



Sustainable Textile Solutions (STS) is a division of BluWin Ltd. (based in the UK).

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(1) Introduction

Tangshan Sanyou Group is one of the largest suppliers of MMCF in China. They are known for their product versatility at the facility and committed to reducing the environmental impact of viscose production.

Tangshan Sanyou Group Xingda Chemical Fibre Co. Ltd, & Tangshan Sanyou Group Yuanda Fibre Co. Ltd as the subsidiaries of Tangshan Sanyou Group, are located in Caofeidian new district, Tangshan, Hebei Province, China, adjacent to Beijing-Tianjin-Tangshan urban region. It has occupied area of 61.3 hectares.

61.3

The first fibre production line of Sanyou Group was formally put into operation in 1998. For nearly twenty years, facility have continued the technological innovation and obtained more than 60 patents and the production capacity has increased from 20,000 tons to about 800,000 tons annually. The facility has one of the world's largest production single line of viscose staple fibre with a production capacity of 150,000 tons per line each year.

1998

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80

Tangshan Sanyou Group actively protects primary forest, practises responsible raw material procurement. They have obtained Chain of Custody (FSC) certifications for forest production and marketing (FSC License Codes: SGSHK-COC-330228/SGSHK-CW-330228, SGSHK-COC-330227/SGSHK-CW-330227). The group has also obtained the certificates of CFCC/PEFC (SGS-CFCC/PEFC-COC-001135 & SGS-CFCC/PEFC-COC-001134). Tangshan Xinda Chemical Fibre has got ISO 9001:2015 Quality Management System certification (15812Q7197R6L), ISO

14001:2015 Environmental Management System certification (15812E7081R4L) and ISO 45001:2018 Occupation Health Safety Management System certification (15812S7059R4L). The certificates of Management System for Energy are also obtained (CCSC22En0619R0M & CCSC22En0618R0L). Tangshan Group has been certified by OEKO-TEX with the OEKO-TEX STeP Green Cleaner Production (level 3) (17001302 & 18001099) at the production end, and OEKO-TEX Standard 100 (Appendix 6) certificate (BEFO 035708 & BEFO 084288) at the product end, etc. The ecological supervision on whole process from raw material to products has been achieved.

FSC	FSC	SGSHK-COC-330228/SGSHK-CW-330228	SGSHK-
COC-330227/SGSHK-CW-330227		CFCC/PEFC	(SGS-
CFCC/PEFC-COC-001135	SGS-CFCC/PEFC-COC-001134)		
ISO 9001:2015	(15812Q7197R6L)	ISO 14001:2015	
(15812E7081R4L)	ISO 45001:2018		
(15812S7059R4L)		(CCSC22En0619R0M	
CCSC22En0618R0L)	OEKO-TEX		
	(17001302 & 18001099)		
	(BEFO 035708 & BEFO 084288)		

Sanyou Chemical Fibre upheld the concept of clean production and green development and continued to promote its development towards the goal of low and zero carbon by means of low carbon product development application of energy-saving and emission-reducing technologies, construction of brand strategy planning, etc. The company officially disclosed its corporate vision of carbon peaking and carbon neutrality – “strive to achieve a 30% carbon emission reduction per unit of product by 2030 and carbon neutrality by 2055”. The company also joined the “30-60 Net-Zero Acceleration Plan” to promote low-carbon energy, green materials, clean production and low-carbon products, taking a leading role in addressing global climate change in the industry.

– “ 2030 30% 2055 ”
“30-60 ”

Purpose and Scope of Assessment

Sustainable Textile Solutions was tasked to conduct an assessment at Tangshan Sanyou Group on 9th to 11th May 2023 with the following objectives:

- (1) Measure the ecological impact of production.
- (2) Assess the performance of viscose production with respect to the limits of EU BAT.
- (3) Identify gaps against EU BAT requirements.

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- (1)
- (2) EU BAT
- (3) EU BAT

The following activities were undertaken:

- (1) Primary Data Collection by the production unit in preparation for the on-site assessment
- (2) On-site assessment
 - a) Opening Meeting
 - b) Factory Tour
 - c) Secondary Data Collection
 - d) Closing Meeting
- (3) Data Analysis
- (4) Report Writing

1

(2)

- a)
- b)
- c)
- d)

3

4

To validate the Facility's compliance against EU BAT limits for viscose production, the following data were collected and analysed:

EU BAT :

Resources and Process efficiency

- Fresh Water Consumption (M3/MTf)
- Energy Consumption (GJ/MTf)
- Sulphur Emission (Kg/MTf)
- CS2 (Kg/MTf)
- (M³/MTf)
- (GJ/MTf)
- (Kg/MTf)
- (Kg/MTf)

Utility Efficiency

- Chemical Consumption (Kg/MTf)
 - Zn
 - H₂SO₄
 - NaOH
- Sulphate emission (Kg/MTf)

(2) Facility Overview

Tangshan Sanyou Group Xingda Chemical Fibre Co., Ltd & Tangshan Sanyou Group Yuanda Fibre Co., Ltd are the subsidiaries of Tangshan Sanyou Group. As a manufacture of viscose fibre, the group holds strong knowledge and expertise in production process and innovation. There are three production plants with 5+1, 4+1 & 2 spinning lines respectively. Seven series viscose products including viscose staple fibre, modal fibre, Lyocell fibre, FR viscose fibre, dope dyed viscose, viscose filament, bamboo fibre and so on are produced in Xingda and Yuanda, which are wildly used in apparel, home textile, wet/dry wipes, and surgical dressing.

3 /

7.5 /

160

120

Facility Name	
Address	No1 Huaxian Road, Nanpu Development Zone, Caofeidian District, Tangshan City, Hebei Province 1
No of Workers	1848 (site 1), 2561 (site 2), 811 (site 3)
Production Capacity	185,000 ton/y of site 1 335,000 ton/y of site 2 280,000 ton/y of site 3
Product Range	Viscose staple fibre, Viscose filament, Modal fibre, Lyocell fibre, Dope dyed viscose, Flam-retardant viscose fibre, Bamboo fibre, etc.
Year of Establishment	1995 for Xingda 2008 for Yuanda
Processes	Viscose Fibre (see below for detailed process)

Process Flow Chart:



The raw material in this unit is pulp and process starts as follows

VISCOSE STAGE

Steeping of wood pulp – Process is carried out in pulp

EXTRUSION STAGE

Spinning – Wet spinning takes place by coagulation of filtered and deaerated viscose in spin bath which consists of Sulphuric acid, Zinc and Sodium sulphate. This process can produce the Fibre count from 0.9 to 2.0 dtex.

(3) Methodology

To meet the objective, we identified and validated both short- and long-term projects carried out by facility with respect to the environmental impact and the respective parameters for benchmarking as per Reference Document on Best Available Techniques in the Production of Polymers (http://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/pol_bref_0807.pdf) and applicable MMCF requirements.

http://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/pol_bref_0807.pdf

MMCF

Focus areas considered for this assessment are: Energy, Air emission and Chemical consumption.

There are three plants with 11 production lines and 2 pilot lines to manufacture viscose staple, modal fibre, Lyocell fibre and many other viscose products at Tangshan Sanyou Group at moment.

11 2

The data evaluated was for assessment period January to December of 2022.

– 2022 1 12

Energy Intensity: Electricity, steam and diesel used directly for fibre manufacture combined to form the total intensity (in GJ/MTf) of fibre production.

GJ/MTf

Air Emission: The factors considered for sulphur air emission with respect to total CS₂ consumption are the recovery of CS₂ through adsorption o activated carbon, through condensation and caustic cleaning, the biological treatment (convert the

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CS₂ & H₂S to the harmless CO₂ as well as elemental sulphur and sulphate by treating with thiobacillus), etc.



(4) Data Verification

The data analysis has been conducted for the timeframe

Fibre Production January to December of 2022

2022 1 – 12

(5) Environmental Impact

5a) Energy

Energy Consumption: January – December of 2022

2022 1 12

Individual processes have been considered for energy intensity and consumption. Data considered for energy intensity was Real time electricity (KWH), steam (MT) and diesel (Kg) for production and operation of viscose production only, as well as the energy consumption of wastewater treatment facility.

(KWH) (MT) (Kg)

5b) Water

Water Consumption: January – December of 2022

2022 1 12

Facility has adopted water conservation and efficiency measures, including condensation and cooling water recovery processes.

5c) Air Emission

The data analysis has been conducted for the following timeframe:

Sulphur Emission: January – December of 2022

2022 1 12

The factors considered for sulphur air emission with respect to total CS₂ consumption are the recovery of CS₂ through adsorption of activated carbon, through condensation and caustic cleaning, biological treatment with thiobacillus in this factory.

The total sulphur recovery/elimination rates were 93.5%, 92.4% & 95.1% at plant 1, plant 2 & plant 3 respectively for the timeframe in assessment.

/ 93.5% 92.4% 95.1%

5d) Wastewater

Wastewater & COD load (January – December of 2022)

COD 2022 1 12

Xingda Chemical Fibre has an onsite ETP for use by the plant 1. Yuanda Fibre has another onsite ETP which is shared by plant 2 & plant 3. The treated wastewater from both ETPs discharges to an external CWWTP in the industrial park for further treatment. The monthly COD loads of wastewater for plant 1, plant 2 & plant 3 could be calculated based on the wastewater generated by these three plants and the average COD testing data provided by the CWWTP. The COD loads of treated wastewater within data period (January – December of 2022) were 2.10 kg per unit production, 1.37 kg per unit production & 1.37 kg per unit production for plant 1, plant 2 & plant 3 respectively, which is lower than EU BAT limit.

						COD
		COD		2022	1	12
	COD	2.10	/	1.37	/	1.37
/	EU BAT					

(6) Plant Performance Comparison with EU BAT Limits
EU BAT

Data Comparison	Unit	EU BAT	Compliance with EU BAT		
			Plant 1	Plant 2	Plant 3
Energy Intensity *	GJ/MTf *	20 - 30			
Pulp Use	MT/MTf	1.035-1.065			
H ₂ SO ₄	MT/MTf	0.6 - 1.0			
NaOH	MT/MTf	0.4 - 0.6			
CS ₂	Kg/MTf	80 - 100			
COD Load COD **	kg COD/MTf	3 - 5			
Zn	Kg/MTf	2 - 10			
Process Water *	M3/MTf *	35 - 70			
S to Air	Kg/MTf	12 - 20			
Spin Finish	Kg/MTf	3 – 5			
NaOCl	Kg/MTf	0 – 50			
Cooling Water *	M3/MTf *	189 - 260			
Sulphate ion (SO ₄ ⁻²) emissions in wastewater **	Kg/MTf	200 - 300			
Zn in wastewater **	g/MTf	10 - 50			
Hazardous Waste **	Kg/MTf	0.2 – 2.0			
Noise **	dB	55 -70			

- Energy, water & cooling water are calculated based on the scalar quantity of fibre (1.67 dtex).
1.67 dtex

– Plant 2 and plant 3 share one ETP and one storage for hazardous waste.

(7) Observations

1) Production

3) Environmental Impact Parameters – energy

5) Environmental Impact Parameters - air emission

The mass balance is used to calculate the sulphur air emission with respect to total CS₂ consumption, which is based on the recovery & elimination of CS₂ through the technologies such as adsorption of activated carbon, condensation and caustic cleaning, biological treatment with thiobacillus, etc.

The total sulphur recovery & elimination rate were from 92.4% to 95.1% for three production plants respectively in the timeframe of assessment. Based on this data, sulphur in emission air is below the usual level of the industry, which are well under local pollution control requirements & EU BAT limit.

92.4% 95.1%

EU BAT

6) Environmental Impact Parameters - hazardous waste

It has been observed that the facility collects and segregates hazardous & non-hazardous wastes at the generation point and controls waste generation every year. The hazardous waste is stored in isolated storing area and treated by authorized third parties. Xingda Chemical Fibre (plant 1) has one storage for hazardous waste and there is another hazardous waste storeroom in Yuanda Fibre which is shared by plant 2 & plant 3. Annual hazardous waste generated in the data period (January – December 2022) varied from 0.168 Kg/MTf to 0.727 Kg/MTf, which were in the usual level of industry.

0.168 Kg/MTf 0.727 Kg/MTf, 2022 1 – 12
EU BAT

7) Salt recovery

As indicated in spinning bath chemical reaction, process generates sodium sulphate (Na_2SO_4) (Reaction -5) salt as by-product which is recovered and

(8) Conclusion

Sustainable Textile Solutions was tasked to conduct EU BAT Assessment at Tangshan Sanyou Group (Xingda Chemical Fibre & Yuanda Fibre) on May 9-11th, 2023 for their viscose fibre production with the following objectives:

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EU BAT

- (1) Measure the ecological impact of production
- (2) Assess the performance of facility against EU BAT limits
EU BAT
- (3) Point out gaps against EU BAT limits
EU BAT

It can be concluded that:

- (1) The group was following local requirements for controlling ecological impact for viscose production.
- (2) The air emission, energy intensity and rest for the group were well under EU BAT norms for viscose production.
EU BAT
- (3) There was no gap identified against EU BAT in the data for the assessment period between January – December of 2022.
2022 1 12 EU BAT

----- End Of Report -----

