

Research of Three Kinds of Criterion Sorting, Case, Container Packaging and Transportation of Mail

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Abstract: According to the current situation of the many kinds of China's regular mail, complex processing procedure, postbag packing, this paper puts forward the classification of three kinds of criterion to the mail, discusses the automatic sorting method of package-shaped mail, flat-shaped mail, letter-shaped mail and the transportation method by using case and container packaging, also has a detailed analysis of expected result.

Keywords: the classification of three kinds of criterion to the mail; case and container packaging; automatic sorting

1. Summary

At present, Chinese ordinary mail is divided into five kinds: parcel, ordinary print, registered print, ordinary letter and registered letter. Each kinds of mail has a large range of size and weight, overlapping and complex procedures, the iterative configuration of the personnel and the equipments, the inefficient sorting process and the intensive labor. Various size of mail are mixed into the postbag when packaging, so there will be serious extrusion between the mail and the mail also will be serious folding, this will undoubtedly lead to certain damage to the mail. In order to improve the sorting efficiency and reduce the personnel, we have to re-division the existing business types and improve the modality of the packaging.

At present there are three categories of world-wide automatic sorting machine, which are letter-shaped sorting machine, flat-shaped sorting machine and package-shaped sorting machine. Among the thickness of 5 mm or less (including 5 mm) letters can be classified by the letter-shaped sorting machine, the sorting efficiency of which is above 30,000 pieces per hour. Thickness of flat-shaped items between 5 ~ 20 mm and weight below 1kg can be classified by flat-shaped sorting machine, the sorting efficiency of which is above 20,000 pieces per hour. Thickness of packaging items above 20mm and weight below 35kg can be classified by package-shaped sorting machine, the sorting efficiency of which is about 10,000 pieces per hour. In order to adapt to the demand of the automatic sorting machine, we have to improve the existing working procedures and the ways of classification. So we can make the five kinds of mails (parcel, ordinary print, registered print, ordinary letter and registered letter) into three kinds of criterion, namely letter-shaped mail, flat-shaped mail and package-shaped mail based on the size and weight, and choose to use case and container instead of postbag when packaging.

2. The classification of the three kinds of criterion to the mail

Letter-shaped: ordinary letter, registered letter and ordinary print whose length and width size $< 230 \times 160\text{mm}$, thickness of 5 mm or less (including 5 mm).

Flat-shaped: ordinary print whose length and width size $\geq 230 \times 160\text{mm}$, weight below 1kg, thickness less than 20mm, as well as ordinary print which length and width size $< 230 \times 160\text{mm}$, thickness between 5 ~ 20 mm.

Package-shaped: The parcel, registered print, as well as ordinary print which more than 1kg in weight and more than 20mm in thickness.

3. The solutions of the three kinds of criterion when sending, transporting and receiving items

3.1. The classification of three kinds of criterion in the sale point

Mails received must be classified into package-shaped, flat-shaped and letter-shaped ones at the sale point. Package-shaped mail is used by container packaging and added to 50 pieces per box. Flat-shaped mail is used by medium-sized case packaging and added to 40 pieces per box. Letter-shaped mail is used by small cases and added to 300 pieces per box or 150 pieces per box (based on the two kinds of specification of the cases). And in the small cases we should mix the ordinary letter with the registered letter in one box.

3.2. Truck receiving, case and container transporting

When sale point hands over with the truck, the truck receiver should use hand-hold barcode scanner to scan the barcode on the case or the container in order to confirm the information of the box full of mails, then loading. The remaining mails not enough for one box or one

case should be handed over as spare parts. As for the package and registered print of the package-shaped mails, the truck receiver should scan the barcode on the package and registered print by hand-hold barcode scanner, and load them into the advanced reserved container of the truck. As for the ordinary print of the package-shaped mails, the truck receiver should directly load them into the advanced reserved container of the truck. As for the flat-shaped mails, the truck receiver should directly load them into the advanced reserved medium-sized case of the truck. As for the ordinary letter and ordinary print of the letter-shaped mails, the truck receiver should directly load them into the advanced reserved small case of the truck. As for the registered letters of the letter-shaped mails, we can tie up them in advance, and then the truck receiver scan the whole mails, finally load them into the advanced reserved small case of the truck.

Mails received by the truck should be loaded into the container and sent to the center of post, then the truck receiver gives information of the mails which is saved in the hand-hold barcode scanner to the receiver at the post center.

The working efficiency and the full-load ratio of the truck get improved by using the classification of the three kinds of criterion and cases and containers to transport.

4. The solutions of the three kinds of criterion at the postal handling center

4.1. The handling of the package-shaped mails

The package-shaped mails sent to the post center by the container are unloaded on the belt conveyor by the turn-over machine and are sent to every item platform through the slope-belt distributor, then these mails are sorted from the item platform to the halved belt sorting machine by the means of scanning the barcode, reading the postal code or the man-made sorting information. The efficiency of the package-shaped sorting machine reaches to 10,800 pieces per hour. The setting of the sorting crotch: 66 crotches of the 1-2 level center departments at the exit. (7 crotches in the 1 level center department, 59 crotches in the 2 level center departments). The quantities of the crotches at the entrance are based on the sorting quantities of the crotches. We called direct-packaging crotch when the sorting quantities is over 50, and we called mix-packaging crotch when less than 50.

When package-shaped mails sorted begin to be loaded in the container, the worker should use the barcode reader to scan the package and registered print mails one by one. As for the ordinary print mails, the worker just counts the numbers when they're ready to be loaded. Then it can automatically creat the loading list and the barcode of the container. Finally these mails are sent to

the temporary storage area and ready to be sent out.

4.2. The handling of the flat-shaped mails

Mails sent to the post center by the medium-sized case should be sent to the temporary storage area of the flat-shaped through the case elevator, transportation system, then taken out from the case by manual work and put into the item platform of the sorting machine. The item-providing system separates mails automatically, reads the postal code one by one, and then sends them into different funnels. When the funnel goes to the crotch, it will open its bottom, and mails will fall into the case which is reserved in advance. The efficiency of the flat-shaped sorting machine reaches to 21,600 pieces per hour. The setting of the sorting crotch: 66 crotches of the 1-2 level center departments at the exit. The quantities of the crotches at the entrance are based on the sorting quantities of the crotches. We called direct-packaging crotch when the sorting quantities is over 40, and we called mix-packaging crotch when less than 40.

Sorted flat-shaped mail will enter into cases automatically. Once a case is full, it will be changed by manual operation and inserted the corresponding label (information contains letter numbers in the case), printed by pressing the printing-button. Then the sorted flat-shaped mails will be transported into temporary storage area for next delivering through conveying equipment.

4.3. The handling of the letter-shaped mail

Letter-shaped mail, transported to mail processing center by small cases, will be delivered to mail sorting temporary storage area through tank elevators and conveying system, and then taken out of the cases and classified into two categories manually. Ordinary letter and ordinary print will be directly put on the platform of the sorting machine, and bunched registered into other temporary turnover cases. Ordinary letter and ordinary print can be separated automatically through sorting supply equipment, and then conveyed into auto-sorting system one by one. Sorting equipment can identify the post code in the red frame of envelopes or on the window or labeled letters, and then convey these mails to different crotch. The large amount will be stored in stockpiling machine and the small ones in crotch. When sorting registered letter, we will unfold the bunch first, then put them into sorting machine waiting for next sorting by scanning the barcode on envelopes. In order to improve the utilization rate, we adopt a time-sharing sorting method when sort ordinary letter, ordinary print and registered letter.

We set efficiency of letter-shaped sorting equipment as 30,000 pieces per hour. When sorting equipment cannot scan post code of the mail, sorting address information will be transmitted to screen of manual-mark area immediately, which will take 7 seconds. When the sorting address information is identified manually and input the right post code, the mails can be sorted into the right

crotch. The setting of the sorting crotch: 66 crotches of the 1-2 level center departments at the exit. The quantities of the crotches at the entrance are based on the sorting quantities of the crotches. We called direct-packaging crotch when the sorting quantities is over 300 or 150, and they will be respectively put into two kinds of small cases with multiple relationships; and we called mix-packageing crotch when less than 150.

Sorted letter-shaped mails will be loaded into two kinds of small cases manually. Once a case is full, the staff will change the case manually and press the print-button. Ordinary letter and ordinary print only need the barcode, which will be inserted into the case, while the registered letter needs both mail list and case label, which will be put into and inserted into the case respectively. Then all of them will be transported to temporary storage area waiting for next delivering.

5. Supporting optimize proposal of three kinds of criterion to the mail

5.1. Optimization of central office department organization

In order to give full play to processing capacity of sorting equipment, increase processing capacity of sorting crotches, it is necessary to set national center department. Abolish 3rd level center department and retain 1st and 2nd level center department, so that the quantity of national center department will decrease to 66 (the total amount of 1st and 2nd level center department) from 201 (the total amount of 1st, 2nd and 3rd level center department). The reduction in quantity of center department can make the increase in processing capacity of the remained center department, which will be beneficial to transportation of both the case and container.

5.2. Information networking of parcel mail in package-shaped mail

When the original office accepts the parcel, the sender should fill in the parcel bill, then the waiter pastes it on the parcel, types the detailed address information of the parcel into computer, prints, and then sticks the barcode related to the detailed address information on the parcel. Via network can the detailed address information of the parcel be send to the postal handling center.

After receiving the detailed address information of the parcel, the postal handling center compares them with the keywords in the computer according to the import and export mail address database, thus realizing information's off-line pre-sorting. When the parcel arrives at the postal handling center, sorting machine will scan the barcode on the parcel, which can get the detailed address information of the parcel, and sort automatically. After delivering the mail, we send all kinds of information of the mail as well as the detailed address information of the parcel to the postal handling center of the destination

office.

After receiving the detailed address information of the parcel, the postal handling center of the destination office, in the same way, conducts information's off-line pre-sorting. When the mail arrives, it will be sorted automatically.

To use networking program of the detailed address information of the parcel, we only need to type the original information into computer when receiving or sending mails, and follow-up processing can realize information sharing as well as automatic sorting of the whole process and network, which can not only improve production efficiency, but also simplify the processing procedures greatly.

6. Technical and economic analysis

1) the original office uses three kinds of criterion sorting, and trucks adopt case or container to collect, which can not only greatly improve the flatness and intact rate of mail, but also increase the load factor of case, container and vehicle. It is convenient to handle and sort mail, and transport capacity and sorting efficiency both can be improved effectively.

2) For reducing the number of the central office from the original of 201 down to 66, the number of the sorting outlets of the sorting machine will be greatly reduced and equipment costs will be significantly lowered. Mail is concentrated in the primary and secondary central office to tackle. We cancel the tertiary central office to save labor cost.

3) When we choose to use "three kinds of criterion" sorting, the size and the scope of weight of mail will be consistent with the three categories of world-wide automatic sorting machine criterion, meanwhile, sorting capacity will be significantly improved, and the utilization of sorting machine will be greatly increased. It is more flexible in terms of equipment selection. As for package-shaped mail, for example, we can choose cross belt sorting machine, tray sorting machine, Pusher sorting machine, etc.; Flat-shaped mail can choose Double-Bucket sorting machine, Chase sorting machine etc.; Letter-shaped mail can choose automatic sorting machine which has OCR or OBR recognition. With automatic sorting, sorting efficiency can be greatly improved, and saving a lot of manual sorting staff.

4) We select case and container when packaging, which can not only reduce the breakage rate of mail, but also be easy to realize mechanization and automation. Internal transport and handling efficiency will be more efficient, moreover, reducing the operator's labor intensity and improving the working environment.

5) For the parcel in package-shaped mail, we use working ways of parcel and bill combined, detailed address information networking and container packaging, thus simplifying the processing procedures of parcel

mail. Compared with the original processing way of postbag packaging and way of parcel and bill separated, unpacking efficiency will be increased by about 90%, offer-unit efficiency about 33%, and clear-outlet efficiency about 100%. Through Comprehensive analysis, the processing efficiency of the whole process can be increased by about 80%. According to calculation that the whole country have 100 million parcels a year whose import and export are processed once respectively, it is estimated that the national staff, who deal with the parcel, will be reduced by about 1,000 people, and the

whole country will decrease the cost of production staff about 40 million RMB each year.

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