

RESEARCH ON CIRCULATION CHAIN OF TAKE-OUT PACKAGING BOX FROM ONLINE ORDERING PLATFORM AT GUANGZHOU HIGHER EDUCATION MEGA CENTER

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Abstract

The research of circulation chain of take-out packaging box from online ordering platform at Guangzhou Higher Education Mega Center can enable us to understand the flow of packaging box and the eventual disposal with it. There are 10 universities in Guangzhou Higher Education Mega Center and 3 of them are selected as the study object, which can represent the 10 universities. Then, by means of online questionnaire, online consultation and offline interview, all nodes of the circulation chain and the flow between them are found. And some problems can be learned, especially a few number of recyclable boxes are recycled, and a large number of remain recyclable and unrecyclable boxes are directly incinerated or landfilled. According to the main problems existing in box circulation chain, the paper proposes several suggestions, aiming at increasing recycling rate of packaging box.

Keywords: Take-out packaging box; Circulation chain; Resources recycling; Garbage classification policy

1 INTRODUCTION

In April 2009, online catering industry was born. Eight years later, in June 2017, big data report released by Eleme showed that the scale of China takeout market has exceeded 100 billion yuan, and it is estimated that the scale of China takeout users will reach 600 million in 2020. Every week, at least 400 million takeaway orders generate and at least 1.2 billion takeaway packaging garbage is thrown in China. Much of the waste is recyclable, but the vast majority go straight to incineration or landfill, or end up in the ocean, preventing recycling of resources and having a huge impact on the environment.

At present, the status of take-away boxes recycling in China is not good. Domestic scholars' Suggestions can be summarized into two aspects. One is improving the recycling technology of packaging boxes, the other is establishing and perfecting the long-term effective recycling system. In terms of improving recycling technologies, GaoTao(2009) suggested that the application of new technologies, such as coking technology and oil-based technology, should be strengthened in the field of waste plastics recycling. ChenDan(2012) analyzed and compared the advantages and disadvantages of landfill method, incineration method, chemical recycling method and recycling and regeneration method, proposed the recycling and granulation method of molten waste plastic by hot air cycle heating. TangGuilan(2013) suggested that single-category plastic polymer treatment technology and multi-category plastic polymer comprehensive utilization technology should be used to strengthen the recycling and modification utilization of waste plastics. In terms of

establishing and improving recycling and utilization system, ZhouBingyan (2010)proposed to adopt long-term comprehensive management countermeasures, such as formulating economic policies to encourage recycling and utilization. ZhangYanan(2013) proposed that government should clarify competent department and supervision department of tableware waste recycling. ZhangFengyi(2016) proposed to establish "environmental protection points" for consumers. Manufacturers and businesses are encouraged to recycle takeaway waste through the form of "replacement by award".

Based on above situation, the research team investigated the circulation chain of take-out packaging boxes from the online reservation platform at Guangzhou Higher Education Mega Center(GHEMC). After in-depth understanding and analysis of the circulation chain, problems were found. This paper puts forward some suggestions on improving the circulation chain by discussing the recycling mode of take-out packaging boxes, so as to improve the recycling rate of packaging boxes, reduce resource waste and environmental pollution.

2 RESEARCH METHOD

This research took GHEMC as the sampling area, where takeout platform has a high penetration rate. We conducted the research by means of online questionnaire, online consultation and offline interview, for each node in the circulation chain of takeaway packaging boxes. 664 valid questionnaires were collected. Among the valid questionnaires collected, the number of students in the Guangdong University of Foreign Studies, Guangdong

University of Technology and Guangzhou University respectively accounted for 32.83%, 40.06% and 25.9% of the entire sample. Since these universities are close to the three major takeaway gathering places, the information from questionnaires can represent the use of takeaway boxes in GHEMC. In view of the production, sales and recycling of packaging boxes, we conducted online consultation and interviews with relevant personnel from each node of the circulation chain, in order to find the circulation chain operation of takeaway packaging boxes deeply.

3 STATUS OF TAKE-OUT PACKAGING BOX'S CIRCULATION CHAIN

3.1 Operational Profile of the Circulation Chain

The processing system for the take-out packaging box at GHEMC has not been fully established which is in a

state of disorderly recycling overall. According to the study, there are four main types of packaging materials: plastic (97.35% polypropylene, hereinafter referred to as PP), disposable foam, paper, tin foil. In terms of processing methods, they can be divided into two categories: recyclable packaging box and non-recyclable packaging box. Only a small portion of the recyclable packaging box is recycled, which contributes under-estimation proportion of the total amount is 5.89%-23.53%. The remaining packaging box garbage is neither classified nor recycled, directly incinerating or landfilling together with ordinary household refuse.

The status of the circulation chain of take-out packaging box at GHEMC is shown in **Figure 1**. The paper analyses the current status of the packaging box's circulation chain through the flow of high-will-recycling packaging boxes represented by PP plastic materials and low-return packaging boxes represented by foam material.

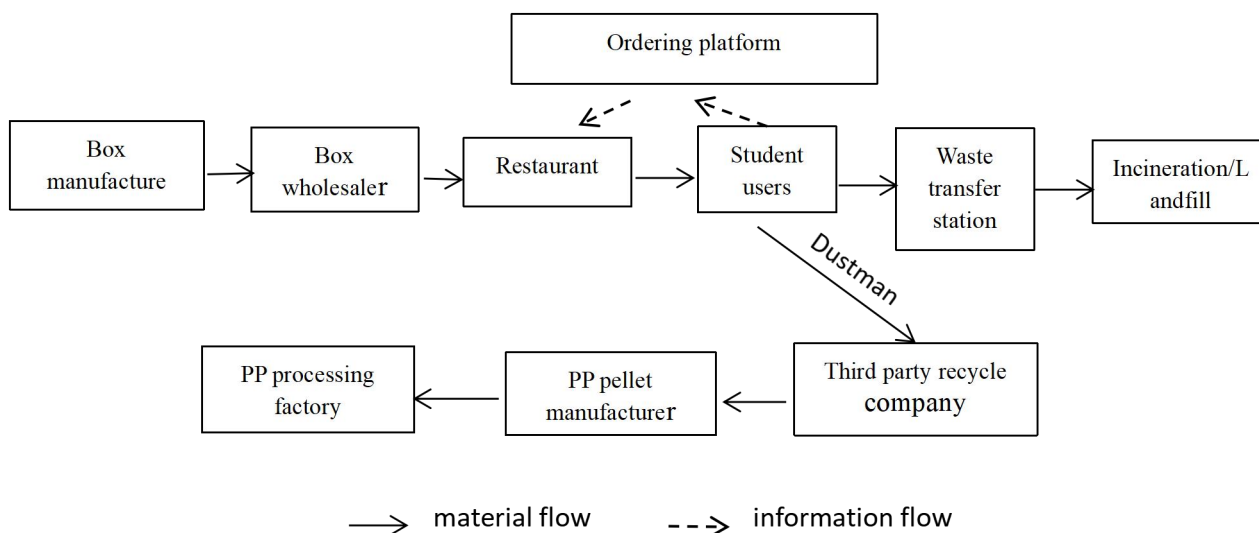


Fig 1 Take-out packaging box circulation chain

3.1.1 Circulation chain of high-will-recycling packaging box

The high-will-recycling packaging box's circulation chain is divided into a forward circulation chain and a reverse recycling chain. In the forward circulation chain, manufacturer sells the packaging box to retailer, then the retailer distributes the packaging box to dealer in the nearby area. After consumer places an order on the ordering platform, the dealer receives the order and starts to prepare food, completing cooking and delivering the food to the customer with take-out box. Finally, most consumers directly throw the box with the food residue left into the trash can in the dormitory. In the reverse recycling chain, college dustman picks up transparent or light-colored plastic boxes that are recycled by third party recycle company, and pre-process them - dumping food residues, after collecting a certain number of boxes, selling to recycling firms. The third-party company transports the recycled packaging boxes to recycled plastic pellets company for sale, which chemically cracks the packaging boxes to produce plastic pellets that can be used to produce new products, and finally processed from recycled pellets. The plastic pellet processing

company processes the secondary plastic granules to produce non-food grade products such as slippers and washbasins.

3.1.2 Circulation chain of low-will-recycling packaging box

The low-will-recycling packaging box's circulation chain has only a forward flow chain. Before the dustman of college pick up the take-away packaging boxes in the dormitory, the circulation of the low-will-recycling packaging box is the same as that of the high. However, when the cleaner sort the garbage, the low-willing recycling packaging box is mixed with the ordinary household refuse because it is not recyclable or the recycling price is too low, and is concentrated in the garbage transfer station of college. The garbage in the waste transfer stations of the colleges in GHEMC is compressed by the vehicles designated by the outsourcer and then transported to the landfill or incineration plant. However, mixed incineration produces a large amount of harmful gases, and mixed landfills can also seriously pollute the soil and water sources, causing serious damage to the environment.

3.2 Existing problems of the circulation chain

On the whole, current recycling efficiency of take-out packaging box at GHEMC is low, a lot of resources are wasted. The main problems are as follows:

3.2.1 *Various types of packaging box causes source problems*

There are four main types of take-out packaging materials in GHEMC. Usually, only a few transparent or light-colored PP packaging boxes are recycled, and a large number of remaining packaging boxes are mixed with ordinary household refuse and burned or landfilled, causing serious waste of resources and environmental pollution problems. Besides, the four types of packaging boxes are littered and mixed together, results in improving the difficulty of sorting and reducing the initiative of the dustman to pick up the box.

The main reason for this result is that the Internet ordering platform does not make specific and mandatory requirements for the packaging box. At present, the platform merchants are all preparing their own packaging boxes, and all ordering platforms have no specific requirements on the quality of the packaging box, only requires no leak. This situation has resulted in various types of and different shapes of take-away packaging boxes on the market. Also, because the ordering platform does not test the quality and safety of the packaging boxes provided by the platform merchants, there is a certain safety hazard for college students to eat the take-away food.

3.2.2 *Bad implementation of garbage classification policy in University increases recycling difficulty*

In recent years, the Chinese government has attached great importance to the comprehensive implementation of the garbage classification policy. In 2017, three national documents on garbage classification policy were published, clearly stating that “by the end of 2020, laws, regulations and standards related to garbage classification will be established basically to form a household garbage classification model that can be replicated and promoted”. From the results of this survey, most college students do not classify garbage, and only less than 30% of the students pour out the food residue before throwing the packaging box. In addition, the dustman does not classify the garbage, only picks up that can be sold. Among three researched colleges, only Guangdong University of Foreign Studies requires cleaners to classify garbage, to separate the take-away packaging box garbage from other household garbage, while the other two universities have not requirement on garbage classification. As a result, the classified garbage bins are mixed with all types of garbage, losing the meaning of garbage classification and causing a large amount of recyclable resources waste. The main reason

for this situation is that the heads of school implement garbage classification policy ineffectively. They neither make regulations for the dustman and restrict their work behavior, nor improve the students' awareness of garbage classification, encourage them to pre-process the recyclable waste and classify garbage before throwing.

3.2.3 *Many middlemen in the recycling chain reduce the willingness of all parties to recycle.*

At present, there exist many intermediate links in the recycling process of take-out packaging box, and is with low recycling scale. Specific problems are, firstly, the dustmen are numerous and scattered, which is the reason why third-party enterprises exist in the packaging box recycling chain. Each dustman picks up a small number of boxes results in low selling price, in turn, dustmen's willingness to pick up box is low. Secondly, many middlemen exist in the recycling chain leads to low recycling profits of all parties, reducing their willingness to recycle, like most third-party recycling enterprises and dustmen are reluctant to recycle black PP packaging box for the recycle price is too low. Thirdly, most plastic pellet manufacturers are small private enterprises, their production processes are backward and production efficiency is low.

4 SUGGESTIONS ON TAKE-OUT PACKAGING BOX'S CIRCULATION CHAIN

According to the relevant literature, Tian Yujie (2018) proposed to build a recycling model, which is based on the “third-party recycling model” for the take-out packaging box from the Internet ordering platform. This model mainly analyzes the reverse recycling chain of take-out packaging boxes, and seeks countermeasures for the main body of the take-out platform, platform merchants, platform users, third-party catering waste recycling enterprises and lunch box manufacturers, and proposes a closed-loop take-out packaging box chain recycling model. Theoretically, some measures of this model have value in practice. If the take-out platform provides a unified packaging box to the platform merchants, the non-recyclable lunch box garbage will be greatly reduced from the upper source.

According to this study, this thesis proposes to adopt a recycling model based on Polypropylene's factory. The main parties include take-out packaging box manufacturers, Internet ordering platforms, platform merchants, platform users, cleaners, colleges and universities, government and polypropylene's factory. Specific suggestions for improvement are shown in **Figure 2:**

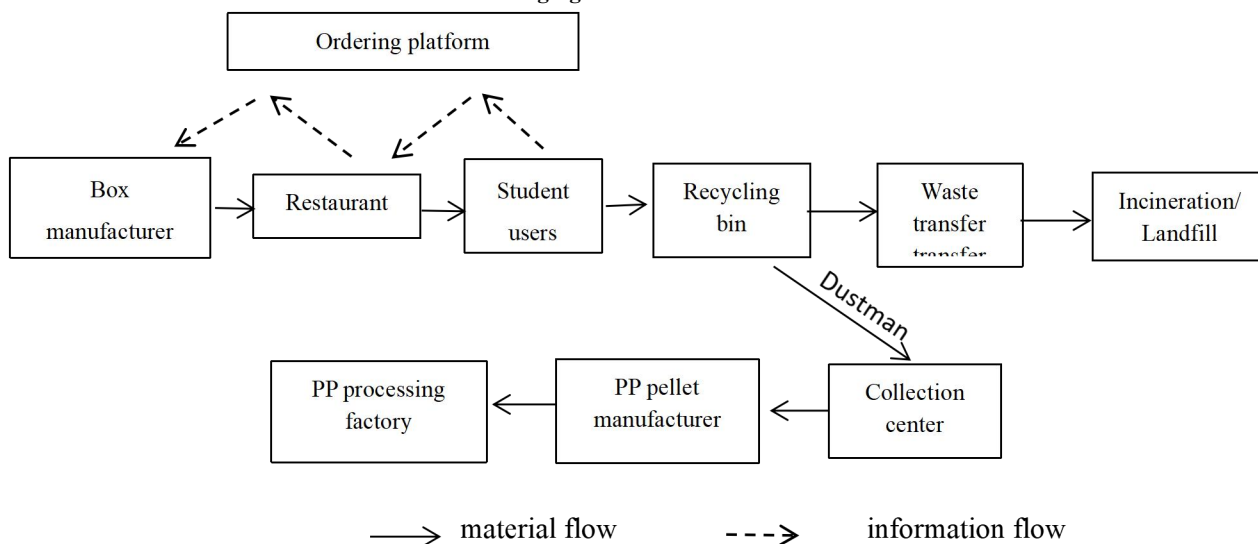


Fig 2 Improvement of packaging box circulation chain

4.1 Ordering Platform Provides Packaging Boxes To Platform Merchants Uniformly, and Prohibits Using Non-Recyclable Packaging Boxes

Based on this research, the root cause of the low recycling rate of the take-away packaging box is that the ordering platform doesn't set specific requirements for the packaging boxes used by the platform merchants, resulting in a variety of packaging boxes on the market, and there are potential food safety hazards. In response to this problem, we recommend that the ordering platform should centrally purchase high-quality, high-security transparent PP packaging boxes from the box manufacturers, and force all platform merchants in GHEMC to use them uniformly. The specific operation mode is: after the ordering platform finds the most suitable packaging box manufacturer and signs the cooperation agreement, platform merchants only need to input the specification and quantity of the packaging box on the ordering platform when purchasing the packaging box according to the delivery lead time. After placing the order, the box manufacturer only needs to accept the order on the platform and arrange order delivery. After the platform merchant signs the goods, the payment is automatically completed within a certain period of time, and the payment can be made in advance. In special circumstance, exchange, return, or other decision are also possible.

First of all, the ordering platform should use the order big data that it has mastered, and find the most suitable box manufacturer and minimum purchase price for the platform customers in the specific area according to the usage data and geographical location of the GHEMC take-out packaging box. For the sake of quality and safety, the ordering platform should look for a strong box manufacturer and set up a quality inspection and feedback mechanism for the package. On the one hand, set up personnel to test box randomly, and set up a feedback channel on the platform. Merchants and platform users can use the channel to provide feedback when they find quality problem of the package. If the feedback is true, the feedback person will be rewarded

and the box manufacturer will be punished by platform. The platform should jointly develop the supply plan according to the packaging box usage data of the merchants in the city, and keep the delivery lead time short and stable. Secondly, the ordering platform should conduct research on the box specifications and styles in advance. According to the survey results, several specifications and styles of packaging boxes are proposed for platform merchants to choose; in addition, the ordering platform should set up a supervision mechanism, and platform users should supervise the merchants. If the user finds that the merchant uses the packaging box provided by the non-ordering platform, he can report it to the ordering platform. If the report is true, the platform will reward the reporter.

Stakeholder analysis:

1) Ordering platform: Through direct procurement and unified provision of packing boxes, the ordering platform can reduce the risk of safety incidents due to quality problems in the packing boxes, winning the trust of more consumers to choose the platform. This action also contributes to protecting the environment and saving resources, creating a good corporate image which is brave enough to undertake social responsibility in society and in the minds of users. At the same time, the platform can print brand logo on the box, which can publicize itself free of charge.

2) Platform Merchants: Platform Merchants always purchase packing boxes from box dealers in higher prices due to the middleman profit overlay. Therefore, if the platform directly to the box manufacturers to centralize purchase of boxes, it not only eliminates the middleman mark-up, but also makes the purchase price more favorable so that merchants purchase box in lower prize. In addition, by the ordering platform to provide a unified box, when the quality of packing box causes safety accidents, the main responsibility of the responsible party from the platform merchants to the ordering platform.

3) Takeaway box manufacturer: In 2014, GHEMC has reached 160,000 students, and the result of this study

shows that the average take-out ordering frequency of three university students is 3.24 times per week. According to these two data, GHEMC students generated 5184 million takeaway orders weekly, that means 518,400 takeaway boxes are used per week. For box manufacturers, such a large demand can bring them a lot of profit.

4) College students: By the ordering platform providing a unified box, it can improve the quality of the box, so that students eat more safely. At the same time, students, as the main person of quality supervision of the box, can prevent the box manufacturers from cutting corners and the platform merchants from changing box secretly. If a quality problem with the box is found, students can provide feedback or report to the ordering platform and receive an award.

4.2 Colleges Implement the Garbage Classification Policy Effectively, Adding Special Takeaway Box Recycling Bins

Implementing garbage classification policy is in response to national requirements. College officials should attach importance to the garbage classification policy, improve their ideological awareness, and lead the school management team to introduce the relevant working mechanism. In view of the weak awareness of waste classification among college students and the problem of not classifying garbage when discarding garbage, the colleges should make a vigorous promotion of the garbage classification policy in the school, and hold relevant competitions and activities to raise students' awareness. At the same time, colleges should restrain students' behavior, punish students who do not classify garbage, and encourage students to pre-process recyclable waste so as to facilitate the waste sorting and recycling.

In view of the phenomenon that cleaners do not classify garbage, the school should formulate working instructions for them, standardize their work, and initiate a monitoring mechanism. In the process of recycling takeaway boxes, one of the major reasons for the instability of recycling rate is that cleaners pick up boxes according to their personal will. The school should formulate work instructions, clarify the work contents for cleaners, including garbage classification and collection of recyclable garbage, and formulate penalty regulations so that cleaners work strictly in accordance with the instructions. At the same time, university should build a supervision mechanism to supervise whether the cleaners comply with the work instructions. For example, checking the process or results of garbage disposal by cleaners randomly and punishing the cleaners who do not work in accordance with the instructions, ensure the implementation of the garbage classification policy, and the recycle rate of takeaway packaging boxes should be improved and maintained in a stable state.

In addition, adding a special recycling bin beside the waste bin in the student dormitory is advantageous and necessary for the recycling of takeaway packaging boxes. The discarded takeaway packaging boxes often adsorb more oil pollution, accompanied by food residues, and they should not be mixed with other recyclable garbage. The recycling bin can also maximize the recovery rate of the packaging boxes.

Stakeholders analysis:

1) College: Implementing the garbage classification policy effectively is in response to national requirements as well as a work that the school should complete. By implementing this policy, the college principals can not only complete their work better, improve their performance, but also create a better campus environment for students, establish a good image to the outside, in other words, they win praise both inside and outside.

2) College dustman: Students classifying garbage, pre-processing recyclable garbage and setting up special packaging box recycling bins greatly reduce the difficulty for dustmen to pick up recyclable waste and to classify garbage. Implementing the garbage classification policy effectively will increase the amounts of cleaners picking up boxes and other recyclable waste, and increase the income from selling scrap.

3) College students: Implementing the garbage classification policy not only improves the living environment of student residences, but also improves the campus learning environment. Students improve their environmental awareness, form good living habits, and assume social responsibilities, which is very beneficial to personal development.

4.3 The Government Intervened to Organize All Universities in GHEMC to Cooperate with Strong Regenerative Pellet Manufacturers, Remove Redundant Intermediaries.

At present, the weakness of the recycling mode of the take-away boxes in GHEMC is that there are many intermediate nodes and low scale. If the government intervenes, organizes the cooperation between the universities and the strong pp pellet manufacturers, who directly recycle the take-away boxes of colleges, it can reduce the intermediate link of the packaging box recycling process, so that the remain nodes can obtain higher profits and increase their willingness to recycle to improve the recycle rate of the box. What's more, the strong manufacturer has advanced production equipment and lean production process, which can improve the take-away packaging box's reproduction efficiency, quality and security.

Stakeholder analysis:

1) College: In three colleges surveyed, only Guangdong University of Technology has obtained revenue from collection of campus take-away boxes, by organizing sorting and unified sales. The other two colleges do not interfere with the recycling of the packaging boxes so do not gain any income. If the college-enterprise cooperation is adopted, college can obtain the proceeds from the recycling of the take-away boxes.

2) College dustman: School-enterprise cooperation greatly shortens the recycling chain of take-away packaging boxes, dustman selling boxes with higher price, and their income increases. At the same time, compared with delivering boxes to a far recycling site, selling boxes in campus is more convenient and easier.

3) PP pellet manufacturer: The amount of take-out packaging boxes generated every day in GHEMC is considerable, and the pp pellet manufacturers can get a lower recycling price than market price by quantitative advantage. Also, such a large amount of boxes generated

everyday means that the packaging boxes are transported to the pellet factory very soon after being thrown, so their washing and reproducing work is easier and saving cost.

4) Government: School-enterprise cooperation increases the revenue of each node in the new packaging recycling chain, increases the willingness of all parties to recycle the packaging box to improve the recycling rate. That is, more recyclable waste can be recycled, which means recycling of resources and reduction of environmental pollution. All of these are in line with China's sustainable development strategy.

5 CONCLUSION

At present, the online take-out market of GHEMC has tended to be saturated, which means that HEMC produces a large number of take-out packaging box garbage and disposable tableware garbage every day. According to this research on the circulation chain of take-out packaging box in HEMC, we found that the recycling rate of take-out packaging boxes is low and the current situation of a large amount of recyclable resources is not recycled. The main reasons are the variety of packaging boxes, the failure of colleges to implement garbage classification policy effectively, and the excessive recycling process. Based on the above situations, several suggestions to the existing take-out packaging box circulation chain are proposed, focusing on online ordering platform, college, and the government. Specifically, ordering platform is proposed to control the type of packaging box from the source; college is committed to improving students' awareness of garbage classification, restricting their behavior, and stipulating the work content of dustman; government organizes all colleges to cooperate with the strong pp pellet manufacturers, removing the middlemen, and thus, maximize the recycling rate of take-out packaging box

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and reduce the waste of resources.

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