Chapter 6

Sustainable Consumption and Production

6.1 FINEX™ Fiber Project

In order to promote the recycling of waste textiles and reduce the environmental pollution and waste of resources caused by waste textiles, Sateri, through independent research and development, uses post-consumer textile waste (such as jeans, T-shirts and other old clothes) to produce FINEX™ recycled fiber, opening up a recycling industry path of “resources—products—consumption—recycled resources” and providing a new solution for the sustainable development of the fashion industry.

6.1.1 Background

China is the world's largest textile and garment producer and exporter, and also one of the world's largest consumer markets for textiles and garments.¹ Under the influence of “fast fashion”, more and more textiles are updated faster and faster; more than 50% of the fast-fashion garments will be discarded within a year. In this case, the recycling of waste textiles has become an urgent requirement. It is estimated that in 2020, the total clothing waste in China weighs as much as 30 million tons, and most of these waste textiles are incinerated or landfilled, with a recycling rate of less than 1%, resulting in severe environmental pollution and waste of resources. At the same time, the textile industry is plagued with tensions in the supply of raw materials, more than 65% of which are imported.

With the further prominence of resource and environmental constraints, China continues to accelerate the systemic transformation of circular economy development in the textile and garment industry. In 2013, China issued the *Circular Economy Development Strategy and Near-Term Action Plan*, clearly stating that the textile

¹ Make Fashion Circular: Outlook for A New Textile Economy.

industry should accelerate the development of biomass textile fiber materials as an alternative to petroleum and promote the standardized development of waste textile recycling.² In 2017, China's *Circular Development and Leading Action* proposed a development direction to promote the recycling of waste textiles and encourage textile enterprises to use recycled materials in the production.³

In the international community, the concept of sustainable consumption is increasingly recognized and practiced by consumers, and a large number of brands and companies are aware of this trend and have taken positive actions: H&M Group is committed to making 100% of its raw materials sustainable fibers, including recycled fibers, by 2030⁴; Inditex (Zara) Group plans to achieve 100% sustainability in raw materials by 2025.⁵ In order to promote the recycling of waste textiles, collaboration should be strengthened within the entire industry chain, from waste textile recycling and sorting, fiber extracting and producing and yarn weaving to terminal brands, advancing the innovation and R&D of the production process and technology of recycled fibers in the upstream and boosting awareness and demand for sustainable consumption in the downstream, to achieve an industry-wide upgrading and value adding.

6.1.2 Project Overview

Viscose is a kind of cellulose originating from natural materials (such as trees and bamboos), which is degradable. Therefore, as a good alternative to man-made fibers made from chemical raw materials and cotton fibers consuming a lot of water during production. Viscose has become one of the most commonly and widely used fibers in the world.

Sateri Group, a subsidiary of the Singapore-based Royal Golden Eagle (RGE) Group, is currently the world's largest producer of viscose. Since June 2019, Sateri has developed an in-depth cooperation with a Swedish pulp supplier to produce recycled dissolving pulp from fibers extracted from discarded textiles (such as jeans, T-shirts, hotel linens and other post-consumer textiles). Through independent R&D, Sateri has realized the industrial production of recycled viscose. Sateri (Jiangsu) Fiber Co., Ltd. has started to produce and sell recycled viscose fiber—FINEX™ fiber, which has been certified to the Recycled Claim Standard (RCS) (Fig. 6.1).⁶

² http://www.gov.cn/zw/gk/2013-02/05/content_2327562.htm.

³ https://www.ndrc.gov.cn/fggz/hjzy/fzxhjj/201705/t20170504_1203307.html.

⁴ H&M Group Sustainability Performance Report 2019.

⁵ INDITEX <https://www.inditex.cn/en/our-commitment-to-the-environment>.

⁶ Recycled Claim Standard (RCS) is a recycling (recycled) standard launched by Textile Exchange (TE) in 2013, providing a basis for the certification of products with recycled raw materials.

Fig. 6.1 Recycled claim

6.1.3 Main Techniques and Applications

(1) **Material Selection**

After tests and comparisons, recycled pulp originating from waste home textiles and denim fabrics is chosen as the raw material for recycled viscose.

(2) **R&D on Production Techniques**

On the basis of traditional production techniques, Sateri's R&D team, through constant adjustment and innovation, has explored a new technique suitable for the industrial production of recycled viscose fiber from recycled pulp and increased the proportion of recycled pulp from 1 to 20%.

(3) **Product Features**

Fabrics made from FINEX™ fiber share similar features with common viscose products. They are skin-friendly, moisture-absorbing and breathable, suitable for blending or interweaving with other fiber products to give the fabrics a bright and soft color and a distinctive style.

(4) **Product Application**

Since April 2020, Sateri has developed an in-depth cooperation with RICOLEE, an emerging designer brand, and LAFUMA, a French outdoor brand, to bring FINEX™ fiber-based garment products to market in succession. In the future, Sateri will continue to promote cooperation with more international brands to launch more garments made from recycled viscose fiber (Fig. 6.2).

Fig. 6.2 Garment products made from FINEX™ fiber

6.1.4 Environmental Benefits

A study carried out by Bureau of International Recycling (BIR) in University of Copenhagen, Sweden in 2008 found that recycling 1 kg of waste textiles means lowering 3.6 kg of carbon dioxide emission, saving 6,000 L of water and reducing the use of fertilizer and pesticide by 0.3 kg and 0.2 kg respectively.⁷ Wood pulp made from waste textiles is used in the production of the recycled viscose FINEX™ fiber, emitting less carbon dioxide than the processing of non-recycled materials.

As is estimated, if the annual output of waste textiles is 26 million tons and the comprehensive utilization rate is 60%, 9.4 million tons of chemical fibers and 4.7 million tons of natural fibers will be saved every year, leading to an annual saving of 18.8 million tons of crude oil, equivalent to half of the output of Daqing Oilfield, and about 10,893.33 million m² of arable land, which accounts for 46% of the total cotton area.⁸

6.2 Yanbu Refinery in Saudi Arabia

The Kingdom of Saudi Arabia (hereinafter referred to as Saudi Arabia) has a fragile environment composed of extensive desert and Gobi areas. As a world-class oil refinery, the Yanbu Refinery project is an effort to execute the national development strategy of optimizing and upgrading the Saudi economy and energy industry.

⁷ <http://www.sh-recycle.org/articledetail.asp?id=1805>.

⁸ <http://www.sh-recycle.org/articledetail.asp?id=1805>.

It has become a demonstration project for energy cooperation between China and Saudi Arabia that adheres to the concept of green development and creates social and economic benefits while minimizing the impact of the project's production and operation on the local environment.

6.2.1 Background

Located in the Arabian Peninsula in Southwest Asia, Saudi Arabia is famous for its rich oil reserves and is the “lead country” of the Organization of Petroleum Exporting Countries (OPEC). In April 2016, Saudi Arabia formally announced its strategic planning “Saudi Vision 2030,” which defined three main visions: “Heart of the Arab and Islamic Worlds,” “the Investment Powerhouse,” and “the Hub Connecting Afro-Eurasia.” It is built around three main themes, namely, society, economy, and national development, and sets out magnificent objectives of “a vibrant society, a thriving economy, and an ambitious nation,” and clarifies the direction of economic, political, military, and social development for the next 15 years.

Saudi Arabia is an important partner of the BRI. In 2019, China and Saudi Arabia signed a memorandum of understanding on the alignment of the Saudi Vision 2030 with the BRI. Upon the signatures of a series of cooperation agreements, the China-Saudi Arabia comprehensive strategic partnership has achieved a new pattern that is multi-dimensional, multi-level, and wide-ranging. “Saudi Vision 2030” has made clear the development goal of diversifying the Saudi economy, and the cooperation of the entire oil and gas industry chain has ushered in tremendous opportunities.⁹

6.2.2 Project Overview

Yanbu Refinery is the first overseas refinery and chemical investment project of China Petrochemical Corporation (Sinopec). In January 2012, Sinopec signed an agreement with Saudi Aramco to establish Yanbu Aramco Sinopec Refining Company Ltd (YASREF), with a joint investment of USD 8.6 billion for the construction and operation of the fuel-based refinery with a crude oil processing capacity of 400,000 barrels per day (20 million tons per day). In January 2016, President Xi Jinping of China and Saudi King Salman attended the project's commissioning ceremony.

The Yanbu Refinery uses Saudi fuel oil as its raw material and has a world-leading scale of its single-series central processing units. With advanced technologies, reasonable processes, and a high degree of automation, the project has achieved full conversion of raw materials, producing 4 million tons/year and 12 million tons/year of gasoline and diesel with ultra-low sulphur content of less than 10 ppm respectively, and also producing 120,000 tons/year of chemical raw material benzene

⁹ <http://world.people.com.cn/n1/2017/1212/c1002-29702218.html>.

Fig. 6.3 A panoramic view of the YASREF

with purity of greater than 99.9%. The quality of the main products has reached the world's top level, and these products are shipped and sold directly to North-West Europe, Asia, the Mediterranean, North America, and other regions.

The Yanbu Refinery has created an excellent track record in the Middle East in terms of its advanced technology, cost-effective investment, short construction period, high quality, and great safety performance, and it has won the “Construction Project of the Year” at the 2015 Platts Global Energy Awards, the highest award in the international energy community (Fig. 6.3).¹⁰

6.2.3 Strict Environmental Management System

Before the construction of the project, a rigorous assessment on the local environmental impact was conducted as required. Saudi Aramco commissioned the independent consulting firm CH2M HILL to prepare a EIA report on the project, which evaluated the emissions of air pollutants and other pollutants, and the main conclusions are as follows: the emissions of NO_x and SO_2 both meet the threshold of the Saudi Environmental Performance Index; the harmless solid waste ($150\text{m}^3/\text{year}$) and hazardous solid waste ($600\text{m}^3/\text{year}$) generated by the project are all sent to a local solid waste treatment landfill plant for disposal; the wastewater is sent out of the plant after pre-treatment and received centralized treatment in an industrial sewage treatment plant. In November 2009, the EIA report for the project was approved by the Royal Commission for Yanbu on behalf of the Saudi government.

The implementation of the project carried through the concept of green development, strictly abode by the local environmental laws and regulations of Saudi

¹⁰ <http://ihl.cankaoxiaoxi.com/2018/0710/2290438.shtml>.

Arabia, and strictly implemented the environmental protection requirements of the facility owner. The project established and improved the environmental protection management system, strictly implemented the environmental licensing requirements, established a list of environmental factors, and performed environmental protection responsibilities.

At the same time, the project organized training for employees to learn environmental protection knowledge and environmental knowledge trivia competition, gave public lectures about environmental protection using the camp radio, set up environmental protection signs and slogans in areas that are clearly visible on the project site, posted promotional materials, and showed short videos about environmental protection to the staff in their spare time. Brochures about environmental protection were prepared in English and Arabic. All these measures intend to the staff can be properly educated about environmental responsibility through different channels.

6.2.4 Green Production

By improving the production process and work flows and adopting energy-saving and emission-reduction technologies, the project effectively controlled pollutant emissions and conducted harmless treatment for the “three wastes (waste gas, waste water, and industrial residue)” that should not be recycled, thus minimizing the negative impact on the environment.

In order to avoid soil pollution, Sinopec has taken the following measures: spreading impermeable fabric for special purposes in the mud pits, installing wastewater treatment equipment at drilling sites, discharging the wastewater after it is pre-treated and up-to-standard to the mud pits through sealed pipelines without a single drop of oil polluting the soil, and cleaning the mud tanks and pipelines regularly to avoid any mud leakage. Solid waste disposal has also been enhanced—all the garbage and solid waste are disposed by qualified companies. At the same time, Sinopec has conducted strict management on the temporary facilities on the construction sites. All the temporary facilities should be approved by the owner before construction and dismantled after use to avoid new pollution (Fig. 6.4).

In order to protect the surrounding environment, Sinopec strictly classified industrial and domestic waste, and the bins for hazardous waste alone are in six different colors. Sinopec regularly asked professional companies to collect the waste and spent an average of more than RMB 3 million per year to treat all kinds of waste. Sinopec requires that all the domestic sewage should be discharged into centralized sewage treatment tanks. In S62 project, a professional sewage treatment unit was installed to treat the sewage in the camp. The treated sewage can be discharged directly and can also be used to water the plants in the camp, thus realizing the recycling of water resources.

Furthermore, 56.1% of the energy consumption of the Refinery is fuel, 34.5% is electricity, and 9.5% is steam. In terms of water consumption, because of the local conditions in Saudi Arabia, the Yanbu Refinery was designed as a water-saving

Fig. 6.4 A panoramic view of the Yanbu Refinery

refinery with a closed recirculating water system and a recirculating seawater cooling system.

6.2.5 Promotion of Local Employment

In accordance with the principle of “employing local talent that has a global mindset,” Sinopec followed the Saudi government’s “Nitaqat Programme” employment policy and “In-Kingdom Total Value Add Program” (IKTVA) system, increased the number of employees recruited from the community and continuously raised the proportion of local employees. During the peak time of some projects, the proportion of local employees was up to over 65%.

The Yanbu Refinery is the second joint venture refinery project in the western region of Saudi Arabia. During the construction and operation of the Yanbu refinery, 6,000 direct and indirect jobs were created in Saudi Arabia. At the same time, nearly 800 technical apprentices were recruited and trained through the Saudi Aramco Training Institute, 600 of whom were employed by the joint venture after passing the examination. In addition, the Yanbu Refinery has provided internship opportunities for nearly 100 students from local Saudi universities. Currently, the proportion of Saudi employees in the joint venture is 75%, making the refinery one of joint ventures with the highest percentage of Saudi employees. The Yanbu Refinery received awards from the Saudi government consecutively in 2014 and 2015 for its outstanding contribution to improving the skills and employment rate of local Saudi employees (Fig. 6.5).

In order to attract more high-quality talent and help improve the employment rate of local Saudi talent, Sinopec has established partnerships with local universities

Fig. 6.5 Chinese and Saudi employees working together

and secondary vocational schools, actively cooperated with Saudi Petroleum Service College, Saudi Arabian Drilling Academy, Saudi Petroleum Services Polytechnic, and Saudi Human Resources Development Fund, provided interview opportunities for Saudi university graduates, and offered internships and jobs to students from several universities and colleges.

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