

Construction of Third-Party Cold Chain Logistics Platform Based On Radio Frequency Identification Technology

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Abstract. In order to ensure the logistics quality of fresh food, the paper introduces radio frequency identification technology and participates in the whole process of cold chain logistics to understand the production, processing and storage information of fresh products, so as to timely replenish and replenish the goods. The operation efficiency and management level of chain logistics realize real-time monitoring of the transportation status of refrigerated trucks and provide traceable information support for food safety review. In this paper, the basic theory of infinite radio frequency identification technology and cold chain logistics is started. Taking the cold chain logistics process as the core, the overall framework of the trace chain monitoring system of cold chain logistics is proposed. From the process and technical level, the radio frequency is analyzed. Identification technology and related facilities, equipment collection, storage and handover, analysis and design of the organization structure and key links in the process, illustrating the operational efficiency of the system, can realize the benefit analysis of the supply chain network, greatly improved the number The operational efficiency of the three-party cold chain logistics.

1. Introduction

Retroactive management of the cold chain, combined with enterprise business processes, logistics processes, monitoring and management, can provide enterprises with an integrated platform for visual tracking, food recall, anti-counterfeiting and other services, and can provide low-cost food cold. The chain logistics management service provides technical means for the government to achieve efficient circulation supervision, and ultimately guarantees the safety of cold chain food.

This paper defines tractability management covering various business links that need to be carried out in a low temperature environment, including agricultural product slaughtering and processing, raw meat distribution status and physical environment parameters (temperature, humidity, etc.), goods transfer and other processes, through the collection of various types of data in real time. Information to track the entire process of production and distribution of agricultural products to support enterprises in the monitoring of cold chain fresh products and government departments [1]. Based on this retrospective business, it is possible to identify which links in the distribution process have not met the cold chain logistics management standards, thus helping enterprises and governments to recall the number of fresh products most conveniently, reliably and effectively after finding unqualified products. To reduce the risks and losses that come with it. At the same time, the tractability system can realize



the whole process tractability of cold chain distribution, combine the production and logistics information of unqualified products, and provide reference analysis for production and distribution enterprises, so as to improve the production process and distribution process, and more effectively avoid future occurrences. The problem. All in all, the whole-line tractability monitoring system of fresh-keeping products can bring huge economic value and social value to the people, enterprises and governments. The future application prospects are immeasurable and have great practical significance [2].

2. The overall structure of the third-party cold chain logistics tractability system

The cold chain supply chain can be divided into two stages. The first stage is that the perishable food is transported from the production and processing company to the supermarket fresh distribution center, and the other stage is that the food is transported from the fresh distribution center to the supermarket store until the final consumer [3]. Within these two large supply chain structures, there are many factors that indirectly or directly affect the efficiency of the supply chain operation, such as whether the cold storage facilities are up to standard, and whether the retailer provides a low-temperature sales environment as required. Considering the actual demand of the market and the feasibility, adaptability and sustainability of the development of logistics network, this paper proposes a tractability system based on RFID technology, which takes the fresh processing center as the node and relies on the third-party logistics to complete the distribution, and designs with reference to the system. The prototype of the tractability system, the overall architecture of the tractability system is shown below [4].

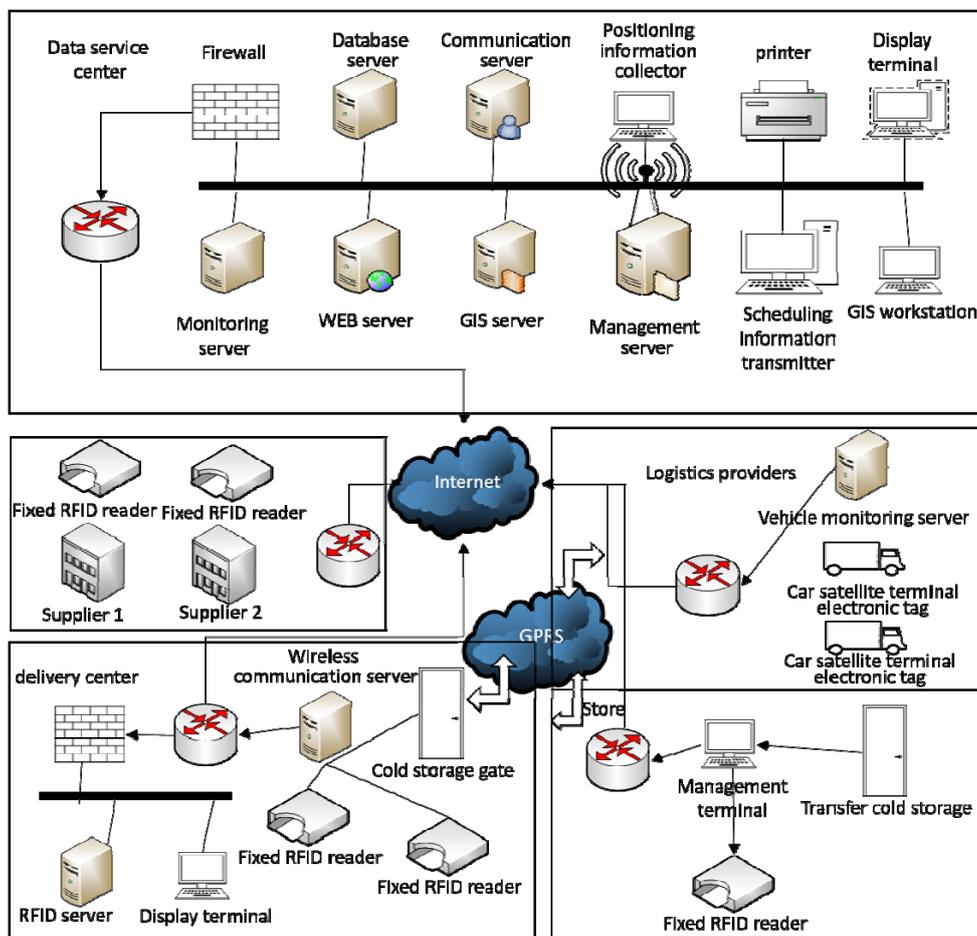


Fig.1 Overall structure of the cold chain tractability system

According to the business process of the cold chain system, this paper divides the system into four parts: production and processing enterprise, third-party logistics enterprise, fresh distribution center and sales store. The generated business data is stored in the enterprise side and partially uploaded to the second party. Data management center to ensure the effectiveness of monitoring and tractability. The system wins the identification of bamboo objects in the supply chain of slaughtering, processing, logistics and retail of fresh meat, and connects them to collect fresh products, their manufacturing, sales and processing, and then save the key information in real time. Into the RFID labeling, there are health and safety issues, can be traced through these signs, accurately narrow the scope of security issues, processing organizations, and even the emergence of a problem, can trace the geographical location of the relevant origin. This cuts the supply of goods from these places into the market and then conducts effective governance [5].

3. Trace system function design

The cold chain logistics tractability system is based on the Internet of Things technology, based on electronic coding, through real-time data collection of cold chain food properties, status and physical environment parameters through electronic label technology, in order to achieve the cold chain food logistics process. Safety warning, product tracking, and support for the monitoring of cold chain foods and the supervision of cold chain food by government departments. It is clear from the above analysis that the tractability system is located in the logistics between supply chain enterprises, and is mainly engaged in the production, processing, transportation and transportation of cold chain foods by production and processing enterprises, logistics enterprises, sales enterprises and government management departments. Data collection and monitoring management of the three links of receiving goods. It can be seen that under the guidance of the system goal of realizing tractability and real-time monitoring, the functional objectives of establishing a food cold chain tractability monitoring system mainly include [6].

First, for the upstream and downstream enterprises to achieve seamless transfer of information, to solve the cold chain chain-break phenomenon; Second, improve the efficiency of the cold chain operation, reduce system costs and losses; Third, once security problems occur, can quickly determine the product The source of the product; facilitate the recall of the product, and be able to determine the responsibility of the companies in the cold chain; on top of this, to ensure the safety and quality of cold chain food, to provide consumers with information security, improve consumers' cold chain food Satisfaction, while assisting the government to achieve market supervision. According to the analysis of the cold chain business process, it is determined that the service objects of the system mainly include cold chain enterprises, governments and terminal consumers. The government gives each enterprise an account password. After the enterprise logs in with this account password, it can only query the information related to itself, and cannot see the relevant information of other enterprises. The government has the authority to inquire and supervise all enterprises. Consumers can obtain information on all aspects of the product from production to sales through the product information of the final product. The overall function of the system is shown in the following figure.

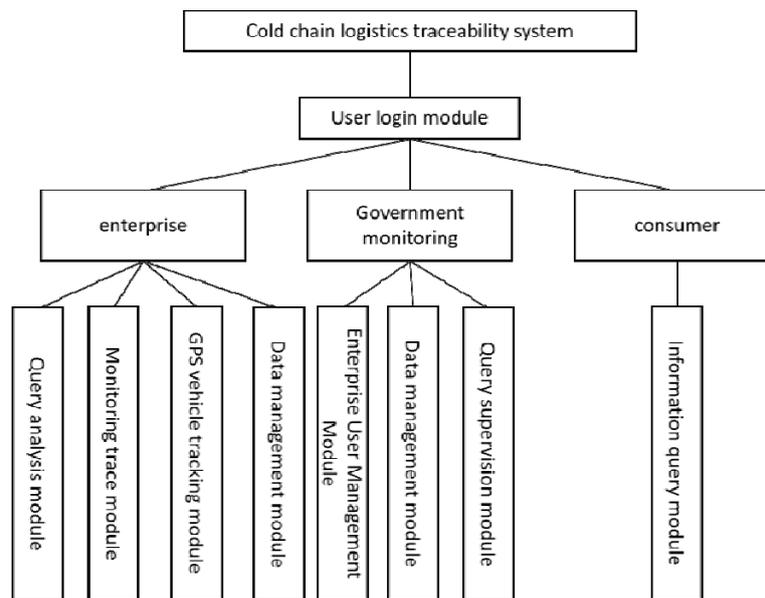


Fig.2 Trace system function structure diagram

3.1. Based on tractability information collection

Cold chain foods are inherently perishable, and the degree of deterioration is not only related to time but also to the environment in the supply chain. However, the current technical conditions can hardly achieve complete records of various environmental parameters of cold chain food. Due to the large changes in environmental factors during the cold chain transportation process and limited by information technology and cost, the risk of quality accidents caused by temperature changes during the transportation and distribution of cold chain foods is larger than other links in the supply chain. Moreover, usually closed transport distribution often makes it difficult to trace the cause of the accident. In order to meet the high standards and high requirements of cold chain logistics, advanced information technology must be used to continuously, quickly and accurately record the temperature of the items and store and send the temperature data to the back-end management system in real time, conveniently and quickly [7].

According to the actual logistics area, fixed/Handel RFID reading and writing devices are respectively distributed for different places, and the reader is directly connected with the data management information system, and the RFID tag is mobile, when the product with the electronic tag passes through the reader/writer, To correlate the position and time of the electronic tag and the reader, the reader will automatically scan the information on the tag, establish an organic connection between the reader and the electronic tag, and pass the electronic tag through a certain part of production and circulation. Corresponding time information, location information and business information of corresponding links are written into the back-end database for storage, analysis and processing, and the purpose of controlling product quality is achieved.

After the RFID information is stored in the back-end database, the ID of a certain type of fresh product can be matched according to the time information stored in the background and the geographical location information. The ID number of each fresh product is used to identify the RFID in the process of production and processing. The information generated by the reader, the update time, and the location information are synthesized, and regardless of whether there is only one production line or multiple production lines in the workshop, these three parameters can be used to define and combine, and the integrity of the query information can be guaranteed.

3.2. Refrigerated vehicle real-time monitoring and management

In view of the current operating environment of the cold chain, the logistics distribution link is the most prone to problems. Therefore, it is necessary to strengthen the monitoring and management of refrigerated vehicles to solve the current situation of fresh meat in normal temperature transportation. In order to ensure the integrity of the cold chain, it is required to install scanning equipment, temperature and humidity sensors on the left, right and above inside the refrigerated truck door to identify the transportation environment and logistics status of the goods; in the cargo door, it is necessary to install a camera. It can track and record the door switch and the unloading status; in the cockpit, it needs to install and system, communication system to realize real-time data transmission; in front of the front of the vehicle, it is necessary to install vehicle tags and readers, indicate vehicle identity information and read terminal store information. The in-vehicle temperature data is read in real time through a fixed reader installed in the car and transmitted to a third-party monitoring center. The monitoring center is responsible for information exchange, storage and forwarding with the vehicle-mounted terminal in the ship, and transmits the data to the handover supermarket. Fresh center; at the same time monitoring and management of the entire logistics network [8].

4. Establish a third-party logistics distribution system

The logistics distribution link plays a key role in achieving the integrity and effectiveness of the cold chain tractability. It is the link that connects the starting point and the end point of the supply chain. However, from the perspective of supply chain distribution, the logistics link has not played its core role. First of all, the diversity of distribution modes leads to the complexity of supply chain management. Different production enterprises have different distribution services, and there are phenomena that the vehicle scheduling is not timely, the carrying capacity is extremely wasted, and the inconsistency of each enterprise information system leads to business data. It is often impossible to hand over, which will result in inefficient operation of the cold chain. At the same time, because the cold chain distribution is in a closed state, it is impossible to know whether the product is distributed and managed according to the cold chain requirements, and even the damage rate and arrival status of the product itself cannot be effectively verified. This paper suggests that a unified logistics mode should be established, not only in form. The supply chain process is simplified, and various data generated during the cold chain process can be uniformly supervised and controlled. An example of cold chain logistics distribution integration is shown in the figure below.

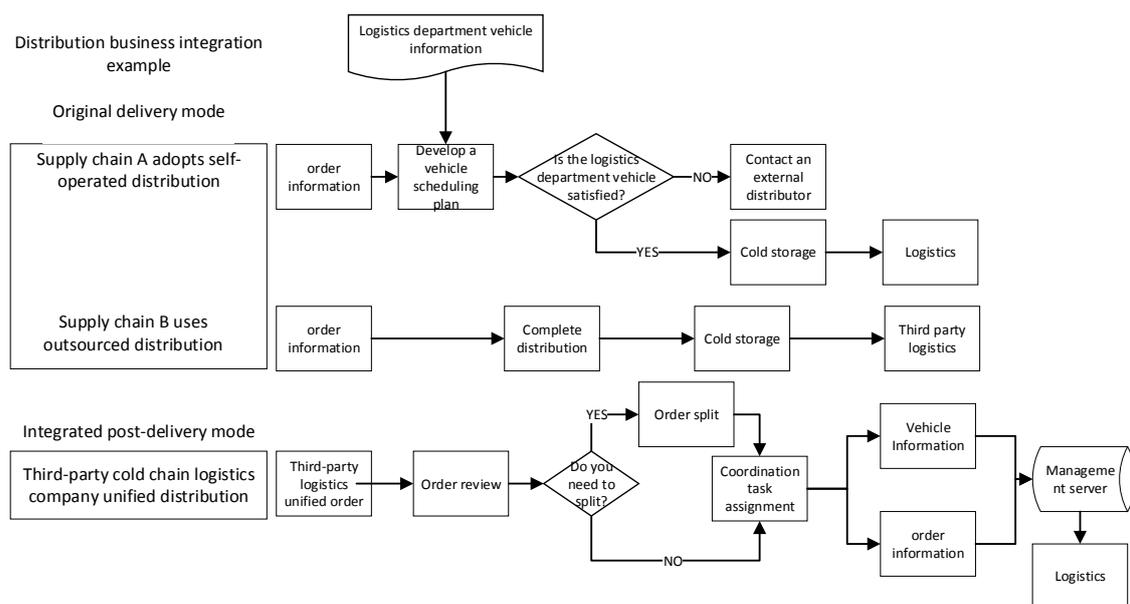


Fig.3 Schematic diagram of logistics distribution mode integration

5. Conclusion

Firstly, according to the system requirements of cold chain logistics tractability management, the paper proposes a system framework based on RFID technology. On this basis, the upstream and downstream enterprises involved in the cold chain have been specifically designed in terms of overall architecture, system functions, organizational structure, and business processes. RFID technology is integrated into the system's function and process design, and RFID technology is used for data collection and business process management. Finally, the effect analysis of the implementation of this system is mainly due to the realization of the cold chain optimization and integration, and improve the efficiency of the cold chain operation.

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References

- [1] Wang Wei. Application of Radio Frequency Identification Technology in Cold Chain Logistics Enterprises. Management and Management, Vol. 4 (2011) No.11, p. 84-85.
- [2] Zhang Hao, Xu Shensi, Liu Rui. Application of Radio Frequency Identification Technology in Vegetable Cold Chain Logistics Management. Logistics Technology, Vol. 7 (2014) No. 33, p. 348-353.
- [3] Wang Tingman, Zhang Xiaoshuan, Chen Wei, et al. Temperature monitoring system for papilla cold chain logistics based on radio frequency identification technology. Transactions of the Chinese Society of Agricultural Engineering, Vol. 9 (2011) No.27, p. 141-146.
- [4] Liu Tao. Research on Application of Radio Frequency Identification RFID Technology in Cold Chain Logistics. Science and Technology Rich, Vol. 1 (2012) No. 30, p. 79-82.
- [5] Xu Binhua. Application of Radio Frequency Identification Technology in Vegetable Cold Chain Logistics Management. Science Chinese, Vol. 12 (2016) No.32, p. 1885-1887.
- [6] Zhang Xiaolei. Application of Radio Frequency Identification (RFID) Technology in Dairy Cold Chain Logistics. Wireless Interconnect Technology, Vol. 10 (2012) No.14, p. 153-157.
- [7] Yu Yang. Analysis of third-party cold chain logistics of foods. Meat Research, Vol. 9 (2009) No. 27, p. 7-9.
- [8] DENG Ai-min, YANG Shun-lian, FU Zhi-ming. Research on Evaluation of Third-Party Cold Chain Logistics Enterprises Based on Extension Method. Journal of Finance and Economics, Vol. 4 (2010) No. 31, p. 86-90.