

ENVIRONMENTAL PRODUCT DECLARATION for ECONYL® NYLON TEXTILE FILAMENT YARNS



EPD®

**CPC263&264-TEXTILE YARN AND THREAD OF NATURAL FIBERS, MAN-MADE FILAMENTS OR STAPLE FIBERS
PCR2013:12 VERS. 2.11**

Program: The International EPD® System, www.environdec.com

Program 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

Publication date: 2015 - 02 - 11

Revision 6, 2020 - 05 - 07

Certification No.: S-P-00278

Valid until: 2025 - 05 - 07



COMPANY AND PRODUCT

Related information

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THE COMPANY

Aquafil Group history began in 1969, when the Bonazzi 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 yarn 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 operational unit was created - Energy & Recycling.

This Energy & Recycling operational 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.

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PROGRAM INFORMATION

PROGRAM OPERATOR

EPD international AB: Valhallavägen 81, SE-114 27 Stockholm Sweden;
E-mail: info@environdec.com

COMPARABILITY

EPDs within the same product category but from different programs may not be comparable.

OWNERSHIP

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

VERIFICATION INFORMATION

CPC263&264-Textile yarn and thread of natural fibers, man-made filaments or staple fibers

PCR2013:12 vers. 2.11

PRC review was conducted by: Technical Committee of the International EPD® System

Independent third-party verification of the declaration and data, according to ISO 14025:2010:

EPD process certification EPD verification

Third party verifier:

Bureau Veritas, accredited by SWEDAC

www.bureauveritas.com

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

YES

NO

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PRODUCT INFORMATION

OWNER OF THE EPD

Aquafil S.p.A., Via Linfano 9, 38062 Arco, Italy

P: +39 0464 581111

E-mail: info@aquafil.com

To get more information about this environmental declaration or about Aquafil activities please contact:

Lucija Aleksić

E- mail: lucija.aleksic@aquafil.com

T. +386 (0)40 193499

LCA performed by:

Jaka Jelenc

E-mail: jaka.jelenc@aquafil.com

T. +386 (0)30 646255

DESCRIPTION OF THE PRODUCT

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

This EPD refers to two types of Nylon Textile Filament yarns

- **ECONYL®** FDY yarns on beam
- **ECONYL®** texturized yarns on cones

Environmental performances for each group of yarn is reported separately. Each group of yarn is consisting of several similar products, but differences in terms of parameters are not significant for all three groups of products.

IDENTIFICATION OF THE PRODUCT ACCORDING TO THE UN CPC SCHEME

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

PRODUCTION SITES INCLUDED IN EPD

- **AquafilSLO d.o.o. - Ljubljana** (Letališka cesta 15, 1000 Ljubljana, Slovenia) > *process E, F, G & H*
 - **AquafilSLO d.o.o. - Ajdovščina** (Tovarniška cesta 15, 5270 Ajdovščina, Slovenia) > *process I*
 - **AquafilCRO d.o.o.** (Ul. Milana Prpića 114, 49243, Oroslavje, Croatia) > *process L*
 - **AquafilSLO d.o.o. - Senožeče** (Senožeče 151, 6224 Senožeče, Slovenia) > *process K*
 - **Aquafil Carpet Recycling (ACR#1)** Phoenix (3555 W. Washington street, 85009 Phoenix, USA) > *process S*
- **Production country:** Slovenia, Croatia
 - **Reference markets:** apparel industry

ISO standard	AquafilSLO Ljubljana	AquafilSLO Ajdovščina	AquafilSLO Senožeče	AquafilCRO	Aquafil S.p.A.	ACR#1 Phoenix
ISO 9001 : 2015	X	X	X	X	X	
ISO 14001 : 2015	X	X	X	X	X	
OHSAS 18001 : 2007	X	X	X	X	X	
ISO 50001 : 2011				X		

PRODUCT CHARACTERISTICS

TECHNICAL SPECIFICATION	NAME	TEST METHOD
Commercial article description	ECONYL® FDY yarn on beams	-
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 2.1	-
Resulting linear density	17 dtex-78 dtex	ISO 2060-1994
Filament number	various	-

TECHNICAL SPECIFICATION	NAME	TEST METHOD
Commercial article description	ECONYL® textured yarn on cones	-
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	Textured Filament yarn	ISO 8159:1987
Type of processing	Partially Oriented Yarn / False Twist Texturizing	BISFA
Intended use	See section 2.1	-
Resulting linear density	17 dtex-120 dtex	ISO 2060-1994
Filament number	various	-

GEOGRAPHICAL SCOPE OF THE EPD

Global.

DECLARED UNIT

Declared unit is 1 kg of ECONYL® yarn delivered and including primary packaging.

REFERENCE SERVICE LIFE

This EPD does not indicate RSL.

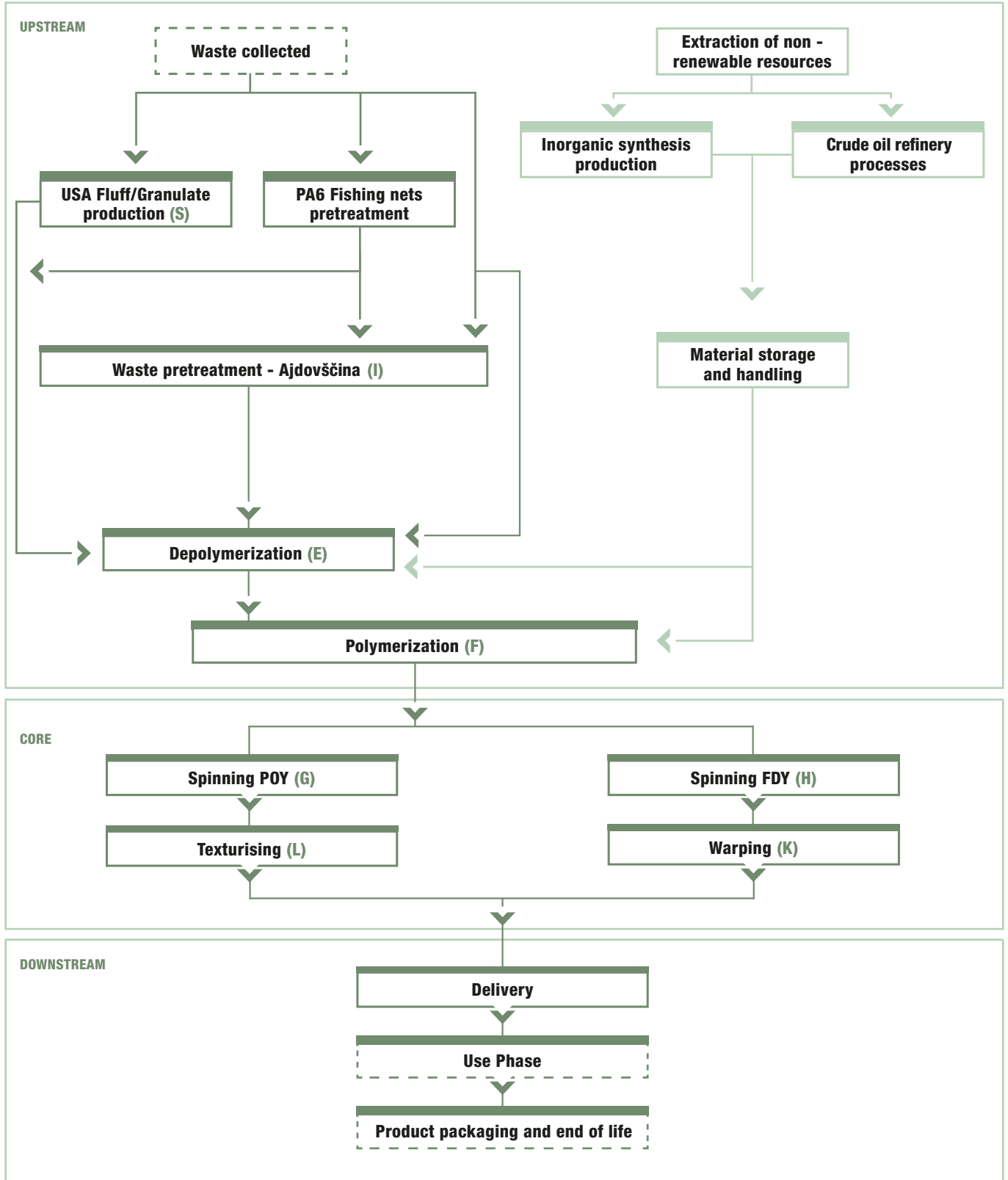
DATA COLLECTION

Life cycle assessment primary data of processes owned by Aquafil group were collected from period of January 2019 to December 2019.

BACKGROUND DATA AND METHOD

All the background data relevant for modelling were taken from Gabi database – service pack 40, (update 2020). CML2001, January 2016 assesment method is used.

SYSTEM BOUNDARIES



CONSIDERED LIFE CYCLE STAGES

Upstream processes include:

- **extraction of non-renewable resources**
- **additives and auxiliary's production**
- **all relevant transportation**
- **waste materials, that are entering pretreatment plant and are constituted of three main types of waste:**
 - A. PA6 fishing nets collection
 - B. PA6 carpets, fluff or granules
 - C. Oligomers and other plastics waste generated by polymer industries

Depending on the type and shape of waste, it can be cleaned, sorted, grinded, washed, granulated or pelletized.

All waste material is characterized with the specific feedstock energy entering the system and the processes are described by means of energy use and emissions.

- **ECONYL® plant operation**
 - A. washing (if and when necessary)
 - B. depolymerization (where specific mix of waste is transformed back into secondary raw material - caprolactam)
 - C. purification of caprolactam
- **polymer production**

All energetic input flows (electricity, heating fuels, steam...) and water consumption to the upstream processes are considered. All emissions to air, water and soil and treatment of waste and wastewater generated are considered as well.

Core Process include:

- **spinning process (POY or FDY)**
- **post spinning processes; texturizing or warping**
- **transportation of materials into the core processes**

All energetic input flows (electricity, heating fuels, steam...) and water consumption to the upstream processes are considered. All emissions to air, water and soil and treatment of waste and wastewater generated are considered as well.

Downstream processes include transportation to average retailer / distribution platform:

- **300 km by truck**

Use phase and end of life of product are not included.

CUT OFF CRITERIA

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

All energy inflows are considered in the study.

Primary packaging material was considered:

- **polymerization process: tank truck**
- **spinning (POY & FDY) and texturizing: paper tubes**

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

4 CONTENT DECLARATION

A. ECONYL® FDY YARNS ON BEAM

TYPE OF PRODUCT/SERVICE	% OF MATERIAL BY WEIGHT	CAS NUMBER
Polyamide 6	93-96	25038-54-4
Pigments	0-1,6	several
Spin Finish	1,0-1,5	several
Water	3-4	7732-18-5
TOTAL	100%	
Percent of which main materials, pigments and dye stuff, and other materials is bio-based	0%	

B. ECONYL® TEXTURIZED YARNS ON CONES

TYPE OF PRODUCT/SERVICE	% OF MATERIAL BY WEIGHT	CAS NUMBER
Polyamide 6	93-96	25038-54-4
Pigments	0-1,4	several
Spin Finish	1,5-2,0	several
Water	3-4	7732-18-5
TOTAL	100%	
Percent of which main materials, pigments and dye stuff, and other materials is bio-based	0%	

ECONYL® 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.

All types of yarns are produced out of 100 % recycled PA6 polymer, with post-consumer and post-industrial recycled content certified by independent third party DNV 18590-2008-PC-ITA-DNV.

5 ENVIRONMENTAL PERFORMANCE

POTENTIAL ENVIRONMENTAL IMPACTS

> **TABLE A.** ECONYL® FDY yarn on beams;

IMPACT CATEGORIES		UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP biogenic*	kg CO ₂ eq	0,01	-0,05	-1,00E-04	-0,05
GWP fossil*	kg CO ₂ eq	0,77	0,26	0,02	1,05
GWP Land use*	kg CO ₂ eq	2,55E-03	9,67E-04	1,59E-04	3,68E-03
GWP total*	kg CO ₂ eq	0,78	0,21	0,02	1,01
Acidification Potentials	kg SO ₂ eq	7,53E-03	1,07E-03	8,77E-05	8,69E-03
Photochemical Ozone Creation P.	kg C ₂ H ₂ eq	5,76E-04	1,07E-04	8,14E-06	6,91E-04
Eutrophication Potentials	kg PO ₄ eq	1,97E-03	7,55E-04	2,16E-05	2,75E-03
Abiotic Depletion Potential - elements	kg Sb eq	4,14E-07	4,29E-07	1,62E-09	8,44E-07
Abiotic Depletion Potential - fossil fuel	MJ net calorific value	8,10	3,27	0,26	11,63
Water scarcity potential	m ³ eq	1,06	0,17	1,76E-04	1,23

Totals may not match, because of rounded data

> **TABLE B.** ECONYL® texturized yarn on cones;

IMPACT CATEGORIES		UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP biogenic*	kg CO ₂ eq	0,01	-0,27	-1,00E-04	-0,26
GWP fossil*	kg CO ₂ eq	0,76	0,34	0,02	1,12
GWP Land use*	kg CO ₂ eq	2,51E-03	8,12E-03	1,59E-04	0,01
GWP total*	kg CO ₂ eq	0,77	0,08	0,02	0,87
Acidification Potentials	kg SO ₂ eq	7,41E-03	1,60E-03	8,77E-05	9,10E-03
Photochemical Ozone Creation P.	kg C ₂ H ₂ eq	5,67E-04	1,28E-04	8,14E-06	7,04E-04
Eutrophication Potentials	kg PO ₄ eq	1,94E-03	1,01E-03	2,16E-05	2,97E-03
Abiotic Depletion Potential - elements	kg Sb eq	4,08E-07	6,23E-07	1,62E-09	1,03E-06
Abiotic Depletion Potential - fossil fuel	MJ net calorific value	7,98	3,89	0,26	12,13
Water scarcity potential	m ³ eq	1,04	0,51	1,76E-04	1,55

Totals may not match, because of rounded data

USE OF RESOURCES

>TABLE A. ECONYL® FDY yarn on beams

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - renewable	Use as energy carrier	MJ, net calorific value	18,38	25,84	0,01	44,24
	Use as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	18,38	25,84	0,01	44,24
Primary energy resources - non renewable	Use as energy carrier	MJ, net calorific value	8,96	3,77	0,28	13,01
	Use as raw materials	MJ, net calorific value	34,42	0	0	34,42
	TOTAL	MJ, net calorific value	43,38	3,77	0,28	47,43

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Secondary material		kg	1,58	0	0	1,58
Renewable secondary fuels		MJ, net calorific value	0	0	0	0
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	0

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Net use of fresh water		m ³	0,03	4,25E-03	1,71E-05	0,03
Agricultural land use for renewable material production		m ²	0	0	0	0

Totals may not match, because of rounded data

>TABLE B. ECONYL® texturized yarn on cones

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - renewable	Use as energy carrier	MJ, net calorific value	18,10	28,82	0,01	46,94
	Use as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	18,10	28,82	0,01	46,94
Primary energy resources - non renewable	Use as energy carrier	MJ, net calorific value	8,83	4,74	0,28	13,85
	Use as raw materials	MJ, net calorific value	33,92	0	0	33,92
	TOTAL	MJ, net calorific value	42,75	4,74	0,28	47,77

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Secondary material	kg	1,55	0	0	1,55
Renewable secondary fuels	MJ, net calorific value	0	0	0	0
Non-renewable secondary fuels	MJ, net calorific value	0	0	0	0

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Net use of fresh water	m ³	0,03	0,01	1,71E-05	0,04
Agricultural land use for renewable material production	m ²	0	0	0	0

Totals may not match, because of rounded data

WASTE PRODUCTION AND OUTPUT FLOWS

> **TABLE A.** ECONYL® FDY yarn on beams

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg	2,30E-03	1,54E-03	1,22E-08	3,84E-03
Non-hazardous waste disposed	kg	0,30	0,03	4,02E-05	0,33
Radioactive waste disposed	kg	6,42E-05	6,98E-05	3,25E-07	1,34E-04

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg	0	0	0	0
Material for recycling	kg	0,16	0,13	0	0,30
Materials for energy recovery	kg	0	0	0	0
Exported energy, electricity	kg	0,60	0	0	0,60
Exported energy, thermal	kg	1,06	0	0	1,06

Totals may not match, because of rounded data

> **TABLE B.** ECONYL® texturized yarn on cones

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg	2,27E-03	2,06E-03	1,22E-08	4,33E-03
Non-hazardous waste disposed	kg	0,29	0,03	4,02E-05	0,33
Radioactive waste disposed	kg	6,32E-05	1,28E-04	3,25E-07	1,91E-04

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg	0	0	0	0
Material for recycling	kg	0,05	0,22	0	0,26
Materials for energy recovery	kg	0	0	0	0
Exported energy, electricity	kg	0,57	0	0	0,57
Exported energy, thermal	kg	1,01	0	0	1,01

Totals may not match, because of rounded data

OTHER ENVIRONMENTAL INDICATORS

>TABLE A. ECONYL® FDY yarn on beams

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
CML2001 - Jan. 2016, Freshwater Aquatic Ecotoxicity Pot. (FAETP inf.)	kg DCB eq.	1,10E+03	233	0,311	1,33E+03

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Energy content of product	MJ	34,42	0	0	34,42
% of bio-based	%	0	0	0	0

Totals may not match, because of rounded data

>TABLE B. ECONYL® texturized yarn on cones

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
CML2001 - Jan. 2016, Freshwater Aquatic Ecotoxicity Pot. (FAETP inf.)	kg DCB eq.	1,08E+05	208	0,311	1,29E+03

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Energy content of product	MJ	33,92	0	0	33,92
% of bio-based	%	0	0	0	0

Totals may not match, because of rounded data

BY - PRODUCT GENERATED

PARAMETER	UNIT	UPSTREAM
ECONYL® FDY yarn on beams	MJ/kg	1,79
ECONYL® texturized yarn on cones	MJ/kg	1,77

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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 which 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.



ADDITIONAL INFORMATION

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DIFFERENCES VERSUS PREVIOUS VERSION OF EPD

The main reason for GWP reduction compared to previous version of EPD is due to implementation of 100% biomass steam consumption in AquafilSLO d.o.o. Ljubljana plant.

A close-up photograph of a mechanical assembly. The central focus is a large, curved, yellow component with a fine, concentric texture, possibly a turbine blade or a part of a compressor. It is mounted on a dark, metallic base with several silver-colored screws. In the lower-left corner, a portion of a red and yellow striped cylindrical component is visible, along with a circular metal flange featuring four screws and a small arrow pointing to the left. The word "References" is overlaid in white, bold, sans-serif font across the bottom center of the image, with a thin white horizontal line extending to the right from its base.

References

References

> ISO 14025:2010

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

> General Programme instructions 3.01

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> 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 STANDARDISATION 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

> OHSAS 18001: 2007

Occupational Health and Safety Management