

Research on Optimization Technology of Automated Warehousing System

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Abstract: By applying automation technology to the logistics field, logistics efficiency can be greatly improved. At the same time, the logistics distribution system relies on the introduction of automation technology to achieve automated warehousing. Specifically, the logistics automated warehousing system covers the three-dimensional library, transmission system, picking system, etc., and thus realizes the functional upgrade of the traditional logistics warehousing system, and thus realizes the effective control of labor costs for the logistics company. To this end, this paper will start with the introduction of domestic automated warehousing development at this stage, expound the advantages of logistics automated warehousing, and conduct research on the overall development of China's logistics automated warehousing for reference.

1. Introduction

In recent years, e-commerce has been extremely active, and the public has changed the traditional shopping model. It has become increasingly accustomed to meeting the shopping needs of individuals or families with online e-commerce platforms. In this process, the logistics company becomes an important link between the online e-commerce platform and the offline consumers. After the consumers purchase the goods through the online platform, the logistics company will provide them according to the address reserved by the consumers. Product distribution service. However, in the process of logistics enterprises distributing offline goods to consumers, because the online e-commerce platform of the consumer's location is usually not in the same region or city, the logistics company must carry out the transfer and storage of the delivered goods. After that, according to the delivery destination of the product, the goods waiting to be delivered are sorted and sorted. From this point of view, warehousing activities are one of the important daily tasks of logistics companies. At the same time, the changes in public consumption habits and the rapid development of online e-commerce platforms have made logistics and distribution personnel undertake extremely heavy work tasks in their daily work [1].

2. Introduction of Domestic Automated Warehousing Development at the Current Stage

Affected by the relatively lagging development of automation technology, the performance of domestic automation related technologies is still quite different from that of developed countries.

The so-called automatic conveyor system covers both the pallet conveyor and the box conveyor. Enterprises usually combine these two transport devices with a stereo library in practice. Domestic research institutes began to conduct research on automatic transportation systems in the 1990s. Nowadays, they have achieved satisfactory results, and the developed systems have been widely promoted and applied in the field of national industrial production.

The research path of domestic scientific research institutions for the research of automatic sorting system is: technical imitation - independent research and development. Initially in the research of this system, it is mostly for the reference and copying of the mature technology outside the domain. Later, with the enhancement of China's comprehensive national strength and the increasing emphasis on independent research and development of technology, domestic scientific research institutions have paid close attention to the independent research and development of this system. It has changed the previous simple reference and copying of extraterritorial technology. The early domestic automated sorting system was only applied in the postal field. With the improvement

of the function of the system, it has been widely used in civil aviation and other fields.

3. Advantages of Logistics Automated Warehousing

Relying on the application of such warehouses, it can reduce the dependence of logistics companies and industrial enterprises on labor costs, and at the same time reduce the requirements for operating sites. Relying on the computer numerical control technology, this kind of warehouse will realize the significant improvement of the storage operation efficiency, and then achieve the purpose of compressing the logistics company's compression operation cost in industrial enterprises. At the same time, the labor of the warehouse is greatly reduced and the working conditions are improved. High-rise shelves in automated warehouses can use space reasonably, increasing the amount of goods stored per unit of land area. In the same land area, the construction of automated warehouses is several times or even ten times more than the storage capacity of ordinary warehouses. In this way, the automated warehouse saves a lot of land under the same storage [2].

From the aspect of work efficiency, such a warehouse can rely on efficient cargo storage location search to realize rapid product access operation, thereby achieving effective control of time cost.

From the point of view of cargo storage, such warehouses can rely on the functions of the shelf-tray system to realize the safe moving and handling of the goods in the warehouse, and thus effectively avoid the past in the process of goods entering and leaving the warehouse. Improper movement causes damage to the outer packaging of the goods. In addition, this kind of warehouse relies on the automatic sealing function to realize the effective control and adjustment of the internal temperature and humidity of the warehouse, so that the goods in the warehouse are under the most suitable storage conditions.

4. The Current Development of China's Logistics Automated Warehousing

At present, the overall development of China's logistics automated warehousing is management automation, logistics management intelligence and zero inventory development.

Nowadays, domestic scientific research institutions have successively focused on the development of management automation technology that can be applied to logistics and storage systems, so as to create opportunities for the efficiency of daily management activities of logistics companies and industrial enterprises through the development and use of such technologies.

This is a high-level application of automation and informationization. The logistics operation process involves a large number of operations and decision-making, such as the determination of inventory level, the selection of transportation, distribution and transportation routes, the trajectory of automatic guided vehicles and operation control, and automatic division. The operation of the picking machine and the decision support of the operation and management of the logistics distribution center need to be solved with a great deal of knowledge. With the popularization and popularization of related technologies such as expert systems and robots in the international arena, intelligentization is bound to be a development trend of modern logistics in the process of logistics automation.

For warehousing activities, the ultimate goal pursued is zero inventory. The so-called zero inventory can be understood from two aspects: 1 the goods in stock are equal to or close to zero; 2 the inventory equipment, the number of facilities and the inventory labor consumption are approaching zero or equal to zero at the same time. The zero inventory in the second sense is actually a reasonable adjustment of the social inventory structure and the performance of inventory concentration. However, in the economic sense, it does not come from a reasonable reduction in the amount of stocks in the usual sense. The main cost of enterprise logistics management is inventory expenses. Therefore, warehousing management implements integrated warehousing, which integrates social warehousing facilities, related suppliers, retailers, manufacturers, wholesalers, and even customers' warehousing facilities to optimize enterprise inventory management.

5. Automated Warehouse System Optimization Method

With the increase of industrial productivity and the popularity of Internet technology, the logistics industry has become an emerging industry in the 21st century. Warehousing is the most important part of the entire logistics. The main function is to keep undelivered goods. The automated warehousing system is a new warehousing mode that integrates multiple technologies in the field of modern logistics. It has the characteristics of mechanization, automation and networking to become the central system of product storage. Warehousing is an indispensable part of the e-commerce industry and other enterprises operating by logistics. The development of the warehousing industry has seriously affected the logistics supply chain and China's economic structure.

According to the results of bionics research, ants find a path by releasing pheromones while traveling, randomly selecting a strange path, and releasing pheromones according to the length of the path. The longer the path, the fewer pheromones, and the later ants will choose more pheromones. The path is also a short path. Ant colonies can find the best path through this method, and even if there are obstacles on the way, the same path can be found in the same way. From the way of ant colony selection path, some scholars have developed an ant colony algorithm that simulates ant colony behavior, which is a new optimization algorithm. Ant colony algorithm optimization includes two aspects: (1) adaptive ant colony algorithm. When the ant chooses the path, it will choose the pheromone higher than other paths. This path will be selected multiple times and the pheromone will be more and more, and the ant will no longer look for other paths. In order to prevent a similar situation from occurring when the algorithm is run, the maximum and minimum values are set for the pheromone trajectory, and the amount of information is adjusted according to the information volatility coefficient, so that the trajectory amount is between the maximum value and the minimum value after each selection. (2) Parallel ant colony algorithm. The ant colony is divided into several groups, the quasi-side is adjusted by information exchange, the pheromone is updated through inter-ant colony communication in a certain period, and (3) niche technology. Niche technology uses excellent individuals as representatives of several group types to exchange information between the same population and other populations, thereby generating new groups and completing operations through selection or sharing [3].

Reasonable arrangement of the storage area and cargo space can reduce the workload of the stacker, reduce the difficulty of inventorying the warehouse, save time for warehousing, and improve the efficiency of the automated storage system. Optimizing fixed shelf scheduling mainly works in two aspects: on the one hand: optimizing fixed shelf positions. The optimization of the location can adjust the arrangement of the goods in a timely and reasonable manner according to the nature of the goods and the problems that may arise during the deployment process. There are several types of storage arrangements: (1) Positioning storage according to the frequency of goods entering and leaving the warehouse. (2) Random storage according to the time of goods storage. (3) Classified storage according to product specifications, attributes, and liquidity. (4) The goods are shared and shared for storage. The allocation of cargo space must conform to the principle of light weight, sub-lane storage, and near/outbound storage. On the other hand: Optimize the stacker job path. There are three types of stackers, namely picking, unit, and unit - picking. When the stacker performs the picking operation in the independent movement, the operator operates the stacker to carry the container to the designated picking position, and returns to the laneway after manually picking up the goods. The operator's picking time for the cargo space does not change with the order of the cargo positions in the picking path. The horizontal and vertical moving speeds of the stacking machine are fixed, and the picking of different goods of the same batch of bills corresponds to different running times.

Rotating shelf is the innovation of the automated warehouse system, and it is an important part of it. Due to its large cargo space and flexible operation, it is suitable for the storage of goods with large variety and high liquidity. The rotating rack in the system can rotate in multiple directions around the vertical axis. The picking station is set at one end of the rack, and can be independently

moved to each shelf for sorting. The dispensing system controls the moving direction of the rack and transports the goods to the picking point. Optimizing rotating shelf scheduling can start at two points. (1) Optimize the allocation of cargo spaces. The moving distance and time of the rotating shelf changes with the order of the picked goods, and the frequently selected ones are placed in the same area, which reduces the moving distance of the shelves. In the automated storage system, there is only one picking station and one rotating rack. The single picking station is a single-layer rotating rack. Each rack has multiple cargo spaces. The system must ensure the correlation between the goods when picking the goods. Each layer of the layered rotating shelf can be rotated independently, and the spacing between the different layers of the goods should be ensured. (2) Optimize the rotating shelf path. The most effective way to improve the efficiency of automated warehouse systems is to shorten the picking path. The single picking station needs to find the optimal order of goods picking, and reasonably arrange how to arrange between the shelves of each layer, so that the time for completing the picking operation is the shortest.

The conveyor system is the link between the storage and sorting in the automated warehousing system, which transports the goods to the various picking stations, with the exception of large cargo. The main problem that the conveyor system needs to solve is how to pick the problem and control the car. The system basically adopts the form of multiple equipment combination work, mainly for coordinating transportation and loading and unloading. The factors affecting the working efficiency of the conveying system mainly include the following aspects: scheduling, routing, planning, and the number of configurations of the automatic guiding trolley. The optimization of the conveying system is to automatically guide the optimization of the trolley, and assign the conveying task to the automatic guiding trolley, which can greatly improve the working efficiency of the conveying system. The problem of optimizing the automatic guided car can be accomplished by a genetic local search hybrid algorithm. Under the problem that the genetic algorithm can not completely solve the system optimization problem with complex conditions, it needs to be combined with other algorithms to improve the search ability. Local search is an algorithm that searches in a certain area. To use this algorithm, you need to define a neighborhood structure. Starting from the initial solution, perform related search in the neighborhood structure. Finding the correct neighborhood is the key point for seeking the optimal solution. . However, there is no specific method for finding neighborhoods that is common to all problems. It is necessary to analyze specific problems, and even the same problem can be solved in different neighborhoods.

6. Conclusion

By introducing automation technology into the logistics field, the logistics distribution system has an automated warehousing function, which greatly improves the logistics warehousing and distribution efficiency of the logistics company, thereby achieving cost reduction and efficiency improvement for the logistics company. Therefore, the development of automated logistics and warehousing is bound to be inevitable and long-term.

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