

Environmental Product Declaration



In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

EcoCycle, recycled content PA6 yarns (China)

from

Beaulieu Yarns

Beaulieu
International
Group



Yarns

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-05973
Publication date:	2022-06-07
Valid until:	2027-06-04

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



**Circular solutions
for a better future**

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR: 2019: 14 – Construction Products – Version 1.11 c-PCR-015 Synthetic carpet yarn (construction product) – Version 2022-03-06 UN CPC code: 264, 355 – Synthetic carpet yarn used for building purposes
PCR review was conducted by: The Technical Committee of the International EPD System Contact via info@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: Simon De Meyer, Beaulieu International Group
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification by individual verifier
Third-party verifier: Dr. – Ing. Andres Citroth, Greendelta, Germany
Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

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

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Beaulieu Yarns - www.beaulieuyarns.com

Contact: Pieter Demeyere – Pieter.demeyere@bintg.com

Description of the organisation:

Beaulieu Yarns is a yarn specialist, providing high expertise and know-how in producing polyamide and polypropylene yarns addressing high demanding needs from the commercial contract market, the customized residential flooring and the automotive interiors. Customer focus, innovation and sustainability are the main drivers for collaborative product development and long-term relationships. The yarns offer high performance with remarkable color contrasts and designs. Most diversified yarns range from BCF to twisted and heat-set yarns, one-color to multi-color, between 650 and 15.000 dTex, applicable for any flooring construction. Beaulieu Yarns has two production sites in Europe – one in Belgium (site Berry Yarns), one in France (site Ideal Fibres & Fabrics Comines) – and one production site in China.

Sustainability Statement:

Yarns division fully commits to integrate the UN Sustainable Development Goals into our business activities, by taking responsibility and bringing sustainable solutions into our core operations, creating value to our customers, and engaging employees and value chain partners. We fully pursue opportunities to support and solve the global environmental challenges through innovation, investment and collaboration.

Our impact on the Sustainable Development Goals (SDGs) has been mapped and action plans were defined to further progress in implementing goals into our organization. We continue along the path of corporate sustainability, define new challenging goals with specific actions, seek business opportunities with impact and encourage our network to continue and contribute to a better world.

Product-related or management system-related certifications:

ISO 9001–Quality Management System

Name and location of production site(s):

Beaulieu Fibres & Yarns (Weihai) Co., LTd.
No. 7, Xingda Road, Qiaotou Town,
Huancui District, Weihai City, Shangdong Province, P.R.China 264212

Product information

Product name: EqoCycle 75

Product identification:

EqoCycle 75 is a Bulk Continuous Filament (BCF) Polyamide 6 yarn.



Product description:

Polyamide 6 polymer for Eqocycle yarns was manufactured by using pre-consumer recovered content. After BCF production EqoCycle 75 yarn contains 75% pre-consumer recovered material. Those yarns are subsequently utilized as raw material for carpet and carpet tile production destined for contract, automotive and residential applications.



Product specification:

Name	Value	UM
Type of manufacture	Bulk Continuous Filament (BCF), solution dyed	-
Material	Polyamide 6	-
Yarncount ¹	650 to 8400	dtex
Tenacity at break ²	1 - 3,5	cN/dtex
Elongation at break ²	25 - 75	%

¹ Internal test method

² Test method according to ISO 2062

UN CPC code: 264, 355 – Synthetic carpet yarn used for building purposes

Geographical scope: Production in China, exported globally including domestic sales in China.

LCA information

Functional unit / declared unit: 1 kg of BCF EqoCycle 75 yarn produced by Beaulieu Yarns (BY)

Time representativeness: All primary data of processes owned by Beaulieu International Group was collected in reference year 2021. Other data is not older than 2019.

Database(s) and LCA software used: The LCA software GaBi Software 10.5.1 & GaBi Content Version 2022.1 was used for inventory and impact assessment calculations.

Description of system boundaries:

This EPD covers the Cradle-to-Gate (with modules C and D) of EqoCycle recycled content PA6 yarns (without the construction process and use stage). The EPD follows the guidelines prescribed in EN 15804 + A2, namely that all flows with an influence higher than 1% of the total mass, energy or environmental impact are included in the LCA. The total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass.

Life cycle stages and modules																	
Product stage			Construction process stage		Use stage								End of life stage				Resource recovery stage
Raw material supply	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X	

X = included in the EPD

MND = module not declared

Product stage (A1-A3)

A1 – Raw materials supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process.

A2 – Transport to the manufacturing

The raw materials are transported to the manufacturing site.

A3 – Manufacturing

Manufacturing consist of extrusion, spinning, drawing and winding of the PA6 yarns. Electricity consumption during manufacturing process comes from the Chinese national grid. The natural gas consumed during production is also coming from China.

The sub-modules A1, A2 and A3 are declared as one module A1-A3.

Construction process stage (A4-A5)

A4 – Transport to the building site

Not taken into account

A5 – Construction installation

Not taken into account

Use stage (B1-B7)

Not taken into account

End of life stage (C1-C4)

C1 – De-construction demolition

It is assumed that no impacts are associated with demolition of the PA6 yarns, since the removal of it is mainly manual work or the removal of it comes with the removal of other (more critical) products.

C2 – Transport

From literature review, it can be assumed that the transport distance to sorting plant, incineration plant and landfill is around 50 km.

C3 – Waste processing

A default scenario for a sorting facility is taken according to NBN/DTD B08-001 (Belgium Annex on EN 15804 +A2)

Impact	Amount
Sorting plant with crusher	0,0037 kWh/kg waste
Diesel consumption	5,9 MJ/m ³ bulk volume of waste*

* the bulk density of waste can be calculated as 0,9 x material density.

The separated PA6 yarn is sent off for disposal (C4).

C4 – Disposal

Disposal of PA6 yarn is based on literature sources. A study from Shandong University gave an overview of the waste plastics components and end-of-life treatment pattern in 2016 in China.

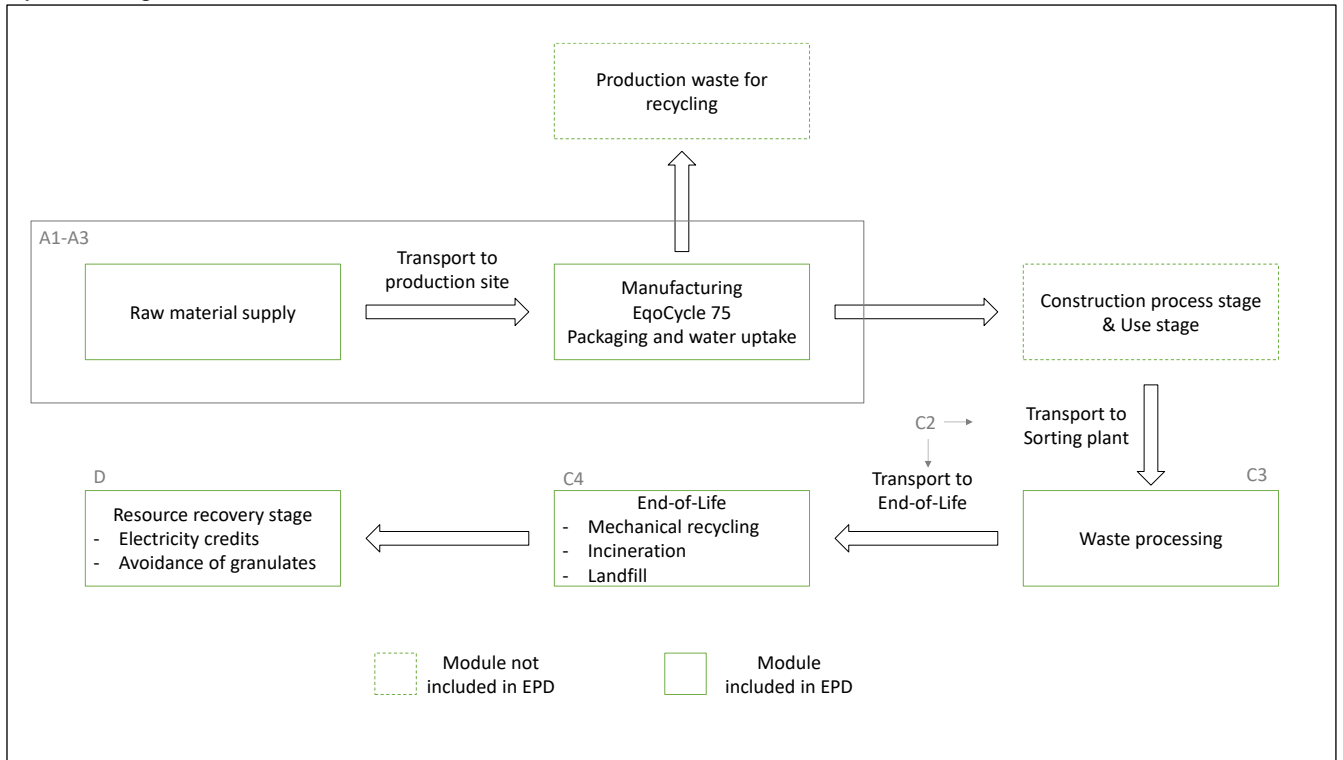
- 59,1% of the plastics in China are sent to landfill
- 26,5% of the plastics are incinerated with energy recovery
- 14,4% of the plastics are mechanical recycled.

Datasets used for the end-of-life of a PA6 yarns are available in the LCA Background document.

Resource recovery stage (D)

The benefits from exported energy due to incineration of the PA6 yarn have been declared in this module (electricity credits on Chinese (CN) electricity grid mix and avoidance of primary PA6 granulates).

System diagram:



Process information:

The yarn production process consists of 7 different process steps i.e. dosing, melting & spinning, quenching, drawing, texturing & fixation, intermingling and winding. More in detail, in the dosing unit or hopper raw materials (PA) are mixed with additives (e.g. colour, UV stabilizer) before feeding the mixture to the extruder. After melting in the extruder, the homogenous melted mixture is subjected to the spinning step which transforms the melted mixture into fine filaments. After spinning, the filaments are cooled down using air cooling in the quenching chamber. By adjusting the air speed and temperature, the crystallinity of the filaments can be influenced (e.g. faster speed and lower temperatures will increase crystallinity). To obtain the final filament properties (tensile modulus and strength), the filaments are reheated and stretched in the so-called drawing step. During the texturing phase, the stretch, warmth, and opacity properties of the yarn are further improved. To fixate the textured and 3-dimensional structure of the yarn, the yarn is fixated on a cooling drum after texturing. Next, different filaments are mixed and entangled with each other by knots created during the intermingling step by leading the yarn through a cylindrical tube while supplying compressed air through radial holes in the tube. Finally, the yarn is wound on cylindrical bobbins which are used for the production of carpets, artificial grass etc.

Assumptions, allocation and estimates:

- For the amount of masterbatch and pigment in the yarn, an average is used. Since there is no LCA data available for most pigments, TiO₂ and carbon black were used as a substitute for inorganic and organic pigments. Data for mono- and masterbatch production is based on primary data from Beaulieu subsidiary and assumed to be valid for external suppliers as well.
- Since there is no LCA data available for spinfinish, this LCI was modelled by combining LCI data of components of the product, using conservative assumptions.
- Due to unavailable LCI data for the water used, the alternative with the highest environmental impact was chosen.
- For primary energy, overall plant data was recorded and divided over the total production of PA6 and PP yarn produced in the plant. It was assumed that the production of PA6 and PP yarn requires the same amount of energy.
- For the consumption of natural gas, no dataset representing China was available. A dataset from a neighbouring country was chosen as representative.

Taking into account the assumptions and cut-off described above, it is assumed that the percentage of total environmental impact that might have been excluded does not exceed 1%.

Content information

Material type	Description	Weight%
Polymer	PA6 for EqoCycle 75	91,25%
Pigments	Several	2,00%
Spinfinish	Lubricant, antistatic	1,00%
Water (humidity)	Commercial allowance according to BISFA	5,75%

To the best of our knowledge, EqoCycle 75 yarns don't contain any materials or substances included in the Candidate List of Substances of Very High Concern (SVHC) for authorization issued by the European Chemicals Agency. Under normal storage and use conditions, these yarns can be handled with no particular precautions or special protective equipment.

EqoCycle 75 yarns are produced on core tubes, packaged in distribution packaging on wooden pallets with cardboard to separate the layers, wrapped in PE film.

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential –fossil	Kg CO ₂ eq.	7,16E+00	0,00E+00	6,62E-03	7,45E-02	6,90E-01	-7,03E-01
Global Warming Potential – biogenic	Kg CO ₂ eq.	-2,07E-01	0,00E+00	2,78E-04	-9,98E-04	-4,36E-04	-1,24E-03
Global Warming Potential – luluc	Kg CO ₂ eq.	2,20E-02	0,00E+00	1,73E-07	1,33E-05	4,46E-05	-1,56E-04
Global warming Potential – total	Kg CO ₂ eq.	6,98E+00	0,00E+00	6,90E-03	7,36E-02	6,90E-01	-7,05E-01
Depletion potential of the stratospheric ozone layer (ODP)	Kg CFC 11 eq.	4,02E-09	0,00E+00	6,51E-16	5,14E-14	2,28E-13	-1,70E-12
Acidification potential (AP)	Mol H ⁺ eq.	1,81E-02	0,00E+00	1,25E-05	3,74E-04	3,90E-04	-1,65E-03
Eutrophication potential freshwater	Kg P eq.	2,12E-02	0,00E+00	8,37E-10	6,23E-08	8,00E-06	-5,52E-07
Eutrophication potential marine	Kg N eq.	8,93E-02	0,00E+00	4,99E-06	8,07E-05	1,12E-04	-4,18E-04
Eutrophication potential terrestrial	Mol N eq.	5,23E-02	0,00E+00	5,49E-05	8,86E-04	1,22E-03	-4,10E-03
Formation potential of tropospheric ozone (POCP)	Kg NMVOC eq.	1,52E-02	0,00E+00	1,13E-05	3,00E-04	3,75E-04	-1,29E-03
Abiotic depletion potential for non-fossil resources (ADP _m [*])	Kg Sb eq.	1,52E-06	0,00E+00	2,69E-10	2,00E-08	5,43E-09	-5,65E-08
Abiotic depletion for fossil resource potential (ADP _f [*])	MJ	1,29E+02	0,00E+00	9,17E-02	6,81E+00	1,08E+00	-1,13E+01
Water deprivation potential (WDP)	m ³	6,43E+00	0,00E+00	5,65E-05	4,44E-03	1,22E-02	-8,61E-02

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Potential environmental impact – additional mandatory and voluntary indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential – Greenhouse Gas ¹ (GWP-GHG)	Kg CO ₂ eq.	7,19E+00	0,00E+00	6,62E-03	7,46E-02	6,90E-01	-7,04E-01

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of resources

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1,46E+01	0,00E+00	7,20E-04	5,56E-02	1,70E-01	-1,06E+00
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,46E+01	0,00E+00	7,20E-04	5,56E-02	1,70E-01	-1,06E+00
PENRE	MJ	1,29E+02	0,00E+00	9,18E-02	6,81E+00	1,08E+00	-1,13E+01
PENRM	MJ	2,98E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,29E+02	0,00E+00	9,18E-02	6,81E+00	1,08E+00	-1,13E+01
SM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	3,39E-24	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	3,98E-23	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	MJ	1,62E-01	0,00E+00	1,42E-06	1,12E-04	3,09E-04	-2,70E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste production and output flows

Waste production

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	Kg	1,31E-05	0,00E+00	2,30E-13	1,79E-11	1,39E-10	-9,16E-10
Non-hazardous waste disposed	Kg	1,36E-01	0,00E+00	3,80E-06	2,86E-04	5,99E-01	-3,97E-03
Radioactive waste disposed	Kg	6,46E-03	0,00E+00	5,17E-08	4,02E-06	1,76E-05	-1,25E-04

Output flows

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	Kg	1,10E-01	0,00E+00	0,00E+00	0,00E+00	1,44E-01	0,00E+00
Materials for energy recovery	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,65E-01	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Information on biogenic carbon content

Indicator	Unit	Value
Biogenic carbon content in product	Kg C	0,00E+00
Biogenic carbon content in packaging	Kg C	3,44E-02
Note	1 kg of biogenic carbon is equivalent to 44/12 kg CO ₂	

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Additional information

End-of-life (C1-C4)			
Process	Scenario information	Unit	Value
Collection process	% collected separately	%	0
	% collected with mixed construction waste	%	100
Recovery system specified by type	% for re-use	%	0
	% for recycling	%	14,4
	% for energy recovery	%	26,5
Disposal specified by type	% for final deposition	%	59,1

References

The International EPD System	General Programme Instructions of the International EPD® - Version 3.01 PCR 2019:14 Construction products – Version 1.11 c-PCR-015 Synthetic carpet yarn (construction product) – Version 2022-03-06
EN 15804+A2	Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. EN 15804:2012+A2
ISO 9001	Quality Management Systems. ISO 9001:2015
BISFA	Terminology of man-made fibres – 2017 Edition (review of 2009)
LCA report	LCA background report for EqoCycle recycled content PA6 yarns (China)
ISO 14025: 2006	International Organization for Standardization (ISO), Environmental labels and declarations – Type III environmental declarations – Principles and procedures
ISO 14040: 2006	International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Principles and framework
NBN/DTD B 08-001:2017	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products - National supplement to NBN EN 15804+A2
Literature	Chen et al. (2019, July). <i>Life cycle assessment of end-of-life treatments of waste plastics in China</i> . Resources, Conservation and Recycling. https://doi.org/10.1016/j.resconrec.2019.03.011

