage (upstream, core and downstream modules) shall be included and a cut-off rule of 1% regarding energy, mass and environmental relevance shall apply.

ASSUMPTIONS AND LIMITATIONS

Some general assumptions have been made around transport vehicles to enable use of database data from Ecoinvent4 to represent primary data. Country electricity mix datasets have been used for electricity when the site reports that they use the country electricity net.

DATA QUALITY

The data quality has been considerably increased by the experience from making similar studies in the past. Generally, the LCA data should be used with precaution if interpreted for any other purpose than this EPD®.

ADDITIONAL INFORMATION

ABOUT THE LCA STUDY

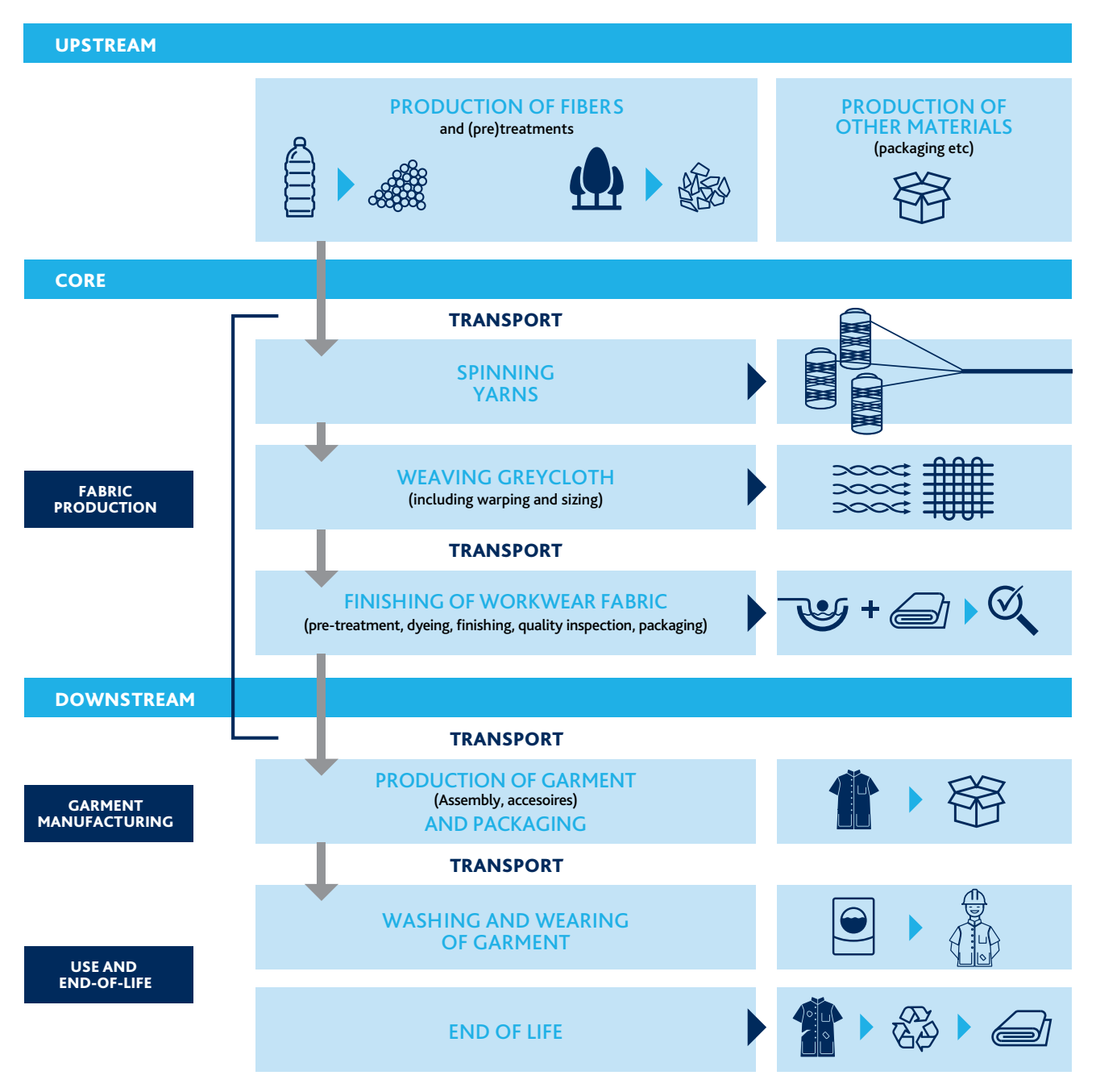
Time representativeness:	2018
Database(s) and LCA Software used:	SimaPro version 9.0.0.48 Ecoinvent version 3.46
Description of system boundaries:	Cradle-to-gate
LCA Practitioner:	Sandra Roos and Kristin Fransson RISE institute (RISE IVF) PO Box 104, SE-431 22 Mölndal, Sweden
Third party reviewer:	Marcus Wendin MILJÖGIRAFF AB Övre Hövik 25b SE-430 84 Göteborg, Sweden

* *The data for fabric manufacturing was collected by the staff of TenCate Protective Fabrics.*

SYSTEM DIAGRAM

The system boundaries of this EPD® are decided by the Product Category Rules (PCR) and illustrated by Figure 1.

Garment manufacturing, retail, use, (industrial)wash and end-of-life processes are not included. The only downstream process included in the system boundary, the transport to the customer, was found to give a negligible contribution to the environmental impact (<1% for all categories). Therefore, the downstream phase is not reported separately.



1 *EPD® International, 'General Program Instructions for the International EPD® System Version 3.0' (2017) <www.environdec.com.>.*

2 *Cradle-to-gate = all processes from cradle (mining site, forest etc.) to gate (until the goods is produced and ready for delivery at the factory gate).*

3 *EPD® International, Product Category Rules According to ISO 14025 for woven, knitted or crocheted fabrics (2016-09-23). Product category classification: UN CPC 267.281. Version 2.0' (2012:14).*

4 *Ecoinvent, 'Ecoinvent' <https://www.ecoinvent.org/database/database.html>.*

5 *PRé Consultants, 'SimaPro 9.0' <http://www.pre-sustainability.com/simapro.*

6 *Ecoinvent (n4).*

ENVIRONMENTAL PERFORMANCE

The potential environmental impact including the use of resources and waste has been analyzed for the upstream and core processes (visualized in the system boundary of Figure 1). The only downstream process included in the system boundary, the transport to the customer, was found to give a negligible contribution to the environmental impact (<1% for all categories). Therefore, the downstream phase is not reported separately.

POTENTIAL ENVIRONMENTAL IMPACT

PARAMETER		UNIT	FABRIC	UPSTREAM	CORE	TOTAL
Global warming potential (GWP)	Fossil	kg CO_2 eq.	EG 225	0.67	1.51	**2.18**
			EG 260	0.78	1.60	**2.37**
			EG 310	0.92	1.81	**2.73**
			P/C 215	1.05	1.47	**2.52**
			P/C 245	1.20	1.65	**2.85**
			C/P 255	1.12	1.61	**2.73**
	Biogenic	kg CO_2 eq.	EG 225	0.05	0.06	**0.11**
			EG 260	0.06	0.06	**0.12**
			EG 310	0.07	0.08	**0.15**
			PC 215	0.02	0.06	**0.07**
			P/C 245	0.02	0.06	**0.08**
			C/P 255	0.02	0.06	**0.07**
	Land use and land transformation	kg CO_2 eq.	EG 225	0.000	0.02	**0.02**
			EG 260	0.001	0.02	**0.02**
			EG 310	0.001	0.06	**0.06**
			P/C 215	0.001	0.01	**0.02**
			P/C 245	0.002	0.01	**0.01**
			C/P 255	0.002	0.01	**0.01**
	TOTAL	kg CO_2 eq.	EG 225	0.72	1.58	**2.31**
			EG 260	0.83	1.68	**2.51**
			EG 310	0.99	1.95	**2.94**
			P/C 215	1.07	1.54	**2.60**
			P/C 245	1.22	1.72	**2.94**
			C/P 255	1.14	1.68	**2.82**

PARAMETER	UNIT	FABRIC	UPSTREAM	CORE	TOTAL
Acidification potential (AP)	kg CO_2 eq.	EG 225	0.0023	0.0088	**0.011**
		EG 260	0.0026	0.0092	**0.012**
		EG 310	0.0031	0.0100	**0.013**
		P/C 215	0.0056	0.0079	**0.014**
		P/C 245	0.0064	0.0090	**0.015**
		C/P 255	0.0075	0.0086	**0.016**
Eutrophication potential (EP)	kg PO_4^{3}- eq.	EG 225	0.0010	0.0018	**0.003**
		EG 260	0.0012	0.0019	**0.003**
		EG 310	0.0014	0.0022	**0.004**
		P/C 215	0.0020	0.0018	**0.004**
		P/C 245	0.0023	0.0021	**0.004**
		C/P 255	0.0032	0.0019	**0.005**
Formation potential of tropospheric ozone (POCP)	kg NMVOC	EG 225	0.0017	0.0054	**0.007**
		EG 260	0.0019	0.0059	**0.008**
		EG 310	0.0023	0.0068	**0.009**
		P/C 215	0.0034	0.0047	**0.008**
		P/C 245	0.0039	0.0055	**0.009**
		C/P 255	0.0040	0.0053	**0.009**
Water scarcity potential	m^3 eq.	EG 225	0.073	0.610	**0.683**
		EG 260	0.084	0.632	**0.716**
		EG 310	0.100	0.694	**0.794**
		P/C 215	6.76	0.66	**7.41**
		P/C 245	7.70	0.76	**8.46**
		C/P 255	14.50	0.72	**15.22**

USE OF RESOURCES

PARAMETER		UNIT	FABRIC	UPSTREAM	CORE	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	EG 225	0.72	2.88	**3.60**
			EG 260	0.83	3.07	**3.90**
			EG 310	0.99	3.90	**4.89**
			P/C 215	4.53	3.06	**7.60**
			P/C 245	5.17	3.06	**8.22**
			C/P 255	8.87	3.02	**11.90**
	Used as raw materials	MJ, net calorific value	EG 225	0	0	**0**
			EG 260	0	0	**0**
			EG 310	0	0	**0**
			P/C 215	0	0	**0**
			P/C 245	0	0	**0**
			C/P 255	0	0	**0**
	TOTAL	MJ, net calorific value	EG 225	0.72	2.88	**3.60**
			EG 260	0.83	3.07	**3.90**
			EG 310	0.99	3.90	**4.89**
			P/C 215	4.53	3.06	**7.60**
			P/C 245	5.17	3.06	**8.22**
			C/P 255	8.87	3.02	**11.90**
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	EG 225	7.38	24.38	**31.8**
			EG 260	8.52	25.78	**34.3**
			EG 310	10.16	28.68	**38.8**
			P/C 215	19.20	23.72	**42.9**
			P/C 245	21.88	26.93	**48.8**
			C/P 255	17.65	25.93	**43.6**
	Used as raw materials	MJ, net calorific value	EG 225	0	0	**0**
			EG 260	0	0	**0**
			EG 310	0	0	**0**
			P/C 215	6.68	0	**6.68**
			P/C 245	7.62	0	**7.62**
			C/P 255	4.27	0	**4.27**
	TOTAL	MJ, net calorific value	EG 225	7.38	24.38	**31.80**
			EG 260	8.52	25.78	**34.30**
			EG 310	10.16	28.68	**38.80**
			P/C 215	25.88	23.72	**49.58**
			P/C 245	29.50	26.93	**56.42**
			C/P 255	21.92	25.93	**47.87**

USE OF RESOURCES

PARAMETER	UNIT	FABRIC	UPSTREAM	CORE	TOTAL
Secondary material	kg	EG225	0.17	0.00	**0.17**
		EG 260	0.19	0.00	**0.19**
		EG 310	0.23	0.00	**0.23**
		P/C 215	0	0	**0**
		P/C 245	0	0	**0**
		C/P 255	0	0	**0**
Renewable secondary fuels	MJ, net calorific value	EG225	0	0	**0**
		EG 260	0	0	**0**
		EG 310	0	0	**0**
		P/C 215	0	0	**0**
		P/C 245	0	0	**0**
		C/P 255	0	0	**0**
Non-renewable secondary fuels	MJ, net calorific value	EG 225	0	0	**0**
		EG 260	0	0	**0**
		EG 310	0	0	**0**
		P/C 215	0	0	**0**
		P/C 245	0	0	**0**
		C/P 255	0	0	**0**
Net use of fresh water	m^3	EG 225	0.000	0.014	**0.014**
		EG 260	0.000	0.014	**0.014**
		EG 310	0.000	0.014	**0.014**
		P/C 215	6.36	0.014	**6.38**
		P/C 245	7.25	0.014	**7.27**
		C/P 255	14.02	0.014	**14.03**

WASTE PRODUCTION AND OUTPUT FLOWS

PARAMETER	UNIT	FABRIC	UPSTREAM	CORE	TOTAL
Hazardous waste disposed	kg	EG 225	0.000	0.003	**0.003**
		EG 260	0.000	0.004	**0.004**
		EG 310	0.000	0.005	**0.005**
		P/C 215	0.000	0.003	**0.003**
		P/C 245	0.000	0.004	**0.004**
		C/P 255	0.000	0.004	**0.004**
Non-hazardous waste disposed	kg	EG 225	0.000	0.030	**0.030**
		EG 260	0.000	0.033	**0.033**
		EG 310	0.000	0.037	**0.037**
		P/C 215	0.000	0.029	**0.029**
		P/C 245	0.000	0.032	**0.032**
		C/P 255	0.000	0.037	**0.037**
Radioactive waste disposed	kg	All products	0	0	**0**

ADDITIONAL INFORMATION

The diagrams below show selected results from the environmental performance tables per square meter of fabric.

WATER SCARCITY FOOTPRINT REDUCED

The water scarcity footprint of Tecawork™ Ecogreen fabrics compared to poly-cotton fabrics is reduced by up to 95%. This stems mainly from substituting cotton fibers by TENCEL™ Lyocell fibers in the upstream processes, which is illustrated in Figure 2.

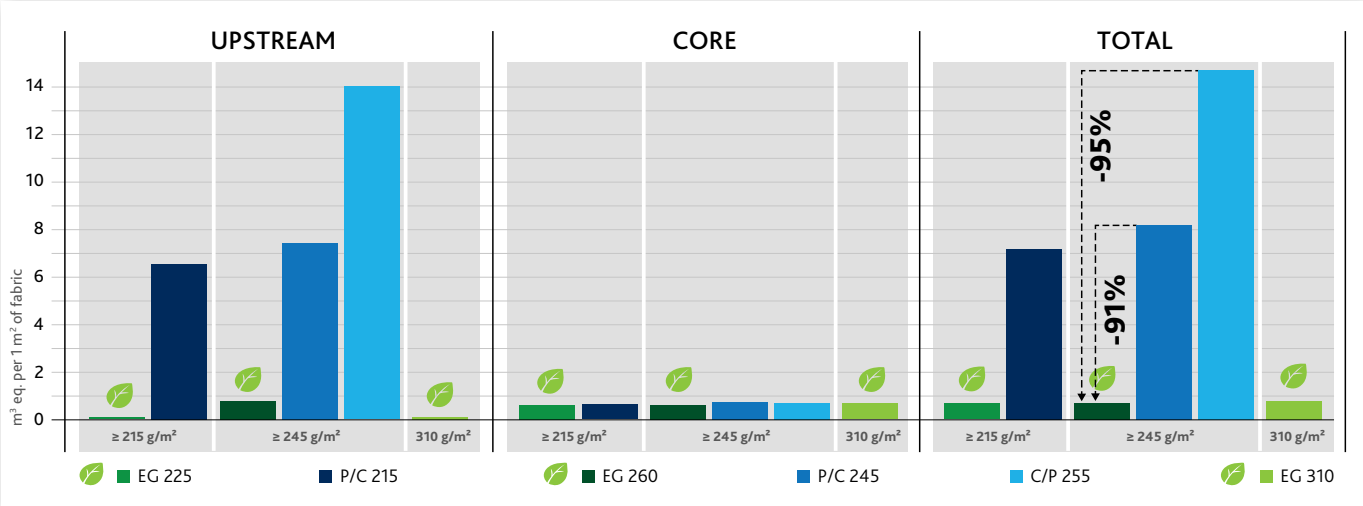


Figure 2. The Water Scarcity Footprint of Tecawork™ Ecogreen fabrics EG 225, EG 260, EG 310 compared to poly-cotton fabrics P/C 215, P/C 245 and C/P 255. Figures for one square meter fabric.

NO CHEMICAL FERTILIZERS

Wood and pulp used to make TENCEL™ Lyocell comes from natural forests and plantations that grow without using chemical fertilizers. A major step forward knowing that cotton cultivation is criticized for its use of pesticides, using 25% of the world consumption of insecticides on a land area which is only 2.4% of total agriculture.

LOWER CHEMICALS CONSUMPTION

Figure 3 shows the amounts of chemicals that are used in the core processes of the production of the fabrics. The production of Tecawork™ Ecogreen fabrics has a lower chemicals consumption compared to poly-cotton fabrics.

As a general conclusion, the results show a high dependence on fabric weight. The fabric weight is designed to match the quality requirements for the final product, the garment. High quality performance prolongs the garments' life span, and the environmental impact per use (likewise the economic cost per use) gets lower for each time the product can be used. The quality performance is decided by several parameters: strength as well as looks after washing and wearing.

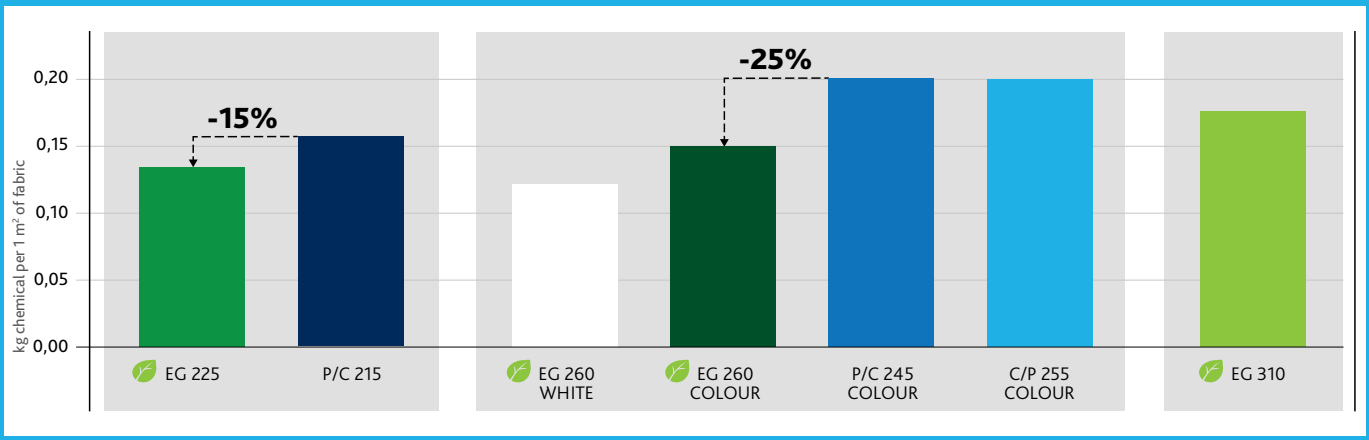


Figure 3. The chemicals usage in the core processes for Tecawork™ Ecogreen fabrics EG 225, EG 260, EG 310 compared to poly-cotton fabrics P/C 215, P/C 245 and C/P 255. Figures for one square meter fabric.

GLOBAL WARMING POTENTIAL

The Global Warming Potential (GWP) of Tecawork™ Ecogreen fabrics compared to poly-cotton blended fabrics are shown in Figure 4. The lower climate impact stems from using less fossil fuels in the upstream phase due to the use of 65% recycled polyester fibers instead of virgin polyester as well as substituting cotton cultivation by 35% TENCEL® Lycocell fibers. The core processes depend on fabric weight where lighter fabrics are more resource intensive to produce.

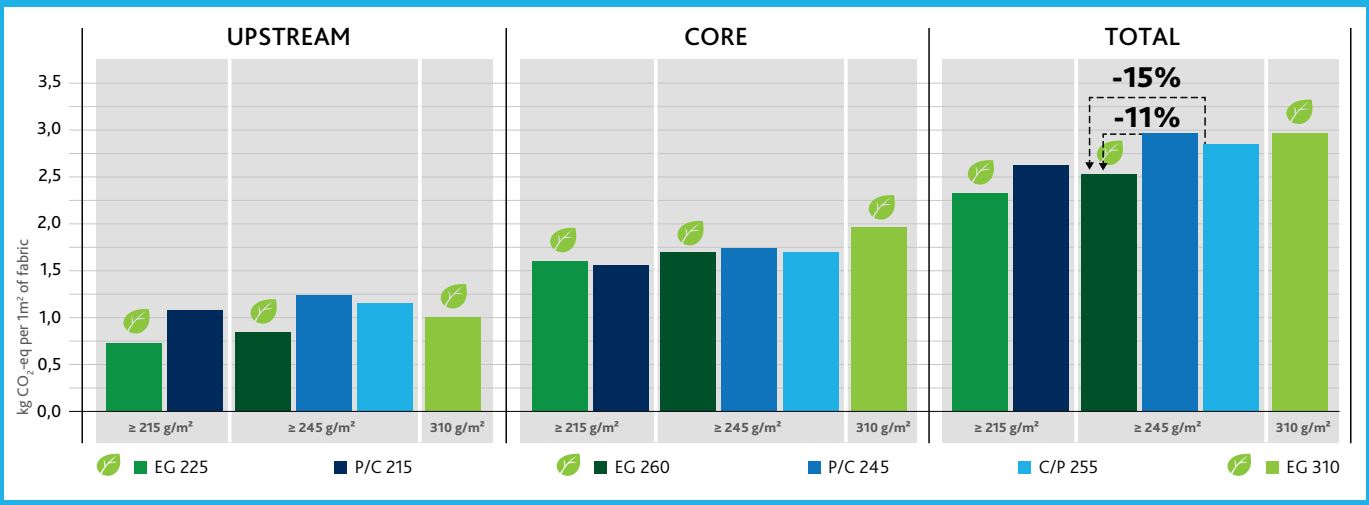


Figure 4. The Global Warming Potential of Tecawork™ Ecogreen fabrics EG 225, EG 260, EG 310 compared to poly-cotton fabrics P/C 215, P/C 245 and C/P 255. Figures for one square meter fabric.

IMPACT ON CLIMATE

The following results illustrate the contribution to climate impact throughout the value chain from fiber to fabric production. This illustration is an example of the Tecawork™ Ecogreen - EG 260 fabric displayed in Figure 4 – which is a breakdown of the total Global Warming Potential figure.

This means we can conclude that fiber production and fabrics preparation are the most contributing processes.

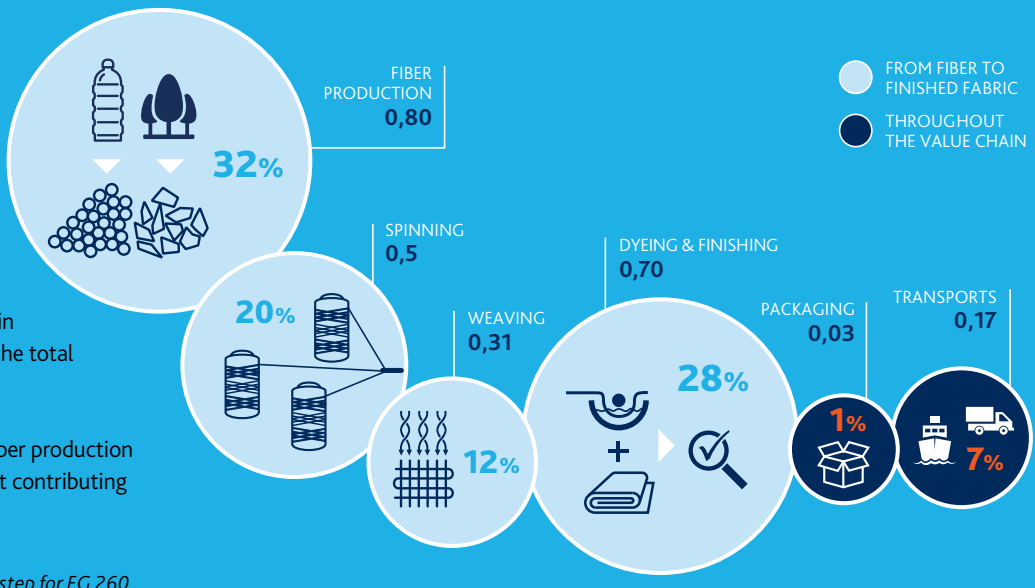


Figure 5. Climate impact per processing step for EG 260.

PRODUCTION TECHNOLOGY

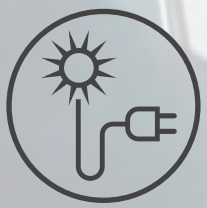
In addition to the environmental performance of our workwear fabrics (pag 16 – 17 of the EPD®), TenCate Protective Fabrics continuously strives to make improvements for a safe, social and sustainable environment for all stakeholders.

We have established a solid base by innovating on our products and improving our production technologies. As the examples below show, this already has had a positive effect on the environmental impact of our production process. Continued improvements on different assets ensure we keep on contributing to a better world.

WASTE WATER TREATMENT

TenCate Protective Fabrics applies highly efficient waste water treatment and technologies to improve the environment. It's a stable process that is practically odour-free and sludge-free, making sludge treatment obsolete. Efficiency on this comes from the removal of 60% COD (Chemical Oxygen Demand) as well as all toxicity. After discharge, the water is clean to the point that further neutralisation can be handled by the sewage treatment company.

An additional advantage of this waste water treatment technique is the formation of biogas. TenCate Protective Fabrics uses this purified source of energy to create steam for the standard manufacturing process that otherwise would have been wasted.



ENERGY CARE

In compliance with ISO 14001, TenCate Protective Fabrics uses an energy management system that ensures continuous improvements. In line with compliance, an energy-efficiency plan (EPP 2017-2020) has been developed and carried out. Recent examples of realised energy savings are:

- The upgrade from conventual to LED-lighting in all operational and auxiliary facilities. This has resulted in a reduction of energy consumption by 80%.
- Within operations a flue gas condenser is installed in the exhaust of the steam generator to preheat the water used in our 40°C and 60°C systems. This investment reduces the direct gas consumption significantly with >14%.
- The investment in a state-of-the-art continuous dyeing line that is much more energy-efficient and better insulated (the previous machinery dated from the 1980s).

The energy source used for electricity is supported by green power generated mainly by wind turbines. Guarantees of its origin are available via certification upon request.

CLEAN AIR (AIR)

TenCate Protective Fabrics purifies air from exhausting emissions with extraction systems to ensure that no harmful substances are released and odours are depleted. This system is compliant with all hydrocarbon regulations (class O3 < 100 mg/m^3 and O2 < 50 mg/m^3).

PROGRAM-RELATED
INFORMATION AND VERIFICATION

The EPD® owner has the sole ownership, liability, and responsibility for the EPD®. EPD®s within the same product category but from different programs may not be comparable.

Program	• The International EPD® System • EPD® International AB, Box 210 60, SE-100 31 Stockholm, Sweden • www.environdec.com, info@environdec.com
EPD® registration number	S-P-01703
Published	2019-10-28
Valid until	2024-10-28
Product Category Rules	pcr2012-2014 v2.1. Woven, knitted and crocheted fabrics (2016-09-23)
Product group classification	UN CPC 267.281 – version 2.0 (2012: 04)
Reference year for data	2018
Geographical scope	Europe
PCR review was conducted by	Eurojersey Spa & Centro Tessile Cotoniero e Abbigliamento Spa.
Independent third-party verification of the declaration and data, according to ISO 14025:2006	☐ EPD® process certification ☑ EPD® verification
Third party verifier	Marcus Wendin Miljögiraff AB
Approved by	The International EPD® System
Procedure for follow-up of data during EPD® validity involves third party verifier	☐ YES ☑ NO

REFERENCES

Anonymous. (2019b).
Facility A for weaving and yarn spinning.

Ecoinvent, 'Ecoinvent'
<https://www.ecoinvent.org/database/database.html>

EPD® International, 'General Programme Instructions for the International EPD® System Version 3.0' (2017)
<www.environdec.com.>

EPD® International. (2019). PCR 2012:14. Woven, knitted or crocheted fabrics (of synthetic fibers). Product category classification: UN CPC 267, 281. Product category rules according to ISO 14025. Version 2.12. Stockholm.

TenCate Protective Fabrics (2019) - production facility for dyeing and finishing.

PRé Consultants, 'SimaPro 9.0'
<http://www.pre-sustainability.com/simapro>

Contact information:

EPD® International AB
info@environdec.com
www.environdec.com

TENCATE protectivefabrics

G. van der Muelenweg 2
P.O. Box 186
7440 AD Nijverdal
The Netherlands

Tel: +31 (0)548 633922
E-mail: protectivefabrics@tencatefabrics.com
tencatefabrics.com