
FROM WASTE TO RESOURCE: THE VIRTUAL PLATFORM DRIVING BOX RECYCLING EFFORTS

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Abstract: In the backdrop of China's burgeoning express delivery sector, characterized by a substantial volume of parcels and a correspondingly low recycling rate of express boxes, coupled with the evolving ethos of carbon neutrality, this paper introduces an innovative platform for the recycling and repurposing of express packaging. The proposition advocates the adoption of express recycling cabinets as a recycling mechanism, leveraging a mobile mini-program to incentivize users towards express packaging recycling through a reward-based system. By accumulating points via recycling activities, users gain access to exquisitely designed express boxes and culturally inspired creative products housed within the recycling cabinet. This approach not only contributes to the ongoing efforts in epidemic prevention and health hygiene but also expedites the green and low-carbon evolution of the express industry. Additionally, it catalyzes a sustainable shift in the realm of express packaging, aligning with the principles of green, sharing, and enduring development.

Keywords: Express Delivery, Recycling Platform, Carbon Neutrality, Sustainable Development, Green Transformation

Introduction

Based on the current situation that the total number of express delivery in China is large and the recycling rate of express boxes is low, and with the continuous introduction of the concept of carbon neutrality, and considering that people tend to avoid taking express boxes home in the context of the epidemic, this essay proposes a new platform for the recycling and utilization of express packaging. It is proposed to adopt the recycling method of express recycling cabinet; use the mobile mini-program to encourage users to recycle express packaging through the reward mechanism (earn points through recycling, so as to exchange beautifully designed express boxes and cultural and creative products in the recycling cabinet simultaneously), thus contributing to the positive development of epidemic prevention and health hygiene, accelerating the green and low-carbon development of the express industry, promoting the green transformation of the express packaging field, and Implement the new development concept of green, sharing and sustainable.

1. Status of express packaging recycling

1.1 Foreign packaging waste recycling status

Germany uses the "Green Dot" company's recycling method: the only "Green Dot" pattern printed on the product packaging, after consumers use the products with this packaging, the packaging in the

specific yellow bags, and finally by the operation of the "green dot" system of enterprises to send special staff regularly to each household to collect. The United States, like Germany, considers the issue of resource recycling at the beginning of production, marking the location of recycling waste on the packaging of goods, and putting the packaging waste with reuse value into the blue plastic barrels of the sanitation system, so that businesses can recycle and reuse, thus realizing the resource utilization of packaging waste. And in the process of use also set clear classification standards, requiring consumers to classify packaging waste in accordance with the standards to facilitate the recycling of packaging waste.

France is the second country in Europe to introduce "packaging regulations", in which the regulations clearly set up an enterprise to recover packaging waste, changing the original process, and strictly ordered distributors and importers responsible for the packaging waste generated during its operation. 1994 promulgated the "Packaging Waste Transportation Act" strict provisions, the consumer for the abandoned packaging to the production side, sales side, etc. for recycling has a fixed obligation. France has also set up a packaging waste recycling organization, with the producing party as a shareholder of the recycling organization and an additional guarantor party to ensure that the recycling organization has a sound regulatory system and fairness. The French recycling system of packaging waste is closely connected, and all levels are bound to each other using agreement contracts, and the division of responsibility is clear, so the recycling system is more effective and efficient [1].

1.2 Packaging waste recycling status

In August 2016, the State Post Bureau of China promulgated the "Implementation Plan for Promoting Green Packaging in the Express Industry", which clearly promotes the development of packaging in the express industry following the goals of green production, effective recovery and recycling, and by 2020, the use of green packaging materials on a large scale and the basic establishment of an effective express packaging recycling system in the whole society. Also, express packaging recovery and recycling as a policy regulation into the "Circular Economy Promotion Law" and "Express Regulations" to actively encourage e-commerce and logistics enterprises to choose packaging products conducive to recycling, as well as to promote the end of express packaging consumers, utilization and manufacturing parties to join the ranks of recycling express packaging. March 21, 2018 the State Council also promulgated the "Express Interim Regulations" to encourage relevant enterprises to carry out recycling of packaging materials, thus practicing the goal of packaging material reduction.

However, at present, the state only encourages enterprises to recycle, there is no strict law stipulating the express packaging waste recycling program, and there is no legislation to compel various e-commerce companies and manufacturers to carry out green packaging, but the number of enterprises carrying out express packaging recycling is slowly increasing. Today, e-commerce platforms and courier companies that recycle express packaging continue to innovate to improve the efficiency of express packaging recycling.

There are several express companies in Table 1 [1].

Table 1: Express packaging recycling enterprises

Enterprises and platforms explore green logistics	
No.1 Shop	Recycle a carton to get 50 points, which can be used to redeem products, participate in lotteries, etc.
Yuan Tong	On-line RFID system, batch use of RFID environmental protection bags that can be recycled.
SF	Form a packaging lab to develop recyclable and shareable express packaging
Vipshop	Use electronic face sheets and tape-free green recycling boxes to recycle and share

1.3 The development of the existing courier recycling

In view of the packaging consumption and recycling problems in the courier industry in recent years, some students take universities as a pilot to build a multi-linked courier packaging recycling system of "government-enterprise-university-students", form a government to encourage enterprises to use new contactless courier boxes and establish an incentive mechanism for cooperation between universities and enterprises. The government encourages enterprises to use new contactless express boxes and establishes an incentive mechanism for cooperation between universities and enterprises. Enterprises develop new contactless courier boxes, and the picker opens the intelligent courier delivery vehicle by sweeping the code, and then sweeps the code to open the pop-up courier box, and the courier box is automatically recycled after completing the pickup [2]. However, putting the express box back to its original place after pickup will significantly reduce the utilization rate of express cabinets/delivery vehicles for storing expresses and limit the use of scenarios. We aim to establish a complementary device with express cabinets/express storage stations to recover express boxes and other incidental packaging without reducing the utilization rate of express cabinets and to realize the dual combination of recycling and environmental protection.

Students from Nanjing Audit University conducted experiments on recycling courier boxes on campus and found that it was difficult to achieve courier box recycling and required tripartite coordination among government departments, courier companies, and universities for better implementation [3]. Other authors proposed a network crowdsourcing model of courier packaging recycling, a "shared courier box" model, and a green packaging model [4].

Zou Xiao and Li Yuqin's theoretical basis for constructing a courier packaging recycling system based on circular economy theory aims to address the challenges facing community courier recycling[5]. Ye Yue and Yang Liying conducted an investigation of the community courier packaging recycling system by examining the four links in the courier packaging circulation: courier box manufacturers, community express packaging recycling points, customers, and e-commerce enterprises. The investigation aimed to explore the commercial value of express packaging, creating a closed loop of interest beneficial to all four parties. This would solve the problems of difficult recycling of express

packaging, low value of express packaging, weak consumer awareness of recycling, and lack of corresponding recycling channels^[6]. It can be seen that most express recycling is carried out within universities, and there is less express recycling in the community, and we are committed to universalizing the recycling of express boxes to achieve environmental protection and resource conservation.

2. Community courier packaging recycling mechanism

2.1 Operation mode

2.1.1 Existing courier packaging flow process and improvement

According to the preliminary investigation and collation, we made a diagram of the existing express packaging process, as shown in Figure 1. According to the diagram, in the purchase stage of online shopping, the express packaging has to go through a total of five subjects, including production enterprises, platform merchants, logistics enterprises, individual consumers and sanitation departments, to complete the whole process. In this process, the consumer is the last subject before recycling, a large number of individual differences, it is difficult to unify management, courier packaging brought about by the waste pollution more from this link. And in the return phase of online shopping, this problem still exists. In the production of packaging enterprises to the use of packaging consumers this link, due to the lack of production companies lack of channels to packaging directly to consumers in the offline scene, and because of the packaging retail profit is low, self-built channels can hardly cover the cost, so the lack of incentive to develop offline sales scene. When it comes to consumers, returning goods purchased online can be a challenge when it comes to finding suitable packaging. The packaging materials may not be readily available offline and may not be time-sensitive when ordered online. As a result, consumers often rely on logistics companies to handle the packaging process, which may not guarantee the safety of the items being shipped.

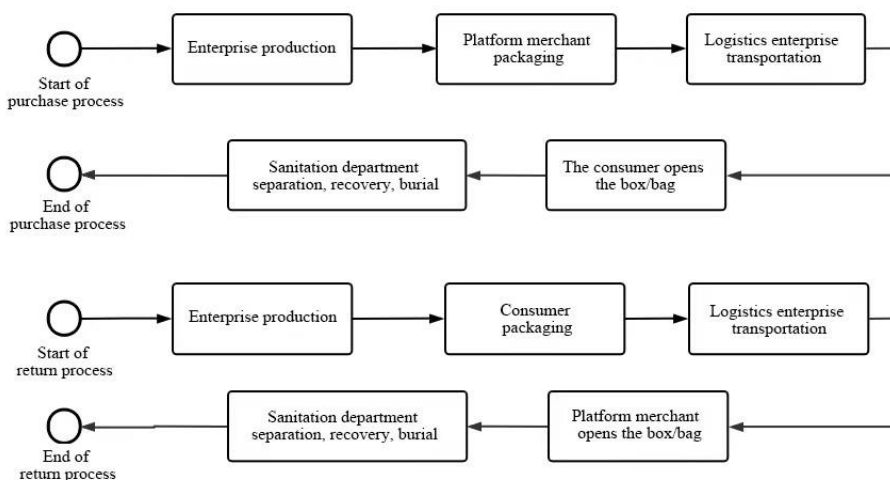


Figure 1: Current express packaging recycling flow chart

To address the pain points of these two links, we propose the use of recycling bins to improve the process. After consumers receive the courier and unpack it, they can directly choose to go to the

recycling bin located near their residence or near the courier cabinet to sort and recycle the courier, thus solving part of the environmental pollution problem caused by courier packaging. And when consumers need the package, they can go directly to the recycling box to get the packaging made of recycled materials and send the items out. The two links are disassembled as shown in Figure 2.

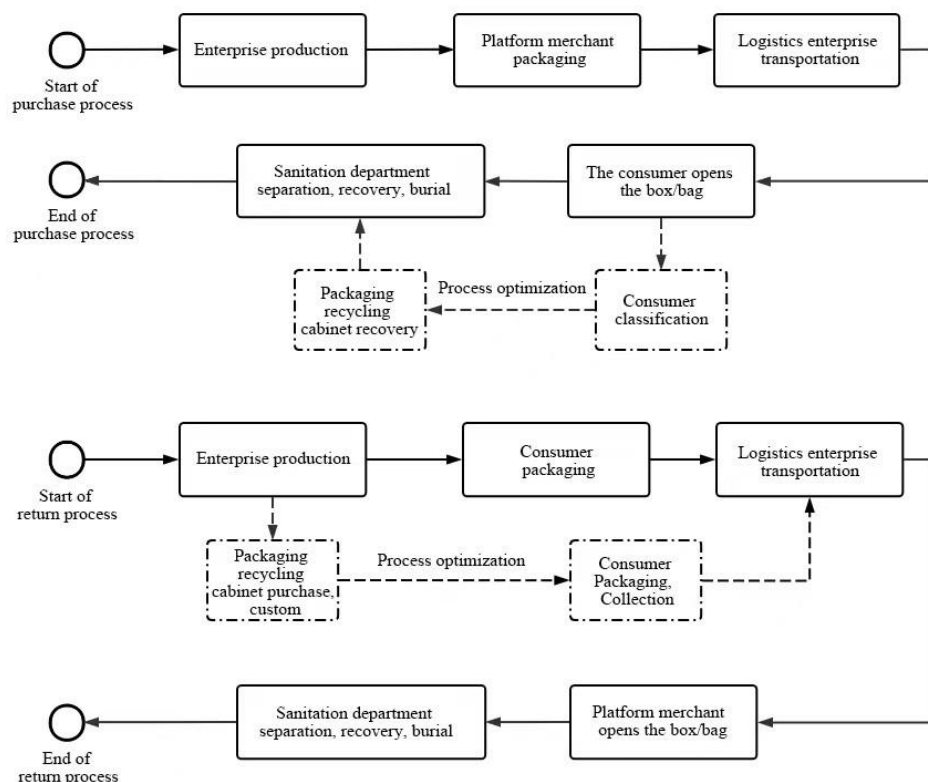


Figure 2: Flow chart of the express packaging cycle after being improved by the system

2.1.2 System Composition and Functions

The system is mainly divided into two parts, online and offline. Offline, the multi-functional recycling cabinet mentioned above, provides two types of services: first, environmental services, which are related to the classification and recycling of express packaging; second, value-added services, which are responsible for the extraction and use of materials such as parcel cartons and plastic sealing tapes, as well as parcel disinfection and removal of personal privacy information. On-line is a WeChat applet responsible for packaging volume calculation and packaging information upload, recycling cabinet use certification, and exchange of packaging boxes and other cultural and creative products. A general overview of the system is shown in Figure 3.

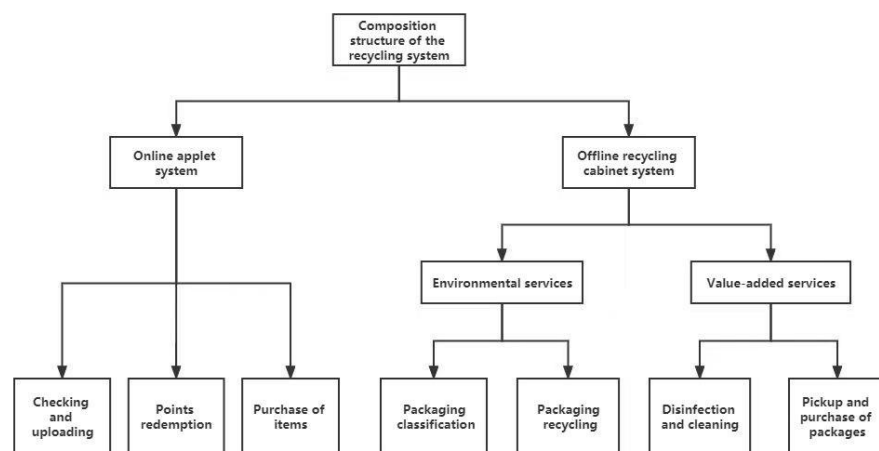


Figure 3: Composition structure of the recycling system

2.1.3 Supporting facilities to provide value-added services

After the epidemic, people have become more aware of disinfection and the demand for express disinfection has soared, and our recycling bins come with disinfection supplies and other ancillary facilities. At the same time, these supporting facilities will attract more people to use our recycling bins, in line with the call for green. As for the security of the supporting facilities, the disinfection supplies can only open the bin door after the user takes a photo and uploads the information of the courier package. There is also a sensing device added in the storage cabinet, when these supporting facilities are detected not put back, the system will remind the user through the applet even if they are put back, after the reminder is still not put back, the applet will not be able to enter the next UI interface through the entrance, and the recycling cabinet door will not be closed. In addition, if the user does not return the items, the system will black out the user and upload credit information.

2.2 Features and Innovations

2.2.1 Recycling bin design

Different from ordinary garbage recycling; different from multiple-sized courier recycling devices, this project takes the form of courier recycling bins to store plastic and paper packaging separately. The flat, only-in, only-out drop-off port avoids reckless taking of paper packaging and space waste, while saving courier box stacking site and creating a tidy courier pick-up point. In addition, we have built-in display cabinets to facilitate customers to redeem gifts through recycling points. Inspire the new fashion of environmental protection trend.

2.2.2 Reward mechanism

Users upload their photos to the platform by taking photos and uploading them. After verification, the platform will give the user the corresponding points. Use the form of exchanging boxes for boxes and bags for bags. For courier box users, box coins are given to exchange for blind boxes and beautiful gift boxes, and for courier bag users, bag coins are given to exchange for canvas bags. At the same time, we provide coin conversion to exchange for more goods, to enhance the enthusiasm of users to recycle express packaging and create a resource-friendly society. For the blind box category we take the form

of mail to give rewards, for the gift box category can be directly redeemed in front of the recycling machine. **3.2.3 Resource recycling**

At present, the overall recycling rate of e-commerce packaging is less than 20%, the recycling rate of outer packaging boxes is far below 50%, while the recycling rate of express packaging fillers, sealing tape, packing tape and other plastic components is basically zero. This project takes express packaging centralized recycling, return to packaging production, degradation field for recycling. It not only saves the cost of extracting paper bags after waste classification, but also returns directly to the factory more efficiently, avoiding the problem of poor utilization of waste packaging.

3. Summary

In this era of extremely developed logistics, the recycling rate of logistics packaging waste is still low, and the harmless treatment of randomly discarded logistics packaging waste is low, and most of it is directly landfilled, which has become an important environmental protection problem today. This paper is in the middle of consumers and sanitation departments, guided by the circular economy, green logistics as the goal, providing "Internet +" joint recycling mode, timely recovery and disposal of waste courier waste, greatly improving the efficiency of resource recovery. It also adopts a point exchange system to increase the number of points redeemed for cultural and creative products through the recycling of express delivery, which can effectively motivate people to recycle express delivery. This concept can enable consumers to independently purchase different sizes of courier boxes, courier bags and gift bags. When people want to send something but can't find something to wrap, or find it difficult to buy courier boxes outside, providing single-sale items of packaging through courier recycling cabinets can facilitate people's lives, and also give courier packaging recycling stations an implemented economic value. From a societal perspective, express recycling cabinets promote environmental protection and resource conservation, and enhance the efficiency of express recycling, thereby driving the development of the express industry towards a more sustainable, low-carbon path. From a consumer perspective, the point redemption system can also serve as a motivating factor for citizens to take on a greater sense of social responsibility towards protecting the environment and conserving resources.

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