Automatic Control of Food Packaging Machinery

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Abstract: At this stage, in the process of rapid development of food packaging machinery, the dependence on technology is stronger. However, in the process of food packaging machinery automation design, more foreign technology is introduced, which will affect the research level of food packaging machinery automation in my country to a certain extent. Therefore, we need to pay attention to the research work on the localization of food packaging machinery automation in my country, and the development and innovation of drive technology and numerical control technology. Only in this way can we integrate digital technology into the development and research of food packaging machinery and equipment, and gradually improve the level of automation, energy saving and greening of food packaging machinery.

1. Introduction
In the process of rapid development of the food industry, we must improve the level of food packaging machinery automation. Only in this way can we increase the utilization rate of production equipment, ensure that it can meet the development needs of the food industry, and improve the safety and consistency of food packaging. In order to improve the level of automation of food packaging, a comprehensive study of control methods, controllers, sensors, and driving methods is required. And according to the current technological development level, the development direction of food packaging machinery automation should be discussed and analyzed. Only in this way can the level of automation of food packaging machinery be improved, the reliability and stability of food packaging machinery during operation can be ensured, and the economic benefits of food packaging machinery enterprises can be improved.

2. The Significance of Realizing Automatic Control of Food Packaging Machinery
With the continuous improvement of the social and economic level, people's quality of life has also been greatly improved, and the development of the food industry has become faster and faster. In order to meet people's ever-changing consumer needs, the original food packaging machinery can no longer meet the development speed of the food industry. At present, my country's food packaging machinery companies have relatively few applications of automated machinery technology, which will seriously affect the development speed and level of my country's food packaging industry. At present, our people's new requirements for food packaging machinery mainly include the following aspects: First, we must improve the production efficiency of food packaging machinery. Secondly, we need to improve the flexibility and flexibility of food packaging machinery to ensure that food packaging machinery can complete standardized and standardized packaging according to the characteristics of the items being packaged. Third, during the operation of food packaging machinery, we must be able to eliminate the failure of food packaging machinery in a timely manner and improve the stability and reliability of food packaging machinery. Fourth, when the food packaging machinery is running, we must ensure that it has an automatic recognition function, thereby improving the operation level of the
food packaging machinery. Fifth, in order to reduce the energy consumption of food packaging machinery during operation, we need to improve the environmental protection performance of food packaging machinery. The above new requirements determine that promoting the automation of food packaging machinery is an important trend in the development of current food packaging machinery enterprises. Only by increasing the level of automation of food packaging machinery can we improve the economic efficiency of enterprises [1].

3. Overview of Food Packaging Machinery Automation
Food packaging machinery refers to machinery and equipment that can package food. Food packaging machinery mainly includes the steps of filling, sealing, measuring and stamping food. The operation and operation of food packaging machinery in the process of operation are relatively complicated. In order to improve the operating efficiency of food packaging machinery, it is necessary to promote the automatic development of food packaging machinery. This is mainly determined by the main characteristics of food packaging machinery. The characteristics of food packaging machinery are shown in the following aspects: First, the operation process of food packaging machinery is more complicated. This is mainly because the internal structure of the food packaging machine itself is relatively complicated, especially when measuring, filling, and sealing food, the accuracy requirements are relatively high. And to ensure the operating efficiency of food packaging machinery. There are also many factors that affect its structural performance during the operation of food packaging machinery: packaging size, container quality, etc. will affect the operation level of food packaging machinery to a certain extent. In addition, in the design process of food packaging machinery, its requirements are relatively high. It is necessary to improve the accuracy of food packaging machinery operation and ensure that it has strong wear resistance. Therefore, the difficulty and complexity of the entire design process are relatively high. Second, there are relatively many types of food packaging machinery, and the update speed is relatively fast. The rapid development of the food industry requires more and more food packaging machinery, which leads to a rich variety of food packaging machinery. At present, there are more than 2,000 types of main machinery and equipment for food packaging machinery. If auxiliary machinery and equipment are added, there will be more types. In today's socio-economic and technological development, the food industry's products are also constantly enriched. This has led to the rapid development of food packaging technology and materials, and is constantly developing in the direction of environmental protection and high technology. At the same time, it has also promoted the upgrading of food packaging machinery to a certain extent [2].

4. Main Points of Food Packaging Machinery Automation Design

4.1 Control Method Design
The process from food production to packaging mainly includes open-loop control, closed-loop control and semi-closed-loop control. When choosing the control method of food packaging machinery, we need to accurately understand these three control methods: First, open-loop control is generally applicable to food processing processes where quality and packaging requirements are not high. The application cost of this control method is relatively low, but its reliability is relatively high. Secondly, the closed-loop control method is mainly used in sensors in food packaging machinery, which can accurately detect the working state of food packaging equipment. This will help to grasp the various information detected in time. Under normal circumstances, in the case of higher requirements for product packaging quality, choose to use this control method. Finally, the semi-closed loop control method can use a sensor on the food packaging machine to detect the state of the device. If the quality requirements of food packaging are relatively high, you need to choose a semi-closed loop control method. The application cost of this control method is relatively high.

4.2 Controller Selection
The controller on food packaging machinery is an important device to improve the efficiency of
automatic control of mechanical equipment. When designing the controller of food packaging machinery, the following requirements need to be considered: First, the electrical circuit of the controller must be simplified, because this can improve the operability of the automatic control of food packaging machinery. Second, when designing the controller, use a programmable controller as much as possible. Because the logic function of the programming controller is relatively powerful, it can effectively control the operation of the food packaging machinery and improve the flexibility of the food packaging machinery. And it is helpful to improve the automation of mechanical equipment during operation, and it is convenient for workers to operate. Third, we need to use the computer to control the controller. The use of computer programs has a positive significance for achieving the purpose of automatic control, and can greatly improve the automation level of food packaging machinery and equipment.

4.3 Drive Technology Design

In the process of designing food packaging machinery, there are many complicated procedures, and it is necessary to ensure that all actions in the equipment are consistent. Traditional food packaging machinery will use a host to use complex processes to complete each packaging action. However, this may lead to an increase in the incidence of failures and increase the difficulty of equipment maintenance. Therefore, we need to use advanced food packaging drive technology to improve the automation level of food packaging machinery and simplify the operation steps during the operation of equipment. Servo drive technology is the main drive technology used in food packaging machinery automation design, which can simplify the mechanical transmission of the entire equipment and improve the reliability and stability of the equipment operation. For example, the application of three-axis linkage or multi-axis linkage servo drive technology in food packaging machinery can not only simplify the mechanical transmission mechanism, but also improve the stability of equipment operation and prevent serious failures during operation from affecting the packaging efficiency [3].

4.4 Sensor Design

When the food packaging machinery is designed for automation, we must install multiple sensors on the food packaging machinery so that the food packaging machinery can be automated. For example, when packaging and cleaning beverages, multiple sensors are required. Under normal circumstances, we will choose pressure sensors, photoelectric sensors, etc. to achieve the purpose of mechanical automation.

5. Development Trend of Food Packaging Machinery Automation

5.1 Intelligent Development of Fault Diagnosis

In the process of automatic design of food packaging machinery, in order to improve the level of automation and ensure the production efficiency of mechanical equipment, we need to establish a fault diagnosis and monitoring system for food packaging machinery. Using the fault diagnosis and monitoring system, we can accurately and quickly determine the abnormal conditions and causes of faults in the operation of food packaging machinery and equipment. This requires the full use of the fault diagnosis expert system. In addition, we also need to use the multi-sensor information fusion monitoring system, so that the actual operation of the mechanical equipment can be monitored in real time. Once problems are found, we can directly use the equipment fault diagnosis system to accurately determine the specific conditions of the equipment failure and the location of the failure, improve the efficiency of equipment maintenance, and ensure the reliability and stability of the operation of food packaging machinery and equipment. With the intelligent development of fault diagnosis technology, we can effectively apply network technology in the design process of the fault diagnosis system of food packaging machinery. In this way, we can not only realize the remote monitoring function, but also carry out automatic monitoring, intelligent fault diagnosis, and automatic troubleshooting of food packaging machinery and equipment to further ensure the reliability and stability of food packaging
machinery [4].

5.2 CNC Development of Mechanical Operation
In the process of the development of food packaging machinery automation, promoting the development of its numerical control is also one of its main development directions. CNC technology itself is an important technology type to improve industrial production level and industrial automation. In addition, the relevant theories and applications of CNC technology are relatively mature and perfect. In the process of research and utilization of the numerical control technology of food packaging machinery, we can use the experience of CNC machine tool development in the design process of food packaging machinery, and design corresponding applications through digital control methods to the food packaging machinery packaging process and control the packaging movement. This is conducive to enhancing the use and adaptability of food packaging machinery and equipment to improve the application value of food packaging machinery.

5.3 Mechanical Control Information Integration Development
In the process of rapid development of information technology, the application of information technology is becoming more and more common. In the future development of food packaging machinery automation, it is one of the main trends to promote the development of machinery control in the direction of information integration. At this stage, the application of CAD technology in the field of engineering is relatively extensive, and the application of CAD technology in the research and innovation of food packaging machinery is conducive to reducing the design and development cycle of equipment and improving the level of automatic control of food packaging machinery. In the actual design work, ergonomics can be used to fully design the operation functions of the food packaging machinery, improve the simplicity of the machinery operation process, and ensure the efficiency of the machinery. After the design is completed, the results of the design can be applied to the CAE software to optimize the operation performance and control structure of the food packaging machinery. This can ensure that the design results meet the requirements of environmental protection and improve the ecological benefits of machinery operation. When applying CAPP technology, it can promote the standardization of product parts, code and classify parts, and store the corresponding processing technology plans in the parts processing library, which is convenient for the standardized management and application of product parts. In the product manufacturing process, CAD technology can be applied, which can simulate the part processing process and generate CNC machining codes, which can effectively simulate the virtual manufacturing of the product, so as to correct the problems in the design and improve the reliability of the design results. What we need to pay attention to is that in the research process of food packaging machinery and equipment, we must proceed from the market demand to ensure that the design functions of food packaging machinery and equipment can meet the actual needs. At the same time, we must improve the application level of equipment as much as possible. We can summarize the research and maintenance work of food packaging machinery and equipment into CIMS to ensure that the operation and maintenance of equipment can be smoothly carried out. In addition, the application of CAX technology in the design and development of food packaging machinery is conducive to improving the adaptability of machinery and equipment to market demands [5].

6. Conclusion
In summary, in the current food processing industry, traditional food packaging machinery can no longer meet the needs of food processing. Therefore, we must promote the automated development of food packaging machinery. Only in this way can the operating efficiency of food packaging production equipment be maximized, ensure that food packaging machinery can meet the needs of food processing, and improve the development level of China's food processing industry. At the same time, this is also in line with the growing needs of people in the new era adapt. What we need to pay attention to is that during the development of food packaging machinery automation, we have to
understand that the operation process of food packaging machinery is relatively complicated. Therefore, it is relatively difficult to design and research its automation control system. This requires relevant staff to proceed from the development of automation technology and strengthen the application of automation control technology in the operation of food packaging machinery, so that we can promote the effective integration of automation control technology and food packaging machinery to achieve the improvement of food packaging machinery automation aims. In the actual design and research process, we must focus on the research and analysis of the automation of food packaging machinery. At the same time, we must also promote the development of food packaging machinery in a more advanced direction. This is mainly because the development of the food processing industry is relatively fast, the types of food processing are constantly increasing, and the requirements for food packaging machinery will develop in the direction of diversification and standardization. Therefore, we must actively introduce advanced automatic control technology, so as to enhance the development level of food packaging machinery automation technology and protect the economic benefits of enterprises.

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