

# ENVIRONMENTAL PRODUCT DECLARATION for ECONYL® BCF REPROCESSED YARNS



EPD®

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PCR 2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES, VERSION 2.0, 2015-03-03  
APPENDIX B TO PCR 2012:01 *CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES*, VERSION 2.0

Revision 0,5. August 2015  
Certification No.: S-P-00767  
Valid until: 5. August 2020



# **COMPANY**

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## **Related information**

## 1

# Company related information

## 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 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 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) business unit.

Meanwhile, the Group continued to widen its product offering by opening a number of production plants in Europe and entering (with its "Polyamide products priority focus" always in mind) the Engineering Plastics business to supply modified polyamide products 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 3 key markets where it was operating (carpet yarn, textile yarn and engineering plastics), gradually becoming a global leader in the manufacturing of Polyamide 6 fibres. In 2013, the Group sold the Engineering Plastics division to DOMO and acquired DOMO's BCF business Xentrys.

The internationalization process continued by adding significant investments in the Asian market where in 2005 a manufacturing facility was established in Thailand for processing and marketing BCF products for the carpet industry. In 2009, a new manufacturing facility was built in China to assist in the ever-growing Asian market.

From 2007-2011, Aquafil developed 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 System** (the recycling of pre- and post-consumer Polyamide 6 waste material), which launched in 2011.

As of 2014, the Group operates 15 manufacturing plants worldwide with more than 2,700 employees in 8 countries (Italy, Slovenia, Croatia, Germany, United Kingdom, USA, Thailand and China) on 3 continents (Europe, North America and Asia).

#### **IT OPERATES 2 DIFFERENT BUSINESS UNITS:**

- **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 business unit was created - Energy & Recycling.

This Energy & Recycling business unit is dedicated to the promotion of sustainability and environmental issues. It has a transverse nature in respect to the other business units, providing solutions and innovative technologies in the area of energy, recycling and the promotion of the culture of sustainability.





# **PRODUCT**

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## **Related information**

# Product related information

## 2

### DECLARATION OF GENERAL INFORMATION

This environmental product declaration is compliant with ISO 14025 and EN15804.

## 2.1

### PUBLISHER

**EPD international AB**; Valhallavägen 81, SE-114 27 Stockholm Sweden;  
www.environdec.com

## 2.2

### OWNER OF THE DECLARATION

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

## 2.3

### GEOGRAPHICAL SCOPE OF THE EPD

**Europe**

## 2.4

### PRODUCTION SITES INCLUDED IN EPD

- **Julon d.o.o - Ljubljana** (Letališka cesta 15, 1000 Ljubljana, Slovenia)  
> process B
- **Julon d.o.o - Ajdovščina** (Tovarniška cesta 15, 5270 Ajdovščina, Slovenia)  
> process A
- **Julon d.o.o - Celje** (Teharje 105, 3221 Teharje, Slovenia)  
> process F
- **Aquafil S.p.A. -** (Via Linfano 9, 38062 Arco, Italy)  
> process C, D
- **Tessilquattro S.p.A. -** (Frazione Cares, 38071 Bleggio Inferiore, Italy)  
> process G
- **AquaSpace S.p.A. -** (Via del Garda 40, 38068 Rovereto, Italy)  
> process F

## 2.5

**SPECIFICATION OF THE PRODUCT**

ECONYL® BCF yarns are bulk continuous filament yarns, made out of 100 % recycled PA6 polymer. BCF yarns are usually reprocessed by twisting, air entangling and heat setting processes. In some cases they may contain antistatic yarns. As such are delivered to customers for manufacturing carpet tiles and tufted or woven carpets, within the scope of construction product.

**> This EPD refers to three groups of Bulk Continuous Filament yarns**

- ECONYL® Twisted & Heat-set yarns (dope dyed)
- ECONYL® Air entangled & Twisted yarns (dope dyed)
- ECONYL® Space dyed yarns

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 the first two groups of products (Twisted & Heat-set yarns and Air entangled & Twisted yarns). Meanwhile for the third group of products, the parameters are reported as a range of values, due to higher variation in energy consumption between one product to another in the reprocessing step.

## 2.6

**CONTENT DECLARATION**

MATERIAL	SUBSTANCE	WEIGHT (%)	CAS NUMBER
<b>Polymer</b>	Polyamide 6	92 - 96	25038-54-4
<b>Pigments</b>	Several	0 - 3	Several
<b>Spin finish</b>	Several	max. 1	Several
<b>Water</b>	-	3 - 4	7732-18-5
<b>TOTAL</b>		100	-

ECONYL® BCF yarns do not contain any materials / substances hazardous to health and the environment (carcinogenic, mutagenic or toxic to reproduction, allergic, PBT, vPvB). All ECONYL® BCF yarns are OEKOTEX® 100 class II certified.

## PRODUCT RELATED INFORMATION

## 2.7

## PRODUCT SPECIFICATION

> **TABLE 2.7.A.** ECONYL® TWISTED & HEAT-SET YARNS (DOPE DYED)

UM		VALUE	TESTING METHOD
PARAMETER			
Linear density	dtex	1600-4000	DIN 53830
Tenacity at break	cN/dtex	2,1-3,0	ISO 2062
Elongation at break	%	75-125	ISO 2062

> **TABLE 2.7.B.** ECONYL® AIR ENTANGLED & TWISTED YARNS (DOPE DYED)

UM		VALUE	TESTING METHOD
PARAMETER			
Linear density	dtex	1300-8000	DIN 53830
Tenacity at break	cN/dtex	2,1-3,4	ISO 2062
Elongation at break	%	35-70	ISO 2062

> **TABLE 2.7.C.** ECONYL® SPACE DYED YARN

UM		VALUE	TESTING METHOD
PARAMETER			
Linear density	dtex	1300-4500	DIN 53830
Tenacity at break	cN/dtex	2,1-3,4	ISO 2062
Elongation at break	%	35-70	ISO 2062

## 3

LCA: CALCULATION  
RULES

## 3.1

## DECLARED UNIT

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



## 3.2

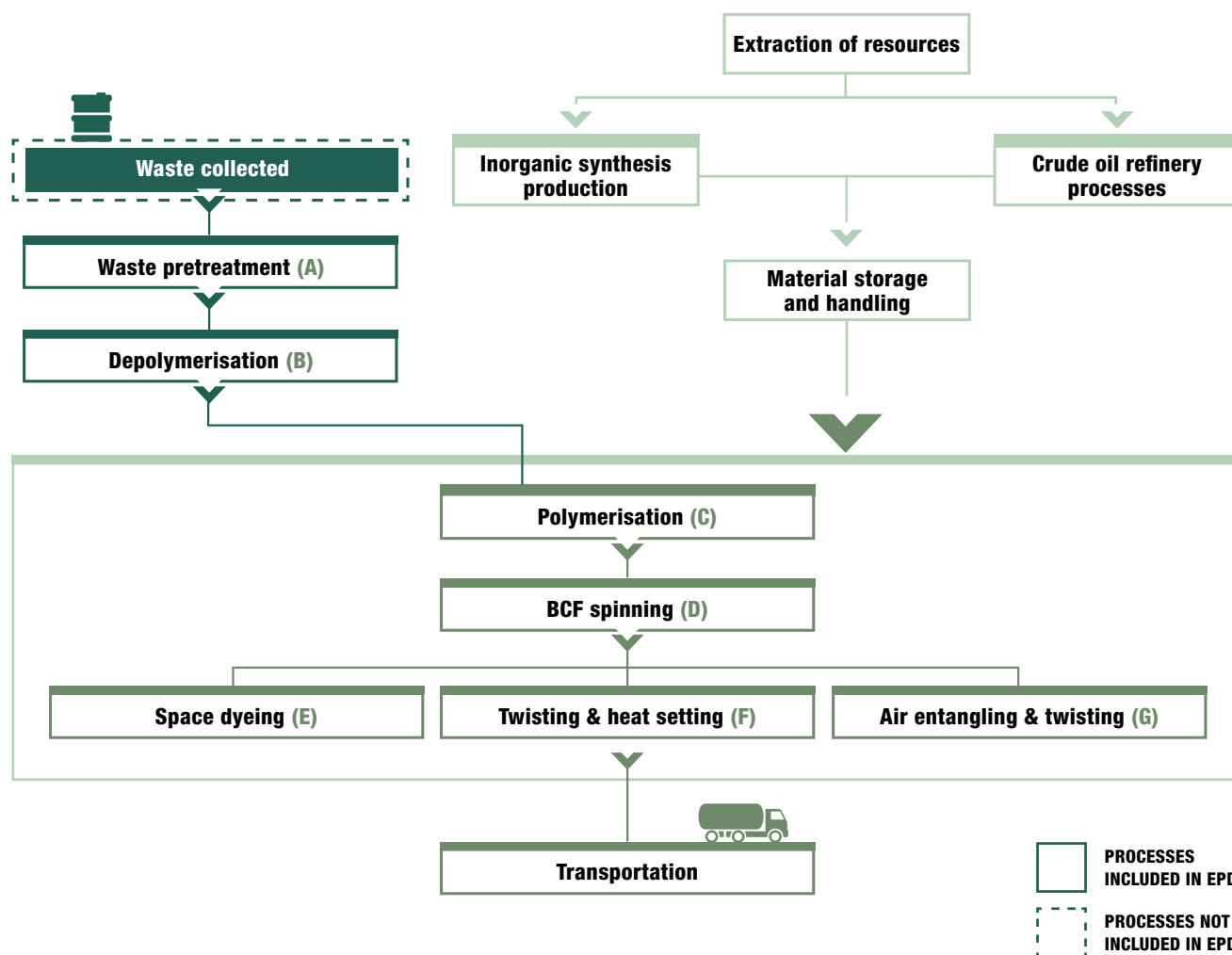
### SYSTEM BOUNDARIES

This is a »Cradle-to-gate« with options EPD, including modules A1-A4 and D module. Modules A1-A3 are reported as one number.

Modules A1-A3 include processes, that provide materials and energy input for the system, manufacturing and transport processes up to the factory gate, as well as the waste processing.

Module A4 includes transport to the customers.

Module D indicates credits resulting from energy recovery of waste treatment.



### 3.3

#### **CUT OFF CRITERIA**

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All data from processes owned by Aquafil and pre-treatment of waste is considered in this EPD as indicated in section 2.8 System boundaries.

### 3.4

#### **BACKGROUND DATA**

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All the background data relevant for modelling were taken from Gabi database – service pack 25, (update 2014). If appropriate Gabi database was not found, Ecoinvent 2.2 database was used instead (update 2010).

### 3.5

#### **DATA COLLECTION**

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Life cycle assessment primary data of processes owned by Aquafil group were collected from period of January 2014 to December 2014.

### 3.6

#### **COMPARABILITY**

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EPD of construction products may not be comparable if they do not comply with EN15804.

## 4

## LCA: SCENARIOS AND OTHER TECHNICAL INFORMATION

### 4.1

### TRANSPORT TO SITE (A4)

- **Means of transport:** truck
- **Transport distance:** average distance to customers
- **Capacity utilisation:** 85%
- **Fuel type:** diesel

### 4.2

### REFERENCE SERVICE LIFE

This EPD does not indicate RSL.

### 4.3

### MODULE D

Waste sludge generated in module A3 is used as secondary fuel in cement industry. Credits in module D are generated by thermal recovery of such waste.

## PRODUCT RELATED INFORMATION

## 5

## LCA: RESULTS

Product stage			Construction process stage	Use stage								End of life stage				Resource recovery stage
Raw materials	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

(X = included in the LCA; MND = module not declared)

## 5.1

## USE OF RESOURCES

&gt; TABLE 5.1.A. ECONYL® TWISTED &amp; HEAT-SET YARNS

Unit		A1-A3	A4	TOTAL	D
PARAMETER					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	19,55	0,02	19,57	-0,01
Use of renewable primary energy resources used as raw materials	MJ	0	0	0	0
<b>Total use of renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>19,55</b>	<b>0,02</b>	<b>19,57</b>	<b>-0,01</b>
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	54,54	0,45	54,99	-3,92
Use of non-renewable primary energy resources used as raw materials	MJ	33,91	0	33,91	0
<b>Total use of non-renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>88,45</b>	<b>0,45</b>	<b>88,90</b>	<b>-3,92</b>
<b>Use of secondary material</b>	kg	<b>1,73</b>	<b>0</b>	<b>1,73</b>	<b>0</b>
<b>Use of renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of non-renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of net fresh water</b>	m3	<b>0,09</b>	<b>6,81E-06</b>	<b>0,09</b>	<b>-4,80E-04</b>

Totals may not match, because of rounded data

## PRODUCT RELATED INFORMATION

&gt;TABLE 5.1.B. ECONYL® AIR ENTANGLED &amp; TWISTED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	20,89	0,02	20,91	-0,01
Use of renewable primary energy resources used as raw materials	MJ	0	0	0	0
<b>Total use of renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>20,89</b>	<b>0,02</b>	<b>20,91</b>	<b>-0,01</b>
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	51,40	0,45	51,85	-3,88
Use of non-renewable primary energy resources used as raw materials	MJ	33,59	0	33,59	0
<b>Total use of non-renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>84,99</b>	<b>0,45</b>	<b>85,44</b>	<b>-3,88</b>
<b>Use of secondary material</b>	kg	<b>1,71</b>	<b>0</b>	<b>1,71</b>	<b>0</b>
<b>Use of renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of non-renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of net fresh water</b>	m3	<b>0,12</b>	<b>6,81E-06</b>	<b>0,12</b>	<b>-4,76E-04</b>

Totals may not match, because of rounded data

&gt;TABLE 5.1.C. ECONYL® SPACE DYED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	15,31 – 19,02	0,02	15,33 – 19,04	-0,01
Use of renewable primary energy resources used as raw materials	MJ	0	0	0	0
<b>Total use of renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>15,31 – 19,02</b>	<b>0,02</b>	<b>15,33 – 19,04</b>	<b>-0,01</b>
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	74,67 – 93,26	0,45	75,12 – 93,71	-3,80
Use of non-renewable primary energy resources used as raw materials	MJ	32,93	0	32,93	0
<b>Total use of non-renewable primary energy resources; primary energy and primary energy resources used as raw materials</b>	MJ	<b>107,60 – 126,19</b>	<b>0,45</b>	<b>108,05 – 126,64</b>	<b>-3,80</b>
<b>Use of secondary material</b>	kg	<b>1,64</b>	<b>0</b>	<b>1,64</b>	<b>0</b>
<b>Use of renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of non-renewable secondary fuels</b>	MJ	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Use of net fresh water</b>	m3	<b>0,14 – 0,15</b>	<b>6,81E-06</b>	<b>0,14 – 0,15</b>	<b>-4,66E-04</b>

Totals may not match, because of rounded data



## PRODUCT RELATED INFORMATION

## 5.2 POTENTIAL ENVIRONMENTAL IMPACTS

&gt;TABLE 5.2.A. ECONYL® TWISTED &amp; HEAT-SET YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
GWP100 fossil	kg CO <sub>2</sub> eq	5,21	0,03	5,24	-0,39
Ozone depletion potential	kg CFC-11 eq	3,97E-08	1,54E-13	3,97E-08	-3,99E-13
Acidification potential	kg SO <sub>2</sub> eq	1,36E-02	1,63E-04	1,38E-02	-6,16E-04
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> eq	6,50E-04	4,02E-06	6,54E-04	-3,14E-05
Eutrophication potential	kg PO <sub>4</sub> -eq	3,15E-03	3,69E-05	3,19E-03	-6,36E-05
Abiotic depletion potential (elements)	kg Sb eq	2,84E-06	1,21E-09	2,84E-06	-1,35E-09
Abiotic depletion potential (fossil)	MJ	52,64	0,44	53,09	-3,90

For ADP elements and fossil original pre-set impact assessment method of Gabi 6 was used – CML 2001, April 2013  
Totals may not match, because of rounded data

&gt;TABLE 5.2.B. ECONYL® AIR ENTANGLED &amp; TWISTED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
GWP100 fossil	kg CO <sub>2</sub> eq	5,02	0,03	5,05	-0,39
Ozone depletion potential	kg CFC-11 eq	4,22E-08	1,54E-13	4,22E-08	-3,96E-13
Acidification potential	kg SO <sub>2</sub> eq	1,32E-02	1,63E-04	1,34E-02	-6,10E-04
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> eq	6,31E-03	4,02E-06	6,35E-04	-3,11E-05
Eutrophication potential	kg PO <sub>4</sub> -eq	3,06E-03	3,69E-05	3,10E-03	-6,30E-05
Abiotic depletion potential (elements)	kg Sb eq	2,68E-06	1,21E-09	2,68E-06	-1,34E-09
Abiotic depletion potential (fossil)	MJ	49,45	0,44	49,89	-3,87

For ADP elements and fossil original pre-set impact assessment method of Gabi 6 was used – CML 2001, April 2013  
Totals may not match, because of rounded data

&gt;TABLE 5.2.C. ECONYL® SPACE DYED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
GWP100 fossil	kg CO <sub>2</sub> eq	6,41 – 7,58	0,03	6,45 – 7,62	-0,38
Ozone depletion potential	kg CFC-11 eq	5,19E-08 – 5,19E-08	1,54E-13	5,19E-08 – 5,19E-08	-3,88E-13
Acidification potential	kg SO <sub>2</sub> eq	1,47E-02 – 1,58E-02	1,63E-04	1,49E-02 – 1,60E-02	-5,98E-04
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> eq	8,28E-04 – 9,58E-04	4,02E-06	8,31E-04 – 9,62E-04	-3,05E-05
Eutrophication potential	kg PO <sub>4</sub> -eq	3,31E-03 – 3,42E-03	3,69E-05	3,35E-03 – 3,46E-03	-6,18E-05
Abiotic depletion potential (elements)	kg Sb eq	2,96E-06 – 3,11E-06	1,21E-09	2,97E-06 – 3,12E-06	-1,31E-09
Abiotic depletion potential (fossil)	MJ	72,56 – 91,11	0,44	73,00 – 91,56	-3,79

For ADP elements and fossil original pre-set impact assessment method of Gabi 6 was used – CML 2001, April 2013  
Totals may not match, because of rounded data

## PRODUCT RELATED INFORMATION

## 5.3

## OTHER INDICATORS

> **TABLE 5.3.A.** ECONYL® TWISTED & HEAT-SET YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
<b>Hazardous waste disposed</b>	kg	3,43E-03	1,02E-06	3,43E-03	-5,79E-06
<b>Non-Hazardous waste disposed*</b>	kg	5,20	1,57E-03	5,20	-0,66
<b>Radioactive waste disposed</b>	kg	3,56E-04	5,83E-07	3,57E-04	-4,86E-06

*\*more than 84 % of non-hazardous waste (stock pile goods-deposited) is generated in the stage A1 due to coal extracting process  
Totals may not match, because of rounded data*

> **TABLE 5.3.B.** ECONYL® AIR ENTANGLED & TWISTED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
<b>Hazardous waste disposed</b>	kg	3,77E-03	1,02E-06	3,77E-03	-5,73E-06
<b>Non-Hazardous waste disposed*</b>	kg	5,14	1,57E-03	5,14	-0,65
<b>Radioactive waste disposed</b>	kg	3,66E-04	5,83E-07	3,66E-04	-4,64E-06

*\*more than 84 % of non-hazardous waste (stock pile goods-deposited) is generated in the stage A1 due to coal extracting process  
Totals may not match, because of rounded data*

> **TABLE 5.3.C.** ECONYL® SPACE DYED YARNS

	Unit	A1-A3	A4	TOTAL	D
<b>PARAMETER</b>					
<b>Hazardous waste disposed</b>	kg	1,59E-02	1,02E-06	1,59E-02	-5,62E-06
<b>Non-Hazardous waste disposed*</b>	kg	4,95 – 5,02	1,57E-03	4,95 – 5,03	-0,64
<b>Radioactive waste disposed</b>	kg	3,68E-04 – 3,79E-04	5,83E-07	3,69E-04 – 3,79E-04	-4,55E-06

*For ADP elements and fossil original pre-set impact assessment method of Gabi 6 was used – CML 2001, April 2013  
Totals may not match, because of rounded data*

# References

## > Bibliography

LCA report, *REV1*, 29 June 2015

ISO 14025:2006

EN 15804:2012

*General Programme instructions 2.5*

PCR 2012:01 *Construction products and Construction services*, Version 2.0, 2015-03-03

Appendix B to PCR 2012:01 *Construction products and construction services*, Version 2.0

For data elaboration the following tools are used:

Software: Gabi 6

Main database: Gabi professional database – pack 25

## > Contacts

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

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## > Independent verification

Independent verification of the declaration and data, according to ISO 14025:

☐ INTERNAL

☒ EXTERNAL

Third party verifier:

Bureau Veritas Group

www.bureauveritas.com

Accredited by: SWEDAC

Valid until: 5. August 2020