

Research Review on Material Management of Intelligent Warehouse Based on Big Data Analysis

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Abstract: In recent years, the rapid development of big data at home and abroad, the rapid development of intelligent warehouse, the combination of the two management mode into people's daily life. In this paper, the current intelligent warehouse material management related literature review and review, respectively, from the hardware upgrade and software upgrade aspects of this related discussion, focusing on the interpretation of the WMS and ERP collaborative work process, and the future development of this industry was prospected and summarized.

Keywords: Intelligent warehouse; Material management; WMS; ERP.

1. Introduction

1.1. Intelligent warehouse

Intelligent warehouse is the product of the combination of automation and intelligent control. Similar to smart home, intelligent warehouse can be realized through a variety of automation and interconnection technologies. These technologies work together to improve the productivity and efficiency of the warehouse, minimize the amount of labor, and reduce errors.

1.1.1. Classification

Automatic warehouse: This kind of warehouse uses automation technology and equipment, such as automatic conveyor lines, automatic stackers, etc., to realize the automatic storage, pick-up and sorting of goods, and improve the efficiency and accuracy of the warehouse.

Robot warehouse: This kind of warehouse adopts robot technology, such as AGV (automatic guided vehicle), manipulator, etc., to realize the automatic handling and storage of goods, and can flexibly adjust the warehouse layout and goods storage location as needed.

Internet of things warehouse: This kind of warehouse uses the Internet of things technology to interconnect the equipment, goods and systems in the warehouse, realize the collection, monitoring and management of real-time data, and improve the visualization and intelligence level of the warehouse.

Unmanned warehouse: This type of warehouse does not require manual operation, all warehousing and logistics tasks are completed by robots, automation equipment and systems, greatly improving the efficiency and safety of the warehouse.

Data-driven warehouse: This kind of warehouse uses big data and artificial intelligence technology to optimize the operation process and resource allocation of the warehouse and improve the operation efficiency of the warehouse through the analysis and mining of data inside and outside the warehouse.

Intelligent distribution center: This kind of warehouse is not only a place for simple storage and sorting of goods, but also has the function of distribution. Through intelligent scheduling and route optimization, the rapid and accurate distribution of goods can be realized and the logistics

efficiency can be improved.

1.1.2. The development process of intelligent warehouse

(1) Chinese development

As an important part of the logistics supply chain, many scholars have made some research and analysis. Chinese intelligent warehouse was first proposed by Guo Luming, a Chinese logistics scientist and professor of Tsinghua University. He began to study the intelligent logistics system in the 1980 s, and put forward the concept of intelligent warehouse in 1995. Professor Guo Luming has made important contributions to the design and optimization of intelligent warehouses and promoted the development of intelligent warehouse technology in China. With the advancement of science and technology and the promotion of applications, intelligent warehouses have been widely used in China and have achieved remarkable benefits.

(2) globe development

globe intelligent warehouse was first proposed by American logistics scientist Jerome Bell. He put forward the concept of automated warehouse in the 1950 s, believing that the efficiency and accuracy of the warehouse can be improved by using computer and automation technology. This concept has laid the foundation of intelligent warehouse, and has been continuously developed and improved in the following decades.

1.2. Outline

With the advent of the information age, big data has become a key resource in all walks of life. In this digital age, companies need to process huge amounts of data in order to make informed decisions and remain competitive. In order to cope with this challenge, big data intelligent warehouse came into being.

Big data intelligent warehouse is a data storage and analysis system that integrates big data technology and artificial intelligence technology. It can integrate a large amount of data from different sources, and analyze and mine the data through data mining, machine learning and natural language processing. Through intelligent warehouses, enterprises can better understand and utilize their data assets, thereby improving business efficiency and decision-making quality.

2. Research Review Based on Management System

2.1. On the warehouse management system

WMS and ERP upgrade and improvement

Intelligent WMS is mainly responsible for the unmanned operation of materials inside the warehouse, mainly covering the operation of materials in and out of the warehouse, the daily management of materials, and the periodic inventory of materials. In order to achieve the purpose of downsizing and increasing efficiency, it is decided to use the historical data transmission function in the original function, so as to achieve the function of transmitting data to the terminal equipment.

Wu Yanfei et al. proposed an unattended warehouse based on WMS in the article, that is, based on the WMS warehouse management system, the hardware and software are improved. In terms of hardware, intelligent access control, intelligent outbound operation terminal, intelligent security, intelligent shelf, intelligent material screen and so on are added to ensure the efficiency of material operation to a certain extent[1]. In terms of software, the daily management information system and intelligent hardware control system are built to realize the intelligent unattended warehouse with basic full coverage.

Xu Zhizhong, a scholar, also proposed a way of data integration between WMS and SAP through interface development in his article, which improved the management defects of inconsistent data and cumbersome operation management between WMS and SAP. SAP system is one of the ERP management software in the enterprise resource management system. The improved warehouse management system completes the interface development through webservice technology, and realizes the unified integration of data between WMS and SAP[2].

For the development of the interface, the scholar Di Honglin proposed a Restful-style API interface. By using the micro-service architecture and the timing task module, it is convenient to realize the integration of multiple systems and realize the collaborative processing of upstream and downstream services. At the same time, automatic order dispatching can improve the work efficiency of employees, save resource costs, and reduce manual errors in warehouse

operations[3].

In his article, Cheng Hong, a scholar, proposed a three-dimensional warehouse with intelligent inventory function, which combines machine vision technology with WMS. The three-dimensional warehouse has a very positive effect on improving the traditional warehouse environment and improving the efficiency of the warehouse[4].

Inventory planning is based on inventory quotas. The company calculates reasonable inventory based on production, such as planning and sales planning, which can reduce the production cost of the enterprise and the risk of production stagnation. Sales and material maintenance plan and production department plan Inventory plan is based on determining the type, quantity, specifications, etc. of the required materials. In view of the importance of planning, the quality of planning needs to be improved. The company uses ERP systems to : analyze early production material requirements and finished product sales when planning inventory. Customize the company's backup plan in a timely manner according to the rhythm of production and sales to meet sales needs. The production and sales departments provide reliable data[5].

2.2. Intelligent warehouse technical support

Radio frequency identification technology (RFID) is commonly known as electronic tag technology. Its principle is to use radio frequency signal characteristics, namely spatial coupling and transmission characteristics, to realize the use of automatic machines to identify static or dynamic items to be identified. It is an automatic identification technology that does not contact items. This application has many aspects of development and promotion in the construction of intelligent warehouse.

Zhang Yongxuan, a scholar, combines RFID technology with urban rail transit intelligent shelves to design a new type of intelligent warehouse with intelligent input of goods information that works together with information technology management science. Through the powerful data sharing function and standard open database interface, to meet the support of various types of databases, to achieve advanced monitoring technology and scientific management of the integration of the application platform[6].

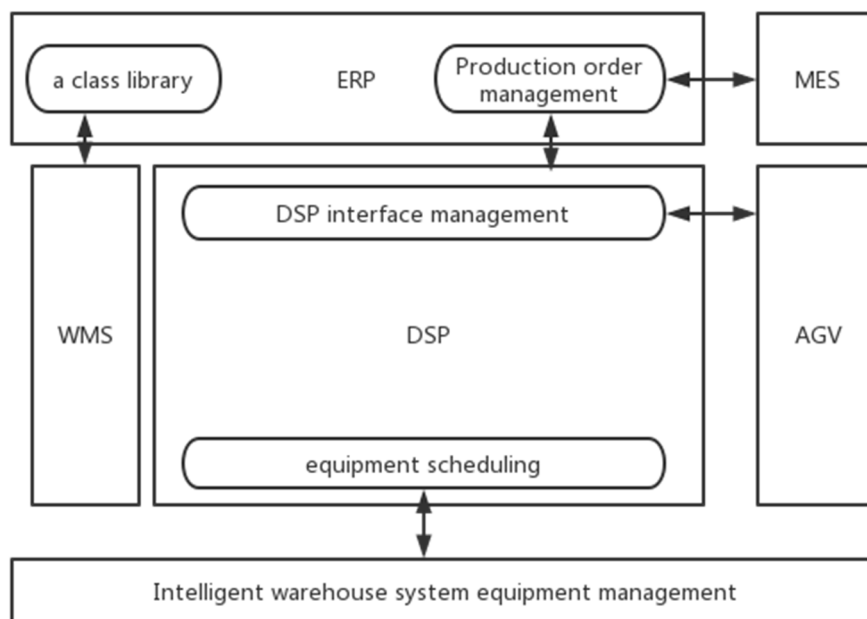


Figure 1. Working system architecture of the DSP system

Fan Hao, a scholar, also proposed an intelligent picking and distribution system for electronic tags in the article, referred to as the DPS system. Through the electronic tag technology, employees can quickly pick and distribute goods, shorten the time for employees to move and find goods, improve the efficiency of picking operations and monitor the order execution process. At the same time, it can manage the material position in the cargo hold, ensure the consistency of information flow and physical flow to a certain extent, and realize the precise distribution of materials[7].

Applicable to a variety of interfaces, such as webservice, intermediate data tables, views, etc. Based on this, the system can work together with WMS and ERP management systems and AGV car intelligent control system to achieve high efficiency and intelligence[7]. The working system architecture of the DSP system is shown in the figure.

Electronic tags realize the automation and intelligence of logistics warehousing, so that the transportation and search of goods have higher efficiency and safety [8].

3. Discussion and Thinking

With the development of contemporary big data science, information technology science and Internet of Things science, the development of intelligent warehouses has gradually diversified. Whether it is from material management or automated transportation, it has shown a vigorous vitality of divergent development[8]. Most scholars and enterprises continue to try new methods for different enterprise product characteristics to achieve the purpose of reducing staff and increasing efficiency, and it has also become the core competitiveness of many enterprises[9].

4. Developments and Prospects

Warehousing management is a very important part of the logistics supply chain. The future development needs more attempts to improve the software and hardware. In terms of hardware, it is hoped that the follow-up of this industry can promote the development of material management inventory from automation to intelligence, the integration of robots, and the diversification of material management, such as the detection of whether fresh food is deteriorating, and the regulation of dynamic temperature can continue to develop.

Looking forward to the development of its software, under

the dominant position of ERP system and WMS system, more functions can be developed to improve efficiency and reduce the error rate caused by manual participation[10]. For example, according to the intelligent dynamic pricing of inventory, demand forecasting is carried out according to inventory changes, and the optimal location of warehouse is carried out intelligently by demand within the system, which is the direction of its further development.

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