

# Research on the Application of Mechanical Automation Technology in the Field of Food Packaging

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## Abstract:

*In recent years, the application of mechanical automation technology in the field of food packaging has greatly improved production efficiency and saved a lot of material and human resources in the production process. In mechanical automation, mechanical equipment runs the whole process automatically according to the specified program without manual control. Through the use of mechanical automation, it can realize automatic control and operation through mechanical means, promoting the development of the food packaging field, so that the backward production conditions have been improved. However, even so, there are still many aspects of mechanical automation worthy of attention, to make it better to promote the development of the field of food packaging, and improve production efficiency and quality, but also need to solve the existing problems.*

## Keywords:

*Machine automation; food packaging; application; investigation;*

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With the continuous improvement of food safety awareness, people put forward higher requirements for safe and hygienic food packaging technology. With the development of mechanical and electronic technology, the emergence of safe and efficient food automatic packaging technology. In order to make our country reach the world's advanced level in the field of food packaging machinery automation, we need to break the industry, market, and regional boundaries of the food packaging industry. Reasonable use and integration of domestic advantageous resources, integration of small enterprises, take the group route, increase the mechanical automation innovation and research and development efforts to make up for the gaps, bigger and stronger.

## **1. The application of mechanical automation technology in the field of food packaging in China**

### **1.1 Lack of overall concept and limited application of complete sets of equipment.**

Although mechanical automation technology has been applied in the field of food packaging in China, it is limited to a small range and complete sets of equipment are not used in the production process. Compared with developed countries in Europe and the United States, the application of mechanical technology in China is not very wide, but the developed countries in Europe and the United States have gotten rid of the traditional production mode of a single machine, in the whole packaging process used in the mechanical packaging equipment to truly realize the automation of the machine production. The application of complete sets of equipment to make production more flexible, can improve product adaptability, improve production efficiency, improve the degree of automation, and more importantly, make the whole production process more stable. Computer technology and simulation technology in the process of mechanical automation also reduce the pollution of the environment and reduce the failure of mechanical operation. Therefore, our country should try to apply the whole set of mechanical automation technology and equipment to the whole field of food production to keep pace with the times.

### **1.2 Low packaging starting point and lack of advanced awareness.**

From the perspective of China's food packaging industry, many enterprises have a low level of automation, most of which are small and medium-sized private enterprises. The strength of private enterprises in either direction, there are more or less limitations, they cannot carry out in-depth research and development of automation technology and innovation. Therefore, the

level of food packaging in China is somewhat inadequate, whether in quality, price, or service, cannot be compared with foreign products. From the perspective of the market, not only domestic goods, economic globalization has led to a large influx of imported products. Therefore, in the face of this phenomenon, if we do not improve the quality of our domestic products, we will lose our advantage and will not be able to compete with foreign products.

### **1.3 Lack of innovation and increase on product energy consumption.**

Innovation has always been the eternal topic of the times. The food packaging field of mechanical automation technology is not limited to the existing technology, but the need for product innovation on this basis. Although China advocates innovation, there are still some shortcomings in the innovation mechanism. For example, in the field of food packaging in China, the mechanical automatic packaging technology involved in a variety of small, low-performance equipment, backward technology level, etc., can not compete with foreign countries. And low-performance packaging technology will increase energy consumption, reduce the service life of the equipment, and so on.

## **2. Machinery automation innovations in China**

### **2.1 The application of high and new technology.**

China's mechanical automation equipment in the development of high-tech has made great progress, mainly in the aseptic cold irrigation packaging, ultra-high-temperature sterilization, vacuum packaging, microcomputer technology, etc., the mature application of these technologies for the storage time of food packaging and quality has brought a reliable guarantee.

### **2.2 Effective use of resources.**

The use of resources, mainly to improve mechanical equipment for repeatable and renewable recycling of limited resources, gives full play to the full use of materials, and strengthens the extraction of raw materials to reduce the loss of nutrients caused by food packaging quality problems.

### **2.3 Development of energy-saving equipment.**

Industry insiders predict that China's future food packaging machinery application trend should be towards energy-saving, recyclable, intelligent direction. For example, with the increasing maturity of servo technology, foreign advanced equipment has gradually shifted from ordinary gears, belts, and other mechanical transmission to servo-driven, in which intelligent, precise control can be based on a large degree of energy savings.

## **3. The use of mechanical automation in the field of packaging**

Currently, in the field of food packaging, many advanced food machinery and equipment with strong automated processing and operation capabilities. For example, with the help of programmable language groups and equipment interaction between the application of many mechanical equipment can be freely controlled by the operator, and can better adapt to the production of a variety of adjustments; for example, manufacturing execution system (MES) can be connected to such areas as shop floor operation of the control system PLC program controllers, data collectors, bar codes, a variety of metrology and testing instruments, manipulators, and so on, to achieve centralized control and optimization of the management of the entire production process to complete the transfer of product information. Optimize the management of the entire production process to complete the product information transfer. In the future of the food packaging industry, mechanical automation will be towards the above intelligent, graphical, intuitive direction, it can be said that, in order to ensure the efficiency of production efficiency, intelligent testing systems and automated machinery and equipment in the future application is essential.

### **3.1 The application of safety monitoring in food packaging**

In the field of food packaging, ensuring the safety of food packaging is the basis of all business operations and all the industry's guidelines for action, and its importance is self-evident. The traditional means of food safety testing is usually through the specified processing machinery parameters to judge, while the quality of raw materials, packaging technology, food characteristics, and other specific issues cannot be judged by simple parameters. With the progress of mechanical automation technology, the food packaging process involves a variety of safety issues that will have accurate means of monitoring. For example, in the entire processing and packaging of certain food products, factories should conduct real-time bacterial content testing of all processes involved in the product. In order to prevent bottle top residues from causing product leakage or mold,

a high liquid level detector for bottle caps has been developed. There is also food packaging in the production process, which involves the printing process, in the production process a large number of organic solvents, including xylene, isopropyl alcohol, butanone, and so on. The amount of these harmful solvents will also remain in the packaging material, which requires manufacturers to fully utilize the safety monitoring technology of mechanical automation, and strict monitoring of residual solvents on food packaging. At present, comprehensive electronic testing equipment has been widely used in some large-scale food processing plants abroad. Through this technology can accurately detect the quality and safety of food and predict the time of food spoilage. This kind of testing equipment is equipped with scanning, sensing, photography, and other instruments. Detectors can observe the radio wave feedback from the scanner to the food, observe the music wave formed, and analyze the photo image to realize the detection of food quality.

### **3.2 Motion control system in food packaging**

The key step in the development of automation of China's food packaging machinery is the upgrading of the motion control system so that the motion control system technology continues to improve and mature. Motion control technology in food packaging machinery is mainly to achieve accurate control of the movement position, the running speed must be strictly synchronized, motion control technology is mainly used in food filling, packaging, and other links. Once the entire food packaging operation begins, there must be a set of accurate control of the production rhythm and control of the entire production process technology. Servo motor technology is used to control and position the equipment's operating torque, operating accuracy, speed, operating position, and other indicators. More advanced market, such as bus motion control equipment, is to achieve real-time, accurate control of the entire operating line through high-speed communication means, to realize the positioning of multiple target points, equipment features rapid conversion control mode and information interaction port diversification. At present, China has more mature products in motion control technology, and the popularity of the application in the production enterprises is also increasing year by year.

### **3.3 The application of automatic identification technology in food packaging.**

In the process of food packaging, the system needs to identify the quality of the raw materials and finished products involved, and automatically reject the substandard products, promoting the development of automatic identification technology. Automatic identification technology through photoelectricity, computers, intelligent information processing, and other advanced technologies, gradually formed a set of mature and stable identification systems, including radio frequency, photography, and other technologies. The application of this technology, it improves the production efficiency of enterprises, reduces the probability of operational errors caused by manual fatigue, and creates upgraded conditions for a single packaging line to pack multiple varieties of food. Reduce the production cycle, food information acquisition 100% accurate, to ensure the quality and safety of the food produced. However, it must be deeply recognized that the sensor technology of our motion control equipment is relatively backward. In the procurement process of the relevant sensors, the dependence on imported products is very serious, and the gap between domestic sensors is huge. According to statistics, imported sensors account for 75% of all products, and cutting-edge control chips account for more than 90%.

### **Conclusion**

In short, China's food packaging enterprises are small in scale, and lack of economic strength, and mechanical automation innovation ability, so we are in a passive position, it is difficult to establish a foothold in the world in the same industry. Therefore, in order to make China in the field of food packaging machinery automation to reach the world's advanced level, it is necessary for China to break the industry, market, and regional boundaries of the food packaging industry, the rational use and integration of domestic advantageous resources. Integration of small enterprises, takes the road of the group, strengthening the mechanical automation innovation and research, make up for the gaps, bigger and stronger.

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