prihoda®

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner:
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Established in 1994, Prihoda® s.r.o. is a Czech firm specializing in fabric ducting and diffusers, designed for transport and distribution of air. Prihoda® s.r.o. was the first company in the world to use fabric microperforations, negative pressure ducting, and adjustable length duct parts. These and other high-quality components allow tailor-made solutions rather than ducting simply fabricated by linear foot or meter, delivering innovation to customers around the globe.

Product

Prihoda® tailor-made fabric ducting and diffusers,
(Model: Prihoda® Recycled)

Functional Unit

One m^2 of substantial products used to produce the duct surface area of any single duct section of the ductwork.

EPD Number and Period of Validity

SCS-EPD-03932
Beginning Date: March 22, 2016 – End Date: March 21, 2019

Product Category Rule

UN CPC 36950, 42190, 42999: Air ducts, substantial materials, Version 1.2 (2012). International EPD® System.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608

SCSglobal SERVICES

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Disclaimers: *This Environmental Product Declaration (EPD) conforms to ISO 14025, 14040, ISO 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

PCR review, was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino. info@environdec.com.
Approved Date: March 22, 2016 - End Date: March 21, 2019	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007.	☐ internal ☑ external
Third party verifier	Tom Gloria, PhD, Industrial Ecology Consultants

PRODUCT DESCRIPTION

Prihoda® tailor-made fabric ducting and diffusers are assembled at the manufacturing facilities in Hlinsko, Czech Republic. The product is a fabric duct and diffuser, often commonly referred to as duct socks or textile air dispersion system, which is custom-made by the company to suit different industrial operations such as food processing facilities, chemical, textile or electronic industries, supermarkets and large retail stores. Prihoda® products facilitate the supply of air (air transfer) as well as air distribution/diffusion into the occupied zone. The air ducts and diffusers are constructed with 100% post-consumer recycled polyester fabric, derived from plastic water bottles. The textile air dispersion systems are sold in the Heating Ventilation and Air Conditioning (HVAC) sector. The geographic scope of this EPD includes Germany, Czech Republic and other regions in Europe and North America. According to the manufacturer, the service life of the product ranges from 15-30 years.

Table 1. *Product characteristics of Prihoda tailor-made fabric ducting and diffusers.*

Product Characteristics	
Operating temperature	-50°C up to 110°C for fabric
Thickness of each component (mm)	0.3mm
Material density (kg/m^2)	0.22 kg/m^2
Reactivity to fire	B s1,d0 (EN135-1:2003) ; UL/ULC/NFPA90a 25/50
Flexural rigidity (Nmm^2)	Not applicable
Tensile Strength	1880 warp / 1090 weft according to EN ISO 13934-1
Thermal Resistance (for insulated products) [m^{2}K/W]	Not applicable
Presence of antimicrobial treatment	Treatment available upon request (not included in this EPD)
Microbial growth	Antimicrobial treatment available upon request (not included in this EPD)
Fibrous material outflow	Clean room quality- non fiber shedding ISO 14644-1 : Class 4
Blowing agent (for foamed materials)	Not applicable
Hazardous substances content	No hazardous material content

MATERIAL COMPOSITION

Table 2. *A summary of the product materials, by mass and percentage, for 1 m² Prihoda® fabric duct and diffuser.*

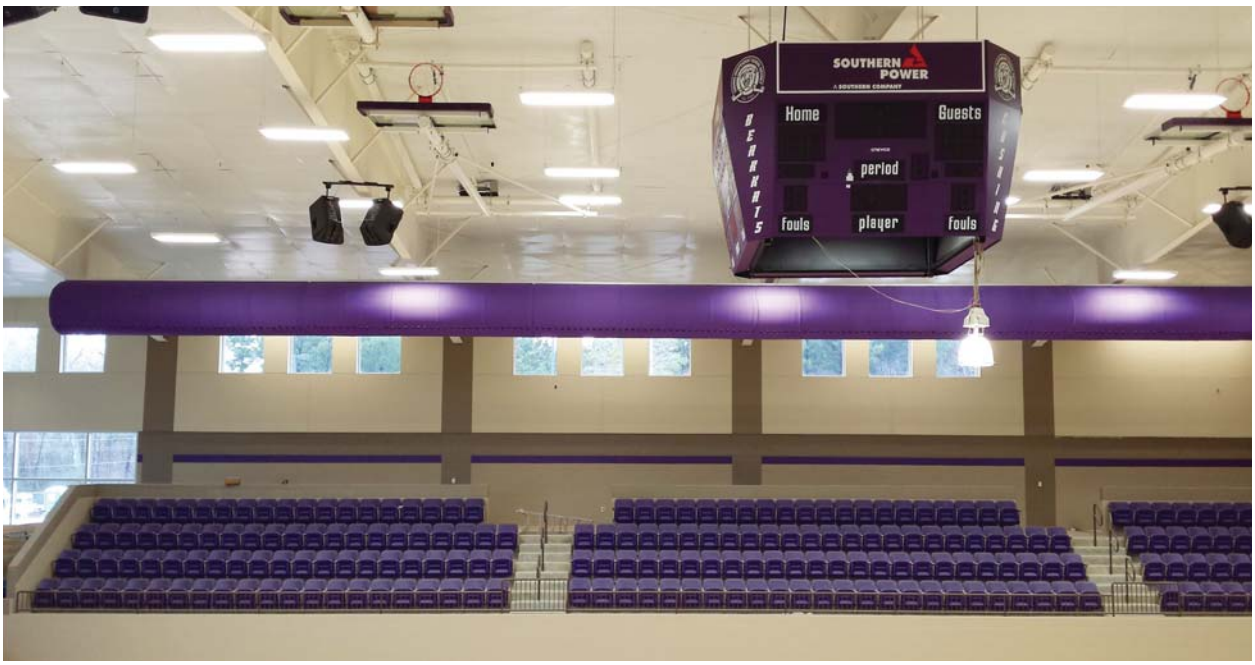
Product Material Type	Percent of Product	Weight (kg)	Resource
REPREVE® (100% Recycled Polyester)	100%	0.22	Post-consumer recycled content (derived from plastic water bottles)
TOTAL	100%	0.22	
Packaging Material Type	**Percent of Product**	**Weight (kg)**	**Resource**
Corrugated board	100%	0.05	Recycled content
TOTAL	100%	0.05	

LIFE CYCLE ASSESSMENT OVERVIEW

A Life Cycle Assessment (LCA) was conducted to evaluate the environmental performance of the Prihoda® tailor-made fabric ducting and diffusers in accordance with ISO 14044 standard. LCA accounts for the potential environmental impacts of a product over its entire life cycle, from raw material extraction through manufacturing, use, and end-of-life.

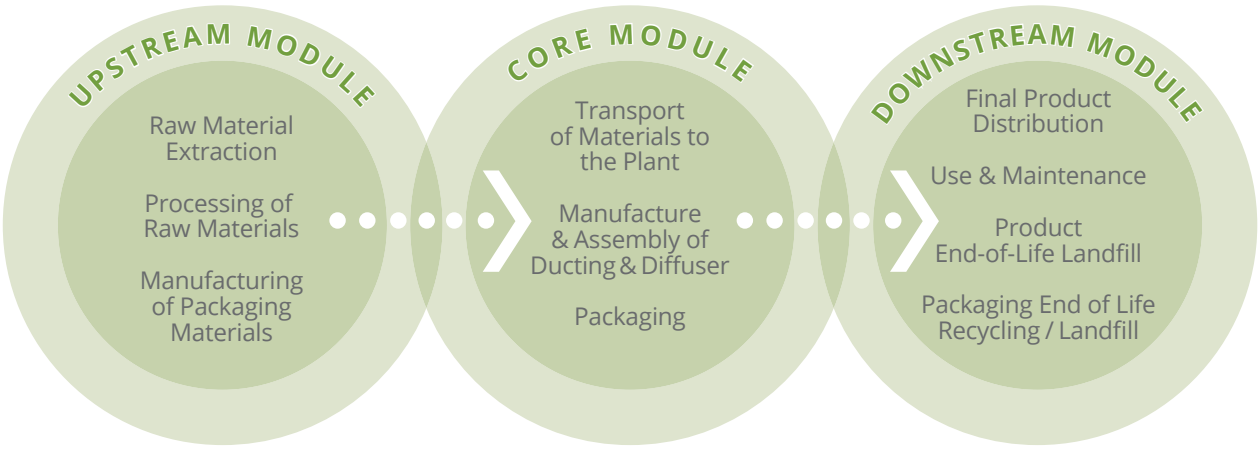
FUNCTIONAL UNIT

Textile air ducts and diffusers are used in heating, ventilation and air conditioning with the primary function of distribution of air. The functional unit used in the study, as specified in the PCR, is 1m² of substantial product used to produce the duct surface area of any single duct section of the ductwork. The reference flow of the product system is considered to be 220 grams of fabric that is used to make 1m² of the duct.



LIFE CYCLE ASSESSMENT STAGES

The system boundary diagram for Prihoda® tailor-made fabric ducting and diffusers outlines the life cycle phases included in this cradle-to-grave study[1]. The study has been separated into three different modules 1) Upstream Module (from cradle-to-gate) 2) Core Module (from gate-to-gate) 3) Downstream Module (from gate-to-grave) as presented in the diagram below.



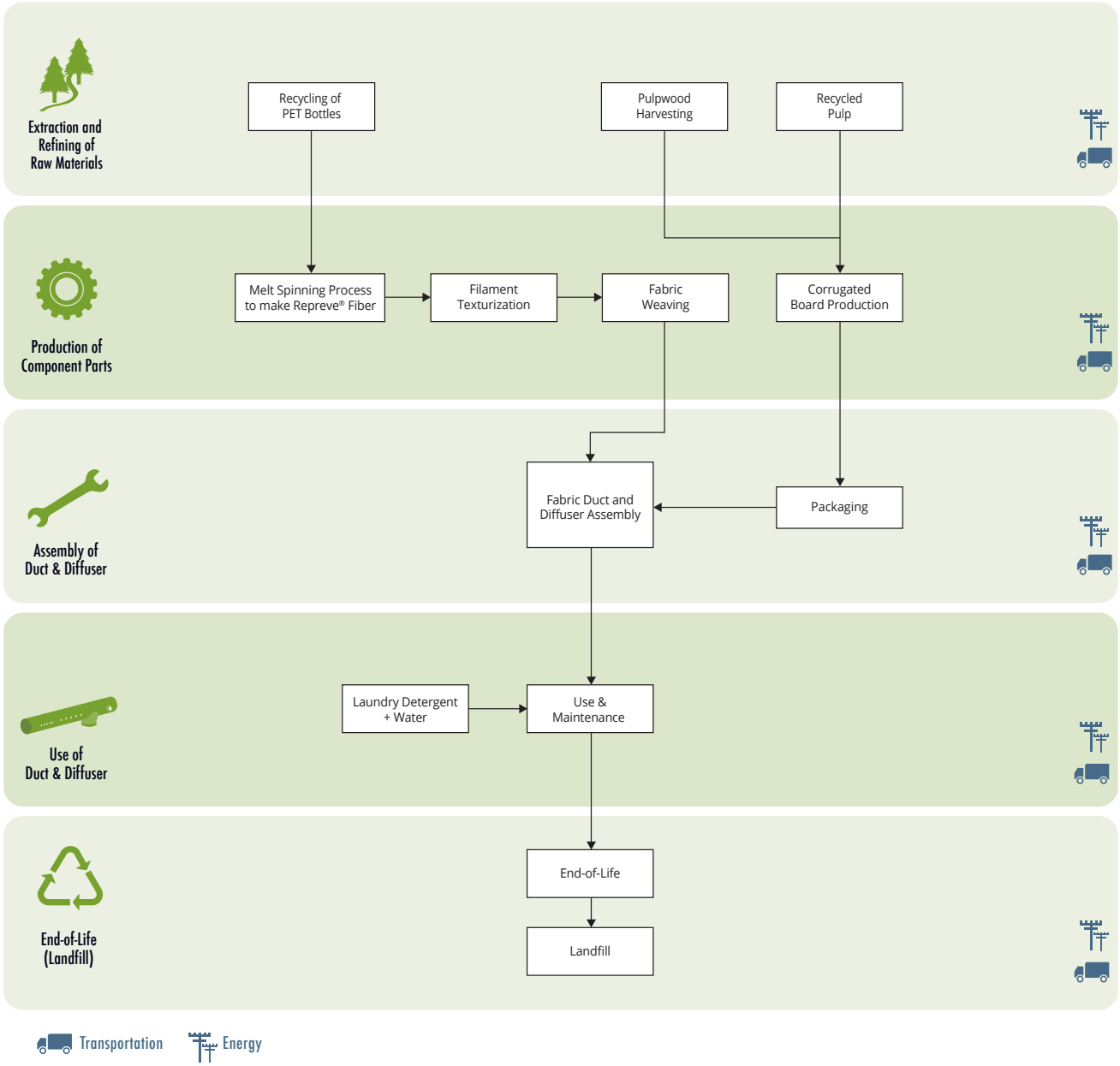
Processes excluded from the study are listed below:

- Duct accessories such as flanges, hangers, supports, and connection devices to diffusers related to the installation of the duct have not been included in the system boundary

[1] In accordance with the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory.

PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the major material and energy flows to the life cycle of the Prihoda® tailor-made fabric ducting and diffusers. This includes resource extraction, raw material processing, transportation, assembly of air duct, use and maintenance, and end-of-life. Mass flows below 1% are not shown in the diagram.



ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

USE OF RESOURCES

The resource use and emissions from each step of the product life cycle are summed to obtain the life cycle inventory results. An aggregated inventory for consumption of energy resources are reported by classifying the type of resources utilized in the product:

(i) Non-renewable resources include the material and energy in fossil fuel and nuclear fuel.

(ii) Renewable resources include electricity generation from hydropower, geothermal, wind and solar.

(iii) Secondary resources are the recycled material inputs and recovered energy obtained from waste energy.

Tables 3 and 4 present the results for consumption of energy and material resources respectively divided into core, upstream and downstream modules. Table 5 presents the results for water use divided into upstream, core and downstream modules.

Table 3. *Inventory categories for energy use in terms of MJ as well as percent of total. Results shown for 1m² of Prihoda® fabric duct and diffuser.*

Parameter	Total		Upstream Module		Core Module		Downstream Module	
	MJ	%	MJ	%	MJ	%	MJ	%
Non-renewable energy resources	91	93.8	41	42	6.7	6.9	44	45
Secondary energy resources	0.14	0.14	0	0	0.14	0.14	0	0
Renewable energy resources	5.7	6	5.2	5	0.1	0	0.3	0
Primary energy Demand	**97**	**100**	**46**	**47**	**7.0**	**7**	**44**	**46**

Table 4. *Inventory categories for material resource use in terms of kg as well as percent of total. Results shown for 1m² of Prihoda® fabric duct and diffuser.*

Parameter	Total		Upstream Module		Core Module		Downstream Module	
	kg	%	kg	%	kg	%	kg	%
Non-renewable material resources	3.1	93	1.8	55	0.31	9	0.96	29
Secondary material resources	0.23	7	0.23	7	2.4×10^{-5}	0	0	0
Total material resources	**3.3**	**100**	**2.1**	**62**	**0.31**	**9**	**0.96**	**29**

Table 5. *Water use for 1m² of Prihoda® fabric duct and diffuser.*

Parameter	Total	Upstream Module	Core Module	Downstream Module
Water use (m^3)	0.33	0.31	0.013	0.009

WASTE PRODUCTION

The waste generated along the life cycle of fabric duct and diffuser includes hazardous waste and non-hazardous waste.

Table 6. *Waste production in terms of kg. Results shown for 1m² of Prihoda fabric duct and diffuser.*

Parameter	Total	Upstream Module	Core Module	Downstream Module
Hazardous Waste (kg)	1.1×10^{-4}	9.1×10^{-5}	2.1×10^{-6}	2.0×10^{-5}
Non-hazardous Waste (kg)	1.1	0.14	0.07	0.87

OTHER ENVIRONMENTAL INDICATORS

Feedstock energy is the amount of energy contained in raw materials used in the product.

Table 7. *Feedstock energy in terms of MJ/m² for Prihoda® fabric duct and diffuser.*

Parameter	Total	Upstream Module	Core Module	Downstream Module
Feedstock energy (MJ/m²)	5.6	5.6	0.0	0.0

LIFE CYCLE IMPACT ASSESSMENT

Life cycle impact assessment is the process of converting the life cycle inventory results into a representation of potential environmental impacts. For example, emissions of carbon dioxide, methane, and nitrous oxide (inventory data) together contribute to climate change (impact assessment). The impact assessment for the EPD is conducted in accordance with the requirements of the Product Category Rule (PCR).

Impact category indicators were estimated using CML-IA characterization method, including Global Warming Potential (100 year time horizon), Acidification Potential, Eutrophication Potential, Photochemical Oxidation Creation Potential, and Ozone Depleting Potential.

Table 8. *Life cycle impact assessment results for 1m² of Prihoda fabric duct, divided into upstream, core and downstream modules. The percentage contribution of impacts for each module is presented in parenthesis.*

Impact Category	Units	Total	Upstream Module	Core Module	Downstream Module
Global warming potential	kg CO_2 eq	7.2 (100%)	3.6 (49%)	0.46 (6%)	3.2 (45%)
Acidification Potential	kg SO_2 eq	0.036 (100%)	0.023 (62%)	0.002 (6%)	0.012 (32%)
Eutrophication Potential	kg PO_4^{3-} eq	0.014 (100%)	0.007 (49%)	0.002 (16%)	4.8×10^{-3} (35%)
Photochemical Oxidation	kg C_2H_4 eq	1.5×10^{-3} (100%)	8.4×10^{-4} (56%)	7.4×10^{-5} (5%)	5.9×10^{-4} (39%)
Ozone Depletion Potential	kg CFC-11 eq	4.3×10^{-7} (100%)	4.9×10^{-8} (11%)	2.1×10^{-8} (5%)	3.6×10^{-7} (84%)

ADDITIONAL ENVIRONMENTAL INFORMATION

The recycled polyester fabric used by Prihoda® is certified to the REPREVE® standards[2] which ensure that the products are made with recycled fiber that is traceable.

Prihoda® s.r.o has achieved Quality Certification ISO 9001 and Environmental Certification ISO 14001.

SUPPORTING TECHNICAL INFORMATION

System Boundaries

The fabric duct and diffuser is a product, which is manufactured entirely from 100% recycled polyester fabric. The system boundary includes three different life cycle stages- Upstream module, Core Module and Downstream Module. The LCA model includes unit processes for recycling polyester, manufacturing the polyester fabric, the upstream transportation of the fabric to the Prihoda® facility, the manufacture and assembly of the ducts, the energy inputs associated with manufacture and assembly in the Prihoda® facility, the downstream distribution of the ducts, use and maintenance, and end-of-life. In accordance with the PCR, duct accessories such as flanges, hangers, supports and connection devices to diffusers related to the installation of the duct have not been included in the system boundary

Cut-off Criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact must be included in the inventory. This cut-off rule was followed in this LCA study and all unit processes contributing to greater than 1% of total environmental impacts are included.

Data sources

Unit processes were developed with SimaPro 8.0, drawing upon data from multiple sources. Primary data were provided by Prihoda® for the manufacturing facility in Czech Republic. Secondary LCI data from Ecoinvent v2.2 and 3.1, USLCI database, and published literature were used.

[2] "Products made from fabric with REPREVE are tested and certified before the REPREVE brand name can be used."; (http://unifi.com/pdf/utsc_repreve_eng.pdf)

Table 9. *Data sources used for the LCA.*

Component	Material	Dataset	Material Processing Dataset	Data Source	Date
Raw Materials					
REPREVE®	100% Recycled PET fabric	Created new dataset in SimaPro by modifying existing datasets to incorporate geographic coverage: (i) Recycled PET flakes (USLCI dataset modified to include electricity mix) (ii) Recycled flakes to filament (data from literature)	(i) Texturing of yarn (data from literature) (ii) PET fabric manufacturing (data from literature)	USLCI; Literature,	2011
Prihoda® Fabric Ducting & Diffusers					
Fabric ducting and diffusers"	NA	Created dataset with primary data from Prihoda® by modifying existing datasets to incorporate geographic coverage: (i) Electricity, medium voltage, production CZ, at grid/CZ (ii) Heat, natural gas, at boiler modulating (iii) Water, cooling, unspecified natural origin, CZ	NA	Ecoinvent 2.2; Prihoda®	2010; 2014
Packaging					
Corrugated box	Cardboard	Corrugated board box {RER}|production/U	Included with material	Ecoinvent 3.1	2014
Transport					
Truck transport	NA	Transport, lorry 16-32t, EURO4/RER U	NA	Ecoinvent 2.2	2010
Aircraft Freight	NA	Transport, aircraft, freight, Europe/tkm/RER	NA	Ecoinvent 2.2	2010
Oceanic Freighter transport	NA	Transport, transoceanic freight ship/OCE U	NA	Ecoinvent 2.2	2010

Data quality

The data quality assessment addresses the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 10. *Data Quality of Life Cycle Inventory.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data should be collected.	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old (2010 or typically more recent). All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on 2014 annual production.
Geographical Coverage: Geographical area from which data for unit processes is collected.	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily in Asia. Surrogate data used in the assessment are representative of textile operations in Asia. Datasets are modified to include the energy mix for country of manufacture in Asia. The resource use at the manufacturing facility in Czech Republic is modeled using electricity grid for Czech Republic. Data representing product disposal are based on European waste scenario for solid waste disposal in a sanitary landfill. Data for disposal of packaging material is based on Czech Republic waste scenario that is available in the Ecoinvent database.
Technology Coverage: Specific technology or technology mix.	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Specific information regarding recycled polyester fabric manufacturing was not available. Representative datasets for recycled PET bottles to flakes, yarn manufacturing and polyester fabric weaving datasets were modeled in SimaPro based on data from International Textile Manufacturers Federation (ITMF) as published in peer reviewed LCA journal.
Precision: Measure of the variability of the data values for each data expressed. (e.g. variance)	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated.	The LCA model included all known mass and energy flows for production of air ducting and diffuser. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage.	Data used in the assessment represent typical or average processes as currently reported from multiple data sources, and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis.	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in the Czech Republic.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study.	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the data: Description of primary and secondary data sources.	Data representing energy use at the Prihoda® facility in Czech Republic represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. LCI data from published literature was used as secondary data source in the LCA model.
Uncertainty of the information: Uncertainty related to data, models, and assumptions.	Actual supplier data for upstream textile operations was not available and relied upon use of existing representative datasets in LCA studies from peer reviewed journals. These datasets contained relatively recent data (<5 years), but lacked geographical representativeness. There is uncertainty related to impact methods used, because the impact method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

REFERENCES:

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