

The Researches of the Electro-waste Recycling

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Abstract: The E-waste emerged along with the economic development and the improving of the science and technology, it was large in amount, harmful and high economic value, and these features make the recycling of electronic waste can not be disposed like daily trash. Current e-waste recycling system is in a state of dispersion management, it lacks the perfect recycling system and the effective supervision which cause serious environmental pollution and waste of resources. In order to change these problems, we should establish a sound legal system, implement the producer to extend the responsibility system, strengthen government supervision, construction a cooperation pattern of “Individual recycling household + Professional logistics companies+ specialized processing enterprise” to enhance the effective utilization of resources, reduce the hazards to our environment and health.

Keywords: Electro-waste, Extended Producer Responsibility, Collaborative model

1. Introduction

Replacement of electronic products continue to accelerate the pace along with the rapid economic development and technological level as well as the continuous improvement of living standards, simultaneously also lead to global alarming increase in the number of electronic waste. We should study the problem of pollution caused by electronic waste while we enjoy the convenience of electronic products.

Liangbo (2009) has analyzed the electronic waste recycling logistics, the responsibilities of producers, consumers, managers, and other parts responsible party logistics. He thought that all quarters should undertake the corresponding responsibility; in particular, the producer should undertake the comprehensive responsibility, the logistics side must bear responsibility for the safe. Zhuangxiaojiang (2010) has analyzed the development of e-waste reversion physical distribution actuation factor in its research, and has constructed the e-waste reverse logistics system processes. Linglejing (2008) thought that as technology advances and modern consumer attitudes changing, product life cycles are constantly shortening, the e-waste has both hazardous property and relatively high potential economic value, he advocated that we can considered the recycling decomposition question from the product design stage, provides the convenience in the channel aspect for the recovery processing.

Existing studies suggest that, there is a large gap between China E-waste recycling system and foreign. Zhangkejing (2009) has analyzed four kinds which in its research Germany, Switzerland , Japan, Dutch four countries implement typically extends the responsibility system based on the producer (EPR) the electronic reject regeneration converting into resources operation system, she puts forward the e-waste recycling system in the establishment of recycling should pay attention to evidence, environmental impact assessment model and the combination of the operation of materials recovery certification. Xiaoyuefeng (2010) proposed in his research that third-party companies involved in e-waste recycling model, and conducted analysis of the pattern of income and expenditure. Wupeijing (2010) put forward to strengthen our e-waste management approach from the legal point of view. Tianyaming (2010) thought under the current domestic situation, the most viable mode of e-waste reverse logistics should be the union pattern which composed by the Government, manufacturers, vendors, consumers and professional recycling agencies. Yanghuaguo (2010) analyzed the problems of individual operator recycling, the supply and marketing cooperative recycling and professional dismantling electronic waste recycling; he unified the Zhejiang Yongkang's experience to put forward the corresponding proposal.

We can see the results of these studies; China's current e-waste recycling is still in the low stage, it has

not form a complete system.

2. Model of E-waste Recycling at Home and Abroad

The electronic trash, also known as e-waste, they are produced by obsolete electronic equipment, they mainly include fridge, air condition, washing machine, TV, self phone, computer, printer, electrograph and so on.

E-waste contains metal, ceramic, plastic, glass, rubber, composite materials and various chemical substances, these substances have varying degrees of impact on human health. It will do great harm to the natural environment and human health if thrown away or recycled unreasonably. Electronic waste contain a large number of chemical substances, it is poisonous, but also contains a variety of non-ferrous and precious metal components; we can obtain a high economic value after Large-scale processing. Per ton of waste mobile phones containing 3.5 kilograms of silver, 0.34 kg gold and 0.14 kilograms of palladium and 130kg of copper, worth 15,000 \$. According to a rough estimate, there will be 500 million scrapped TV on average each year, about 500 million washing machines and 400 million refrigerators, elimination of waste home appliances in China each year will up to 14 million units, and it does not include fast updates of the electronic and communications equipment. Therefore, electronic waste can not simply be treated as garbage, the E-waste should be appropriately handled, make sure to make full use of recycling resources, and will not cause the pollution to the ecological environment.

2.1 Mode of Electronic Waste Recycling

Chinese current electronic waste recycling is mainly self-employed business and the main state-owned materials recycling business.

(1)Self-employed business model

Individual household recycling is the absolute main force of E-waste, 90% of our e-waste recycling is done by the individual business households, Self-employed are quite flexible in the mode of operation, and the domestic labor force cost is inexpensive, the individual operator drops from house to house frequently. Individual households often carried on later period's recovery processing work for cost and profit considerations, They usually use the most simple chemical reaction to extract metal components, Simple and primitive means of recycling, the open workplace, lack of effective protection measures for operating workers, it is easy to cause serious environmental pollution and serious health damage to operating workers.

(2)Business model of state-owned materials recovery

This business model was seen in the planned economy era, Its operation time is long, perfect recovery of the network, the high social prestige, rich experience. But with the gradual establishment of market economy, multi-channel market competition, this enables State-owned business's traditional weakness to be completely unmasked, the system ossified, the modes of business operation are backward, the management scale is small, the processing craft is backward.

We can see from our current mode of e-waste recycling, Our current processing mode mainly based on third-party recycling company, from the perspective of supply chain, producers are only responsible for production, the consumer use them, as a third-party recycling companies and self-employed are in the end of the supply chain. They are basically going it alone, they have no direct contact with the whole supply chain, and the production enterprise has not had any responsibility in the recycling process.

2.2 Overseas electron waste disposal pattern

Abroad, especially developed countries take seriously regarding to the E-waste recycling. Electronic Waste Recycling Industry in the developed countries has entered a period of rapid development. The recycling system set up very well, members of the responsibility system are very clear, strong legal regulatory measures. There are two main forms of mode.

(1)Independent mode

The producer is responsible to recycle and the processing entire process independently. Developed countries stressed the Extended Producer Responsibility in e-waste recycling process, this system requests the producers of electronic waste recycling process must bear all or part of the responsibility. Some developed countries also raise this system to the legal altitude. Therefore, some enterprises that occupy a larger market share in home appliance often independently collect and dispose of its present production of electronic products. Such as Toshiba and Panasonic, they have their own electronic waste recycling, Mitsubishi, Sharp, Sanyo, Sony, they jointly set up treatment plants to pursuit of higher efficiency of resource.

(2) Collaborative model

Under this model, different companies or member cooperate to complete the recovery and disposal of electronic waste. It usually composed of recyclers and producers together, all e-waste recycling were finished by the completion of these two collaborative. The recyclers were responsible for recycling: set up recycling sites, recycle by category, they should notice Coordination Centre once the waste container full, the producer was responsible for the rubbish bin in collection points, arranging logistics, sorting, dismantling, processing, automatic crushing. Under this model, the recyclers usually served by the municipal waste management sector, they are not specialized enterprises, therefore, this model requires the strong waste separation awareness. The producer does not refer to each independent enterprise, but together is composed of all enterprises.

In the framework of Extended Producer Responsibility, the producers may stem from the cost consideration, recycling and disposal operations will be distributed to third-party companies.

No matter which model is above, all expenses must be considered, the entire e-waste recycling in the process of who will pay the costs incurred. Extended Producer Responsibility stipulate that the electronic products producer should pay the cost, but the producer may shift this expense to the consumer, there are different forms in the process of practice. Consumers can pay when pay for the new appliances; it can also be paid in the electronic waste recycling.

2.3 Comparisons of Independent model and collaborative model

Extended Producer Responsibility stipulates that manufacturers must be responsible for the entire life cycle of the product. Be directed to EOL Stage, if the manufacturers should bear the Extended Producer Responsibility independently, it means that manufacturers will take responsibility for product recycling, logistics, dismantling and processing tasks, it means that manufacturers need to bear the high costs of operation and management, but this can guarantee a higher recycling and re-treatment rate of resource, and to encourage manufacturers to improve the design, and to design for recycling.

In Collaboration model, all e-waste were recycled by recycling department, they don't distinguish between brands and manufacturers. The treating processes were undertaken by the special decomposition processing enterprise. In actual operation process, In order to improve the efficiency of the logistics system and economies scale of recovery and logistics system, existing recycling and logistics responsibilities are collective commitment. In addition, manufacturers can also associate with logistics and business process outsourcing to a third party. This model allows vendors to take advantage of economies of scale, but it does not encourage manufacturers carry on the environmental protection design.

The independent mode means that producers bear only their own production、sale e-waste that have entered the field of recycling. The approach needs the manufacturer that can be able to distinguish the E-waste accurately. One possible solution is the radio frequency technology.

It has some difficulty in E-waste recycling by the independent model, Challenges include: ① long life cycle of electronic products; ② large number of electronic products manufacturers; ③ more products and rapid technological upgrading; ④ more electronic processing channels. In addition, not all manufacturers of electronic products have sufficient technical capacity to achieve the recycling of electronic waste.

3. The Suggestion to Chinese Electron Waste Disposal Processing

The actual situation in China is different with foreign countries, therefore, we can not copy the foreign system in the e-waste recycling and processing systems, we should set up a treatment system suited to China's national conditions. We can established the model combine the foreign collaborative model and domestic facts, establish and improve laws and regulations, construct "Individual recycling household + Professional logistics companies+ specialized processing enterprise" recycling system, Individual households recycle collection, professional logistics companies use professional equipment to bear the logistics transportation, professional processing enterprises bear the decomposition.

The individual recycling household modes of business operation are flexible, Channels can be extended to the each residential area, it can improve the recovery of electronic waste in the greatest degree, the Individual recycling households give the waste to logistics enterprises, and logistics enterprises will use special equipment to deliver the waste to the Professional enterprises.

3.1 Legal support

Laws and regulations support Electronic waste recycling in foreign countries, such as, The European Union actualized "Directive on Waste Electrical and Electronic Equipment" in August 2005、 July 1, 2006 with effect from the "electrical and electronic equipment on the Prohibition of the Use of Certain Hazardous Substances Directive"、 United States, more than half of the state promulgated the electronic Waste Management act, "Household Appliances Recycling Law" was actualized in Japan in April 2001, these laws are directed at the development of electronic waste. In China, laws are quite lacking, "The People's Republic of China Solid Waste Pollution Prevention Law" and "The People's Republic of China Circular Economy Promotion Law" are not clearly defined how electronic waste recycling, the full implementation in March 2007 the "Electronic Information Products Pollution Control and Management Measures" has not risen to the legal level, the "waste electrical and electronic product recycling regulations" are also incomplete. Therefore, China is urgently needed for well-developed legal dimension of the laws and regulations, the manufacturers Extended Producer Responsibility enshrined in the law in to regulate recycling of electronic waste in the process of division of responsibilities and corporate behavior.

3.2 Establish market access system, strengthen supervision

Risk and benefit are both coexisting in Electronic waste recycling and processing, we obtain the benefit, the pollution risks of the environment and human health at the same time. We must supervise professional enterprises and set up a market access system, and the establishment of strict technical standards. Only licensed companies can engage in E-waste recycling. Logistics companies are also required strict regulation to prevent the contamination occurred during transport and logistics, validate the Individual recycling household and carries on essential training to understand the process of e-waste recycling potential risks.

3.3 Strict implementation of Extended Producer Responsibility

Through the implementation of Extended Producer Responsibility, we should force electronics manufacturers to develop new products more environmentally friendly design, product environmentally friendly products, reduce or even eliminate use of hazardous substances from the source of the supply chain, use more recycled materials and green design. Manufacturers must always implement extended producer responsibility, makes the product design, production and recycling processes close contact with enterprises, and promote product environmental design and technological innovation. The payment of costs and the payment system must be clear.

3.4 Strengthen propagandizes to the consumer, raise consumer awareness of environmental protection

The government should increase the propaganda dynamics, the consumer should change the idea, raises the environmental consciousness, we should educate and guide consumers to sold E-waste to appliance vendors, service organizations, and legitimate recycling companies.

4. Conclusion

Electronic waste recycling is a complicated system, it related to the environment and health, electronic waste recycling and processing of the responsible party must bear their own security responsibilities, under the supervision of management departments in the government, the Dominant ideology of China electronic waste recycling and processing is producers, consumers, recyclers, processing enterprises, and logistics co-operation between enterprises. We should construction a cooperation pattern of “Individual recycling household + Professional logistics companies+ specialized processing enterprise” to enhance the effective utilization of resources, reduce the hazards to our environment and health.

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