Upgrading of Intelligent Warehouse Management System Based on RFID Technology- Taking Company as an Example

Zhang Tongliang, Wang Xinxin, Yang Xue

School of Economics, Shandong University of Technology, Zibo 255000,China

Abstract— With the continuous development of e-commerce in China, more and more attention has been paid to modern logistics. The competition in the new era is not only in the fields of technology, cost and management, but also in the comprehensive competition of supply chain. The traditional warehouse management system is mainly completed by human resources, which consumes a lot of manpower and material resources and has low efficiency. It can no longer meet the needs of the development of modern e-commerce logistics. New retail industry is changing. New logistics has become the core of new retail form. Developing intelligent warehousing has become a solution to advance intelligent logistics. Radio Frequency Identification (RFID) technology has the advantages of large data storage, fast information reading and storage, and can effectively solve the problems of low efficiency, low accuracy and easy interference in information transmission of traditional warehouse management system. Based on the analysis of the existing problems of company A in warehouse management, this paper proposes to use RFID technology to optimize and upgrade it.

Keywords— RFID technology, intelligent , warehousing, logistics, digitalization.

With the close integration of network technology with various real industries and financial economy, China's agriculture, industry and commodity service industry have achieved new development. At the same time, they are facing new opportunities and challenges. Logistics, as an important part of commodity trade, plays an increasingly important role. However, our traditional logistics network has been insufficient to meet the increasingly vigorous transportation needs. The warehouse management system also needs to be upgraded urgently.

At present, the intelligent warehouse management system is integrated with wireless communication technology and RFID radio frequency technology. These new technologies enable the existing warehouse management system to be reconstructed and intellectualized,

and use the flexibility of wireless network wiring to meet the special needs of data close-range and low-speed in intelligent warehouse management. At the same time, along with the development of RFID radio frequency technology, the whole process of goods from inbound to outbound has also undergone innovative changes and leaps and bounds. Because of the non-contact and fast reading and writing characteristics of RFID, the goods can basically be intellectualized and mechanized in warehousing, discharging and picking. Intelligent warehouse management means changing the traditional way of warehouse management, realizing a more thorough sense and measurement of business, and interconnecting each other more comprehensively. On this basis, we can get a deeper understanding.

I. ENTERPRISE AN OVERVIEW

Enterprise A is located in the northern cities of China, mainly engaged in the acquisition and sale of agricultural products. Because of the higher requirements of agricultural products for logistics transportation and warehousing, the traditional logistics warehousing mode of enterprise A from origin to warehouse to sales point has higher cost, and the efficiency of logistics warehousing mode mainly relying on human participation is low, and the error rate needs to be reduced. In the period of enterprise transformation to meet the needs of contemporary society, the application of new technology is particularly important.

II. OVERVIEW OF RFID TECHNOLOGY

Radio Frequency Identification (RFID) is a non-contact automatic identification technology. It uses radio frequency signals to automatically identify target objects and acquire relevant data information at the same time. Therefore, the recognition technology does not need manual intervention, so this technology can be applied to a variety of working environments more harsh scenarios. Its core component is the RFID tag with a diameter of 2mm and a storage capacity of two to the ninety-sixth power. The technology mainly relies on electronic sensors to transmit

radio waves to read and store information. The storage information in the RFID tag is read by the radio wave emitted by the sensor, which is mainly used to identify the object, while the distance of the sensor is from several centimeters to several meters. A perfect industrial chain of RFID technology should include chips, reading and writing devices, antennas, application software, label packaging, system integration and many other components, among which chips are the most important design focus in the overall industrial chain. This technology has the functions of fast speed, large capacity, small volume, strong penetration, long service life and high reusability. At the same time, this technology can also track and locate the target object for a long time, so it can be applied to many fields such as supply chain management, intelligent transportation, quality management in manufacturing industry. RFID has become the main technical means of logistics management in developed countries. In Japan and Korea, electronic tags have become the standard configuration of most logistics distribution centers. In recent years, many enterprises in China have introduced electronic tags to upgrade the management system, and achieved some results. Mainly used in the following three aspects: first, within the enterprise ,the placement of radio frequency tags on the pallets of automated warehouses can significantly improve the management of refinement, Haier, Shenzhen Baisha Group and other cases; second, the use of a supply chain can reduce management costs, improve product quality and improve inventory scheduling level, such as Hong Kong Yida Group. Radio frequency label is used in Xinjiang cotton purchasing process. Third, it is applied in a wide range of networks. The typical case is the vehicle management and dispatching system of the Ministry of Railways.

III. THE FRAMEWORK OF CURRENT WAREHOUSING MANAGEMENT AND ITS PROBLEMS

From suppliers supplying commodities, sorting commodities into warehouses, information registration, and then determining the location of commodity storage for storage, to commodities into production workshop for production, and finally to new commodities out of warehouses, this step-by-step process is more complex.

1. Framework of warehousing management:

⑴.Storage of goods. Suppliers supply commodities toproducers. Warehousing centers grasp relevant information of commodities from suppliers (such as the name, quantity, specifications of commodities), and determine the storage location of commodities. Warehousing centers arrange inspection and storage of commodities when they receive commodities.

(2) Management of goods in warehouse. The management of goods in warehouse must also follow certain standards. For example, some goods consume fast, some goods consume slowly, and some goods must be stored under special conditions, so their storage location needs to be strictly controlled. Moreover, there are certain requirements for the storage of similar but different specifications of commodities. These problems make it necessary to confirm that the goods are in accordance with the location when they are stored.

(3) Goods out of warehouse. In the warehouse management procedure, if the customer has issued an order to the sales department, the sales department will send the customer's order requirements to the warehouse management department, and the warehouse management system will confirm the goods location.

2.Problems in warehousing management:

(1) Human factors have great influence and lack of decision-making ability. If the management mode is basically manual management, a large number of staff need to be arranged in warehousing operations, such as warehousing, inventory and warehousing, which increases the cost of management and also affects the efficiency of work. Once problems arise in the intermediate work, the situation can not be transmitted to the higher level in time, and some staff's mishandling will lead to the inaccuracy of the inventory work, the upper leadership can not make correct decisions, and can not accurately understand the storage, in-storage and out-of-storage operations of the inventory, which will cause losses.

(2) The use of bar code technology. Nowadays, barcode is often used in warehouse management system to improve the speed of collecting goods information. Compared with traditional manual paper records, it does improve the efficiency. However, in the face of increasingly frequent logistics warehousing needs, the drawbacks of barcode technology are becoming more and more prominent, such as slow identification speed, inaccurate reading of information and less information.

(3) Visualization operation can not be realized. More and more users hope to see the goods information and dynamic transportation status in real time, instead of the static logistics information on the client side. This will require enterprises to further implement intelligent logistics strategy to meet the needs of users, while realizing the dynamic feedback of cargo transportation status. Intelligent logistics can be more conducive to enterprises for targeted analysis and decision-making, and improve all aspects of enterprises. Save work efficiency.

(4) When goods are stored in warehouse, they need to be inspected. Some goods, such as glass products, are

inevitably exposed to the risk of breakage. Similarly, in warehouse management, some commodities are of the same kind and have very low differentiation, which makes warehousing management more difficult. Similar commodities may lead to staff negligence and make two different commodities mixed together.

IV. OPTIMIZING AND UPGRADING MEASURES OF INTELLIGENT WAREHOUSE MANAGEMENT SYSTEM BASED ON RFID TECHNOLOGY

The warehouse management system based on RFID can effectively realize the visual management of commodity inventory information through the application of RFID technology and wireless network technology, thus greatly improving the efficiency of warehousing operations. Based on these requirements, we can get several main modules of the system: user management module, stock management module, warehousing management module, as well as goods management, inventory statistics management module.
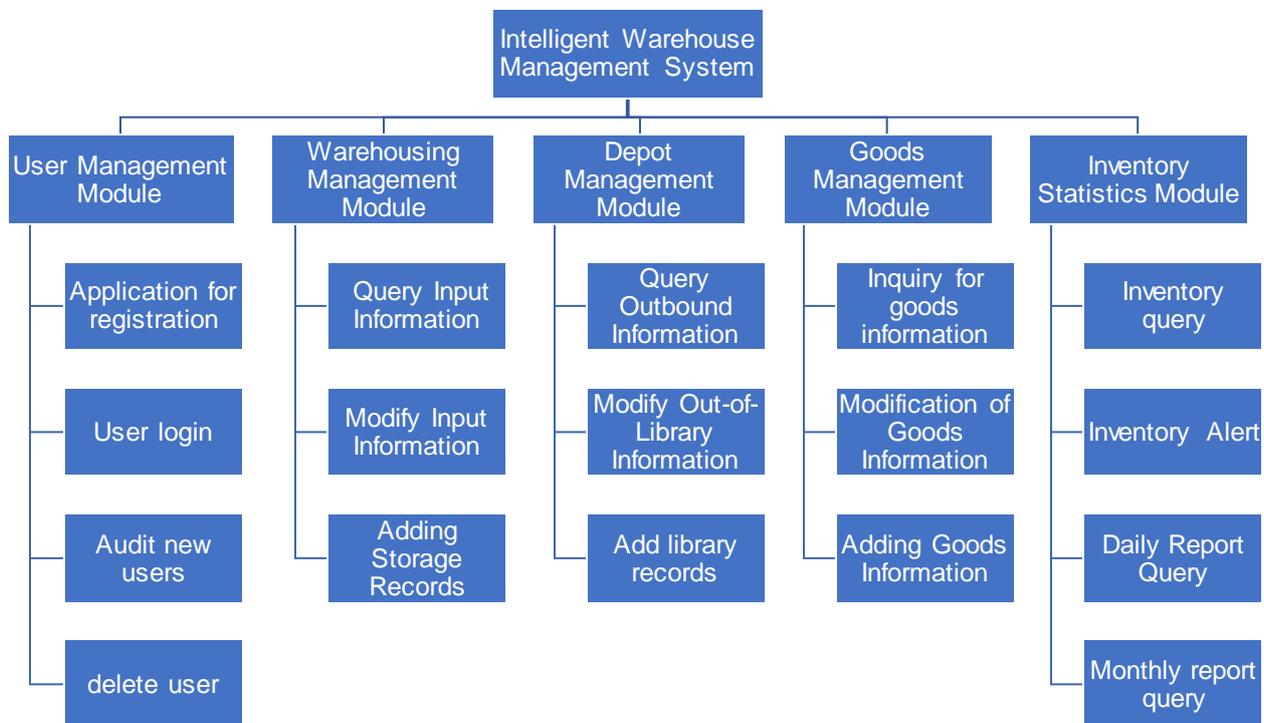
Fig. 1 Performance structure of warehouse management system based on RFID Technology

In the software structure design of digital logistics warehouse management system based on radio frequency identification technology, the functional module flow of the system is designed separately, the control structure of the system is optimized, and the operation efficiency of the system is improved. The warehouse is composed of warehousing temporary storage area, storage area and out of storage temporary storage area. RFID access control devices are installed at storage and storage outlet. The warehouse is designed as an automatic three-dimensional warehouse, equipped with three-dimensional shelves and

roadway stackers. The quantity depends on the size of the warehouse. In order to monitor the warehouse environment in real time and install a suitable number of temperature, illumination intensity and humidity sensors, the sensor transmits the environmental information to the monitoring system through the network. When the environmental information of the warehouse exceeds the set value, the system sends out alarm instructions and displays the reasons for the alarm. The alarm is sent out by the warehouse administrator. The warehouse administrator processes and records the alarm in time. The reason of the

alarm is summarized and analyzed regularly and the suggestions for improvement are put forward.

In the goods management module, the main functions include inventory management, inventory, inventory early warning. Detailed function design: add, modify and delete warehouse information; add, modify and delete and disable goods allocation; view inventory information and inventory situation of each warehouse location; adjust the warehouse location on the visual interface, regard the whole backstage as the warehouse location adjustment component, so as to reduce energy consumption and save running time of the system. In the user management module, it mainly includes user login control and user management. In the user's login control, the load driver is used to obtain the connection object, and the state statement is created to generate the processing result data set and release the connection. When the user enters the username and password and clicks on the login, the data input by the user will be processed in the background, matching the account and password in the database. If the match is successful, the login will succeed, otherwise the prompt will fail, and the main page will be returned. For the purpose of ensuring the confidentiality and reliability of the system, the storage management system uses the management form of multi-level users. Users are divided into several levels: supervisors, system managers, purchasing personnel and warehouse managers. Different levels of authority, multi-pronged, clear division of labor, conducive to the smooth operation of the system.

In order to rationalize inventory and reduce inventory cost, statistical software can be used to invoke information such as commodity category, quantity, date of entry and exit, existing inventory, goods damage and order satisfaction rate, so as to calculate the period of entry and exit, monthly demand and average level, off-peak season analysis, annual total demand, roughness analysis, overstocked commodity varieties and quantity, and goods loss rate and so on, assist managers to make scientific demand forecasting, and provide data reference for improving warehousing conditions and commodity production plan.

RFID technology combined with computer technology and pallet management can optimize the business process of distribution center. When warehousing, the goods are scanned on the conveyor belt, then directly stacked on the pallet. The pallet is automatically sent to the corresponding floor by the hoist under the control of the system. Finally, the forklift truck sends the pallet to the allocated storage space of the system. When discharging from the warehouse, the forklift truck sends the target tray to the hoist according to the system instruction and the first-in-first-out principle, and then sends it to the sorting center for sorting. Through the effective management and application of the tray, the number of cargo handling and the probability of damage are reduced, and the operation efficiency is improved. The application of RFID technology improves the speed of goods searching, reduces the occurrence of commodity out-of-sale, shortens the time of supply and marketing planning, thus reduces the stock occupation funds, reduces freight, and makes the retailer's commodity sales meet in time.

V.   CONCLUSIONS AND SUGGESTIONS

Combining RFID technology with warehouse management to improve the accuracy of warehouse management data can not only overcome the shortcomings of traditional manual management, but also reduce labor costs with the improvement of automation level of warehouse system. In recent years, the technology of RFID has become a hot spot in logistics informationization, especially in the promotion of foreign powerful enterprises, which makes the application prospect of this technology in China receive much attention. As far as the whole country is concerned, the application cost of RFID is too high, the technical standards are not uniform, and the government has not played a leading role in the process of its application and promotion, which makes enterprises show cautious attitude in the face of RFID, so the promotion and application of RFID in China is still in a very slow starting stage. In order to promote the development of RFID in China's logistics field, we should actively participate in the formulation of international standards and establish a unified RFID system; the government should drive enterprises to promote the exchange and research of RFID. Through the establishment of an industrial alliance for the application and promotion of RFID, and under the leadership of the relevant departments of the state, we will work with relevant manufacturers, research institutes and user departments to launch products and technologies with distinctive features, and actively promote extensive international exchanges between domestic enterprises and relevant units in the fields of RFID hardware, software and applications.

REFERENCES

[1] Application of Wang Minyu. RFID in Storage Material Management of Mall [J]. Education and Teaching Forum, 2018, (21): 103-104.

[2] Yu Shixin, Li Yong. Warehousing Management System Based on RFID [J]. Information Technology, 2016 (05): 81-83

[3] Li Qi. Application of RFID in Logistics Warehousing [J]. Management and Technology of Small and Medium-sized Enterprises (Previous Periodicals), 2013 (04): 298.

[4] Xu Huijian. Design and Implementation of Intelligent

Warehousing System Based on Internet of Things RFID Technology [J]. Manufacturing Automation, 2012, 34 (4): 139-141.

[5] Ouyang Ping, Wu Yunze, Sun Wenwen. Digital warehouse management system based on radio frequency identification technology [J]. Aviation standardization and quality, 2015, 10(5): 48-52.

[6] Liu Bingbing, Sun Libo, Yu Yugang. Recent advances in warehousing, logistics and supply chain management [J]. Journal of China University of Science and Technology, 2017, 47 (2): 176-187

[7] Liu He. Logistics Storage Management System for Frozen and Refrigerated Food Based on Radio Frequency Identification Technology [J]. Food and Machinery, 2016 (1): 121-124

[8] Wang Xiuxing. Application of Intelligent Warehousing System in Electronic Commerce Environment [J]. Information Technology and Informatization, 2015, 4 (8): 73-74

[9] Kongxing. Discussion on the Application Mode of RFID Technology in Intelligent Warehouse Management [J]. China Market, 2013 (34): 19-20.

[10] Xiang Daodong. Optimization and design of warehouse management system based on RFID technology [J]. China Commerce, 2018 (17): 24-25.