

## **Development of the second packaging logistics system and the equipment technology of Rentian edible salt company**

Quan-hua Li

Wuhan Rentian packaging technology LTD

Recently, logistics system technology in small package of edible salt industry has been developed fast. The main reasons are listed as followed: First, the further establishment of modern logistics concept in the enterprises. Second, the design level and integration compatibility of system in the logistics equipment enterprises has been enhanced. Third, mergers and acquisitions in the industry require the improvement in logistics technology level in order to achieve high efficiency and high benefit.

Recently, the development of salt industry promotes adjustment of organization structure in the enterprises. Manufacturing and logistics enterprises have been merged and recombined. After reforming of salt industry system, there are some provincial distribution centers, most of which implemented one library system and collective distribution. In order to improve benefit, the circulation link is the least, business process is the shortest, and the circulation realizes large scale industry. These reform measures of direct-runs and less link provided system foundation for promoting modern logistics construction and improving the whole competitiveness in salt industry. Every year it can reduce plenty of logistics secondary transportation and relevant occupation of fund. The distribution center of scale and few links can strengthen salt quality control, protect physical health of the people

and avoid repeated construction.

Rentian packaging technology LTD is the earliest and the largest edible salt packaging technology supplier in the country. In long-term research and development of engaging in salt packaging technology, we continually used new technology and reformed traditional production lines. Especially in salt secondary packaging production lines, we developed technological innovation, constructed flexible manufacturing system of grouping processing and order production. We also made systematic design based on modern logistics design and process and information technology, which got a certain achievements.

### **1. SECONDARY PACKAGING EQUIPMENT AND TECHNOLOGY**

#### **Packing machine**

Packing machine is the main machine of edible salt secondary packaging. The types of packing machine developed by Rentian Company are deadweight drop type, side push type and grasping type. Deadweight drop type is suitable for boxing of bag-scale small bag salt. The boxing forms contain uniserial, biserial and multi-serial. The boxing rate can reach more than 120b/min. The side push type is suitable for boxing of cased or bottled

package. The grasping type has the same function as the side push type.

### **Industrial robots**

The application of industrial robots in salt industry is mainly stacking. Industrial robots are high-intelligent equipment. They can be divided into right angle type, polar coordinate, and joint type. The key of them is the manipulator action control algorithm. Four-axis joint type robots were integrated in salt industry by Rentian Company. Re-orientation accuracy can reach positive and negative 0.05mm.

The robots stacking had many kinds of abilities, which can adapt to the changes of market needs such as reasonable cost, compact size, and flexibility of adapting to palletizing size. It can also deal with more than one packaging production line.

The Rentian Company developed rectangular coordinates and simplified joint robots (manipulator), which can be used for boxing (boxes, bottles) and stacking of less weight packages.

### **Stereoscopic warehouse**

Stereoscopic warehouse designed for customers is a simple automated warehouse system designed by Rentian Company. It is also intelligent warehouse according to varieties of industrial salt products and distribution functions. According to customers' different requirements, we centralized storage of raw materials and finished products, efficiently utilizing existing space storage, improving warehouses' management level, decreasing warehouse cost. The aim is to reach modern management of low-income and high-efficiency.

Equipments of stereoscopic warehouse system are mainly automatic pallet shelves and case shelves, focusing on the up and down of fork-lift truck. The characteristics is the system has only one reservoir inflow channel and one retrieval channel, which can save greatly warehouse space. Stereoscopic

warehouse system integrated information system, which also can intelligently manage the customer's information and reservoir of storage.

### **Metal detector**

Metal detector is used to detect metal objects in salt bags (boxes, bottles), which not only can detect small package of salt, but also can detect a certain size of bag.

### **Weighting machine**

Weighting machine is used to weight the packages and it is mainly used in weighting mobile objects. Currently there are box weighting machine and bag weighting machine. Box weighting machine developed by Ren Tian Co., Ltd is use to weight the box between the encasement and dock, and it also can exclude the unqualified one. The bag weighting machine can be used to weight a small bag of salt

### **Code spraying machine**

The code spraying machine is use to spraying code on the bag and package, which can record the date of production, production batch, the operator and other information.

### **Transportation and other**

Material handling conveyor is the main equipment, Ren Tian Co., Ltd has develop a series conveyors such as : belt, roller, chain plates, expansion and upgrade, shift, merge, separation winding and so on.

## **2. INTEGRATED AUTOMATION SYSTEMS**

Integration is not a simple combination of equipment, which requires comprehensive utilization of the equipment using system thinking. It also ensures the seamless and speedy interface of hardware and software. Integrated automation systems consist of



electrical control technology and information technology.

### Controlling System

The electrical controlling part of the second packaging line is based on the PLC (programmable logic controller) as the core modules, which adopts the currently advanced CC-LINK communication bus to the completion of mutual communication and data acquisition of the entire system, which constitutes a simple distributed control system. The CC-LINK is an information network processing high-speed at industrial field level, which provides efficient and integrated factory and process control networks. The high speed (up to 10M/s) and stability are fully able to meet the special requirement in salt making industry, which requires recording of error warning and communication between the packaging equipment.

In addition, we have developed a more comprehensive self-diagnostic system in software design, which will resolve the practical issues encountered in production by the touch-screen prompts rather than let the customers to be familiar with the whole system

Control system has a very complete failure alarm system. The majority of the errors can be detected through the system, and it will provide corresponding solutions to the problem. The alarm system is working as follows:

When PCL at each station detects errors, the information of location and error code will be delivered to the main PLC through CC-LINK, then the PLC will deal with it and transmit it to the touch-screen and be displayed there.

In order to facilitate the equipment testing, each device in the system can be operated separately. Point testing is operated in this way: All the units device in each electrical equipment has a different code. When you touch the device, the signal will be transmitted to the main PLC through CC-LINK, then the PLC station will run

related equipment

### Information Management System

In order to grasp comprehensive, timely and dynamic product information, it is necessary to establish an advanced logistics information management system, which is based on the market chain and can satisfy strategic management ever-changing management needs of operations in different stages of the salt industry, which is "adaptive, advanced, integration, security and reconstruction. The system is based real-time data and centered on logistics management, targeting at cost management. The system will integrate the production, storage and logistic to realize optimization management.

Component-based logistics information system must be able to further facilitate the expansion of system functions. The general requirements is to integrate the space displacement in the production, storage, transport, packaging, processing and distribution, which emphasizes the overall unity, division of collaboration, resource sharing and remote monitoring in order to form a national unity of the salt market demand. The ultimate goal is to build up e-commerce based on enterprise information portal

The entire system is divided into basic functions and extended functions. Basic functions include production management system, warehouse management systems, office automation systems, products quality retrospective inquiry system and information center. Extensions include order management, allocation management, customer management, distribution and transportation management (GPS systems, GIS systems), the cost management, financial management, human resources management.

The system can achieve coding box management, and record bar code information of each product, realizing the association between the package and tray. Security code can be found on the boxes of products, which records the whole information about the

product in stacking, transportation, streamline, operators and so on.

Cargo warehousing management and division can reflect the real-time storage area, cargo spaces, and use. Digital library management, product management of the storage (including storage management, storage statistics), stock alarm, and warehouse management distribution centers. Digital library management includes storage location settings, storage location perspective, and storage location transportation and so on. The company can view the current warehousing and distribution in order to plan and allocate resources, avoiding the occurrence of a database error. The storage management includes storage in management, storage in statistics management, and storage out management, storage out statistics management (in contrast to the receipt and navicert). Stock statistics are compiled primarily for the inquiry of information about the balance of stock and inventory status and product inventory statistics, facilitating the understanding of the current status and inventory in the warehouse. Storage management is mainly used to account the workload and generate labor costs. It also has fault-tolerant capability and is able to deal with accident.

### **3 DEVELOPMENT TREND OF LOGISTICS EQUIPMENT IN THE SALT**

## **INDUSTRY**

### **Intelligent**

Progress in science and technology has made the equipment in salt logistic become more and more intelligent and humanistic, which can reduce labor intensity and improve reliability and accuracy of duplication of work. Continuously enriched salt products and large-scale production in future requires more efficient management. The basic equipment currently used in salt industry is electromechanical integration. Some of the advanced technology such as wireless communications, automatic recognition, vision technology, laser technology, non-contact energy transfer, etc., will have applications in salt industry.

Process speed of equipment is more and more fast, which requires the system to coordinate each sub-system in order to improve the accuracy of the entire line and stability. Without reliability, a faster speed loses its meaning, which requires the intelligent system continuously being improved.

### **Modular**

In order to meet the needs of market diversification, the system will be a portfolio of various sub-systems in order to meet the demands of the customers.