CNTAC-LCA

丝丽雅 GRACE

碳足迹评价报告

THE CARBON FOOTPRINT ASSESSMENT REPORT

GRACE

宜宾丝丽雅集团有限公司
涡流纺粘胶纱线碳足迹评价

THE CARBON FOOTPRINT ASSESSMENT OF VORTEX SPUN VISCOSE YARN
YIBIN GRACE GROUP CO., LTD.

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Executive Summary

The functional unit in this report is 1 kg 30S vortex spun viscose yarn, and the type of system boundary is “Cradle-to-Gate”, including raw material acquisition stage, fiber processing stage and yarn processing stage.

The Office for Social Responsibility of China National Textile and Apparel Council(CNTAC) is responsible for the coordination of various industrial chains in this report. Due to the epidemic, the data survey is conducted online. The composition of the reported product is 100% viscose staple fiber, so the survey traces the upstream supply chain around the viscose staple fiber. The carbon footprint data of Guaiba bleached hardwood kraft pulp is provided by CMPC Pulp SPA. and processing data of Arauco bleached softwood kraft pulp is provided by Celulosa Arauco Y Constitucion S.A.; data on energy consumption, material consumption and pollution emission in other links are provided by each manufacturer, and the authenticity, accuracy and reliability of enterprise data are guaranteed by themselves.

The impact assessment method used in this report is CML2001-Jan.2016 (in compliance with the requirements of ISO14040, please refer to the footnote section of “3.4.1. Assessment Method and Impact Category” in the main text for relevant explanations), selecting the Global Warming Potential (excl. biogenic carbon) index. The table below shows the evaluation results of the carbon footprint of Yibin Grace’s 30S vortex spun viscose yarn (with two decimal places).

The Performance of Product Carbon Footprint	Global Warming Potential (excl. biogenic carbon)（Unit: kg CO_2 eq./kg）
30S Vortex Spun Viscose Yarn	**7.87**

The carbon footprint used in this report does not consider the effect of biogenic carbon, and the carbon footprint is 7.87 kg CO_2 eq./kg.

1.Basic Information

1.1.Assessment Object

1kg 30S Vortex spun viscose yarn of Yibin Grace, the details are as follows:

1.2.Functional Unit

This life cycle assessment takes 1 kg 30S vortex spun viscose yarn as the functional unit.

1.3.Description of the Product Function

The Assessment Object	**Yibin Grace's 30S Vortex Spun Viscose Yarn**
Picture of the Product	
Product Parameters	Components: 100% Viscose staple fiber Yarn Counts: 30S
Manufacturer	Guaiba BHKP: CMPC Pulp SPA Arauco BSKP: Celulosa Arauco Y Constitucion S.A. Viscose staple fibre: Yibin Grace Group Co.,Ltd. Vortex spun yarn: Yibin Grace Textile Co.,Ltd.

2.Assessment Scope

2.1.System Boundary

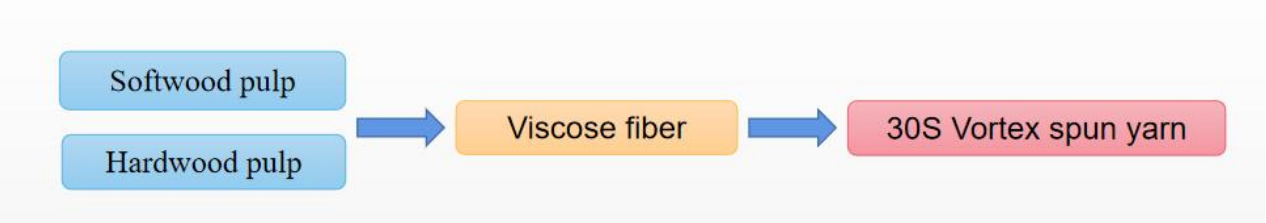
The time frame concerning the assessment of product life cycle is 2021, and the system boundary is "Cradle-to-Gate" , including the following three stages:

1) Raw material acquisition stage: It involves the processing and overseas transportation of wood pulp. The carbon footprint data of Guaiba bleached hardwood kraft pulp is provided by CMPC Pulp SPA processing data of Arauco bleached softwood kraft pulp is provided by Celulosa Arauco Y Constitucion S.A.,which includes the data of raw materials, electricity, chemicals and transportation;

2) Fiber processing stage: it involves domestic transportation of wood pulp and processing of viscose staple fiber, and the processing data includes electricity, packaging, chemicals and transportation;

3) Yarn processing stage: It involves the transportation of viscose staple fibers and vortex spinning, and the processing data includes electricity, packaging and transportation;

The specific products in each stage included in the system boundary are shown below:



2.2.Used Software and Tools

This report uses the "Whole Life Cycle Assessment Application System for Textile and Garment Industry Products" (abbreviated as "LCAplus System", developed by China Textile Information Center, meets the requirements of ISO14040) to carry out life cycle modeling and assessment.

3. Lifecycle Inventory Analysis

The inventory analysis mainly calculates the energy input and resource consumption of the product life cycle (raw material acquisition stage, fiber processing stage, yarn processing stage), as well as the data of discharge of various environmental load substances (including exhaust gases, wastewater and solid waste).

3.1.Data Collection

The data used in this reports are divided into two parts: primary data and background data.

Primary data is obtained through such methods as the field collection, historical files collection to get the actual processing data, mainly including energy consumption in the production process, the usage amount of raw and supplemental materials, main packaging materials and the waste generation, the transportation distance of raw materials, main packaging from the manufacturing place to the final delivery place, and the transportation distance of products from the production to distribution places.

Background data includes processing data of main supplemental materials, electric power discharge data, and environmental impacts caused by different transportation types. Due to the challenge of collecting background data, this report mainly uses the data in the LCAplus system (built-in GaBi database version 2020). In the softwood pulp processing data, the carbon emission coefficient of wood production is calculated from the related data of hardwood pulp.

The data collection process mainly adopts the method of filling in the data collection form, processing and distributing according to the field data collected. Finally the data in each stage of the product is gotten.

3.2.Data Sources

The Office for Social Responsibility of China National Textile and Apparel Council is responsible for the coordination of various industrial chains in this report. Due to the epidemic, the data survey is conducted online. Data sources include enterprise data (actual measurement, production statistics or empirical data), third-party data (environmental monitoring data), map measurement, and LCAplus system provision.

The composition of the reported product is 100% viscose staple fiber, so the upstream supply chain is traced around it. The carbon footprint data of Guaiba bleached hardwood kraft pulp is provided by CMPC Pulp SPA, the processing data of Arauco bleached softwood kraft pulp is provided by Celulosa Arauco Y Constitucion S.A; data on energy consumption, material consumption and pollution emission in other links are provided by each manufacturer, and the authenticity, accuracy and reliability of enterprise data are guaranteed by themselves.

3.3.Data List

The calculation of domestic road transport is referenced by the database of “Truck, Euro 5, up to 7.5t gross weight / 2.7t payload capacity”, international sea transportation is referenced by the database of “Bulk commodity carrier, coastal transportation”, which will not be explained separately. The data list for each stage is as follows:

3.3.1 Raw Material Acquisition Stage

The carbon footprint data of Guaiba bleached hardwood kraft pulp is provided by CMPC Pulp SPA, the processing data of Arauco bleached softwood kraft pulp is listed below:

Input	**Materials**	**Chemicals**					
	100% Radiation	Caustic Soda	Sodium Chloride	Methanol (CH_3OH)	Sulfuric Acid	Oxygen (O_2)	Perhydrol (H_2O_2)

	Pine	(NaOH)	(NaCl)		(H_2SO_4)		
Input	**Energy**	**Output**	**Main Product**		**Waste and Discharge**		
	Electricity		Softwood Pulp		Sewage		CO_2

3.3.2 Fiber Processing Stage

Input	**Materials**		**Energy**			**Packaging**	
	Hardwood Pulp	Softwood Pulp	Diesel oil	Vapour	Electricity	PE Packing Bag	Packing Belt
Input	**Water Resource**	**Chemicals**					
	River Water	Zinc Sulfate ($ZnSO_4$)	Caustic Soda (NaOH)	Sulfuric Acid (H_2SO_4)	Hydrogen Peroxide (H_2O_2)	Oiling Agent	Amino acid mixture	Active Agent
Output	**Main Product**	**By-product**					
	Viscose Staple Fibre	Sodium Sulfate (Na_2SO_4)	Carbon Disulfide (CS_2)	Sulfuric Acid (H_2SO_4)	Elemental Sulfur		
Output	**Waste and Discharge**								
	COD	BOD	Ammonia Nitrogen (NH_3-N)	Vapour	Total Nitrogen	Total Phosphorus	Sulfide	Sewage	Hemicellulose (HCEL)

3.3.3 Yarn Processing Stage

Input	Materials	Packaging				
	Viscose Staple Fibre	Paper Tube	Carton	PE Packing Film	PP Bag	Packing Belt
Input	Energy		Water Resource			
	Hydropower	Thermal Power	Tap Water for Opening	Tap Water for Carding	Tap Water for drawing	Tap Water for Vortex Spinning
Ouput	Main Product		Waste and Discharge			
	30S Vortex Spun Viscose Yarn		Water Vapour	Lap Waste	Spinning Waste	

3.4. Results and Analysis of Carbon Footprint Assessment

3.4.1.Assessment Method and Impact Category

The impact assessment method used in this report is CML2001-Jan.2016 [1] , which meets the requirements of ISO14040. The calculation process of assessment is to input the list data of each process into the LCAplus system, and each process unit is connected through the consumption proportion of the products in each process. The final result is quantified in the form of the environmental index result of CML2001-Jan.2016.

Based on the research objectives of quantifying the carbon footprint of products, this report selects the Global Warming Potential (excl. biogenic carbon) index in the CML-IA characterisation factor.The calculation process and results meet the principles of ISO14067 and PAS2050, but the specific results display needs to be adjusted according to the requirements of different standards.

[1] CML method is an impact assessment method system for life cycle assessment, developed by research experts of Leiden University in the Netherlands. It is designed according to ISO14040 to conduct environmental impact assessment following the midpoint approach , including Global Warming Potential,

Acidification Potential, Eutrophication Potential and other indexes. It is the calculation method used in GaBi software. For details, please check:
https://gabi.sphera.com/support/gabi/gabi-lcia-documentation/cml-2001/.
[2] CML-IA is a characterisation factor for life cycle impact assessment under the CML method, which belongs to the midpoint approach. In addition to the Global Warming Potential, there are several characteristisation factors in other environmental dimensions, such as Acidification Potential and Eutrophication Potential, etc. For details, please check:
https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors.
[3] Based on ISO14040, ISO14067, conducting special carbon footprint accounting and reporting. In ISO14067, biogenic carbon needs to be explained separately in the result report, excluding addition and subtraction of its total carbon footprint value.

Indicator English name	Unit
Global Warming Potential (GWP 100 years), excl. biogenic carbon	kg CO_2 eq.

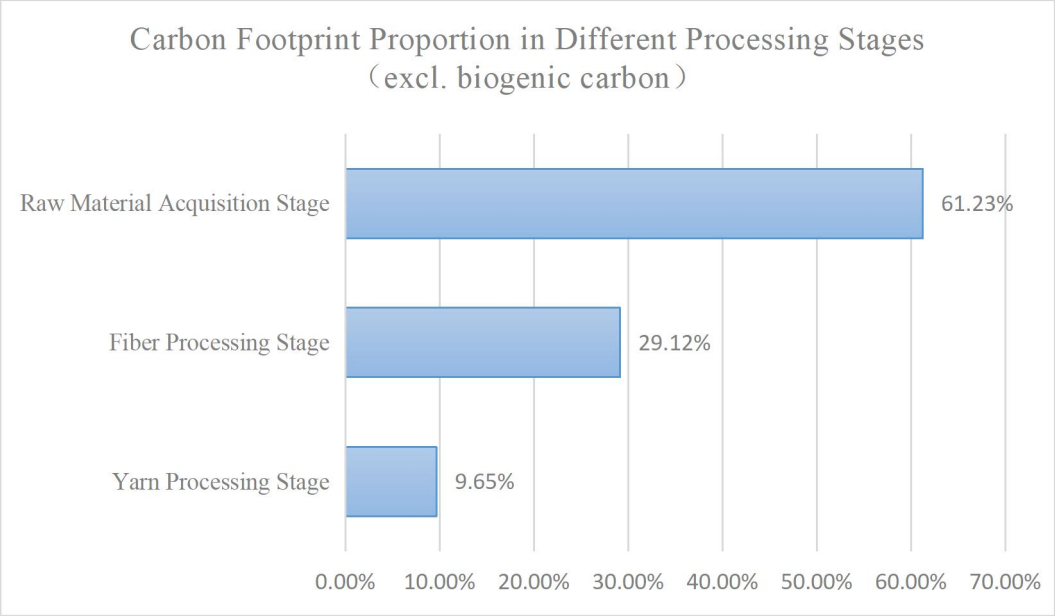
3.4.2.Overall Performance of Carbon Footprint

The following table shows the assessment results of 30S vortex spun viscose yarn of Yibin Grace Group Co. Ltd. (with two decimal places).

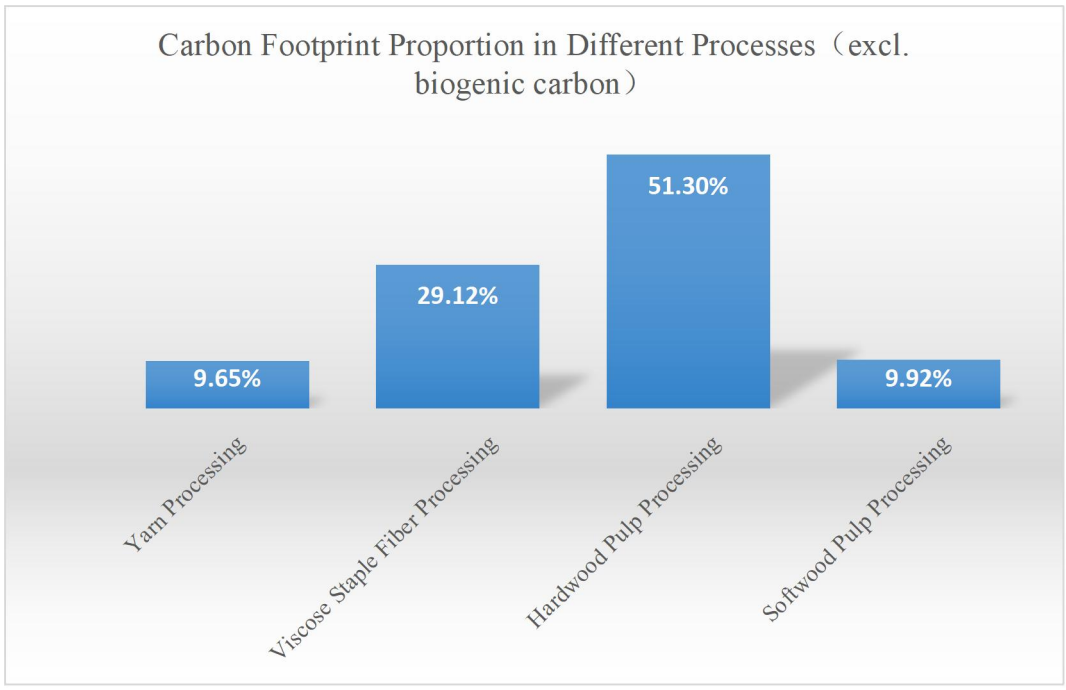
Product Carbon Footprint Performance	Global Warming Potential (excl. biogenic carbon) （Unit：kg CO_2 eq./ kg）
30S Vortex Spun Viscose Yarn	**7.87**

3.4.3.The Carbon Footprint Proportion in Each Production Stage and Process

The comparison of the resulting values in each processing stage gives the following figure:



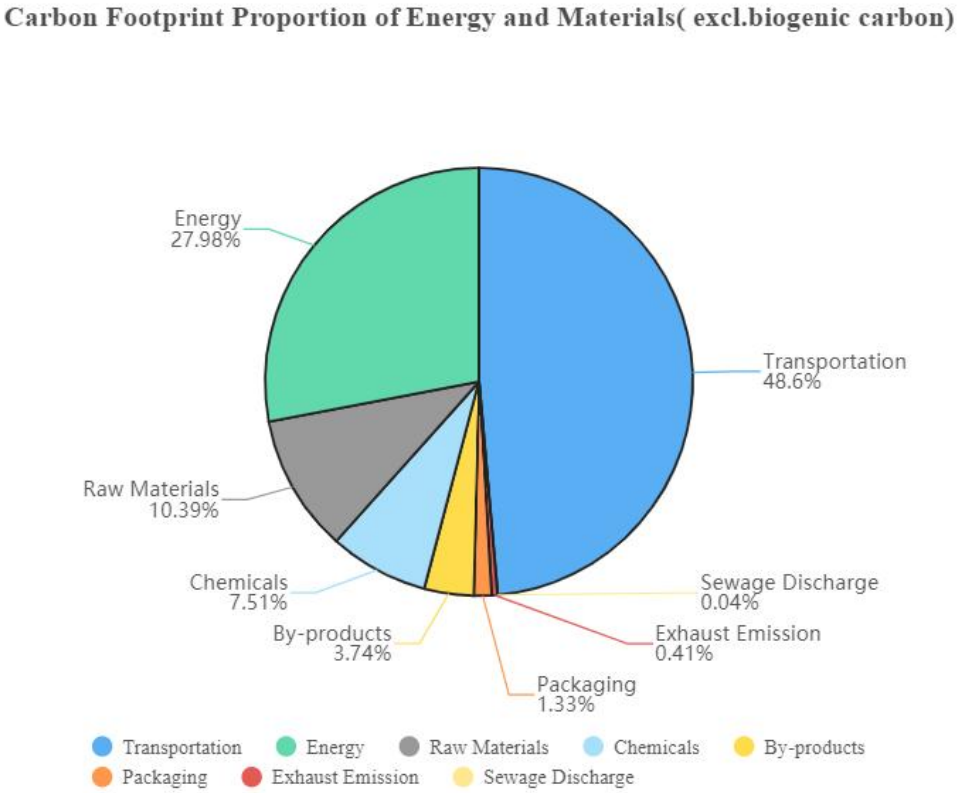
Under the Global Warming Potential (excl. biogenic carbon) index, the carbon footprint proportion in different processing stages is ranked by figure as: raw material acquisition stage> fiber processing stage> yarn processing stage



Under the Global Warming Potential (excl. biogenic carbon) index, the carbon footprint proportion in different production processes is ranked by figure as: hardwood pulp processing> viscose staple fiber processing> softwood pulp processing> yarn processing.

3.4.4 The Carbon Footprint Proportion of Energy and Materials

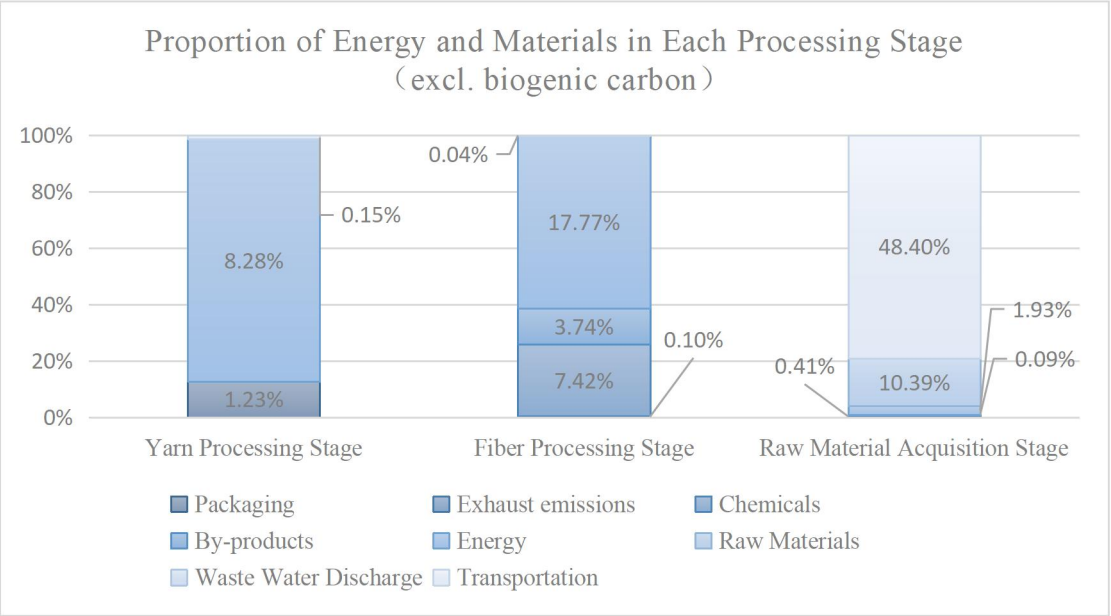
The analysis of the proportion of energy and materials under the Global Warming Potential (excl. biogenic carbon)index.



Under the Global Warming Potential (excl. biogenic carbon) index, transportation accounted for the highest proportion 48.60%, mainly from the overseas transportation of wood pulp in the raw material acquisition stage. The calculation of transportation quoted the "bulk cargo ship, ocean transport" coefficient, which will be the focus of future emission reduction. It can be considered from the dimensions of procurement distance and transportation mode. You can also directly obtain the transport energy consumption so as to optimize coefficient reference.

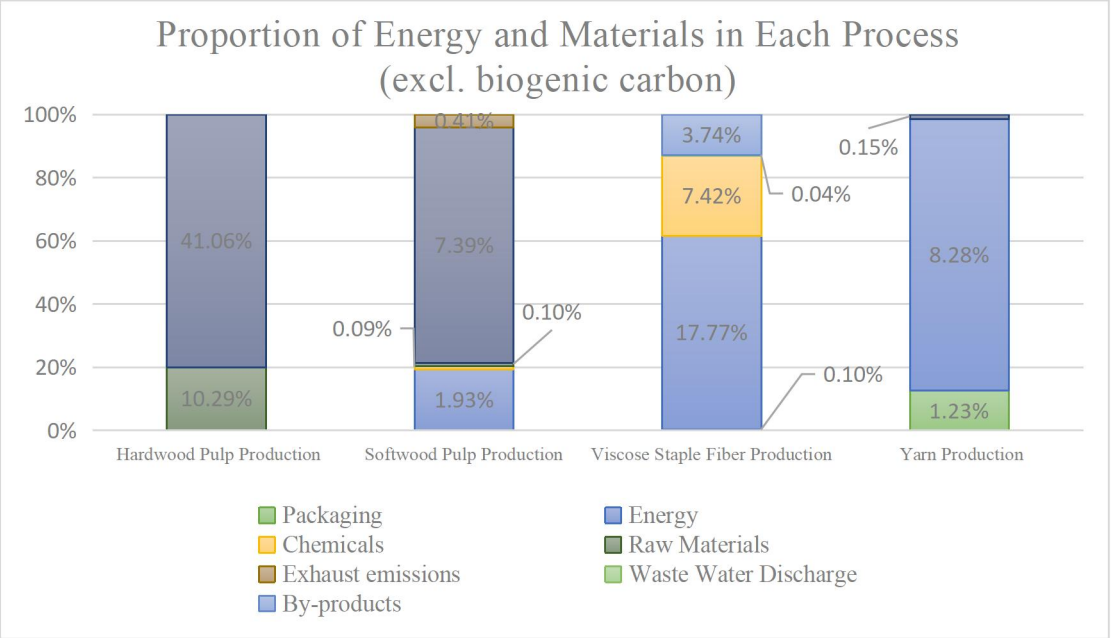
Energy was the second with 27.98%, with steam accounting for 14.14%, mainly coming from the use of low-pressure steam in the fiber processing stage; the total proportion of materials was 22.97%, among which the raw materials accounted for the highest proportion, with 10.39%.

The analysis of the proportion of energy and materials in each processing stage under the Global Warming Potential (excl. biogenic carbon) index.



Under the Global Warming Potential (excl. biogenic carbon) index, in the raw materials acquisition stage, the highest proportion was transportation 48.40%, mainly from overseas transportation of wood pulp, followed by raw materials, with 10.39%. In the fiber processing stage, the energy proportion was the highest, at 8.28%, coming from the use of electricity, of which 8.13% came from thermal power generation.

The analysis of the proportion of energy and materials in each process under the Global Warming Potential (excl. biogenic carbon) index.



Under the Global Warming Potential (excl. biogenic carbon) index, in the hardwood pulp process, the transportation accounted for a relatively high proportion- 41.06%, from the overseas transportation of wood pulp, followed by raw materials, 10.29% ; in the softwood pulp process, transportation accounted for the highest proportion 7.39%, from the overseas transportation of wood pulp; in the viscose staple fiber process, energy accounted for the highest proportion 17.77%; in the vortex spinning process, energy accounted for the highest proportion 8.28%, from the use of power.

4.Conclusion

The carbon footprint values adopted in this report do not consider the effect of biochar, and the carbon footprint value of processing 1kg 30S vortex spun viscose yarn of Yibin Grace is 7.87 kgCO_2eq./ kg.

5.Statement

1) The results are calculated by LCAplus system, which meet the requirements of ISO14040. The calculation of Global Warming Potential index meets the requirements of ISO14067 and PAS2050;
2) The original data source is provided by each supplier, and the authenticity, accuracy and reliability of the enterprise data shall be guaranteed by each manufacturer;
3) The characterisation factors (coefficient) of energy, materials and emissions are from GaBi database which is the international authoritative database. The carbon emission coefficient of wood production in the softwood pulp processing data is calculated from the related data of hardwood pulp;
4) This report is banned reproduced. If you need to use the text, pictures and data in this report as a reference, written authorization is required (please visit this site: sdg@ctic.org.cn) , and the Office for Social Responsibility of China National Textile and Apparel Council, China Textile Information Center, CMPC Pulp SPA., Celulosa Arauco Y Constitucion S.A., Yibin Grace Group Co., Ltd. and Yibin Grace Textile Co., Ltd. will reserve all legal rights.
5) The color change of the warming stripes indicates the change of the average surface temperature in China from 1901 to 2019 compared with that from 1970 to 2000. The graphics have a CC-BY 4.0 license, so can be used for any purpose as long as credit is given to Professor Ed Hawkins (University of Reading) and a link is provided to this website. (https://showyourstripes.info)

6.CNTAC-LCA Working Group Introduction

The Life Cycle Assessment Working Group of China Textile and Garment Industry (abbreviated as "CNTAC-LCA Working Group") was officially established at the China Textile Conference in December 2020. The CNTAC-LCA working group hopes to give full play to the collaborative and organizing capabilities of industry organizations to guide the industry to carry out the whole life-cycle assessment of textile products and product environmental information disclosure. By establishing life cycle assessment system of textile product and environmental footprint database, speed up the establishment of whole chain traceability green product environmental information disclosure system from the terminal brand end to raw materials end so as to enhance the ability of enterprises to deal with green trade barriers in the international market; as well as support consumers' green product identification so as to guide the green consumption.

The CNTAC-LCA working group currently has 62 institutional members, including 51 enterprises and 11 academic and technical institutions and organizational alliances, covering the whole industrial chains of fiber materials, textile chemicals, spinning, weaving, printing and dyeing processing and garment production, as well as the brand and consumer end.