Safety Control of Mechanical Design Automation Equipment with Computer Aid

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Abstract. Safety control is required in the mechanical system design to ensure that the safety risks of mechanical equipment can be effectively controlled to improve the automatic control and management capacity of mechanical equipment. This paper aims to analyze the safety management of automation systems in mechanical design to understand the characteristics of automatic safety control and management in mechanical design. In addition, the specific applications of safety equipment are comprehensively evaluated to improve the control and management level of automation equipment in mechanical design and create excellent internal and external conditions for the comprehensive safety optimization of mechanical equipment.

Keywords: Mechanical Design, Automation Equipment, Control, Computer

1. Introduction

In the mechanical design, the automation system should be optimized to ensure that the safety indexes of mechanical equipment can meet the specific requirements of mechanical control and management, improve the level of comprehensive management and control of mechanical equipment, create a good equipment safety environment for mechanical design, and generate The comprehensive detection of failures improves the efficiency of comprehensive control and management of mechanical equipment and continuously improves the safety control and management capacity of mechanical equipment [1, 2]. Safety is one of the important issues facing mechanical design. At the same time, safety is also accompanied by people's production and life. Safety is the basic requirement and premise of mechanical design. The safety control and management of automated equipment in mechanical design need to be handled from different perspectives. Ensure that safety management can be implemented and ensure that mechanical equipment control and management can meet the expectations of mechanical equipment control and management [3, 4]. During the mechanical design process, the equipment safety research and development team needs to take various mechanical safety factors into comprehensive consideration. Through a comprehensive investigation of production needs, it fully optimizes the equipment's safe production line, improves equipment safety management, and creates a good equipment safety management environment for machine design [5, 6]. From the perspective of equipment management, the safety control of mechanical design automation equipment must comprehensively evaluate the safety risks in mechanical design to ensure that the safety design of mechanical equipment can be carried out smoothly.
The purpose of this paper is to analyze the safety management of automation systems in mechanical design, to grasp the characteristics of automatic safety control and management in mechanical design, and to comprehensively evaluate the specific application of safety equipment, to improve the level of control and management of automation equipment in mechanical design. The comprehensive safety optimization of mechanical equipment creates excellent internal and external conditions.

2. Safety risk assessment of mechanical design automation equipment

2.1. Basic model for the safety assessment of mechanical design automation equipment
The safety assessment of mechanical design automation equipment should start from a series of logical control and management, and continuously optimize the mechanical design so that the mechanical design automation equipment can meet the basic requirements of safety assessment, analyze various modes of risk assessment, and control the safety of automated equipment. It will have a positive effect, through comprehensive analysis and management of safety equipment, to improve the total control and management level of safety equipment. Mechanical design automation equipment safety control needs to actively work in accordance with relevant national standards to ensure that the various processes can be fully applied in the engineering of equipment safety design, and achieve the goal of automation system design safety control through mode optimization.

2.2. Safety assessment of mechanical design automation equipment
The safety assessment of mechanical design automation equipment (as shown in Figure 1) requires a comprehensive analysis of risks, optimization of the information in the risk assessment of mechanical equipment, improvement of the full safety judgment capacity of mechanical equipment, and safety control and management of mechanical equipment. And design optimization creates excellent conditions. In the process of mechanical design, the design plan and equipment control mode need to be closely integrated to improve the comprehensive control and management level of mechanical equipment. The safety control of mechanical design automation equipment needs to perform a risk assessment and analyze the critical points of the risks of mechanical automation equipment so that it can judge the safety of mechanical automation equipment and improve the safety control and management level of mechanical equipment. In the automatic control and management of mechanical equipment, safety restrictions must be determined. The safety control and management of mechanical equipment are performed in different stages of mechanical equipment service life to ensure that mechanical equipment can operate and use correctly, and improve the comprehensive safety judgment and control capacity of mechanical equipment. Through the correct use and correct operation of mechanical equipment, the safety of mechanical equipment can be found, so that the safety of mechanical equipment can be analyzed, and the safety control and management level of mechanical equipment can be improved. The automatic control and management of mechanical equipment should be quantitatively analyzed to ensure that different safety control indexes can meet the requirements of safety management, and to achieve comprehensive control and management of mechanical equipment. The safety control of automation equipment in mechanical design needs to start from the factors affecting the risk, conduct an in-depth analysis of the fault situation, and perform a type analysis of the safety control of the automation equipment to ensure that the automation equipment can meet the specific requirements of safety risk management. In the design of mechanical equipment, the safety risk assessment of automation equipment needs to be analyzed from three parameters. One is the severity of the damage. Through the analysis of the consequences of the accident, the automation control of the mechanical equipment can be analyzed to ensure that the damage to mechanical equipment meets the requirements of safety control and management. The time and frequency of equipment danger in the mechanical design must be controlled. By analyzing different time periods, the safety control and management capacity of automation equipment in the mechanical design are improved, and excellent internal and external conditions are created for the safety assessment of
mechanical equipment. The safety and automation control of mechanical equipment should be optimized from the perspective of the operating cycle. The second is to start from the risk indexes of safety management and conduct comprehensive safety inspections of mechanical equipment. The third is to ensure that mechanical equipment can be effectively identified from the perspective of avoiding the possibility of risk management. Through the risk assessment of mechanical equipment, improve the risk level management of mechanical equipment, perform safety management on the entire process of risk assessment, and realize the automatic optimization of mechanical equipment.

2.3. Risk assessment of automation equipment in mechanical design

In the design of mechanical equipment, automatic safety risk assessment of equipment is required to reduce safety risks better and create good conditions for the normal operation of mechanical equipment. As the level of mechanical automation becomes higher and higher, the iterative process of risk assessment of mechanical equipment becomes more and more complicated. It is necessary to proceed from the entire process of risk identification, continuously strengthen the safety management of automation equipment, and improve the safety and automation control capacity of mechanical equipment. The risk identification of automated equipment in the mechanical design should start with information confirmation to ensure that the automatic iteration of mechanical design risk meets the requirements of safety control.

There are many ways to assess risk. For example, firstly, the risk of automated equipment is classified, and the classification assessment is conducted. If the range of risk $x$ is assumed to be $[a, b]$, change the number $x$ in $[a, b]$ to the fuzzy domain $[E, E]$ and fuzzy number $y$ in the interval, as shown in equation (1):

$$\begin{align*}
Y &= \frac{2E}{b-a} \left[ X - \frac{a+b}{2} \right] \\
&= 2E \left[ X - \frac{a+b}{2} \right]
\end{align*}$$

(1)

The lower approximate set of $X$ risk sets on $R$ is shown in equation (2):

$$R, (X) \left[ X \subseteq U : R(X) \subseteq X^r \right]$$

(2)

That is, if and only if $R(X) \subseteq X$ has $x \in R^r (X)$, $R^r (X)$ represents the largest set consisting of certain elements that fall in $X$ based on existing risks.
3. Basic principles of safety control for mechanical design automation equipment

3.1. Safety control of mechanical design automation equipment should meet the requirements of mechanical functions

The safety control of mechanical design automation equipment should be based on the basic principles of design, and ensure that various safety automation control functions meet the specific requirements of mechanical equipment. Mechanical design automation equipment safety control must meet the requirements of core functions and ensure that mechanical information and equipment control can meet the needs of technical indexes. During the implementation of mechanical equipment, we must proceed from the requirements of manufacturing, design, and safety management to improve the level of automation, safety control, and management of mechanical equipment.

3.2. Advanced technology for safety control of mechanical design automation equipment

Mechanical design automation safety control must be based on advanced technology, ensure that the mechanical design can meet the requirements of safety management, complete the essential functions of various mechanical equipment, and improve the comprehensive control and management capacity of mechanical equipment. Regardless of product or system perspective, the safety management of mechanical design automation equipment is continuously improved. The safety control of mechanical design automation equipment must be based on technology, to ensure that mechanical equipment can complete the intelligent function, and at the same time, it can meet the humanized safety management requirements. Mechanical design automation safety equipment management should optimize the framework of various processing equipment, and from the perspective of safety management, continuously increase the function of output equipment. In the process of energy conversion mechanical equipment, it is necessary to ensure that various energy conversions can be safe and reliable, and improve the safety control capacity of mechanical equipment.

3.3. Improved safety control efficiency of mechanical design automation equipment

In the management process of mechanical design automation control system, it is necessary to optimize the control of various information, ensure that various automation products and equipment can meet the requirements of safety functions, and improve the safety control efficiency from multiple aspects. It is one of the essential principles of mechanical design. It is necessary to start from the actual characteristics of mechanical equipment and strengthen its fundamental capacity to process information. The information management and management of mechanical equipment should be closely integrated with the mode of comprehensive management of mechanical equipment to improve the level of comprehensive control and management of mechanical equipment and create excellent conditions for the comprehensive optimization of mechanical equipment. The safety control of mechanical design automation equipment can improve the automation capacity of mechanical equipment, can save the number of machine tools, and improve its production efficiency continuously.

3.4. The control of mechanical design automation equipment should adhere to the principles of safety and reliability

Mechanical design automation equipment control should start from the perspective of product fault management, ensure that mechanical equipment can perform automatic fault handling, and improve the control and management capacity of mechanical equipment. Mechanical automation control and product optimization are closely integrated. Mechanical automation products should be closely combined with safety and intelligent control to ensure that the diagnosis, processing, and monitoring of various mechanical equipment can meet the basic principles of safety control. The control of mechanical design automation equipment should start from the operation link to reduce the probability of mechanical accidents. The safety of mechanical design automation equipment can improve the sensitivity of mechanical equipment. From the operational convenience, the safety control and management of mechanical equipment must continuously optimize the design scheme to ensure that
the operating mechanism can meet the requirements of the operation scheme. The functions of various automation products in mechanical equipment should be fully monitored to ensure that the operation process can meet the requirements of equipment control and management. By controlling various safety levels of mechanical equipment, the overall goal of the optimized operation is achieved, so that the automatic control and management of mechanical equipment can be fully implemented. The safety indexes of the automatic control system of mechanical equipment should start from different cycles, and actively introduce new technical solutions, to analyze the safety control measures comprehensively and improve the comprehensive management level of mechanical equipment.

4. Conclusion
The safety control and management of mechanical design automation equipment should start from the safety scheme and ensure that the application of mechanical equipment can meet the requirements of safety management and improve the automatic control and management capacity of mechanical equipment. The safety control of automation equipment in the mechanical design should start from different safety perspectives, fully optimize safety management strategies, raise the safety management level of mechanical equipment, and create a good platform for improving the mechanical equipment functions. The safety control mode in the design of mechanical equipment should be continuously optimized to improve the comprehensive operating efficiency of mechanical equipment. Mechanical design automation equipment control should start from the product fault management to ensure that mechanical equipment can perform automatic troubleshooting, thereby improving the control and management capacity of mechanical equipment. Various faults can occur in the automatic control of mechanical equipment. There are various faults in the automatic control of mechanical equipment. It is necessary to analyze the causes from the fault management perspective to design automation schemes for faults and improve the safety control and management level of mechanical equipment. Mechanical design is a systematic project. During scheme design and optimization, the design functions should be analyzed comprehensively to improve the capacity of mechanical design management and create excellent internal and external conditions for the comprehensive management and control of mechanical equipment. The information management and management of mechanical equipment should be closely combined with its comprehensive management model to improve the level of comprehensive control and management of mechanical equipment and create excellent conditions for the comprehensive optimization of mechanical equipment. The safety control of mechanical design automation equipment can improve the automation capacity of mechanical equipment, save the number of machine tools, and continuously improve its production efficiency. The operation of mechanical equipment is closely combined with automatic safety control. It is necessary to improve the comprehensive control capacity of mechanical equipment from the management model of mechanical equipment and create excellent internal and external conditions for the comprehensive optimization of mechanical equipment. The automation safety control and management platform for mechanical equipment should meet the requirements of mechanical functions to improve the management functions of mechanical equipment continuously, ensure that the information of mechanical equipment can achieve safe intercommunication, and create excellent conditions for optimizing the mechanical equipment and information.

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