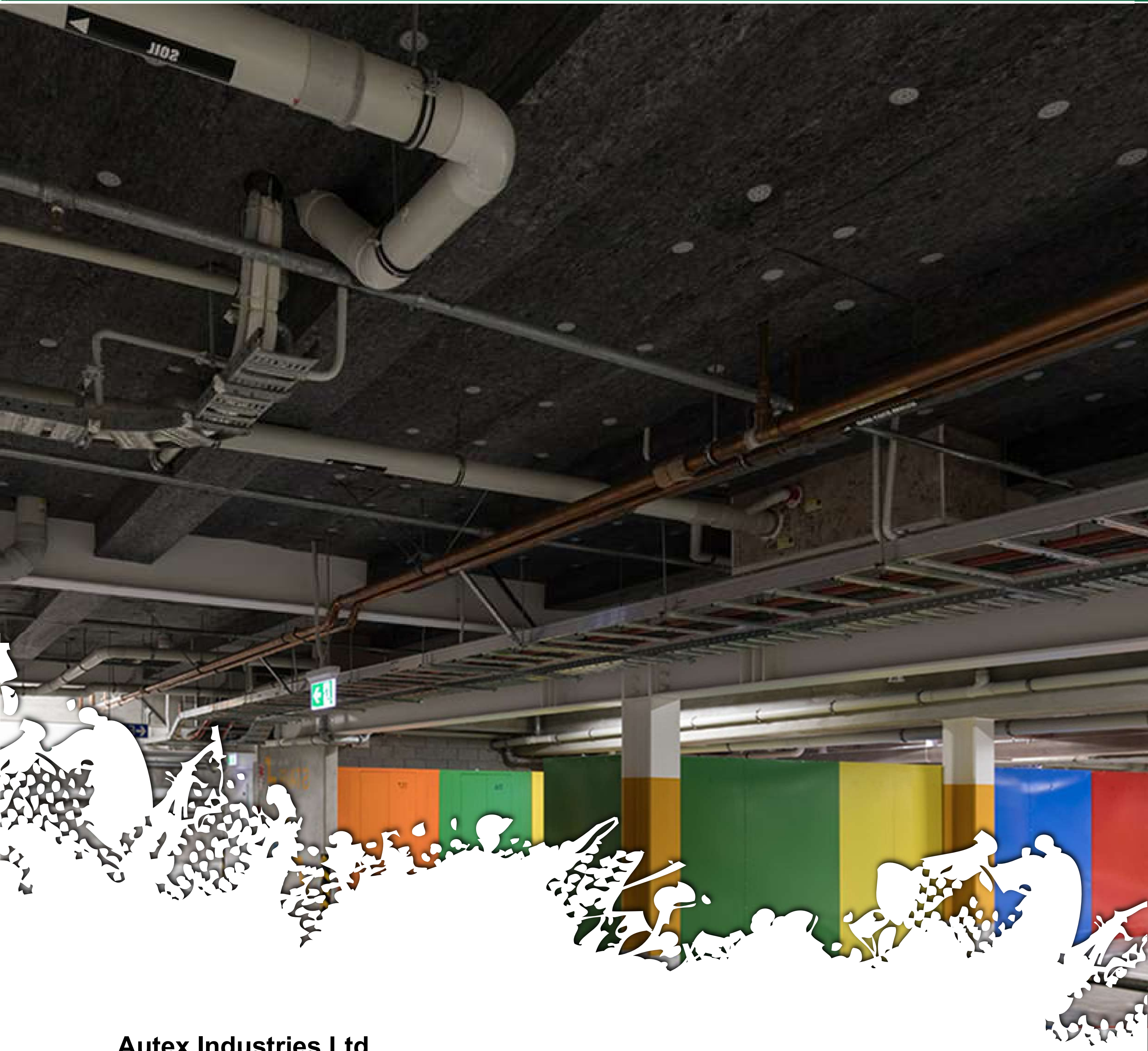
EPD™

Environmental Product Declaration

Global GreenTag^CertTM EPD Program

Compliant to EN 15804:2012+A2 2019



Autex Industries Ltd

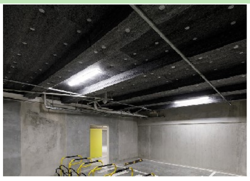
Greenstuf® Autex Soffit & Slab Liners

702-718 Rosebank Road, Avondale, Auckland, New Zealand

GreenStuf®
Polyester Insulation

EPD Verification and LCA Details

EPD Scope	Cradle to Gate +Options
EPD Number	ATX SL01 2022EP
Issue Date	24th January 2022
Valid Until	24th January 2027



Demonstration of Verification

Standard EN 15804 serves as the core Product Category Rules (PCR) [1].

Independent external verification of the declaration and data, according to ISO 14025:2010

☑ External		Third Party Verifier[a] Shloka Ashar Sustainability Consultant
☑ Internal		LCA Reviewed by Mathilde Vlieg, VliegLCA
☑ Internal		EPD Reviewed by David Baggs, Global GreenTag Pty Ltd

a: Optional for business-to-business communication; mandatory for business-to-consumer communication according to EN ISO 14025:2010, 9.4 [2]

The EPD is property of declared manufacturer. Different program EPDs may not be comparable as e.g. Australian transport is often more than elsewhere. Comparability is further dependent on the product category rules used and the source of the data. Further explanatory information can be found at www.globalgreentag.com or contact: certification1@globalgreentag.com.

This EPD discloses potential environmental outcomes compliant with EN 15804:2012+A2:2019 for business-to-business communication. LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.

EPD Program Operator [3]	LCA and EPD Producer	Declaration Owner
Global GreenTag Pty Ltd	The Evah Institute	Autex Industries Ltd
PO Box 311	Division of Ecquate Pty Ltd	702 Rosebank Rd, Avondale, Auckland, New Zealand
Cannon Hill, QLD 4170	PO Box 123 Thirroul NSW	Phone: +64 9 828 9179
Phone: +61 (0)7 33 999 686	Phone: +61 (0)7 5545 0998	http://www.autexglobal.com
http://www.globalgreentag.com	http://www.evah.com.au/	

Product Information

Product Name	GreenStuf® Autex Soffit & Slab Liners (ASL)
Product code	Autex Soffit & Slab Liner (ASL), ASL Black Finish and ASL E-foil
Declared Unit	Declared product per kilogram [4,5]
Factory warranty	10 years
Manufacturing Site	702-718 Rosebank Road, Avondale, Auckland, New Zealand
Site Representation and Geography	New Zealand, Australasia, Pacific Rim and the World
Cut-off criteria and Data quality	Complies with EN 15804:2012+A2:2019
Standards	Sound absorption performance complies as determined using ISO 354 methodology. Reaction to fire performance is assessed in accordance with ISO 9705:1993 and AS 5637.1:2015 using AS ISO 9705 - 2003 methodology.
Product Specifications	Thermally bonded polyester ASL; ASL with black polyethylene finish, ASL with fire-compliant Aluminium e-foil
Functional & Technical Performance	Product Name / Nominal mm / NRC[1] / R-Value m^2/Kw / Sheet size mm ASL R1.7 / 75 / 0.95 / R1.7 / 1200 x 2400 ASL R2.1 / 90 / 1.00 / R2.1 / 1200 x 2400 ASL R3.0 / 140 / 1.05 / R3.0 / 1200 x 2400
Functional Performance in Building	Liners are installed as a slab and soffit covering to reduce interior noise and heat transfer into and out of building spaces.
Range and variability	Significant differences of average LCIA results are declared. They were most sensitive to PET fibre melt-spin process energy reported ranging from (1.8 to 17.6)MJ/kg with a mean of 8.3MJ/kg and standard deviation of 8. As the LCIA variability based on such a mean is outside acceptable confidence limits, lower and upper median results from that range are declared.
Primary Data	Data was collected in accordance with EN ISO 14044:2006, 4.3.2, from primary sources including the manufacturer, suppliers and their publications on standards locations, logistics, technology, market share, management system and commitment to improved environmental performance [6].
No Chemicals of Very High Concern	Contains no substances in the “Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)” with the European Chemicals Agency

Functional & Technical Performance:

Product Name	Nominal mm	NRC[1]	R-Value m^2/Kw	Sheet size mm
ASL R1.7	75	0.95	R1.7	1200 x 2400
ASL R2.1	90	1.00	R2.1	1200 x 2400
ASL R3.0	140	1.05	R3.0	1200 x 2400

[1] NRC = Noise reduction coefficient conforming to ISO11654 standard methods

Base Material Origin and Detail

Table 1 lists composition by component, function, source and percentage mass share.

Table 1 Base Material Chemical Analysis

Function	Component	Source	ASL	ASL Black Finish	ASL E-Foil
Main fibre	100%rPET[2]	South Korea	>25 <28	>24 <28	>23 <27
	80% rPET	Taiwan	>25 <28	>24 <27	>23<27
Binder	PETG[3]	Korea	>50 <55	>48 <53	>47 <53
Finish	LDPE[4]	Australia		>2 <4	>3 <4
Foil	Aluminium	PR China			>0.8 <0.9

Program Description

EPD type	Cradle to gate + options as defined by EN 15804
System boundary	The system boundary with nature includes material and energy system input processing plus manufacture and transport to factory gate plus waste arising.
Service Life	Unspecified reference service life for this cradle to gate plus options scope
Comparability	Construction product EPDs may not be comparable if not EN15804 compliant
Scope	Compliance demands declaring modules A1–A3, C1–C4 and D. Scenarios for C1–C4 modules declare zero results. Justifications for D omission are given.
Stages excluded	A4-5 are excluded.
Product stages included	Stages denoted by x in Figure 1 are included from A1 raw material acquisition, extraction, refining and processing plus scrap reuse from prior systems; electricity generated from all sources with extraction, refining & transport plus secondary fuel energy and recovery processes. Also, A2 transport internal and to the factory gate as well as A3 manufacture of product packaging, inputs and flows leaving at end-of-waste boundary allocated as coproducts.
Omission of Modules C1–C4	All C1–C4 end of life results are zero because all insulation is assumed to outlast the fitout and build life. So, there is no processing to C1 deconstruct, C2 transport discards for processing to recyclers or landfills etc; C3 waste processing of scrap to reuse, recycle and recover energy. C4 waste disposal including pre-treatment and disposal site management.
Omission of Module D potential load or benefit beyond the system boundary	Unreliable background data excluded all conservative calculation of: • results or summing B1-B5, C1-C4 secondary flows leaving the system, • design to reuse, recycle and recover avoiding subsequent system loads, • benefits from exported energy ex C4 substituted another in next systems. • secondary flow results from substituting primary flows in next systems
End-of-life scenarios for	No specification of end-of-life scenarios to forecast or link to any current practice is reasonable because the background data was too unreliable.

Information Modules System Scope and Boundaries

Figure 1 shows an x marking EPD LCA inventory and impact results to be declared as summed for modules A1-3. All modules B1 to C4 are declared as zero. Modules A4-5 and D1-3 that are marked not declared MND does not indicate zero inventory or impact.

Figure 2 shows included processes in a cradle to grave system boundary and excluded scenarios in dashed lines to end of life fate to recycling or to landfill grave.

2 Main fibre % Mass share of post-consumer recycled Polyester (rPET)
3 Bonding fibre of low melt primary Polyethylene terephthalate glycol (PETG)
4 Linear Low Density Polyethylene (LDPE)

Model Stage	Actual			Scenario													Potential		
	Product			Construct		Operational Use							End of Life				Benefit & load beyond system		
						Fabric					Use								
Unit Operations	Raw material	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replace	Refurbish	Energy	Water	Demolish	Transport	Waste Process	Dispose	Reuse	Recycle	Recover
Module Key	A1	A2	A3	MND	MND	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3
Cradle to Gate + Options	x	x	x	MND	MND	0	0	0	0	0	0	0	0	0	0	0	MND	MND	MND
Cradle to Grave	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Optional		

Figure 1 EPD Life Cycle Phases and Stages Cradle to Gate or Grave

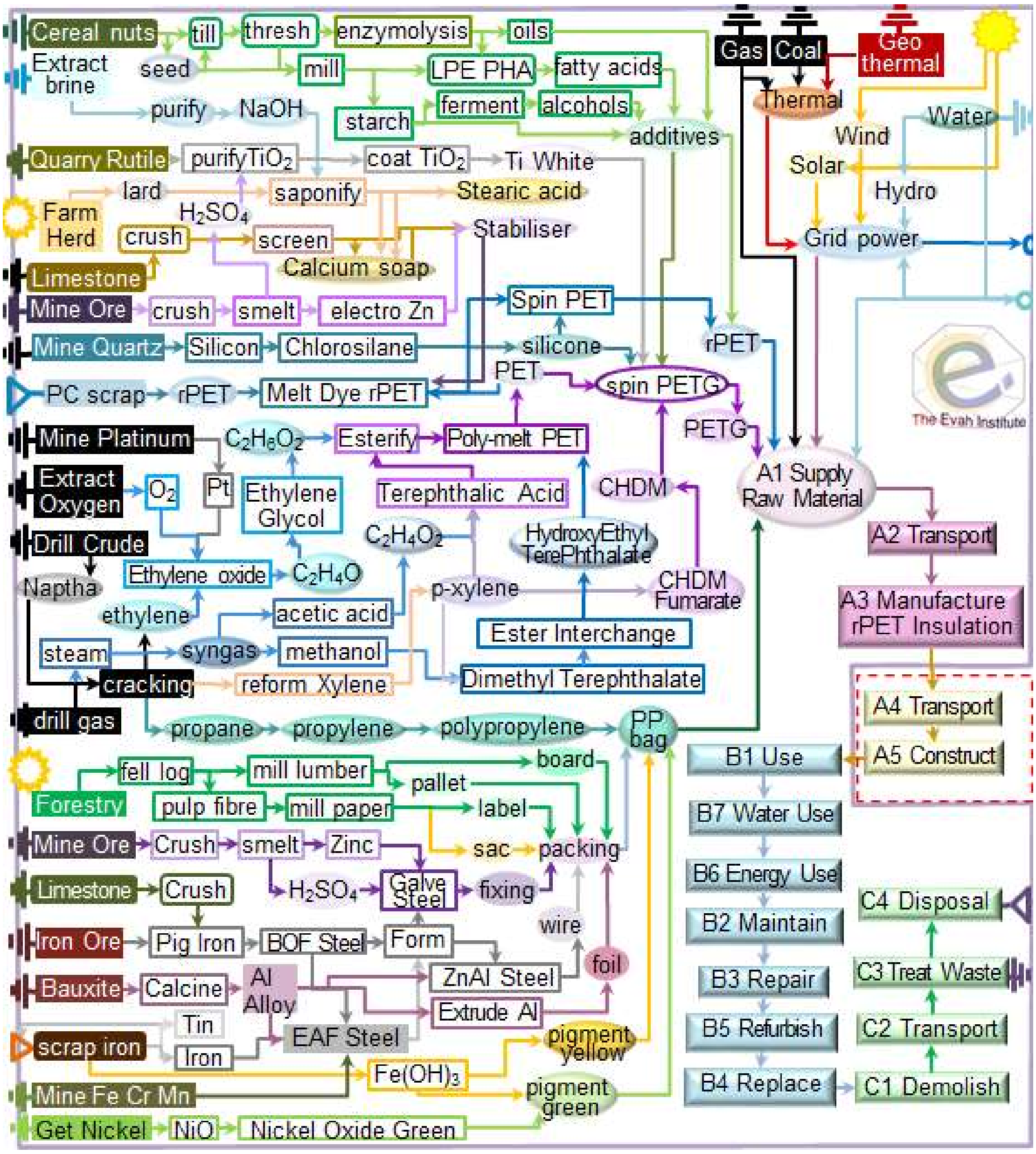
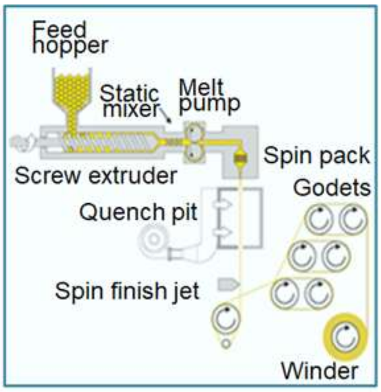


Figure 2 Product Process Flow Chart

Background Data Quality Parameters and Sensitivity

PET fibre LCA results were most sensitive to energy use in the melt-spin process. Figure 3 depicts fibre melt-spun into filament a function of polymer extrusion energy not fibre diameter. It is then cut into staple fibers (often 38 mm) or then drawn and textured to make spun yarn.

As Figure 4 depicts surveys of industry and EcoInvent V2 to 3.4 LCI by Sandin, Roos & Johansson (2019) and van der Velden et al (2014) reported PET fibre melt-spin energy from lowest 1.8MJ/kg to highest 17.64MJ/kg [7 & 8]. The mean of 8.3MJ/kg had a standard deviation of 8.



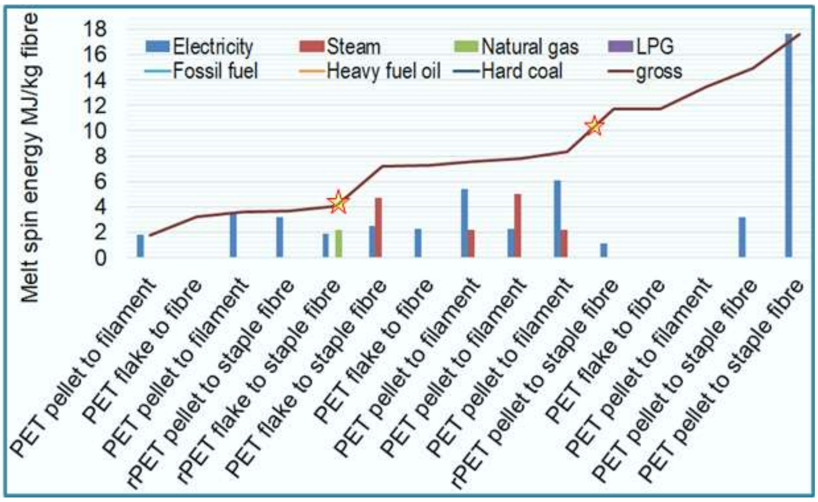


Figure 3. Melt-spin Process **Figure 4. PET Melt-spin Gross Energy & Sources**

They found gross melt-spin energy ranged from 3.2 to 11.7MJ/kg PET staple fibre and 1.1 to 13.6MJ/kg partially drawn untextured filament. Table 2 lists survey data selected on quality and age.

Table 2 Pre-oriented Yarn Melt-spin Fibre Extrusion Energy MJ/kg

Process	gross	Electric	Heavy fuel oil	Natural gas	LPG	Steam	Hard coal	Fossil fuel
rPET pellet to staple fibre	3.684	3.204	0.48					
rPET flake to staple fibre	4.10	1.872		2.21	0.02			
PET flake to staple fibre	7.234	2.484				4.75		
PET pellet to filament	7.600	5.400				2.20		
PET pellet to filament	7.784	2.304	0.48			5.0		
PET pellet to filament	8.320	6.120				2.20		
rPET pellet to staple fibre	11.69	1.116					10.57	
PET pellet to staple fibre	14.90	3.2						11.7

As surveys reported such a wide hot melt-spin energy range and standard deviation that LCA results were most sensitive to, this EPD declares both lower and upper melt-spin energy. The lower melt-spin energy modelled 4.102MJ/kg fibre with 1.87MJ electricity, 2.21MJ natural gas & 0.02MJ propane.

Beyond 4.1MJ/kg, upper melt-spin energy was modelled to reflect a 10.4MJ/kg median using electricity only along with that using 8.1MJ Electricity, 2.21MJ Natural gas and 0.02MJ propane. Results of these 3 modelled value sets are discussed in the Interpretation section. For clarity this EPD declares results of one lower and one upper melt-spin value only.

Environmental Impact Methods and Terminology

This section outlines environmental impact methods used. The following glossary of terms lists units used and references to the impact calculation methods.

Glossary of Terms	Indicator Potential Methods	Units
Climate Change total	Global Warming Potential (GWP) total [9]	kg CO_{2eq}.
Climate Change fossil	GWP fossil fuels (GWP fossil) [9]	kg CO_{2eq}.
Climate Change biogenic	GWP biogenic (GWP biogenic) [9]	kg CO_{2eq}.
Climate Change land use	GWP land use & change (GWP luluc) [9]	kg CO_{2eq}.
Stratospheric Ozone Depletion	Stratospheric Ozone Depletion (ODP) [10]	kg CFC_{11eq}
Photochemical Ozone Creation	Photochemical Ozone Creation (POCP) [11]	kg NMOC $_{eq}$
Photochemical Ozone Formation	Photochemical Ozone Formation (POCF) [11]	kg C_2H_{4eq}
Acidification	Acidification air land and water (AP) [12]	kg SO_4^{+} $_{eq}$
Acidification	Acidity Accumulated Exceedance (AP) [12]	mol H^{+} $_{eq}$
Eutrophication	Eutrophication of waters (EP) [13]	kg $PO_{4\ eq}$
Eutrophication Freshwater	EP nutrients freshwater (EP freshwater) [13]	kg P_{eq}
Eutrophication Marine	Eutrophication marine nutrients (EP marine) [13]	kg N_{eq}
Eutrophication Terrestrial	Terrestrial Accumulated Exceedance (EP terra) [13]	mol N_{eq}
Mineral & Metal Depletion	Abiotic Depletion (ADP minerals & metals) [14]	kg Sb_{eq}
Fossil Fuel Depletion	Abiotic Depletion fossil fuel (ADP fossil) [15]	MJ_{ncv}[5]
Water Depletion	Water Deprivation-weighted (WDP) [16]	m^3 $_{WDP\ eq}$

Different methods are reported to comply with the EN15804+A2 2019 standard versus those required for the Green Building Council of Australia (GBCA) credit assessment. Methods used for the lower 4.1MJ/kg melt-spin energy meet needs of the Green Building Council of Australia (GBCA) credit assessment. Methods used for upper electric 10.4MJ/kg melt-spin results/kg declared unit meet needs of both the EN15804+A2 2019 standard and GBCA credit assessments.

The following table describes environmental impacts contributing to risks of ecological issues and collapse lists each indicator with ***common names*** and remedies.

[5] NCV stands for net calorific value

Global warming potential (GWP)	Greenhouse gases absorb infra-red radiation. This heat reduces thermal energy differentials, from equator to poles, forcing ocean current and wind circulation to blend and regulate climate. Weakly blended "lumpier" weather has more frequent, extreme heat wave, fire-storm, cyclone, rain-storm, flood and blizzard events. Accumulation of carbon dioxide, natural gas methane, nitrous oxides and volatile organic compounds from burning fossil fuels causes global warming. Forest and wilderness growth absorbing air-borne carbon in biomass can drawdown such accumulation. Urgent renewable energy reliance is vital in time to avoid imminent tipping points and the worsening "***climate emergency***".
Ozone depletion potential (ODP)	Stratospheric ozone loss weakens the planet's solar shield so more shorter wavelength ultraviolet (UVB) light reaching earth damages plants and increases malignant melanoma and skin cancer in humans and animals. Chlorofluorocarbons, hydrochlorofluorocarbons (HCFC), chlorobromomethane, hydrobromofluorocarbons, carbon tetrachloride, methyl chloroform, methyl bromide and halon gas cause ozone layer loss. To repair the "***ozone hole***" reliance on ozone-safe refrigerants, aerosols and solvents is essential to avoid further its depletion and enable accumulation of naturally-formed ozone.
Acidification potential (AP)	Acidification reduces soil and waterway pH, impedes nitrogen fixation vital for plant growth and inhibits natural decomposition. It increases rates and incidence of fish kills, forest loss and deterioration of buildings and materials. Chief synthetic causes of "***acid rain***" are emissions of sulphur and nitrogen oxides, hydrochloric and hydrofluoric acids and ammonia from burning fossil fuels polluting rain and snow precipitation world-wide.
Eutrophication potential (EP)	Eutrophication from excessively high macronutrient levels added to natural waters promotes excessive plant growth that severely reduces oxygen, water and habitat security for aquatic and terrestrial life across related ecosystems. Chief synthetic cause of "***algal blooms***" is nitrogen (N, NOx, NH_4) and phosphorus (P, PO_4^{3-}) in rain run-off across over-fertilised land catchments.
Photochemical ozone creation potential (POCP)	Tropospheric photochemical ozone, called "***smog***" near ground level, is created from natural and synthetic compounds in UV sunlight. Low concentration smog damages vegetation and crops. High concentration smog is hazardous to human health. Chief synthetic causes are nitrogen oxides, carbon monoxide and volatile organic compounds (VOC) pollutants. Avoiding reliance on dirtiest coal fuel and volatile chemicals has reduced smog incidence in many areas globally.
Abiotic depletion potential elemental (ADPE)	Abiotic depletion of finite mineral resources increases time, effort and money required to obtain more resources to the point of extinction of naturally viable reserves. This can limit access to available, valuable and scarce elements vital for human-life. The youth movement "***extinction rebellion***" calls on adults to secure climate, reserves and biodiversity for current and future generations.
Abiotic depletion potential fossil fuel (ADPF)	Abiotic depletion of resources by consuming finite oil, natural gas, coal and yellowcake fossil fuel reserves leaves current and future generations suffering limited available, accessible, plentiful, essential valuable as well as scarce raw material, medicinal, chemical, feedstock and fuel stock. Approaching "***peak oil***" acknowledged fossil fuel reserves are finite and the need for decision-makers to act to avoid market instability, insecurity and or oil and gas wars.

Aditional Environmental Information on Carbon Offsets

Autex has purchased carbon certificates to offset all these products greenhouse gas global warming potential (GWP). These certificates were 3rd party certified as compliant for this EPD.

Table 2a shows Total Greenhouse Gas with GWP Offset/kg declared unit modelled on lower 4.102MJ/kg melt-spin energy. In each lower energy case, all cradle to gate product emissions were more than fully offset . These are reported as negative emissions acting as a carbon sink.

Table 2a also shows that Total Greenhouse Gas had no GWP Offset/kg declared unit modelled on upper 10.4MJ/kg electric melt-spin.

Table 2a A1-A3 Total Greenhouse Gas with GWP Offset kg CO_{2e}/kg declared product

Melt-spin energy modelled	ASL	ASL Black Finish	ASL E- Foil
Lower 4.102MJ/kg product	-1.87	-1.88	-1.94
Upper 10.4MJ/kg product	8.12	8.02	7.94

The lower melt spin energy reflects competing products data source position taken. The GWP offset amounts are the true 3rd party certified valid GWP estimates to be assigned these products and not calculated results tabled in the following section that compliance demands not show offset results.

Assessment Results Cradle to Gate

For Green Building Council credits the Additional Environmental Information 3rd party certified GWP offset amounts reported are valid for these products not calculated results and Table 2b and 2c.

Table 2b shows calculated LCIA results/kg product using lower 4.102MJ/kg melt-spin energy excluding offsets.

Table 2c shows calculated LCI and LCIA results/kg assuming upper 10.4MJ/kg electric melt-spin that has no offsets considering the effective GWP avoided using thermal insulation.

Table 2b A1-A3Calculated Lower GWP Results kg CO_{2e} /kg declared product

Impact potential sources	ASL	ASL Black Finish	ASL E- Foil
Greenhouse Gas Biogenic	-0.41	-0.40	-0.38
Greenhouse Gas Land Use Change LULUC	1.0E-09	1.0E-09	9.9E-10
Greenhouse Gas Fossil	3.98	3.99	4.09
Total Greenhouse Gas	3.58	3.59	3.71

Table 2c A1-A3Calculated Higher GWP Results kg CO_{2e} /kg declared product

Impact potential sources	ASL	ASL Black Finish	ASL E- Foil
Greenhouse Gas Biogenic	-0.48	-0.46	-0.45
Greenhouse Gas Land Use Change LULUC	1.0E-09	1.0E-09	9.9E-10
Greenhouse Gas Fossil	8.59	8.48	8.38
Total Greenhouse Gas	8.12	8.02	7.94

Results for Inventory and Potential Impact

Results for the lower melt-spin energy meet needs of the Green Building Council of Australia (GBCA) credit assessment.

Cradle to Gate Inventory and Potential Impact Results

Table 2 shows product LCI and LCIA results/kg declared unit based on the lower 4.1MJ/kg melt-spin energy. The lower melt spin energy results reflect the competing products data sources position taken.

Table 2 System LCI and LCIA Results A1-A3/kg

Impact potential categories	Units	ASL	ASL Black Finish	ASL E- Foil
Stratospheric Ozone Depletion	kg $CFC11_e$	1.8E-09	2.0E-09	3.3E-09
Photochemical Ozone Creation	kg C_2H_{4e}	1.2E-02	1.2E-02	1.2E-02
Acidification	kg SO_{2e}	1.1E-02	1.2E-02	1.2E-02
Eutrophication	kg PO_{4e}^3	2.6E-03	2.6E-03	2.6E-03
Abiotic Depletion Fossil Fuel	MJ ncv	4.1	4.1	4.1
Abiotic Depletion Mineral (Elemental)	kg Sb eq	4.5E-03	4.3E-03	4.3E-03
Water Deprivation Weighted Scarcity	world m^3eq	6.73E-02	6.58E-02	6.32E-02
Input flows				
Net fresh water	m^3	0.41	0.40	0.39
Secondary material	kg	0.47	0.46	0.44
Secondary renewable fuel	MJ ncv	0.74	0.73	0.71
Secondary non-renewable fuel	MJ ncv	0.19	0.47	0.46
Primary renewable energy not feedstock	MJ ncv	4.16	4.17	4.13
Primary energy renewable feedstock matter	MJ ncv	1.96	1.91	1.83
Total primary renewable energy resources	MJ ncv	6.12	6.08	5.96
Primary energy not renewable or feedstock	MJ ncv	51.04	51.10	51.84
Primary non-renewable feedstock energy	MJ ncv	20.73	21.53	20.85
Total primary non-renewable energy use	MJ ncv	71.77	72.63	72.69
Output flows				
Hazardous waste disposed	kg	5.3E-03	5.2E-03	5.0E-03
Non-hazardous waste disposed	kg	0.60	0.62	0.60
Radioactive waste disposed	kg	1.7E-09	1.6E-09	1.6E-09
Components for reuse	kg	0.21	0.23	0.24
Material for recycling	kg	0.07	0.07	0.08
Material for energy recovery	kg	3.0E-04	2.9E-04	2.8E-04
Electrical energy exported	MJ ncv	0.E+00	0.E+00	0.E+00
Thermal energy exported	MJ ncv	0.E+00	0.E+00	0.E+00

Table 3 shows the products LCI and LCIA results/kg declared unit modelled on upper 10.4MJ/kg electric melt-spin. Results for upper electric 10.4MJ/kg melt-spin results/kg declared unit meet needs of both the EN15804+A2 2019 standard and GBCA credit assessments.

Table 3 System LCI and LCIA Results A1-A3/kg

Impact potential categories	Units	ASL	ASL Black Finish	ASL e-Foil
Stratospheric Ozone Depletion	kg $CFC11_e$	6.2E-09	6.2E-09	7.4E-09
Photochemical Ozone Formation	kg C_2H_{4eq}	1.8E-02	1.8E-02	1.7E-02
Photochemical Ozone Creation	kg $NMVOC_{eq}$	1.5E-02	1.5E-02	1.4E-02
Acidification Potential	kg SO_{2e}	2.1E-02	2.1E-02	2.1E-02
Acidity Accumulated Exceedance	Mole H^+	2.6E-02	2.6E-02	2.6E-02
Eutrophication Potential	kg $PO_{4eq}{}^3$	5.7E-03	5.6E-03	5.4E-03
Eutrophication Potential Freshwater	kg P_{eq}	2.7E-06	2.7E-06	2.6E-06
Eutrophication Potential Terrestrial	Mole N_{eq}	1.5E-02	1.5E-02	1.5E-02
Eutrophication Potential Marine	kg N_{eq}	7.1E-03	6.9E-03	6.7E-03
Abiotic Depletion Fossil Fuel	MJ_{ncv}	7.8	7.7	7.5
Abiotic Depletion Mineral (Elemental)	kg Sb_{eq}	8.3E-03	7.9E-03	7.8E-03
Water Deprivation Weighted Scarcity	world m^3_{eq}	0.20	0.20	0.19
Input flows				
Net fresh water	m^3	1.2	1.2	1.1
Secondary material	kg	0.47	0.46	0.44
Secondary renewable fuel	MJ_{ncv}	1.9	1.6	1.8
Secondary non-renewable fuel	MJ_{ncv}	0.45	0.48	0.47
Primary renewable energy not feedstock	MJ_{ncv}	7.6	7.5	7.3
Primary energy renewable feedstock matter	MJ_{ncv}	1.9	1.7	1.8
Total primary renewable energy resources	MJ_{ncv}	9.5	9.2	9.1
Primary energy not renewable or feedstock	MJ_{ncv}	115	114	112
Primary non-renewable feedstock energy	MJ_{ncv}	24	24	24
Total primary non-renewable energy use	MJ_{ncv}	139	138	135
Output flows				
Hazardous waste disposed	kg	7.3E-03	7.1E-03	6.9E-03
Non-hazardous waste disposed	kg	2.06	2.03	1.95
Radioactive waste disposed	kg	6.3E-09	6.2E-09	5.9E-09
Components for reuse	kg	0.66	0.67	0.66
Material for recycling	kg	0.09	0.09	0.10
Material for energy recovery	kg	6.0E-04	5.9E-04	5.6E-04
Electrical energy exported	MJ_{ncv}	0.E+00	0.E+00	0.E+00
Thermal energy exported	MJ_{ncv}	0.E+00	0.E+00	0.E+00

Moduel C and D Inventory and Potential Impact Results

All results were zero for B1 Building Use, B3 Repair and B5 to B7 Refurbishment, Operating Energy and Operating Water. All results were zero for D1 Demolition, D3 Waste Processing and D4 Disposal.

Interpretation

This EPD declares results from one lower and upper all electricity melt-spin values but this interpretation section discusses results from two upper 10.40MJ and one lower 4.102MJ value. To compare such influences, Figure 5 depicts Greenhouse Gas global warming potential (GWP) results from the three models. Compared to the lower energy model, the upper was 2.2 to 2.3 times higher and upper gas and electric GWP was 1.9 to 2.0 times higher.

Figure 6 depicts GWP of dope dyed polyester filament fibre extrusion spinning versus wet treatment and knitting fabric from 3rd party reviewed LCA of 6 polyester fabrics in 2017-18 by Roos that also used upper melt-spin energy [15]. That small scale fibre production high GWP should be less with larger-scale efficiency.

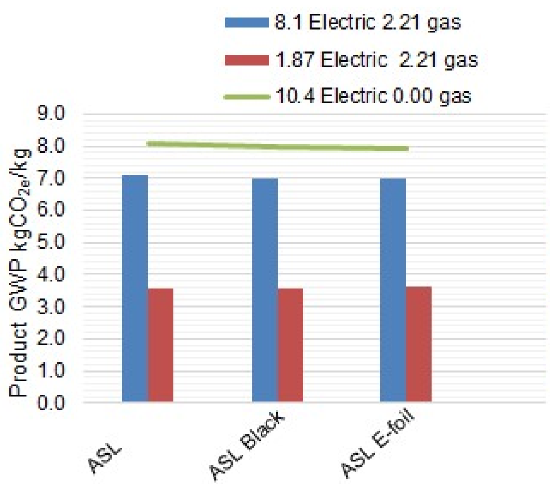


Figure 5. PET Fibre GWP kg CO_{2e}/kg

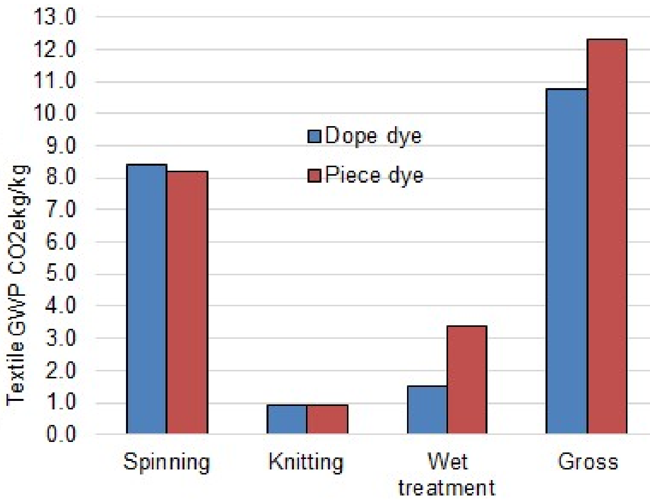


Figure 6. PET Fabric GWP kg CO_{2e}/kg

Nevertheless, this LCA using EcoInvent V3.4 LCI based on first-hand industry PET fibre spinning data shows GWP comparable to upper 10.4 MJ electric melt-spin results and as Figure 7 depicts. Also, Sandin, Roos & Johansson (2019) reported comparable gross production energy use between 96 and 125 MJ/kg PET fibre and calculated GWP from 1.7 to 4.5kg CO_2 eq/ kg PET fibre as declared and Figure 8 depicts [7].

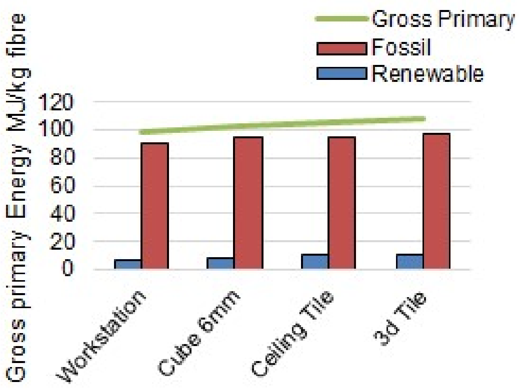


Figure7. PET Fibre MJ/kg

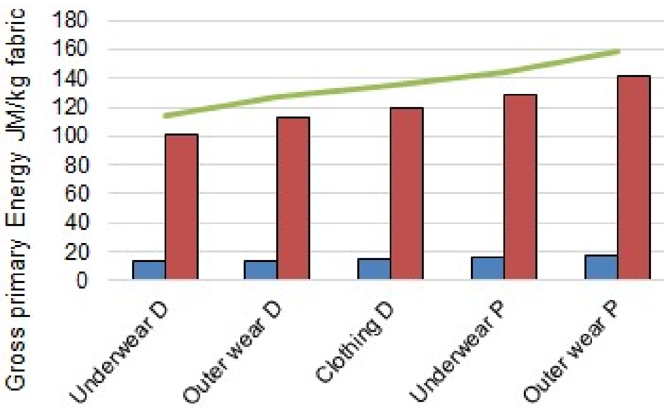


Figure 8. PET Fabric MJ/kg

Such variation in energy use and GWP result suggests that more accurate melt-spin energy definition is vital for true polyester LCA modelling to have confidence in affected EPDs. Unless based on recent post 2019 rPET staple fibre spinning-industry datasets, LCA results based on one melt-spin energy background data value are probably too uncertain to be declared representative of PET fibre.

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