

ENVIRONMENTAL PRODUCT DECLARATION for ECONYL® NTF WARPED YARNS ON BEAMS (produced in Europe)

 EPD®

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

This environmental product declaration is compliant with ISO 14025

Owner of the declaration:
Aquafil S.p.A., Via Linfano 9, 38062 Arco Italy

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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.

1

THE COMPANY

Aquafil Group history began in 1969, when the Bonazzi's family built the first manufacturing plant in Arco (Trentino Alto Adige region, Italy). In 1970, the Group began the polymerization and production of polyamide 6 at this facility, which started Aquafil's market share acquisition in the BCF yarn sector (polyamide yarn for textile flooring). During the '80s, significant investments allowed a consolidation and diversification of the Group's activities. The most significant diversification of the Group's operation occurred in 1995 when the Aquafil Group finalized the first privatization of a public company in the newly born Republic of Slovenia. This acquisition allowed Aquafil to start its Nylon Textile Filament (NTF) product area.

Meanwhile, the Group continued to widen its product offering by opening several production plants in Europe and entering (with its "Polyamide products priority focus" always in mind) the Engineering Plastics business to supply engineering plastics to the automotive, electronics and construction industries. At the same time, the Group started its internationalization process with the creation of Aquafil USA, based in Cartersville, Georgia (USA).

Between 2000 and 2010, the Group expanded its presence in all three key markets where it was operating (carpet yarn, textile yarn and engineering plastics), gradually becoming a global leader in the manufacturing of Polyamide 6 fibers. In 2005, a manufacturing facility was established in Thailand for processing and marketing BCF products for the carpet industry in the Asian area. In 2009, a new manufacturing facility was built in China to assist in the ever-growing Asian market. In 2013, the Group sold the Engineering Plastics division to DOMO and acquired DOMO's BCF business Xentrys.

In 2007 the company started the development of a visionary project aligned with its manufacturing and market growth focus. Driven by a genuine concern for the environment, resources and investments were dedicated to the design and construction of the ECONYL® Regeneration Plant (the recycling of pre- and post-consumer Polyamide 6 waste material), which was launched in 2011. As of 2019, the Group operates 16 manufacturing plants worldwide with more than 2,900 employees, in eight countries (Italy, Slovenia, Croatia, Germany, United Kingdom, USA, Thailand and China) on three continents (Europe, North America and Asia).

IT OPERATES 2 DIFFERENT PRODUCT AREAS:

- **BCF** *Carpet yarns for the flooring market*
 - **NTF** *Special yarns for sportswear and fashion applications*
-

In 2008, during the engineering and design phase of Aquafil's **ECONYL® Regeneration System**, a third production area was created - Energy & Recycling.

This Energy & Recycling operating unit is dedicated to the promotion of sustainability and environmental issues. It has a transverse nature in respect to the other product areas, providing solutions and innovative technologies in the area of energy, recycling and the promotion of the culture of sustainability both inside and outside of the Group.

2

PROGRAMME INFORMATION

PROGRAMME OPERATOR

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

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and

Institute Bauen und Umwelt e.V. (IBU); Panoramstr.1, 10178 Berlin;

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EPDs within the same product category but from different 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.

The EPD owner has the sole ownership, liability, and responsibility for this EPD.

VERIFICATION INFORMATION

<p>Accountabilities for PCR, LCA and independent, third-party verification</p>
<p>Product Category Rules (PCR)</p>
<p>Product category rules (PCR): PCR 2013:12, Textile yarn and thread of natural fibres, Man-made filaments or staple fibres, version 3.0</p>
<p>PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Hüdai Kara. The review panel may be contacted via the Secretariat www.environdec.com/contact.</p>
<p>Life cycle assessment (LCA)</p>
<p>LCA accountability: Aquafil S.p.A.</p>
<p>Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: EPD process certification by accredited certification body Third-party verification: Bureau Veritas is an approved certification body accountable for the third-party verification The certification body is accredited by: SWEDAC (Accreditation number: 1236)</p>
<p>Procedure for follow-up during EPD validity, as defined in the GPI, involves third-party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>

3

PRODUCT INFORMATION

OWNER OF THE EPD

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PRODUCTION SITES INCLUDED IN EPD

- **AquafilSLO - Ljubljana** (Letališka cesta 15, 1000 Ljubljana, Slovenia)
> *process B, C, D*
- **AquafilSLO - Ajdovščina** (Tovarniška cesta 15, 5270 Ajdovščina, Slovenia)
> *process A*
- **AquafilSLO - Senožeče** (Senožeče 151, 6224 Senožeče, Slovenia)
> *process E*
- **Aquafil Carpet Recycling (ACR#1) - Phoenix** (3555 W. Washington street, 85009 Phoenix, USA)
> *process S*

DESCRIPTION OF THE PRODUCT

ECONYL® Nylon Textile Filament yarns are made from 100 % recycled PA6 polymer. Nylon Textile yarns can be reprocessed by warping processes. ECONYL® Nylon Textile Filament yarn is used in several applications such as swimwear, intimate apparel, fashion, sports and tights.

This EPD refers to the ECONYL® raw white or black warped nylon filament yarns on beams that are a group of Nylon Textile Filament yarns produced in Europe.

The Group of yarn is consisting of several similar products, but different in terms of parameters that are not significant for the group of products.

AVAILABLE CERTIFICATIONS OF PRODUCTION SITES

ISO standard	AquafilSLO Ljubljana	AquafilSLO Ajdovščina	AquafilSLO Senožeče	ACR#1 Phoenix
ISO 9001:2015	X	X	X	
ISO 14001:2015	X	X	X	
ISO 45001:2018	X	X	X	
ISO 50001:2018	X	X	X	
SA 8000:2014	X	X	X	

IDENTIFICATION OF THE PRODUCT ACCORDING TO THE UN CPC SCHEME

264 – Textile yarn and thread of man-made filaments or staple fibres.

PRODUCT CHARACTERISTICS

ECONYL® WARPED YARNS ON BEAMS

TECHNICAL SPECIFICATION	NAME	TEST METHOD
Basic polymer; % of basic polymer / Generic name of synthetic fiber; % of synthetic fiber	100% Polyamide 6	EN ISO 1043-1:2011 ISO 2076:2010
Type of yarn or fiber	Filament yarn	ISO 8159:1987
Type of processing	Fully Drawn Yarn	BISFA
Intended use	See section “Description of the product”	-
Resulting linear density	17 dtex-78 dtex	ISO 2060-1994
Filament number	Various	-

DECLARED UNIT

Declared unit is 1 kg of ECONYL® NTF Warped yarn on beams, with end of life. The product is being supplied to the customer on metal beams which are being reused, therefore no impacts are associated to the mentioned type of packaging.

REFERENCE SERVICE LIFE

This EPD does not indicate RSL.

GEOGRAPHICAL SCOPE OF THE EPD

Global.

DATA COLLECTION

Life cycle assessment primary data of processes owned by Aquafil Group were collected from period of January 2022 to December 2022.

BACKGROUND DATA AND METHOD

All the background data relevant for modelling were taken from Gabi database – content version 2023.2, software version GaBi 10.7.1.28. Gabi EN15804 +A2 assessment method based on EF 3.1 is used.

SYSTEM BOUNDARIES

This is a »Cradle-to-grave« EPD; use phase of the product is not included.

Upstream processes include processes that provide materials and energy input for the system including their transportation.

Core processes include manufacturing processes and the transportation of materials into the core processes.

Downstream processes include transportation to average retailer and the End of Life of a product which is based on the available studies and from data for

Europe. End of Life consists of 8% reuse, 10% recycling, 24.9% incineration and 57.1% landfill.

CUT OFF CRITERIA

In general, Life Cycle Inventory data for a minimum of 99% of total inflows (mass and energy) to the upstream, core and downstream module is included.

ASSUMPTIONS AND ALLOCATIONS

The Life Cycle Analysis study is representing large number of similar products, each time taking into consideration an average primary data, for an average mix of products, within the same product group (ECONYL® NTF warped yarns on beams), same geographical position of processes and same time frame (year 2022).

Sensitivity analysis has been performed in order to guarantee the validity of reported impacts.

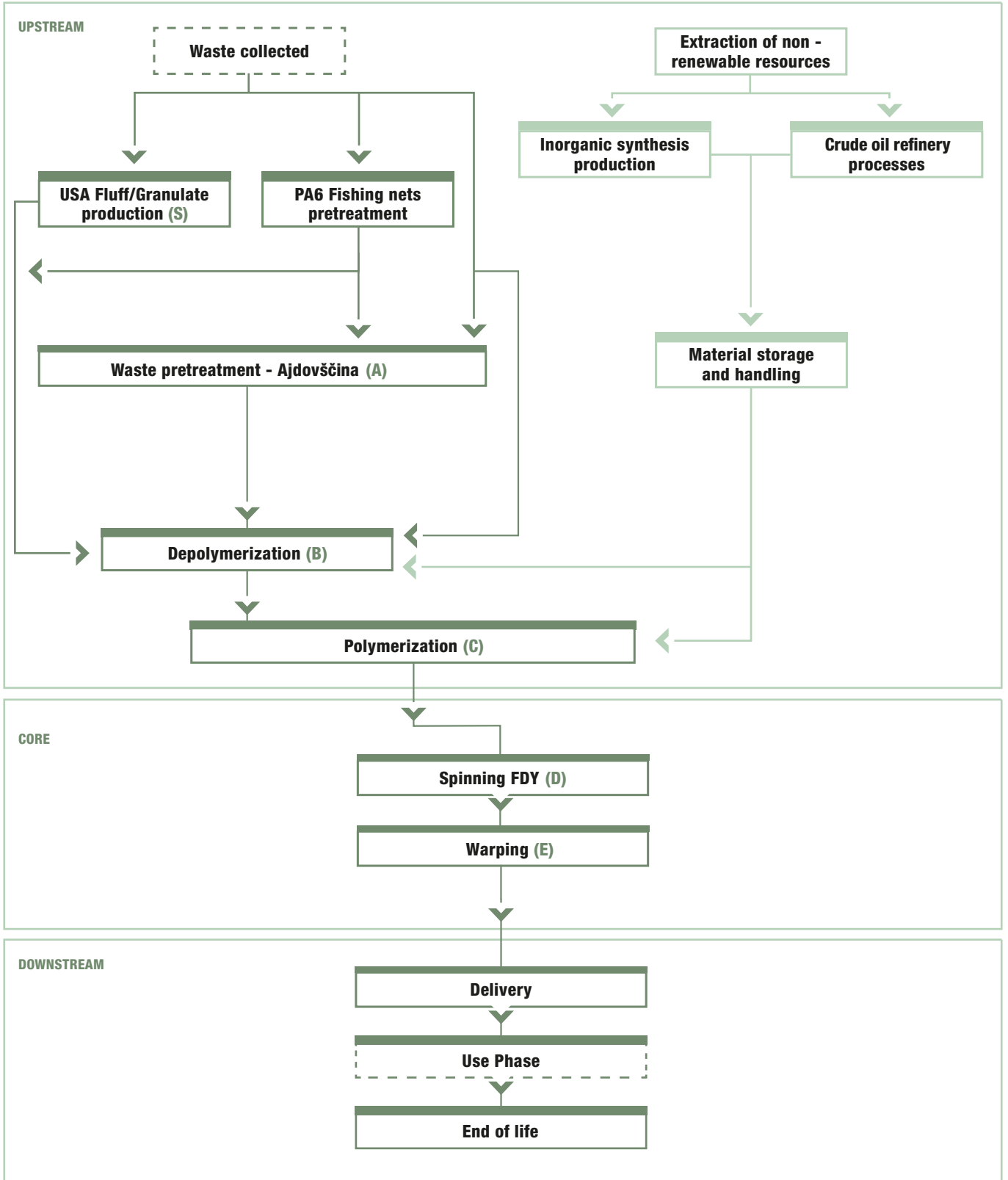
For waste being recycled, the environmental impact of processes until the end-of-waste state are attributed to the product system generating the waste, therefore are not included into this LCA study. Processes after the end-of-waste state are attributed to the product system using the recycled material flow (recycled materials are thereafter considered secondary materials).

Primary packaging material was considered:

- in FDY spinning process: paper tubes.

Excluded secondary packaging materials: paper boxes & separators, wooden pallets, labels, plastic bags, extensible film & adhesive tape.

SYSTEM BOUNDARIES



--- PROCESSES NOT INCLUDED IN EPD

□ PROCESSES INCLUDED IN EPD

□ PROCESSES RELATED TO THE PRODUCTION OF AUXILIARY CHEMICALS

4 CONTENT DECLARATION

ITEM	% OF MATERIAL WEIGHT	% OF BIOBASED MATERIAL		% OF WHICH RECYCLED	
				PRE CONSUMER SHARE	POST CONSUMER SHARE
Polyamide 6	93-96	0	0	50	50
Pigments (white and black)	0-1,6	0	0	0	0
Spin Finish	1,0-1,5	0	0	0	0
Water	3-4	0	0	0	0
TOTAL	100	0	0	50	50

ECONYL® NTF yarns do not contain any materials / substances hazardous to health and the environment (carcinogenic, mutagenic or toxic to reproduction, PBT, vPvB) or substances of very high concern (SVHC), according to Regulation (EC) No 1907/2006 and Regulation (EC) No 1272/2008.

Nylon Textile Filament ECONYL® yarns are OEKOTEX® 100 class I certified and OEKOTEX® 100 class II certified.

Input raw material is waste that is being collected and then further recycled within the Aquafil’s system boundaries to produce recycled PA6 polymer.

All types of yarns are then produced out of 100 % recycled PA6 polymer with post-consumer and pre-consumer recycled content certified by independent third party Global Recycled Standard;

Scope Certificate Number: CU816676GRS-2023-00095306.

5 ENVIRONMENTAL PERFORMANCE

POTENTIAL ENVIRONMENTAL IMPACTS

ECONYL® NTF WARPED YARNS ON BEAMS

IMPACT CATEGORIES	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP Biogenic	kg CO ₂ eq	2,75E-02	7,41E-03	6,72E-01	7,07E-01*
GWP Fossil	kg CO ₂ eq	6,73E-01	1,92E-01	6,72E-01	1,54E+00*
GWP Land use	kg CO ₂ eq	1,53E-03	6,98E-04	3,16E-04	2,54E-03*
GWP Total	kg CO ₂ eq	7,02E-01	2,00E-01	1,34E+00	2,25E+00*
Acidification Potentials	mol H ⁺ eq	6,51E-03	8,96E-04	1,41E-03	8,82E-03*
Photochemical Ozone Creation P.	kg NMVOC eq	5,12E-03	8,25E-04	2,03E-03	7,97E-03*
Ozone Depletion Potential (ODP)	kg CFC 11 eq	8,26E-10	2,20E-11	1,33E-13	8,48E-10*
Eutrophication Potential – freshwater	kg P eq	2,96E-05	1,29E-05	7,87E-06	5,04E-05*
Eutrophication Potential – marine	kg N eq	2,99E-03	8,84E-04	1,02E-03	4,89E-03*
Eutrophication Potential – terrestrial	mol N eq	1,95E-02	3,19E-03	7,56E-03	3,02E-02*
Abiotic Depletion Potential – minerals and metals	kg Sb eq	2,50E-07	1,87E-07	3,65E-09	4,41E-07*
Abiotic Depletion Potential – fossil resources	MJ net calorific value	6,72E+00	2,85E+00	1,28E+00	1,09E+01*
Water Scarcity Potential	m ³ eq	8,09E-01	6,45E-02	6,12E-02	9,35E-01*

Totals may not match, because of rounded data

The environmental impact indicators are in line with EF 3.1 and EN15804 (version 2.0)

** Total value includes EoL of a product under study. In order to obtain the performance of Aquafil's production processes, the Upstream and Core life cycle stages should only be considered*

USE OF RESOURCES

ECONYL® NTF WARPED YARNS ON BEAMS

USE OF RESOURCES		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - renewable	Use as energy carrier	MJ, net calorific value	2,04E+01	2,57E+01	1,19E-01	4,63E+01*
	Use as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	2,04E+01	2,57E+01	1,19E-01	4,63E+01*
Primary energy resources - non renewable	Use as energy carrier	MJ, net calorific value	6,74E+00	2,85E+00	1,28E+00	1,09E+01*
	Use as raw materials	MJ, net calorific value	3,13E+01	0,00E+00	0,00E+00	3,13E+01
	TOTAL	MJ, net calorific value	3,81E+01	2,85E+00	1,28E+00	4,22E+01*
Use of secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non - renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water		m3	2,00E-02	1,85E-03	1,49E-03	2,33E-02*

Totals may not match, because of rounded data
 * Total value includes EoL of a product under study. In order to obtain the performance of Aquafil's production processes, the Upstream and Core life cycle stages should only be considered

WASTE PRODUCTION AND OUTPUT FLOWS

ECONYL® NTF WARPED YARNS ON BEAMS

OUTPUT FLOW	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg	2,22E-03	1,43E-03	9,09E-11	3,65E-03*
Non-hazardous waste disposed	kg	2,32E-01	1,74E-02	4,17E-01	6,67E-01*
Radioactive waste disposed	kg	5,43E-05	4,04E-05	1,44E-05	1,09E-04*

Totals may not match, because of rounded data
 * Total value includes EoL of a product under study. In order to obtain the performance of Aquafil's production processes, the Upstream and Core life cycle stages should only be considered

OUTPUT FLOW	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	8,46E-02	1,52E-01	1,00E-01	3,37E-01*
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	5,27E-01	8,50E-03	1,34E+00	1,88E+00*
Exported energy, thermal	MJ	9,36E-01	1,50E-02	1,97E+00	2,92E+00*

Totals may not match, because of rounded data
 * Total value includes EoL of a product under study. In order to obtain the performance of Aquafil's production processes, the Upstream and Core life cycle stages should only be considered



ADDITIONAL INFORMATION

5

ADDITIONAL INFORMATION

This chapter is intended to provide specific additional information about the ECONYL® Regeneration System as well as some comments of its environmental benefit.

In 2009, we set ourselves the challenge of collecting waste material all over the world and turning it into recycled polymers. It is possible to mention other environmental benefits, besides those appreciated from the impact categories investigated in the present study. In fact, part of virgin raw materials extraction and natural resources exploitation is prevented by the use of waste otherwise disposed of.

The European Commission has estimated that the EU discards 5.8 million tons of textiles and apparel every year, 75% of this is sent to landfill or incinerated, but the vast bulk is destined for landfill. The USA generates 12.7 million tons of textile waste; of this only 14.9% is recycled (US Environmental Protection Agency, 2009, which means more than 85% is waste, again largely being sent to landfill).

To put this number in context, in 2009, a total of 71.6 million tons of fiber was used around the world. This means that the EU and the USA in one year alone discarded 18.5 million tons is equal to 26% of annual global fiber usage.

Another aspect not directly emerging from the present study, which is worth a mention, is the contribution to the prevention of oceans pollution from the collection of fishing nets in their end-of-life.

6

DIFFERENCES VERSUS PREVIOUS VERSION OF EPD

Current version of EPD is compliant to the GPI 4.0 and PCR 2013:12 version 3.0 while the previous de-registered EPD for ECONYL® nylon textile filament yarn was compliant to GPI 3.01 and PCR 2013:12 version 2.11.

As a consequence to that, most importantly a new assessment method for environmental impact calculations was used and the end of life stage was taken into account as well. In order to obtain the performance of Aquafil's production processes, the Upstream and Core life cycle stages should only be considered.

References

> AQUAFIL METHODOLOGICAL REPORT OF THE EPD PROCESS

Version 1.0

> AQUAFIL EPD PROCESS MANUAL

Version 1.0

> ISO 14025:2010

Environmental labels and declarations — Type III environmental declarations — Principles and procedures

> GENERAL PROGRAMME INSTRUCTIONS 4.0

> PCR 2013:12

Textile yarn and thread of natural fibres, man-made filaments or staple fibres, version 3.0

> ISO EN 1043-1:2011

Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics

> ISO 2076:2010

Textiles — Man-made fibres — Generic names

> BISFA - INTERNATIONAL BUREAU FOR THE STANDARDIZATION OF MAN-MADE FIBRES

> ISO 2060-1994

Textiles — Yarn from packages — Determination of linear density (mass per unit length) by the skein method

> ISO 9001:2015

Quality management systems — Requirements

> ISO 14001:2015

Environmental management systems — Requirements with guidance for use

> ISO 45001:2018

Occupational health and safety management system — requirements with guidance for use

> ISO 50001:2018

Energy management systems — Requirements with guidance for use

> SA 8000:2014

Social accountability 8000 International standard

> CARRERA E., CAYUELA D., RIBA M., RODRIQUEZ B.

Estudio sobre la composición en fibras de la ropa usada, Universitat politecnica de Catalunya Barcelona Tech, Institut d'Investigació textil i Cooperació Industrial Terrassa, 2.6.2021