Research on Design and Implementation of Chemical Automatic Storage Logistics Management System Based on Supply Chain Perspective

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Abstract: with the Increasing Demand for Logistics Turnover Speed in Modern Society, the Warehouse Operation Mode Recorded Manually Can No Longer Meet the Needs of the Market by Relying Solely on Manual Management. the Implementation of Warehouse Logistics Management is Conducive to Improving the Company's Service Level, Reducing Costs and Enhancing Competitiveness, Thus Optimizing the Entire Logistics Chain. in Order to Ensure That the Logistics Warehouse Management System is Always in a Controllable and Safe Supply Chain Management System State. Based on the Perspective of Supply Chain, This Paper Analyzes and Discusses the Basic Framework, Hardware Configuration and Workflow of the Chemical Automatic Storage and Logistics Management System, Aiming At Further Improving the Operation Efficiency of Chemical Storage and Logistics Facilities.

1. Introduction

With the Increasing Scale and Concentration of Polyethylene, Polypropylene, Polystyrene and Other Chemical Projects, More and More Solid Chemical Product Packaging and Storage Warehouses Have Been Developed. However, Most of These Warehouses Still Rely on Manual Records and Paper-Based Management, Which Have Failed to Meet the Requirements of Real-Time, Effective, Comprehensive and Centralized Information Management [1]. If a Country or a Region Wants to Realize the Socialization and Modernization of Logistics, It Must First Realize the Socialization and Modernization of Warehousing and Logistics. the Implementation of Modern Warehouse Logistics Management to Improve the Service Level of Enterprises, Reduce Costs, Enhance Competitiveness, So as to Achieve the Optimization of the Entire Logistics Chain [2]. during the "12th Five-Year Plan" Period, the National Logistics Storage Management System Has Formulated the Following Strategies to Promote the Realization and Development of Information Work, Namely, the Implementation of Information Lean Management; a Secure Supply Chain Management System That Ensures Information Systems and Network Systems; Establish a Sound and Standardized Scheduling Mechanism for Integrated Information Systems; It is the General Trend for Warehousing and Transportation to Carry out Collaborative Processing through the Network, and It is Imperative for Warehousing and Logistics Information Automation [3]. Modern Logistics Processes Are Integrated, Upstream and Downstream Are Coordinated, and Static Storage Inventory is Reduced as Much as Possible. Its Business Model is Also Based on the Total Cost Assessment of Logistics. At the Same Time, the Implementation of Each Order and the Inventory Situation in the Storage and Logistics Facilities Are Fed Back to the Enterprise Resource Planning System in Real Time So as to Realize the Automatic Management of the Storage and Logistics Facilities Quickly, Efficiently and Accurately.

2. The Basic Concept of Supply Chain

Supply Chain is a Connecting Structure Composed of Suppliers, Users and End Users Around Core Enterprises. through the Planning, Control and Coordination of the Supply Chain, a Series of Logistics Activities Are Carried out in an Effort to Establish a Reasonable Connection between Customers and Suppliers, to Truly and Quickly Transfer Users' Needs to Manufacturers, and to Process and Sell Production Materials into Value-Added Products At the Fastest Speed [4]. in the

Supply Chain, Different Production Processes and Activities Create the Value of Products or Services and Increase the Cost of Products or Services, Forming Intermediate Products, Final Products or Services At the End and Transferring the Final Products to Customers. as Long as Customers Buy Products or Services, It is Recognition of the Whole Supply Chain. It is the Reconstruction and Optimization of a Series of Management Processes. in Order to Ensure the Effective Implementation of Supply Chain Management, It is Necessary to Reconstruct and Optimize the Management Process and Carry out Process Management on the Traditional Functional Islands [5]. Vertical Integration Generally Refers to the Ownership Relationship between Upstream Suppliers and Downstream Customers. Although This Method Was Once Considered to Be a Good One, in Recent Years, More and More Organizations Have Taken Supply Chain Management as the Philosophy of Enterprise Operation. This Philosophy Enables Enterprises to Focus on Developing Their Core Business and Directly Hand over Non-Core Business to External Enterprises, Thus Realizing Outsourcing [6]. in Short, the Supply Chain is the Process of Providing Products or Services to the End Consumers, and the Organizations Involved in Activities from Upstream to Downstream. Lan Boxiong and Others Believe That the Supply Chain is a Value-Added Chain Composed of Many Enterprises, Including Raw Material Manufacturers, Parts Suppliers, Manufacturers, Wholesalers, Retailers and Transporters [7].

3. Basic Architecture

Chemical automatic storage and logistics facilities generally include two aspects: product packaging and product logistics. At the same time, the facilities also include DCS system and ERP system independent of LMS system. The typical structure diagram is shown in Figure 1.
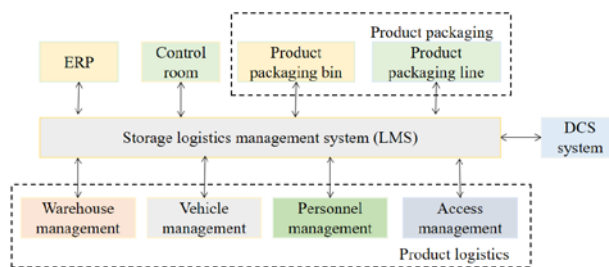

Fig.1 Automatic Storage and Logistics Facility Structure

3.1 Product Packaging

Product packaging generally includes a packaging bin and a packaging line. The packaging bin is responsible for storing the products to be packaged, and the packaging line is responsible for packaging the products and transporting the packaged products to a designated position.

3.2 Product Logistics

Product logistics module usually involves product storage, transportation, outbound management, inbound management, personnel management, etc.

3.3 Erp System

ERP (Enterprise Resource Planning) enterprise resource planning system refers to a management platform based on information technology, which integrates information technology and advanced management ideas and provides decision-making means for enterprise employees and decision makers with systematic management ideas [8]. It can also be said that the system is a management information system developed based on MRP, and its basic idea is supply chain management. After the application of the system, the relevant production resources of the enterprise will be optimized based on the supply chain, thus further improving the business process of the enterprise, reducing the production cost of the enterprise and improving the market competitiveness of the enterprise as a whole [9]. In storage and logistics facilities, it arranges the types and quantities of products to be provided in future cycles through production planning, forecasting and customer order input,

converts the production planning into product planning, and after balancing the needs of materials and capacity, formulates a detailed schedule accurate to time and quantity [10].

3.4 Dcs System

DCS (Distributed Control System) Distributed Control System is a microprocessor-based control system that adopts the design principles of decentralized control functions, centralized display operations, autonomy and comprehensive coordination. In the storage and logistics facilities, DCS will send information such as the brand and weight of unpacked products to LMS system so that LMS system can make statistics on the product loss in the whole storage and logistics process. In the database, all data tables in the database can be displayed. The database is only a framework, and the data table is its real content. According to the classification of information, a database will contain several data tables. In designing the system, Weblogic with high reliability and stability in the industry is adopted as the basic framework, which ensures the systematic management of the safe supply chain of the system. In this way, the system can automatically calculate the warehousing, delivery and storage fees, which provides a lot of convenience in the subsequent settlement between customers and enterprises. When warehousing, the warehousing personnel need to enter the contract number, and the system will automatically display the relevant expense calculation method agreed in the contract.

4. Basic Hardware Configuration

4.1 Server, Engineer Station, Operation Station

The server of the warehouse logistics management system LMS is mainly used to install various related system software (e.g. warehouse management software, entrance management software, vehicle management software, personnel management software, etc.), perform calculation and store data; And store and transmit relevant data; The engineer station still modifies the implementation configuration of relevant software; The operation station is mainly responsible for data entry, task allocation and confirmation of relevant execution operations. , to ensure the effective convergence of each business, in each team, subsidiary of the Internet browser, login to the provincial centralized deployment of the server, promote maintenance, operation is more simple and convenient. The participants of the use case include market specialist, billing specialist and business specialist. The marketing specialist is responsible for signing the contract. After signing, the contract information is entered into the system, and maintenance operations such as modification and deletion of the contract can be performed. Manage the relevant data of goods entering and leaving and check them. Application program interface: interface program, which is responsible for receiving instructions or data and sending them to the server. Event processing: server layer, which classifies and digitizes events. The engineer station is used to configure and modify all kinds of software installed in the server. The operation station is used by operators to perform various operations, such as data entry, data inspection, task allocation and confirmation, etc.

4.2 Wireless Network Server

The most important role of the wireless network server is to cooperate with the wireless routing equipment in the warehouse logistics management system to build a stable wireless network, to provide a good wireless network environment for the operation of related equipment, and to provide a good foundation and guarantee for the operation of related equipment.

4.3 Bar Code Printer and Bar Code

Product identification is a very important work in automated storage and logistics management. At present, many enterprises use bar codes to realize this function. Bar code printer is installed in the packaging production line. Its main function is to print bar codes needed in logistics storage. Barcode is a graphic identifier that arranges a plurality of black bars and blanks with different widths according to certain coding rules to express a group of information. In chemical plants, this information generally includes product category, brand, grade, batch, production plant, production

date, etc.

4.4 Bar Code Scanner/Scanning Gun

The most important function of barcode scanner and scanning gun is to scan barcode to obtain relevant product information. The scanning equipment is mainly composed of light source and lens scanning device. In its working process, the optical elements will convert the optical signals into electrical signals after detecting them, and then the digital signal conversion equipment can convert them into familiar information for analysis and processing via the system processing center. Barcode scanner/scanning gun can transmit data in many ways, such as USB, RS232 and wireless transmission. The bar code scanner is installed at the end of the packaging line and is used for inputting information before the products are put into storage. After entering the contract, the marketing specialist needs to review the contract information. If there are problems or changes in the contract, the contract information, such as the rate code and rate, can be maintained. Other personnel, such as the billing specialist and the business specialist, can only query the information related to the contract cost.

4.5 Wireless Handheld Terminal

The wireless handheld terminal is used for communication between on-site managers and the warehouse logistics management system. It has an operating system, a display screen, a keyboard and a battery. After installing software matching with the LMS system, it can be regarded as an extension of the operating station after LMS function is simplified, and signals are transmitted by wireless means. Communication between managers and systems is a very important part of automated storage systems. Currently, handheld wireless terminals are usually used to realize this function.

4.6 Wireless Vehicle Terminal

The wireless vehicle-mounted terminal is installed on vehicles such as forklifts and trucks, and is used for communication between the vehicles and the warehouse logistics management system, and transmits signals in a wireless manner. From the perspective of systematic and convenient safety supply chain management of business operations and data sources; Realize the evaluation of enterprise safety supply chain management system; Realize the supervision and management of the whole production process. After entering the contract signing information into the system, the salesman can perform the pre-warehousing operation. After the goods arrive at the port, the company can unpack the goods and formally confirm the warehousing operation when transporting the goods to the warehouse. During the warehousing process, the company needs to calculate the relevant expenses and maintain the information. The function and composition of the non-existent on-board terminal and the hand-held terminal are similar, but it should be noted that on-board terminal equipment is usually only equipped with software related to vehicle management, relevant instructions issued by the system can be displayed on the on-board terminal, and drivers can query the relevant status of tasks through relevant query functions.

4.7 Rfid Tag and Rfid Reader

Radio frequency identification RFID (Radio Frequency Identification) technology, also known as radio frequency identification, is a communication technology that can identify specific targets and read and write relevant data through radio signals without mechanical or optical contact between the identification system and the targets. For bar code technology, it attaches the coded bar code to the target object and uses a special scanning reader-writer to transmit information from the bar magnet to the scanning reader-writer using optical signals. After all the goods are actually put into storage, the warehouse management personnel check the information such as the quantity, date of storage, location, name of goods, etc. of the goods actually put into storage, and confirm the current storage information. If there is no problem in the check, update the relevant storage expenses and update the in-stock information of the goods. Physical layer parameters and protocol layer parameters are detected according to specific detection items, detection parameters and

detection methods of physical layer and protocol layer specified in each radio frequency identification standard of high frequency, ultra high frequency and microwave frequency bands. RFID reader-writer is generally installed at the entrance and exit of the vehicle and at specific places where vehicle information needs to be identified (e.g. weighing bridge), and RFID tag is installed on trucks carrying products for logistics transportation.

5. Automated Warehousing and Logistics Process

5.1 Product Packaging and Warehousing Process

Typical product packaging and warehousing processes are shown in Figure 2.
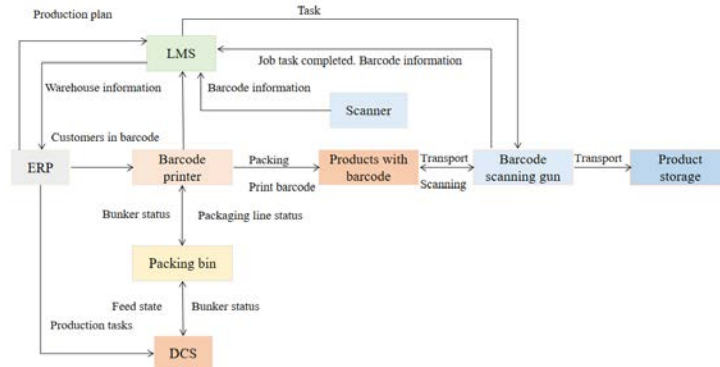

Fig.2 Typical Product Packaging and Warehousing Process Schematic

The packaging line packages the selected products according to the instructions obtained by the operator from the ERP system, and the barcode printer on the packaging line also prints the barcode on the packaged corresponding products according to the information obtained from the ERP system. The staff of the packaging production line will package the products on the production line according to the instructions issued by the ERP system. At the same time, the bar code printer will also receive the instructions and information from the ERP system to print the bar code and paste it on the outer package. In this way, the product will be scanned by the scanning device when passing through the end of the packaging line, and its information will also be read and transmitted to the system. Description of goods is not required, so it is convenient to fill in notes such as notices or customer requirements. Among them, knowledge base management has the function of maintaining the evaluation model and management norms of the safety supply chain management system, providing sufficient basis and standards for relevant departments to carry out evaluation and analysis; The warehouse logistics control system will optimize the stacking position of the products according to the received information and the product production plan issued by ERP, and transmit the warehousing operation task to the vehicle terminal of the corresponding forklift via wireless network. Warehousing personnel can carry out cargo pre-warehousing operation. After the relevant cargo arrives at the port and is transported to the warehousing enterprise, the enterprise staff selects the cargo location to carry out cargo warehousing operation, updates the inventory situation of the cargo at the same time, and finally judges whether there are warehousing expenses according to the contract. If there are, the warehousing expenses will be added to the system.

5.2 Product Outbound and Transportation Process

The warehouse logistics management system obtains and records the truck order number, license plate number, container number, type and quantity of products to be transported, etc. of the products planned to arrive at the facility every day from the ERP system. The evaluation center and the safety supply chain management system can objectively and truly evaluate the production process of the safety supply chain management system of the logistics storage management system, and generate accurate evaluation reports to be submitted to the higher authorities; The business processing center covers a wide range and realizes the supervision and management of the whole production process of the logistics storage management system. After the transport vehicle enters

the loading and unloading position, the forklift driver will receive the terminal information. The forklift can transport the products in the warehouse to the truck. During this process, the scanning equipment will scan the information of the products installed, thus ensuring the correctness of the product loading. Then the relevant information will be transmitted to the warehouse logistics management system. At the same time, the field staff will also supervise the loading and unloading tasks.

6. Conclusion

To sum up, the realization of chemical automatic warehouse logistics management system needs to be applied to advanced information technology and automation equipment. The system needs to be able to accurately record product packaging, storage, delivery, warehousing and transportation. Therefore, the system not only has high requirements for software, but also has very high requirements for hardware. Since entering the information age, the pace of establishing an information and standardized management system for logistics storage management system has been accelerated. In order to realize automatic, intelligent and paperless management of storage and logistics facilities and make real-time and accurate records of storage, delivery and inventory, it is necessary to select appropriate operation flow planning, mature storage management software and reasonable hardware configuration. Only in this way can the application of the warehouse logistics management system effectively improve the warehouse work efficiency, reduce the probability of errors, reduce the workload of staff, and improve the overall efficiency of the enterprise. Therefore, it is a good choice to add a set of automated storage and logistics management system to newly built or existing storage and logistics facilities.

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