Research on the present situation and development direction of mechanical engineering intelligence

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Abstract: In the era of Industry 4.0, the traditional mechanical engineering method has been unable to meet the modern manufacturing industry's demand for efficient, accurate and fast production. Through the introduction of intelligent technology to greatly improve the degree of automation and production efficiency of mechanical engineering, reduce production costs, improve product quality and accuracy, and further meet the diversified needs of the market, has become an important trend in the development of modern manufacturing industry. Based on this, this paper first analyzes the significance and current situation of mechanical engineering intelligence, and then discusses its development direction combined with relevant practical experience, in order to offer suggestions for the development of modern manufacturing industry.

Key words: mechanical engineering; Intelligentization; Status quo; Development direction

Mechanical engineering intelligence is a new type of technology that integrates artificial intelligence, automation technology and information technology in the field of mechanical engineering. It takes intelligent equipment as the carrier, and realizes the automatic control and optimization of mechanical engineering through intelligent technology, so as to improve production efficiency, reduce production costs, and achieve a more efficient, accurate and rapid production mode. To explore the status quo and development trend of intelligent technology of mechanical engineering, to provide theoretical support and practical guidance for the transformation and upgrading of the manufacturing industry, is to improve the core competitiveness of modern enterprises and promote the sustainable development of China's manufacturing industry. Relevant technical personnel should be fully aware of the significance of mechanical engineering intelligence, based on the accurate grasp of the status quo and direction of the development of mechanical engineering intelligence to promote the innovation and development of enterprises.

I. The significance of mechanical engineering intelligence

In the age of information and digitalization, the intelligence of mechanical engineering is leading a new industrial revolution. Its wide application has not only changed the face of traditional mechanical engineering, but also brought unprecedented changes to people's production and working methods. First of all, the intelligence of mechanical engineering greatly improves the production efficiency. Traditional mechanical engineering often requires a lot of manpower input in the maintenance, operation and monitoring of equipment. Intelligent mechanical engineering combines advanced technologies such as artificial intelligence, big data and the Internet of Things with traditional mechanical engineering to automatically complete these tasks, effectively reducing labor costs and improving production efficiency. Secondly, intelligent mechanical engineering helps to improve product quality. Through accurate data analysis and optimized design, intelligent machinery can provide more stable and consistent product quality. At the same time, through real-time monitoring and predictive maintenance, problems can also be detected and resolved in a timely manner to avoid production disruptions and product quality degradation. Moreover, intelligent mechanical engineering helps to improve energy efficiency. Through intelligent energy management, machinery can only be started when needed, which greatly reduces energy consumption; It can adjust itself according to the operating condition of the equipment to achieve more efficient energy use. Finally, intelligent mechanical engineering helps to ensure production safety. Intelligent machinery can detect and deal with potential safety risks in time through real-time monitoring and early warning systems to avoid accidents.

II. The status quo of mechanical engineering intelligence

After entering the era of Industry 4.0, mechanical engineering intelligence has become an important development direction of manufacturing industry. As the world's largest manufacturing country, China's mechanical engineering intelligent development status attracts attention. In recent years, the process of mechanical engineering intelligence in China has made remarkable progress. On the one hand, from the traditional manual operation to the current automation and intelligence, the production efficiency and product quality of China's manufacturing industry have been greatly improved. In terms of intelligent technology, China has made important breakthroughs in key areas such as artificial intelligence, Internet of Things and big data. Through cooperation with universities and research institutes, Chinese enterprises are constantly developing and promoting new intelligent technologies. On the other hand, the Chinese government has also introduced a series of policies to support the intelligent development of mechanical engineering. The government's support for intelligent manufacturing continues to increase, providing financial and policy support for technological transformation and upgrading of enterprises; The cooperation between enterprises and universities and research institutions has been actively promoted, and technical exchanges and personnel training have been strengthened. However, despite remarkable progress in the intellectualization of mechanical engineering in China, some challenges still remain. First, the introduction of intelligent technology requires a large amount of capital investment, which is a big burden for some small and medium-sized enterprises. Secondly, the introduction of intelligent technology requires enterprises to have

the corresponding technical personnel and management personnel, but at present, many enterprises are still relatively short in this respect. Finally, the application of intelligent technology requires enterprises to have the corresponding data foundation and information foundation, which is also a big challenge for some traditional manufacturing enterprises. In general, China's mechanical engineering intelligent development has made remarkable progress, but still need to continue to work hard. In the future, with the progress of technology and the support of policies, China's mechanical engineering intelligence will usher in a better tomorrow.

III. The development direction of mechanical engineering intelligence

1. Intelligent production management

In the process of intelligent development of mechanical engineering, intelligent production management is an indispensable part. Intelligent production management aims to optimize the production process, improve production efficiency, reduce production costs and achieve sustainable development in the field of mechanical engineering through the introduction of advanced information technology. In essence, intelligent production management is the use of advanced technologies such as the Internet of Things, big data and artificial intelligence to effectively integrate all aspects of the production process and realize the automation, information and intelligence of the production process. Including intelligent production line, intelligent workshop, intelligent production plan, intelligent quality control and other aspects. Among them, the intelligent production line, through the industrial Internet and other technologies, to achieve the remote monitoring of each link of the production line, data sharing, collaborative work. This can improve production efficiency, reduce energy consumption and reduce labor costs. Workshop intelligence, through the introduction of intelligent manufacturing execution system (MES), to achieve real-time monitoring, scheduling, optimization and other functions of the workshop. MES can collect data from the production site, carry out data analysis, and provide decision support for production managers. Intelligent production planning, through the introduction of advanced planning and scheduling system (APS), according to historical data and market trends, intelligent prediction of future production demand, optimize production planning. This can effectively shorten the production cycle, improve the on-time delivery rate, to meet customer needs. Intelligent quality control, through the introduction of quality management system (QMS) and intelligent testing equipment, to achieve automatic quality detection and data analysis in the production process. This can effectively improve product quality, reduce the rate of defective products, reduce production costs. Through the introduction of advanced information technology, to achieve intelligent production line, intelligent workshop, intelligent production plan, intelligent quality control and other goals, can effectively improve production efficiency, reduce production costs, improve product quality, and promote the sustainable development of mechanical engineering field.

2. Automation of the production process

With the rapid development of science and technology, the field of mechanical engineering is also constantly innovating and progressing. Among them, the automation of production process is one of the important directions of the intelligent development of mechanical engineering. It can not only improve production efficiency, reduce production costs, but also improve product quality and safety. The so-called automation of the production process refers to the intelligent, remote and autonomous control of the production process through computer technology, sensor technology, automatic control technology and other means. In this way, the machine can complete some repetitive work independently, while the human can engage in more intelligent and creative work. At present, some advanced mechanical engineering enterprises have made some important achievements in the automation of production process. For example, some intelligent production lines have been able to realize automated production, testing and packaging, etc., effectively improving production efficiency; Some robots have been able to replace humans in some high-intensity and high-risk work, reducing the labor intensity and safety risks of workers. While bringing a lot of convenience to people's production activities, the automation of the production process also puts forward more requirements to people, and its realization needs many aspects of technical support. Among them, computer technology is the core, it can realize the data collection, transmission, processing and control functions; Sensor technology can realize the perception and feedback of the machine to the surrounding environment, so that the machine can make corresponding adjustments according to environmental changes; Automatic control technology can realize the remote control of the machine and autonomous control and other functions. With the production process automation has become an important direction of the intelligent development of mechanical engineering, people should pay more attention to the continuous progress and innovation of technology, so that the machine will better serve human beings and help people realize more intelligent and efficient production.

3. Intelligent production equipment

Through the introduction of intelligent technology, enterprises can greatly improve production efficiency, reduce production costs, improve product quality, and reduce the impact on the environment. Today, with the development of intelligent mechanical engineering, intelligent production equipment has become an important trend in the industry, and its application in mechanical engineering is gradually extensive. On the production line, intelligent robots and automation equipment can complete high-precision, high-strength and high-risk work, which not only reduces labor costs, but also solves the error problem in human operation and improves the quality control in the production process. In the product testing link, intelligent testing equipment can quickly and accurately detect product defects to ensure that the quality of the product meets the standard. Intelligent production equipment also has excellent real-time monitoring and early warning capabilities. Through the built-in sensor and data analysis technology, intelligent equipment can not only monitor its own operating status in real time, preventive maintenance, reduce the equipment failure rate, but also can real-time monitoring and analysis of production data, help enterprises find problems in the production process in time, quickly make adjustments, optimize the production process. Intelligent

production equipment also provides enterprises with a more efficient production management method. For example, through the Internet of Things technology and big data analysis, enterprises can know the running status of the production line in real time, and realize transparent management of the production process. Through cloud computing and artificial intelligence technology, enterprises can achieve remote monitoring and management, and improve decision-making efficiency. In terms of environmental protection, intelligent equipment also has significant advantages. Through intelligent energy management, enterprises can effectively reduce energy consumption and reduce carbon emissions. Through the intelligent waste treatment system, enterprises can realize the classification, recycling and reuse of waste to achieve sustainable development.

4. Intelligent fault detection

As an important part of mechanical engineering intelligence, intelligent fault detection not only improves the operating efficiency of mechanical equipment, but also provides a strong support for the failure prediction and prevention of equipment. It is a comprehensive solution integrating advanced technologies such as artificial intelligence, big data and machine learning, which can detect potential faults in advance through real-time monitoring of the running status of mechanical equipment, so as to avoid the shutdown or failure of equipment in the production process, and promote the further improvement of production efficiency and product quality. Compared with the traditional detection methods, the fault detection intelligence has higher accuracy and reliability, it can not only identify a variety of complex mechanical failures, but also provide more accurate suggestions for the maintenance and maintenance of equipment. Moreover, the implementation of intelligent fault detection also greatly reduces the degree of manual participation, and reduces the uncertainty and error caused by human factors. In the process of realizing the intelligent mechanical engineering, we should pay attention to the intelligent fault detection, and do the following points. First of all, to ensure the accuracy and real-time detection data. This requires enterprises to adopt efficient sensor and data processing technology in order to quickly and accurately obtain data on the operating status of equipment. Secondly, it is necessary to pay attention to the optimization and improvement of artificial intelligence algorithms, and constantly improve the accuracy of fault identification and prediction through the analysis and learning of a large amount of data. Finally, a perfect network security guarantee system should be established to ensure the stability and security of the intelligent fault detection system and prevent risks such as hacker attacks and data leaks. Grasping the above aspects helps to improve the operation efficiency and reliability of mechanical equipment, reduce production costs and risks, and inject new impetus into the sustainable development of mechanical engineering industry.

Epilogue

In general, mechanical engineering intelligence not only improves production efficiency, but also improves product quality, reduces energy consumption and ensures production safety. Therefore, technical personnel must realize the importance of mechanical engineering intelligence, and constantly promote its application and development in the field of industrial manufacturing. Specific to the daily work practice, technical personnel should be based on the actual production to promote intelligent production management, automation of the production process, intelligent production equipment, intelligent fault detection, and promote the innovation and development of machinery manufacturing enterprises.

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