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OPTIMIZATION MEASURES OF AUTOMATED CONTROL IN CHEMICAL PRODUCTION SAFETY

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Abstract: Electronic technology has advanced significantly, leading to the widespread application of automation across multiple industries. This integration has resulted in a substantial liberation of the workforce, enhancing both operational efficiency and financial profitability for enterprises. However, the chemical industry poses inherent dangers, necessitating careful consideration of the associated risks when introducing automated control systems. To ensure the effective and safe utilization of automation in chemical production, it is imperative to establish clear operational guidelines and safety measures.
Keywords: Automation control; Chemical industry; Safety production; Optimization measures

1 THE IMPORTANCE OF AUTOMATED CONTROL

Accidents such as explosions, fires and unavoidable corrosion are prone to occur during the chemical production process. In order for the chemical industry to operate normally in society, it is necessary to find more ways to avoid hidden dangers that threaten personal safety. The use of automated control will greatly improve the efficiency of enterprises, but in this process, enterprises must have more safety awareness and increase the safety inspection of equipment in chemical production [1-2]. In order to more accurately predict accidents in the chemical production process, users and enterprises need to have certain scientific management and control knowledge and capabilities, conduct regular equipment safety inspections during the work process, and always update precautions and possible occurrences during the use of the equipment. Hidden dangers should be prevented to ensure the safe operation of automated control.

1.1 The Importance of Automated Control

The application of automation control technology provides hardware conditions for the development of the chemical industry. The chemical industry is a high-risk profession, and the use of automation has inevitably increased the risk factor of the profession to a certain extent. In addition to bringing safety risks to workers, it also brings risks to the reputation of the company. If the lives and safety of employees are threatened, the reputation of the company and its development in society will end in failure. Safety measures cannot just rely on the employees' experience in daily work. The company itself should also pay attention to the inspection and elimination of equipment safety hazards[3]. If necessary, it is necessary to train company employees on the safe use of equipment, and strive to improve the chemical production process. The risk factor is reduced to a minimum, allowing employees to feel at ease at work, better serving the company, and maximizing the company's interests while working with peace of mind.

1.2 Risk parameters

How to estimate risk in an event that never happened? How to calculate the result parameters in an already happened event? These are all security issues that an enterprise should consider during its operations [4]. Avoidance parameter: It is the probability that workers can avoid the danger when a danger occurs. However, this depends on the professionalism of the staff, whether they have sufficient awareness of safety hazards, awareness and theoretical knowledge of safety measures to avoid dangers. Here the author will give a hierarchical classification to avoid parameters[5]. Consequence parameter: refers to the proportion of the number of people who died in the accident or who were killed or seriously injured as a result of the accident to the total number of people in the factory (Table 1-2). N is the number of casualties that may be caused by the accident, A is the ratio of the total factory area occupied by the accident, and V is the fatality rate.

Table 1 Avoid parameter hierarchies

parameter	Divide the scope
P1	May be avoided under certain conditions
P2	almost impossible to avoid

Table 2 Fatal rate values and hazard descriptions

Fatal rate V	describe
0.01	small scale hazard
0.10	massive harm
0.50	Large-scale hazards, but can cause larger disasters such as fires
1.00	More serious explosions and other accidents

2 AUTOMATION CONTROL TECHNOLOGY AND EXPLORATION USED IN THE PROCESS OF CHEMICAL PRODUCTION SAFETY

2.1 Automation Control Technology Used in the Process of Chemical Safety Production

2.1.1 Process monitoring and fault diagnosis system

In the chemical production process, it is unrealistic to use simulated safety inspections to check safety everywhere [6]. Therefore, this requires enterprises to put some expert predictions into a designated database. Once the database is activated by background operations, the database will automatically process the information layer by layer to detect equipment and make security prevention strategies, effectively avoiding detected potential safety hazards. In addition to safety hazards that are easily encountered in the chemical production process, the machinery and equipment used by employees have caused wear and tear due to long-term use. In the long run, the safety performance of the equipment itself also affects the personal safety of users. Therefore, equipment failure monitoring is very important. The use of automation technology to discover safety problems such as long-term disrepair in equipment in a short period of time provides a certain basis for timely maintenance of enterprises, ensures equipment safety and work efficiency, and improves the personal safety factor of employees.

2.1.2 Application of emergency stop system (ESD)

Process monitoring can achieve continuous and stable safety monitoring, but if an emergency hazard is discovered that is too late for human control, it will also cause an irreversible situation. The application of emergency stop system gives the equipment the final safety guarantee in crisis situations. When an emergency occurs and there is no time for human rescue, the emergency parking system will automatically cut off all running machinery and equipment to ensure the safety of people present. With the development of the chemical industry, the requirements for safety monitoring are becoming higher and higher. The emergency stop system was originally based on relays and evolved into the emergence of PLC technology. The original PLC technology was widely used because it relied on programming for accurate monitoring. However, it had certain limitations, so it was only used in safety applications. Projects with lower requirements.

3 IMPROVE MANAGERS' AWARENESS OF EMERGENCY MANAGEMENT

Through the analysis of hazardous chemical accidents, it can be seen that most hazardous chemical accidents are caused by human behavior, and most units have insufficient efforts in emergency management of hazardous chemicals and only focus on the understanding and learning of theoretical knowledge and related technologies. , lack of popularization of safety knowledge and prevention awareness. In this case, once a hazardous chemical accident occurs, there are limited methods during the handling process, making it difficult to effectively control the spread of the accident and the danger. Therefore, relevant administrative departments should do a good job in enterprise execution qualification training, formulate good training plans, and adopt professional training and management training methods to improve the business knowledge level of relevant personnel. In addition, all hazardous chemical companies have the risk of emergencies. Therefore, all companies and departments should develop early warning mechanisms and implement specific training based on the characteristics of chemicals, do preventive work before accidents occur, and be able to prevent accidents after they occur. Provide timely rescue and treatment to reduce property losses and casualties.

4 DO A GOOD JOB IN FIRE SAFETY CONSTRUCTION

In the emergency management of hazardous chemicals storage, fire safety construction work should also be done to provide a corresponding safety environment foundation for the use and management of hazardous chemicals, ensure the adequacy of safety facilities and related configurations, and ensure the effective implementation of hazardous chemicals safety work. , and at the same time improve the safety protection capabilities of warehousing management by drawing on advanced experience in related fields. Carry out regular inspections of safety management equipment and related facilities to ensure that all equipment has good performance and status and can play a stable role in the application process. In addition, ensure that all staff understand the operating methods and procedures of these safety facilities.

5 STRENGTHEN GOVERNMENT SUPERVISION OF EMERGENCY MANAGEMENT

When carrying out emergency management of hazardous chemicals, it is necessary to analyze the potential hazards of hazardous chemicals. The state can promulgate relevant legal systems based on the hazard levels of hazardous

chemicals and do a good job in emergency management legislation. At the same time, government departments also need to do a good job in supervising hazardous chemical companies in accordance with relevant laws and regulations, so that the emergency management work of chemical companies can develop reasonably under the constraints of legal regulations. Through regular or irregular spot inspections and supervision, it attracts the attention of relevant enterprises and ensures the effective implementation of the emergency management safety system.

6 CONCLUSION

To sum up, hazardous chemicals themselves have inherent risks. If not properly managed, they can easily lead to serious safety accidents, resulting in property losses and casualties. However, these hazardous chemicals play an important role in the development of the chemical industry, and it is impossible to cancel production. The only way to ensure the quality of hazardous chemicals management can only be to strengthen prevention, early warning and the formulation of emergency measures. In the formulation of emergency measures and safety warning measures, it is necessary to improve relevant legal systems to provide effective basis for the development of relevant policies. At the same time, we must do a good job in internal management and training of the enterprise, enhance the responsibility awareness and emergency response capabilities of relevant managers, and improve safety facilities. construction work to ensure the implementation of the emergency management system and improve the efficiency of emergency management through the synergy between the government and enterprises.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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