Research on Reverse Logistics of Disused Household Appliances

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Abstract: In recent years, with the development of industrialization and urbanization, the number of household electrical appliances increases rapidly. According to the calculation, five types of waste household electrical appliances are nearly 90 million in 2009. How to properly handle the waste appliances becomes a major problem in front of us. Waste household electric appliances have double attributes. On the one hand, they are harmful, because they can cause environmental pollution, waste of resources and obstacle the sustainable development. On the other hand, they have potential value, if properly handled, we can obtain lots of valuable resources, and promote the sustainable development of our country. Implementation of reverse logistics of disused household appliance is an effective treatment. Especially, it has extremely vital significance to achieve the goals of sustainable development strategy.

Keywords: Sustainable development, Disused household appliance, Reverse logistics

1 Introduction

China is a household appliances production and consumption power. According to the national bureau of statistics (NBS), in 2008, China produced 90.3308 million color TV sets, 47.569 million refrigerators, 42.3116 million washing machines, 82.3093 million air conditioning and 245.2524 million computers. According to statistics, in 2006, our TV’s social holdings up to 550 million units, refrigerators and washing machines are respectively 2.8 million units and 3.4 million units. In the 1980s, household appliances enter China family. By 10 to 15 years of life, since 2003, China has entered the disused household appliances update peak. There are lots of old appliances have been eliminated every year. According to the calculation, five types of waste household electrical appliances are nearly 90 million in 2009, including television sets, refrigerators, washing machines, air conditioning and computers. How to properly handle the waste home appliances becomes a major problem in front of us. To solve this problem, scholars put forward their views from different perspectives. Luo lejuan (2004) proposed that we can use economic incentives, government incentives, market-oriented mechanisms and monitoring mechanisms to encourage social enterprises to construct reverse logistics of disused household appliance. Wang Xin (2005) researched on reverse logistics system of disused household appliance in Germany, Sweden and Norway. He believed the core system is application of Extended Producer Responsibility. Liu Jianmin (2008) study on appliances reverse logistics recovery mechanism in China. She thought the most suitable mode is Third-party mode. This article study on reverse logistics of disused household appliance from the perspective of sustainable development, and discusses operation mode of reverse logistics, lastly puts forward the method of selection mode.

2 The Connotation of Reverse Logistics of Disused Household Appliance

The reverse logistics put forward by American scholars James Stock in the report to American association of logistics management in 1992. Reverse logistics is through information processing, transportation, disposal, sorting makes raw materials, semi-finished products, and products move from consumer to producer. From the definition, the core value of reverse logistics is recycling. The purpose is to protect the environment and save resources. Reverse logistics of disused household appliance refers to collecting, transporting and storing, disassemble, recycling and disposing consumer’s disused household appliance. Through the logistics activity, we can maximize resource utilization rate, reduce the consumption of resources, reduce
the production cost, and reduce the environment pollution, reduce pollution cost and waste disposal expenses, what’s more, it can make enterprise good image, adding intangible assets. Therefore, implement reverse logistics of disused household appliance not only can gain social benefit but also can obtain economic benefit.

![Diagram of Reverse Logistics](image)

**Figure 1** the basic process of reverse logistics

3 The Urgency of the Development of Disused Household Appliance Reverse Logistics

Disused household appliance is a double-edged sword, processing bad causes severe pollution environment, properly handled can bring huge economic and social benefits to us.

### 3.1 Processing bad causes severe pollution environment

Disused household appliance contains a variety of chemical elements and heavy metals, among them, the main six kinds of harmful substances are mercury, cadmium, lead, chromium, PVC and BFRS. If processing bad, disused household appliance will pollute air, earth, rivers, and do great harm to human health.

If burnt down, it can produce Halogenated hydrocarbon compounds and other noxious gas to pollute atmosphere. If buried in the soil without any treatment, the toxic substances in disused household appliance will slowly seep out of the land, contaminated the surrounding land, rivers and underground water bodies, etc. Moreover, the waste appliances contain heavy metals such as lead, barium, pick, once into the environment, will long remain in the ecosystem, and enter the body through various channels. After absorbed these heavy metals, people will be serious ill. For example, mercury would seriously undermine the central nervous system; cadmium can cause chronic poisoning, developed into emphysema, osteomalacia, anemia and other disease; chromium have great destructive effect on DNA and brain tissue; lead will interfere with renal function, reproductive function, resulting in neurological disorders, nephritis.

### 3.2 Properly treated, disused household appliance can bring huge economic and social benefits

Although waste household appliances contain dangerous substances, properly treated can produce high economic value.

Used appliances contain gold, silver, copper, non-ferrous metals, ferrous metals, plastics, glass and etc. By recycling, you can change waste into treasure and obtain a huge economic benefits. Therefore, recycling of waste appliances contains a huge business opportunity. Data shows that 100 grams of gold can be extracted from scrap mobile phone battery per ton. Danish researchers unfolded the results that they can isolate 286 pounds of copper, 1 pound of gold, 44 pounds of tin from each ton of waste e-card. Don’t remember the value of a pound of gold is 18,320 U.S. dollars.
Now, many developed countries lay highly emphasis on recycling of waste home appliances, and regarded as an important way of conserving resources. For example, the United States has a "joint recycling company", which dedicated to recycle and reuse the waste household appliances. It can gain $25 million to $30 million profit each year. Moreover, the United States reused scrap steel accounted for one tenth of the total steel production each year. As a developing country, China should actively promote the reverse logistics of waste home appliances in order to reduce the predatory use of resources, and promote the sustainable development.

4 Reverse Logistics Mode of Waste Household Electric Appliances

4.1 Self-mode
Self-mode refers to the manufacturer establish an independent reverse logistics system and manage the recycling business of waste home appliances (Figure 2). In the self-mode, home appliances manufacturing enterprises tend to lay more emphasis on "green design" and "green production", which will make good use of recycled materials to facilitate their recycling.

Self-model can save resources, establish a good image, enhance the competitiveness of enterprise and avoid the leakage of business secrets. Its advantages as follows:
1. Enhance the competitiveness of enterprise. For manufacturer, implement of reverse logistics can save resources, reduce the cost. What’s more, it can timely find the shortcomings of product and improve the quality of product without delay. It is good to enhance competitiveness of enterprise.
2. Establish a good image. With implement of reverse logistics, manufacturer may make a good impression on the people. Because it pays attention to environmental protection and saving resources, people believe it is a responsible company. It can increase the intangible asset of enterprise.
3. Feedback quickly and accurately. Compared to several other models, the most prominent advantages of self-mode is rapidly feedback. Through the recycling of waste electrical appliances, manufacturer can receive first-hand information about the inadequacies of products from consumers, and give timely feedback to relevant departments, enable them improve product design to eliminate the negative effects.
However, due to the high cost and high risk, self-model is generally suitable for larger, stronger enterprises.

4.2 Joint business model
Joint Business model means enterprises, which produce same or similar types of products, jointly establish a reverse logistics system for joint ventures to provide reverse logistics services (Figure 3). Since self-models requires highly cost, joint business model is better choice. It can release the fund pressure and give full play to technology and logistics advantages of cooperative enterprises. In addition, it can provide cheap raw materials, save the procurement costs and achieve win-win situation.
However, joint management mode has some problems. Firstly, feedback is not quick enough. Manufacturer can’t master first-hand information in the time. Secondly, because of the experience, equipment and capacity constraints, the joint venture is difficult to catch up with professional logistics companies. Thirdly, scope limits made it difficult to obtain Scale Superiority.

4.3 Third-party mode
Third-party mode means manufacturers hand over their recycling work to professional logistics companies through agreement. These professional logistics companies are often called the third-party logistics companies. This mode is the development trend of discarded household appliances reverse logistics (Figure 4).

The advantages of the model as follows:
1. High efficiency. Clear-cut division of labor improves efficiency. Third-party mode makes manufacturer and professional logistics company can concentrate on their core business. Electrical appliances manufacturers can concentrate on design and manufacture of the appliances, at the same time, third-party reverse logistics providers can co-ordinate arrangements to improve efficiency and reduce costs.
2. Feedback in time, it is helpful to optimize product design. In order to facilitate recycling activities, Third-party logistics companies often give timely feedback and valuable suggestion to manufacturer, from the perspective of product design, material composition and other aspects. It is beneficial to product optimization design.
3. Achieve economies of scale. If use advanced technology equipment to make good use of discarded household appliances, it can obtain scale economic benefit, and get rich rewards. With incentive policy of government, there is greater development potential in renewable resources industries.
5 Conclusion

To enterprises, making reverse logistics mode selection, you need take economic, management and technology factor into account, combined with your own resources, strategic direction to choose reverse logistics model. Generally speaking, self-model is suitable for large and strong company, which having a sound basis on logistics. Meanwhile, enterprises, which having a certain economic strength but lack the logistics-based should adopt joint business model. As to these companies, who want to concentrate on their core business, third party logistics model is a good choice.

Reverse logistics of disused household appliance is a complex and important engineering, and it is closely related to people's lives, related to sustainable development. Although, at present, our discarded household appliances reverse logistics is still at the beginning. But if the whole society take participate in understanding and supporting recycle waste electrical appliances, it can give birth to a new industry of renewable resources.

Notes:

References