



**Progress of Post-consumer Clothing
Recycling, and Suggestions**

Lin Shidong

Secretary General

CCFA Recycled Fiber Commission

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Lin Shidong, Secretary General, CCFA Recycled Fiber Commission

22 Sep 2011 Shanghai, China

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1 Post-consumer Clothing Recycling out of China

- North America
- Japan
- Europe

North America

In the US, according to the Environmental Protection Agency, Americans pitch almost 10 pounds of socks, jeans, shirts and sheets per year, per person. In New York, where 190 kt of textiles entered the city's landfills in 2008 alone, a collection plan would place 50 collection bins in high-traffic areas.

Starting in Sep 2010, New York launched one of the largest textile recycling initiatives in the nation. The aim is to make it easy to donate clothing, almost as easy as throwing it away. The city is taking bids for a 10- to 15-year contract with a nonprofit company that will be responsible for the bins. Goodwill Industries is one of the companies bidding on the contract. According to Wearable Collections, a New Jersey-based textile recycling company, almost half of donations are good for resale. The other half is split nearly evenly between being used for rags for businesses like the automotive industry and being broken down for insulation. Less than 5 percent of the total is unusable and goes to the landfill.

Officials say that if New York's campaign is successful, it could lead to a nationwide movement to recycle clothing. Not only would that clear up some room in the nation's landfills, it could also create jobs, said Brenda Platt, co-director of the Institute for Local Self-Reliance based in Washington, D.C. She profiled 20 textile recycling companies and estimates that the industry creates 85 times more jobs than landfills.

Japan

In Japan, people buy around 1.44 million tons of clothing and discard around 1.36 million tons, among which only 300kt would be recycled and the others buried or burned. Post-consumer clothing recycling is an uprising business there. Takashimaya is the first who successfully turned post-consumer clothing into heat and insulating materials used in automobiles. The company has been expanding their recycling business on support from Japan Ministry of Economy since 2002, with its 13 purchasing agencies all over Japan, recycling around 30 thousand pieces of clothes from 4,900 persons each year.

The ECOCIRCLE fabric developed by Teijin Fibers is produced from recycled polyester staple fibers, and could be recycled again, with 80% reduction in CO2 emission during the production progress, which contains quite complex and difficult processes and requires high costs, due to different blending materials and colors of clothing. By now, there is no process that can achieve a 100% recycling rate.

Europe

In Europe, second-hand clothing is quite popular. For example, Belgium recycles 15kt post-consumer clothing each year, in spite of its small population of around 10 million. People put their old clothing into special boxes alongside streets for recycling companies to collect; some of the collected clothing are sold in second-hand stores, and others are recycled.

In the UK, each year people spend almost 40 billion pounds in total on clothing, and throw away around 15kt post-consumer clothing in waste dump, most of which would not be recycled or naturally decompose. Synthetic fibers may remain for thousands of years and wools will keep adding methane into greenhouse gas. Most cost-consumer clothing collected by recycling center from charity shops and clothing collection banks will be exported to African countries south of Sahara. Some badly worn clothing may be used as heat preservation materials of houses.

Europe

In Switzerland, few of disposed clothing are worn out. In 1978, Texaid was jointly found by six charities in order to collect and utilize disposed clothing. Each year they collect and recycle around 18kt post-consumer clothing through about 2,500 collection boxes all around the country. The company sorts out wearable clothing from what it has collected, resells them and adds the gains into charity funds, or donates them to low-income groups and refugees. Worn-out clothing would be used to make cleaning cloth. Thanks to Texaid, almost all the disposed clothing in Switzerland could be utilized again.

Each year the sales value of Texaid is between £15 million and £18 million. As a charity company, the company still has to pay the government a duty of £50 for each ton of cloth they collect. So only 6kt of the collected cloth are processed inside the country, with the remaining processed in other countries.

2 Post-consumer Clothing Recycling in China

2.1 Disposing

2.2 Recycling

2.1 Disposing

In China, transaction of second hand clothing had been playing an important role in resource reutilization until the mid 80's of last century, forming an integrated chain of circulation. However, recently with China economy growing fast and people's living standards improving by leaps and bounds, second hand clothing is fading out from people's daily life. In stead, the growing proportion of post-consumer clothing in wastes is becoming a problem to environment and health, as China has not yet established any sorting system. Most of the post-consumer clothing discarded to garbage heap or burned for power generation are made from chemical fibers, which are hard to degrade and would produce pollution when burning.

According to statistics, every one who live in rural areas has two suits of apparel to dispose each year on average, while the number for urban areas is three. That means in China more than 3.1 billion suits of apparel are disposed every year.

2.2 Recycling

2.2.1 Donation: One major outlet for post-consume clothing. Clothing are distributed to low-income families after a serious of progresses including washing, drying, sterilizing, renovating, finishing, packaging, etc. One new sterilizer could sterilize only 12-18 cubic meters of clothing.

2.2.2 Cleaning cloth: Most cleaning cloth are made from cloth wastes and there is a large market for these cloth, although it requires for high storing and logistic costs. There are people collecting post-consumer clothing in residential quarters of urban areas, but are not in large number.

2.2.3 Reselling: There are vendors who buy second-hand clothes from urban residents and resell them to rural areas or migrant workers who are in favor of cheap clothes. Some of these clothing are even sold to less-developed regions in Southeast Asia.

Recently, China is facing the problem brought by imported foreign wastes. In Jieshi Town of Guangdong Province, local people started smuggling foreign waste clothing since early 80's of last century. Every lane there is crowded with second-hand stores — more than one thousand in total. Most of clothing they sell are from Japan and South Korea, around 60 tons every day. Most clothing from Japan are suits, which will be processed and then resold, while those from South Korea are mainly of lower quality, to be burned in thermal power plant.

2.2.4 Towels and yarns: cotton fibers tore off from pure cotton clothing and cotton-blended clothing could be blended with other materials and spun into yarns and woven into towels.

2.2.5 Cloth shoes: generally two pares of cloth shoes can be produced from one piece of waste clothing, and sold at 30-50 yuan for each.

2.2.6 Renovated clothing: One cloth slitting machine costs around 800-4,700 yuan, with most popular ones at around 1,500 yuan per set. Nowadays there are many ones in China buy slitting machines to renovate post-consumer clothing.

2.2.7 Shoddy fillings: A lucrative business with a margin of more than 500 yuan/ton. Some of these fillings are filled into beddings and those of extremely poor quality are used as warm-keeping materials in construction sites and greenhouses. Some post-consumer clothing are used as fillings though it's forbidden due to health concerns. Beddings filled with such fillings will cause dermatoses and incur parasites such as flea.

2.2.8 Others:

- Adapt post-consumer clothing to styles of fashion.
- Water-absorbing and soft materials can be adapted to diapers, or be scrapped to and then pieced together into quilt covers and pillow cases. Wool sweaters can be turned into blankets or used in pets' nests.
- Exchange with colleagues. It's relatively safe to wear a suit from one you know well, and it feels less different from wearing a new suit, though not brand new.
- To sell them in a flea market can earn you excessive income while put less pressure on environment. Clothing can also be disposed in collection boxes in neighborhoods.

- 2.2.9 Some practices in China: Shanghai Yuanyuan Industry in Huaxin Town, Qingpu District is the only officially admitted post-consumer clothing collection company in Shanghai. They collect post-consumer clothing from residents and in return, give them points which can be converted into gifts. One piece of clothing has to go through several phases before it can be recycled, including: raw material, sorting, adapting, sterilizing, packing, finished goods/wastes.
- Post-consumer clothing usually includes shirts, coats, jeans, skirts, and a great amount of lady's underwear. Adapting of underwear generally takes more delicate works than that of large pieces, like jeans which can be turned into pants, and shirts to vests. Adapted clothing will be sterilized with ozone. About 10 tons of clothing can be sterilized in a day. Sterilized clothing will be packed and then become finished goods. Panties are disposed as wastes due to hygiene concerns.

3 Main Markets in China

Recyclable wastes includes: post-consumer cotton, fabric off-cuts and apparel leftovers, unsold fabrics, post-consumer apparels (down jets, wool sweaters, knitgoods), disposed beddings, plush toys, unsold export apparels, etc. It's a consuming work to deal with clothing of a great variety of fabrics, color and accessories, so most of clothing recycled are off-cuts, leftovers and unsold apparels (in sole material), hereafter referred to as post-consumer clothing.

Major recycling markets:

3.1 Longgang and Yishan Trading Centers

Spontaneously formed trading centers of post-consumer clothing, starting in 1980 and developing into shape in 1985. Nowadays there are more than 100 local spinning mills with recycled cotton as raw materials. More than 60% of goods traded there are cotton products, with a turnover of around 2 million tons a year, among which more than 100kt are from Vietnam, Thailand and India.

3.2 East Guangdong

Formed in the 90's of last century, mainly consists of Guangzhou, Dongguan, Shenzhen and Zhongshan. In Dongguan and Shenzhen around 1kt post-consumer nylon clothing and 5kt post-consumer polyester clothing change hands per month, while the numbers in Chaozhou and Shantou are 6kt and 30kt respectively. There is a total turnover of around 1,000 kt per year, most are shreds of clothing.

3.3 Puning

Starting from the 90's, with polyester wastes accounting for over 60% turnover, while nylon and cotton wastes 40%. Annual turnover is 120kt.

3.4 Shandong

Starting in the late 90's, consists of mainly TaiAn, Weifang, Heze and Jiaozhou, annual turnover at around 400kt.

3.5 Fujian

Starting in the early 90's, mainly consists of Jinjiang, Changle, Fuqing and Putian. In Jinjiang most wastes are jackets and linings (nylon and polyester), with turnover of around 15kt per month, including 10kt polyester's and 5kt nylon's. In Changle and Fuqing monthly turnover is 13kt/yr, with 10kt polyester's and 3kt nylon's. In Fujian the annual turnover is around 400kt.

3.6 Hebei

In Pantang, pure spandex wastes are processed into paints, while polyester wastes are turned into fishpond cloth.

In Shijiazhuang, wastes are turned into highway maintaining cloth.

3.7 Others

Most of post-consumer clothing collected in other areas will be sent to Longgang and Yishan for trading.

3.8 SE Asia Origins

China started to import cut-offs and post-consumer clothing from Vietnam, Thailand, Malaysia and India since 2005, with annual import volume of 200kt.

4 Recent Development in China

(1) Loosened materials of disposed wool sweaters can be processed into woolen fabrics or braided into sweaters again. Italy has achieved valuable experience in this aspect, and can produce woolen fabrics and sweaters from recycled materials, which are as good as those from virgin materials. Recycled wool fibers can be blended with other fibers and be spun into yarns, used to produce decorative fabrics, household textiles, industrial textiles, filter cloth, blanket, garment fabrics and linings.

(2) Loosened pure re-PSF can be used to produce non-woven fabrics, used in shoe and hat linings, industrial gloves, luggage linings, artificial leather base fabric, and auto decoration fabrics, packages and functional textiles, etc.

(3) Those of poor quality and short length can be processed into filling materials used in heat/sound insulating fabrics, cushions, shoe pads and plush toys. Recycled fibers can help to extend the life span of polyfoam materials used in spots fields.

(4) Short cotton linters can be used to produce papers, pulps, viscose fiber, celluloid, films, powder, high-end coatings and etc.

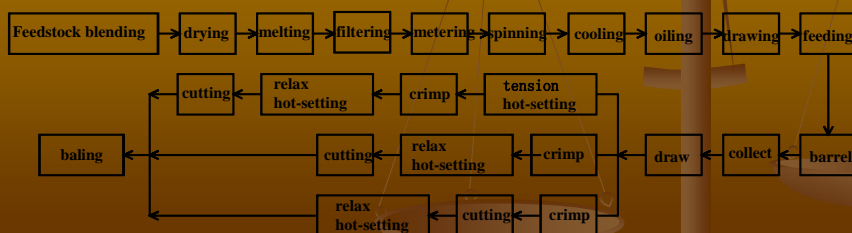
(5) To be turned into rags after cleaning and then into plates and slabs.

(6) Waste nylon products can be turned into engineering plastics after pelletizing. Small quantity of spandex in these wastes would have little impact on recycling.

(7) Pure spandex wastes can be processed into paints.

(8) Pure polyester wastes can be firstly turned into different shapes of materials by compressing, rubbing or extruding, of which only popcorns can be used to produce filament yarn while others can only used to make staple fibers.

Less than 50% of such materials in the mixture with bottle flakes are used to make cotton-type R-PSF; less than 20% for 2D-crimped one and less 15% for 3D-crimped one. Process for recycled polyester fiber production is illustrated as follows:



(9) Special practice — recycling of post-consumer army uniform (mainly pure polyester, cotton and wool products):

Zhejiang Furun Recycling Company started to produce recycled pure polyester spun yarn and T/C yarn with post-consumer army uniform in Nov 2010. With these recycled yarns they produce military supplies including tarpaulin, canvas, belts, gloves, socks, camouflage net, camouflage Oxford fabric, polyester/wool fabric, thread blanket, tower coverlet and geotextiles, etc.

Pure cotton and pure wool clothing will be cleaned, cut and shredded before reused.

5 Problems in China

China government would not officially admit any transaction of second hand clothing as there have been illegal smuggling of waste clothing from overseas since early 80's of last century. In the *Catalogue of Commodities Forbidden to Import* issued in 2002, it is put clearly that import of post-consumer home appliances and clothing is illegal.

Despite forbiddance laws, there are some other problems facing the industry:

- (1) There is almost no policy support to clothing recycling. As a result, most of disposed clothing are buried or burned, causing pollution and resource waste.
- (2) Current laws could hardly prevent some people from pursuing the profits from recycling as the business meets the demand of some low-end consumer groups. What's more, absence of official inspecting and management approaches brings many problems such as safety and health problems, as well as smuggling and tax evasion, etc.

(3) As transaction of post-consumer clothing is legally forbidden, those who want to engage in this business would have to register in management institutes as Apparel Seller instead of Post-consumer Clothing Collection, except for a few experimental enterprises like Shanghai Yuanyuan and Zhujia Furun mentioned before. Neither CDC nor CRGTA have included these businesses into their scope of management.

(4) There is no law or regulation that forbid enterprises from selling their production wastes, so enforcing departments could only monitor those who purchase and further process the production wastes, but could not stop enterprises from selling.

6 Suggestions

To ban transaction of second-hand clothing is helpful to improve public health but it also prevented people from reutilizing them. If we can learn from successful practices of other countries and establish an effective and well-regulated recycling system, it will help to protect environment and save resources.

Hereafter are some suggestions:

(1) Related governmental departments should take reference to the practices of other countries and what China used to have, and draw up strict regulations on recycling of post-consumer clothing, with clarified responsibility and standards, and admitting qualified players, thus to establish a sound and well-managed recycling system.

(2). To lift the ban on circulation of post-consumer clothing, and allow qualified enterprises and institutes to purchase post-consumer clothing and resell them after being adequately processed. We can take reference to the operation methods of second-hand clothing stores in the UK.

(3). To adopt new concept of post-consumer clothing, which can help to relieve pressure on environment and reduce costs in disposing.

(4). To encourage people to adapt their post-consumer clothing by themselves.

(5). To encourage recycling of post-consumer polyester clothing, especially through chemical approach, by promoting related technologies and practices.

(6). To enhance government's efforts in quality control of cotton & cotton wadding products, including establish a supervising system on waste cotton processing, and management of waste medical cotton products. Waste cotton wadding and the one produced from post-consumer clothing should be strictly banned.

7 Latest Supportive Policies

Related government documents:

- Category for Industrial Restructuring (Ver. 2011)
- Textile Industry Restructuring and Rejuvenation Planning
- The 12th Five-Year Plan for Textile Industry
- The 12th Five-Year Plan for Chemical Fiber Industry
- Environment Doc. [2011]1524 issued by China National Development and Reform Commission on 27 Jun 2011 —

About reporting for alternative projects of resource saving and environment protection to be included in central government's budget in 2012

7th China International Recycled Polyester Forum

Thank you!

Email: shidonglin@sina.com

Tel: 86-571-83158352

Mob: 13701864735