Empirical Research on Intelligent Upgrade Technology for Small and Medium-sized Logistics Enterprises

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Abstract. The project uses key technologies such as PLC controller, inverter and sensor technology, integrated mechanical transmission, and motor drive to upgrade the equipment of a small enterprise, thereby realizing the intelligent automation of logistics sorting operations in the enterprise. The project research used interview method, observation method, and empirical analysis method. The research team went to the company's site to investigate and study. After careful observation, it found that the company's sorting system had problems. The misjudgement of the information of the sorting operator is the key reason for the picking error. Pushing the goods by manpower is the reason for the inefficiency. The project combines the principles of the related control system to redesign the operation of the original sorting operator. The intelligent control system and automatic code scanning system are connected to the relevant equipment of the operation line. The project realizes the connection between the intelligent control system and the automatic code scanning system on the existing transmission equipment. The combination of related technical function modules used in the project improves the maintainability of the equipment, which is a major improvement for enterprises to improve production efficiency and achieve capacity upgrades. Production innovation.

1. Significance of project research

1.1. Exploring efficient technical solutions for upgrading and transforming traditional logistics equipment of small and medium-sized enterprises

Accelerating the intelligent development of logistics is an urgent requirement for transportation by the current supply-side reform. This project will upgrade the existing transportation equipment of the enterprise, increase the service life of the equipment, reduce energy consumption, assist the enterprise to get rid of the development dilemma, and solve the problem of waste of enterprise resources and low equipment utilization. The project directly addresses the efficiency of the sorting operation of the Xiaofanghe Transport Company in Weifang West Station. At the same time, the project will drive the upgrade and transformation of traditional logistics equipment for more small and medium enterprises, reducing costs and increasing efficiency.
1.2. Help small and medium-sized logistics enterprises integrate into the urban and rural distribution network system faster.
Research on intelligent technical solutions for small and medium-sized logistics enterprises, adapt to Internet order demand, comprehensively improve the level of enterprise informatization, increase the standardization of enterprise informationization, enable small and medium-sized logistics enterprises to integrate information with large logistics enterprises, and use geography in urban and rural distribution network systems. The convenience of the location and its own flexibility find its own strategic positioning for development.

2. Research content

2.1. Research on the control theory and technical resource integration of logistics sorting system
The theoretical support for the automation improvement of logistics sorting equipment depends on the combination of intelligent control theory and automatic transmission theory. Automatic sorting system is one of the necessary facilities for advanced distribution centers. The system has now become an indispensable part of large and medium-sized logistics centers in developed countries. Sorting is a key link in logistics and distribution. It refers to quickly and accurately picking out products from storage space or other areas according to customer order requirements or distribution center delivery plans, and sorting and concentrating according to a certain method. Waiting for the assembly process. Sorting is the most complicated and workload-intensive link in the operation of the distribution center, and it is also the core of the operation system of the distribution center. Mature automation control theory and technology provide the possibility for the automation improvement of the logistics sorting equipment of Xiaofanghe Transport Company of Weifang West Station.

2.2. Research on intelligent improvement design of logistics sorting equipment in empirical projects
(1) Design of functional components and system connection of logistics sorting equipment
The technical problem to be solved by the project is to diagnose the technical defects of the current equipment, add intelligent control and automatic information reading systems, and provide an improved logistics sorting equipment. By setting an intelligent controller, items can be accurately sorted. The code scanning system ensures the efficiency of object shunting.
(2) Decomposition of the technical module of the sorting system
The technology used in this project is relatively complex. The project mainly uses key technologies such as PLC controllers, inverters, sensors, integrated mechanical transmission, and motor drives. The project design decomposes the function of the sorting system into corresponding functional modules. When the function is decomposed, it is necessary to consider the commercially mature functional modules in the market in order to configure the mature technical modules at a low price, thereby ensuring the usability and maintainability of the equipment.

3. Key issues to be solved

3.1. Description of the core technology of the project
To improve the logistics sorting equipment, the original sorting equipment of the company's sorting system needs to be analyzed first. Although the original electric conveyor used the mechanized operation, the bottleneck restricting the operation efficiency was the manual operation. The root cause was Lack of equipment information transmission and control system leads to inefficient manual operations, and the company's labor costs are increasing, and the overall efficiency is relatively low compared to the same industry. It was determined that the key point for the improvement of the project was locked in the sorting line of Xiaofanghe Transport Company of Weifang West Station. The assembly line has one control operation post and three sorting operation posts. After researching the enterprise's logistics sorting system, the system uses an electric conveyor + manual sorting system.
The electric conveyor is moved back and forth between the chain plate by the chain conveyor and the profiled sliding feet to achieve the material separation. Pick.

The current technology performance of the enterprise is as follows: the sorting system is a kind of logistics equipment that sorts random, different categories, and different destinations of goods with manual control and corresponding classification according to system requirements. The existing sorting device requires manual labor. Code scanning, manual sorting, consumes a lot of labor, and has low work efficiency and high error rate. The existing design of the sorting system is flawed. It is difficult to accurately sort logistics items without the intelligent computer controller and automatic code scanning system. Sorting efficiency cannot be guaranteed.

To realize the transformation from mechanical and manual operations to intelligent automation, it is necessary to improve other functional modules of the sorting system, and add control systems, information collection systems, and network systems to the original transmission device. This enterprise sorting system is divided into control devices, sorting devices, conveying devices and sorting crossings. Through market research and consulting related logistics equipment companies, the sorting device technology is selected and optimized.

3.2. Technical solution
The project team focused on providing technical improvements to the logistics sorting equipment:

1) Design drawings of equipment components

See Figure 1: Divided Conveyor 1 (1), Detected Conveyor (7), and Divided Conveyor 2 (9), which are characterized by: Divided Conveyor 1 (1), Detected Conveyor (7), and Divided Conveyor 2 (9) Both sides are equipped with conveyor belt holders (6). The end of the conveyor belt (7) to be inspected is equipped with a sorting piston (4). The end of the sorting piston (4) is connected to a power supply box (5) and a power supply box. One (5) is connected to the controller of the sorting device (2) through two metal shafts. A sorting code channel (8) is arranged above the sorting piston (4), and the inner side of the sorting code channel (8) is connected to the shunt. Conveyor 1 (1), the other side of the sorting and scanning channel (8) are connected to the diverter conveyor 2 (9), the inspection piston (12) is arranged on the diverter conveyor 2 (9), and the diverter inspection is arranged above the inspection piston (12). Code scanning channel (11), shunt inspection The internal side of the code scanning channel (11) is connected to the end of the inspection piston (12) with the power supply box two (13), and the power supply box two (13) is connected to the shunt test controller through two metal shafts (10), the internal side of the shunt inspection code scanning channel (11) is connected to the logistics Sample cell (3).

Figure 1: Equipment structure connection diagram
3.3. Solutions for other technical support and technology combination business modules

(1) Other technical support
In modern logistics distribution, the application of high technology provides a solid technical guarantee for the improvement of operation efficiency and quality. The technology used in this project is relatively complicated, mainly by using PLC controller, inverter and sensor technology, integrated mechanical transmission, motor drive and other technologies. The solution of key technical problems is achieved by mature functional modules in the market.

(2) Solutions for technology portfolio business modules
Among them, the control and sensing system uses Sanwei FX2N series PLC as the control device, the automatic scanning system contacts professional logistics equipment to purchase finished system components, and the installation and commissioning of the information system module is outsourced to an Internet of Things Technology Co., Ltd., which uses Ethernet communication Technology, PROFIBUS bus technology and OPC technology connect the application of PLC control and sensor technology and each independent module to form a whole, which constitutes an intelligent control sorting system. The system commissioning test is completed by the outsourcing company.

4. Conclusion
(1) The project realized the connection between the intelligent control system and the automatic code scanning system on the existing transmission equipment.

The innovation performance of the project is first manifested in the system's realization of innovation in logistics operations. The system improves the operation process of the original sorting equipment, adds intelligent control system and automatic code scanning system, changes the traditional manual and semi-automatic sorting procedures, and the system realizes automatic sorting. The implementation of the project has improved equipment utilization, thereby reducing labor costs.

(2) The combination of technical function modules improves the maintainability of the equipment. The relevant functional modules are technically mature, and suitable technical service providers can be found in the market. Modules can be replaced and repaired at low cost. Under the premise of limited corporate funds, it is a major production innovation for enterprises to improve production efficiency and achieve capacity upgrades.

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