

Logistics Packaging Recycling--Taking Sam's Club as an Example

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ABSTRACT

In the context of the continuous promotion of the "double carbon" target, green logistics and the development of circular economy makes logistics packaging recycling a core issue for retail enterprises to achieve sustainable development. This paper takes Sam's Club as a research case, applies the literature research method and case study method, combines the theory of circular economy and the practice of green logistics, analyses the current situation of logistics packaging recycling and the bottlenecks, explores the effective ways of logistics packaging recycling and proposes a targeted path to achieve it. The study found that Sam's Club shops have carried out preliminary practices in the fields of recyclable logistics boxes and label-free packaging, but at the same time, they are facing problems such as the high difficulty of recycling large packages and the low degree of consumer participation. Through case analysis and theoretical research, this paper proposes a set of logistics packaging recycling mode based on policy support, technological innovation and consumer participation, which makes up for the shortcomings of existing research and provides reference for the greening process of logistics packaging in warehouse membership retail enterprises.

KEYWORDS

Logistics packaging; Recycling; Sam's club; Green logistics; Sustainable development

1 Introduction

Logistics packaging recycling research began at the end of the 20th century, with the enhancement of environmental awareness and resource shortages increasingly prominent, scholars began to pay attention to the management of packaging waste. Stahel first proposed "from the cradle to the cradle" of the circular economy concept for packaging recycling. Stahel first proposed the concept of "from cradle to cradle" circular economy, which laid a theoretical foundation for packaging recycling. On this basis, Guiltinan and Nwokoye (1975) explored the recycling mode of packaging waste and put forward the early prototype of reverse logistics.

In recent years, the recycling of logistics packaging has become one of the most important hotspots for the green and sustainable transformation of commerce and trade circulation areas under the dual promotion of the national strategy of "Carbon Peak and Carbon Neutral" and the Law on the Prevention and Control of Solid Waste Pollution in the Environment. Logistics packaging as a key link in the logistics process, a large amount of waste generated each year has brought a heavy burden on the environment. China's annual express delivery packaging waste generated up to millions of tonnes, and is a year-on-year growth trend. Warehouse membership retail shops are facing environmental pressure due to the high consumption of packaging materials and the difficulty of recycling, while improving efficiency through the "large packaging, centralised distribution" model. The economic and environmental benefits of green innovation models depend on the synergy between technological innovation and management optimisation.

Existing studies have focused on manufacturing or general e-commerce, but have not paid enough attention to the characteristics of large packaging and centralised distribution in warehouse membership retailing (e.g. Sam's Club). As a high-end brand under Walmart, Sam's Club's logistics packaging accounts for more than 35% of the company's total waste (Walmart China ESG Report, 2023), and its recycling practice is representative of the industry.

This paper focuses on the issue of Sam's logistics and packaging recycling, analyses Sam's logistics and packaging recycling practices, diagnoses the core bottlenecks, and explores the path of adapting to warehouse membership retailing in combination with the theory of green logistics supply chain, so as to provide reference for the similar enterprises to balance the economic benefits and environmental responsibility. The results of the study not only expand the application scenarios of green circular economy in the retail field, but also provide practical guidance for enterprises to reduce packaging costs and improve environmental performance.

2 Sam's club logistics packaging recycling status and bottlenecks

2.1 Existing practices

Sam's Club has established a highly efficient logistics and distribution system to ensure that goods can be delivered to

shops and members in a timely and accurate manner. Its logistics and distribution covers a variety of links from supplier procurement, warehouse storage to shop delivery and last-kilometre distribution. In the logistics distribution process, logistics packaging as an important carrier to protect goods and facilitate transport, need to have good pressure, shock, moisture and other properties to ensure that goods are not damaged in the complex logistics environment.

Carton is one of the most widely used materials in Sam's Club logistics packaging. In the process of commodity transport and storage, cardboard boxes are mainly used to pack all kinds of dry commodities, such as food, daily necessities, electronic products and so on. The cardboard boxes used by Sam's usually have high strength and quality, can withstand certain pressure and collision, and effectively protect the goods. In order to improve the versatility and adaptability of cartons, Sam has standardised the design of carton specifications, with a variety of common specifications to meet the packaging needs of commodities of different sizes. Sam's is also actively exploring the use of environmentally friendly cartons, such as the use of cartons made of recyclable pulp to reduce the impact on the environment. Recyclable logistics boxes made of PP are used to replace disposable cartons in regional distribution, covering 30% of fresh goods, with a recycling frequency of up to 50 times or more, and a 60% reduction in the cost of a single box compared to disposable packaging (Walmart China, 2023).

Plastic packaging also plays an important role in the logistics packaging of Sam's Club shops. Plastic packaging bags are mainly used for packaging fresh food, frozen food, etc., which can effectively extend the shelf life of goods. Some of the plastic packaging materials used by Sam's adopt biodegradable plastics, such as polylactic acid (PLA), in order to reduce the environmental pollution caused by plastic waste. Sam's also uses plastic wrap on the outer packaging of some products to secure them, prevent them from falling apart, and improve the safety of logistics and transport.

In addition to cardboard boxes and plastic packaging, Sam's Club shops also use a number of other packaging materials. When packaging fragile commodities, foam boards, bubble pads and other cushioning materials are used to reduce the vibration and collision of commodities during transport and to protect the safety of commodities. For some large, heavy commodities, wooden pallets will be used to carry and transport, wooden pallets have a high carrying capacity and stability, convenient for forklift handling. Sam is also trying to use some new environmentally friendly packaging materials, such as paper filler instead of foam filler, to further improve the environmental performance of packaging.

Sam's has already upgraded the green packaging of a number of Member's Mark products. For example, it reduces the amount of plastic used by removing and replacing plastic packaging materials; and promotes the reuse and recycling of packaging by improving the packaging process. Our own brand Member's Mark 2024 launched the first label-free PET bottle packaging for drinking natural water on the whole channel, combined with the Plastic IQ tool calculations, is expected to reduce plastic more than 34 tonnes of plastic in a full year (combined with the use of plastic in the product bottle label, the estimated annual sales volume), equivalent to a reduction of about 200 tonnes of carbon dioxide emissions (calculations). (Reference: Based on Plastic IQ tool). A variety of Sam's carton merchandise packaging adopts the over-oil environmental protection process, removing the laminating film to enhance the recyclable value of the carton, and removing the PET bottle labels to enhance the recycling efficiency, which increases the recycling rate of the packaging of this series of products by 25% compared with that of the traditional packaging (Sam's Club Stores official website, 2024).

Sam's shops in 10 cities have set up packaging recycling points to recycle plastic trays for large packaged goods, with an average monthly recycling volume of about 5,000 (Retail Packaging Green Transformation Report, 2024).

2.2 Core bottlenecks

Sam's Club shops currently have a relatively single recycling channel for logistics packaging, relying mainly on shop recycling, and the shop recycling points only cover core shops in first-tier cities, with a lack of systematic recycling channels in second- and third-tier cities, resulting in an increase in the cost of inter-regional scheduling of recycled packaging by 20%. After shopping, if consumers have recyclable logistics packaging, they need to bring it back to the shop for recycling. This recycling method has certain limitations. For some consumers who are far away from shops, the lack of effective incentives and the high cost of recycling have led to their low motivation to participate in recycling. Only 12% of members said they were "willing to return packaging voluntarily", with the main obstacles being a cumbersome return process (member shops do not have a partition for systematic recycling, and materials are not precisely classified) and no direct benefit (in Germany, all bottles are recycled, and the Germans came up with a bottle deposit fee system), and more often than not, members do not have the initiative to return outer layer packaging. Awareness. Sam's co-operation with external professional recycling enterprises is not close enough, failing to make full use of the advantages of external recycling networks to further expand recycling channels.

Sam's Club shops have inadequate recycling facilities in the shop recycling process. The number of recycling containers in shops is limited and their distribution is not reasonable enough, which makes it inconvenient for consumers to recycle logistics packaging. The labelling of recycling containers is not clear enough, and some consumers are not clear

about which packages can be recycled and how to carry out the recycling operation. In addition, Sam's recycling facilities in logistics centres and distribution sites are relatively weak, affecting the efficiency and coverage of logistics packaging recycling.

The logistics packaging recycling process at Sam's Club shops lacks standardisation. In the recycling process, there are no clear standards and operating procedures for the inspection, classification and sorting of packaging, resulting in uneven quality of recycled packaging. The recycled packaging also suffers from poor interface problems in storage, transport and reuse, which can easily lead to damage and loss of packaging and increase the cost of recycling.

Sam's Club still has some technical bottlenecks in the technology and management of packaging recycling. The green packaging materials used by Sam's still have the problem of high cost, especially at the front end of the supply chain and in the context of product diversification, standardisation and mass production of environmentally friendly packaging materials is not easy. Different product types and market demands have led to difficulties in unifying and standardising packaging design, which creates additional difficulties in recycling and reusing packaging. For example, during the recycling and sorting process, the mixing of different materials in packaging leads to the complication of the recycling process and reduces the efficiency of the recycling process. This needs to be addressed by improving the level of intelligence and automation in packaging design. More than 60% of Sam's commodities are in large packages of more than 5kg, and due to the large size and complexity of dismantling, the rate of independent return by consumers is less than 10%, which is far lower than the industry average of 35% for small packages, and some consumers will dismantle large packages of commodities into separate packages for easy subsequent use; however, the majority of consumers opt for one-time use of commodity outer packaging.

3 Logistics packaging recycling realization path

Packaging design optimisation needs to take into account both functionality and recyclability. Referring to the durability design theory of Dong Zhaohui et al. (2025), large packages of more than 5kg can be split into modular units that can be combined, and a snap structure is used instead of tape encapsulation to improve the disassembly and recycling efficiency. The large package of rice, flour and other commodities is designed into three small modules that can be sealed independently, which not only meets the needs of household batch use, but also facilitates packaging folding and recycling. Expanding the scope of application of label-free packaging, adopting laser coding technology to replace traditional labels for categories such as toiletries and food and oils; adopting compostable PLA materials for fresh food packaging, and supporting the provision of a Material Identification Guide to help consumers sort and recycle.

upgraded the construction of the shop recycling network system, online and offline synergistic development, managers set up "packaging recycling zones" in all shops, equipped with intelligent identification equipment, members can accumulate points for returning packaging (e. g., 1 large package = 10 points, which can be deducted from consumption), and the points system is integrated with the member APP to enhance convenience (EAPP). The points system can be integrated with the members' app to enhance convenience (Ellen MacArthur Foundation, 2022). Community recycling outlets. Work with property owners to set up recycling bins around member-heavy neighbourhoods, and arrange logistics vehicles to pick up recyclables on the way every week to reduce cross-regional dispatching costs.

Technology-enabled digital tracking and management. Embed RFID tags in the recyclable boxes to track the flow path, number of uses and losses in real time, and optimise the dispatch frequency through big data analysis to reduce the rate of empty boxes to less than 15% ("Retail Logistics Technology White Paper", 2024). We have added the function of "Packaging Recycling Reservation" in our member APP, which supports online ordering and door-to-door pickup (free shipping for 3 large packages), solving the pain point of "inconvenient return" for consumers.

Multi-supplier participation mechanism for synergistic development, and P&G, Unilever and other core suppliers signed a "green packaging agreement", agreed to jointly bear the research and development costs of recycled packaging (suppliers to bear about 40%), and give priority to the purchase of goods using recyclable packaging (Zhang Jinqian et al., 2023). Suppliers apply for "green logistics subsidies" from local governments to provide tax exemptions for the construction of R&D and recycling facilities for recyclable packaging, which reduces the pressure on enterprises' initial investment (Mao Tao, 2023).

4 Conclusion

Taking Sam's Club as a case study, this study explores in depth the realization path of logistics packaging recycling, by analysing the status quo of its logistics packaging, the challenges it faces as well as the measures taken and the effectiveness. Comprehensively speaking, this paper has very important theoretical and practical value.

First of all, Sam's Club has actively explored and achieved certain results in logistics packaging recycling. From the theoretical basis, in cooperation with suppliers to optimize packaging, joint research and development of environmentally friendly packaging, the implementation of packaging standardisation and the establishment of information sharing mechanisms and other initiatives, effectively reducing the waste of packaging materials and improving the recycling efficiency of packaging. For example, the biodegradable paper packaging boxes launched in cooperation with food suppliers have reduced environmental pollution while safeguarding the quality of commodities, and the number of times of reuse has increased significantly after some of the packaging has been standardised and designed. In terms of building a diversified recycling system, measures such as expanding recycling channels, improving recycling facilities and standardising the recycling process have improved the recycling rate of logistics packaging. The optimised layout of shop recycling points and the development of community recycling cooperation have enabled more consumers to participate in packaging recycling, and the amount of recycling has increased significantly compared with before. In terms of cost control and economic incentives, through large-scale procurement of environmentally friendly materials, optimisation of the recycling process and improvement of the consumer incentive mechanism, the cost pressure has been alleviated to a certain extent, while increasing the enthusiasm of consumers and employees within the company to participate in recycling.

Secondly, Sam's Club still faces some challenges in the process of logistics packaging recycling that cannot be ignored. The problem of an imperfect recycling system still exists. Despite the expansion of recycling channels, the scope of recycling coverage is still insufficient compared to the huge amount of logistics packaging used, and consumers in some remote areas find it difficult to participate in recycling conveniently. The maintenance and updating of recycling facilities also require continuous investment to ensure their normal operation. The cost issue is still a key factor restricting the in-depth promotion of recycling. Although the price of environmentally friendly packaging materials has been reduced through large-scale procurement, it still does not have an advantage over traditional materials, and the high cost of manpower and equipment in the recycling process has led to a relatively limited economic return from recycling. In terms of consumer awareness and participation, although it has been improved through publicity and incentives, there are still some consumers who do not have sufficient knowledge of logistics packaging recycling, and their motivation to participate in recycling needs to be further improved.

Finally, based on the practical aspects of Sam's Club, the realisation of logistics packaging recycling requires the concerted efforts of many parties. Enterprises should play a leading role in strengthening cooperation with suppliers to promote recycling from the source of packaging design and material selection. At the same time, build a perfect recycling system, expand recycling channels and improve recycling efficiency. The government should introduce relevant policies and regulations to increase support for logistics packaging recycling, such as providing financial subsidies, tax incentives, etc., to reduce business costs. Consumers should also enhance environmental awareness and actively participate in packaging recycling to form a good atmosphere for the whole society to participate.

5 Research not enough

Based on the conclusions of the study, it can provide theoretical basis and ideas for large membership shops, and better provide guidance for practice. Although the Sam's Club shop logistics packaging recycling has been analysed in depth, there are still some shortcomings. The research method of this study is a qualitative method, and there is a lack of research on this field, so in the future, we can use a quantitative method to study the problem discussion, and then verify the rationality of the theoretical model with a quantitative method to improve the scope of application of the theoretical model.

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