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Analysis on the Development Trend of Mechanical Design and Manufacturing and its Automation Technology under the Background of Intelligent Manufacturing

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Abstract: With the rapid development of intelligent manufacturing, mechanical design and manufacturing and its automation technology are facing new opportunities and challenges. This paper starts from the advantages of mechanical design and manufacturing and automation technology, on this basis, discusses the development under the background of intelligent manufacturing machinery design and automation technology strategy and trend, including improve the independent innovation ability, improve the management and supervision system, strengthen the talent training and introduction and promote the sustainable development, etc. Research shows that the development of mechanical design and manufacturing and its automation technology will provide strong support for the promotion of intelligent manufacturing, and promote the development of manufacturing to a higher level and higher quality.

Keywords: Intelligent manufacturing; Mechanical design and manufacture; Automation technology; Development trend

Introduction

Driven by the new round of global scientific and technological revolution and industrial transformation, intelligent manufacturing has become an important direction of the development of manufacturing industry. As an important part of the manufacturing industry, mechanical design and manufacturing and its automation technology are undergoing profound changes. Under the background of intelligent manufacturing, mechanical design and manufacturing and its automation technology are facing great development opportunities, but also facing many challenges. This paper aims to explore the advantages of mechanical design and manufacturing and its automation technology, analyze its development strategy and trend under the background of intelligent manufacturing, and provide reference for promoting the innovative development of mechanical design and manufacturing and its automation technology.

1. The advantages of mechanical design and manufacturing and its automation technology

1.1 Improve production efficiency and quality

The application of mechanical design and manufacturing and its automation technology greatly improves the production efficiency and product quality. By introducing advanced computer-aided design, computer-aided manufacturing and other technologies, the design process becomes more accurate and efficient. The application of 3 D modeling and simulation technology enables the product to be virtually tested and optimized before it is put into production, greatly reducing the cost of trial and error and time. In the manufacturing link, the extensive use of CNC machine tools, industrial robots and other automation equipment, not only improve the processing accuracy, but also to achieve continuous and uninterrupted production, significantly improve the production efficiency.

In addition, the introduction of automated production lines makes the product quality more stable, effectively reducing the quality fluctuations caused by human factors. In terms of quality control, the application of automatic detection and online detection technology enables the product quality to monitor the whole process. By collecting and analyzing the production data, the problems in the production process can be found and solved in time to ensure that the product quality is always in the best condition.

1.2 Reduce labor intensity and cost

The application of mechanical design and manufacturing and its automation technology has greatly reduced the labor intensity of workers. Many repetitive, dangerous, and intense work has been replaced by automated equipment, and workers can be freed from heavy manual labor to pursue higher-level operations and management. This not only improves the working environment, improves workers' job satisfaction, but also helps to attract and retain high-quality talent.

From a cost perspective, although the initial investment of automation equipment is large, the benefits are significant in the long term. Automated production line can achieve 24 hours of uninterrupted operation, greatly improving the utilization rate of equipment. At the same time, due to the reduction of manual operation links, the waste of raw materials and defective rate in the production process has been effectively controlled. In addition, the application of automation technology also reduces energy consumption and further reduces production costs. With the continuous progress of technology and the emergence of scale effect, the cost of automation equipment is also gradually reduced, so that more small and medium-sized enterprises can afford advanced automation equipment, so as to improve the level of automation of the whole industry.

1.3 Promote data sharing and information management

An important advantage of mechanical design, manufacturing and its automation technology is that it promotes data sharing and information management. Through the establishment of a unified data platform, the data generated by the design, manufacturing, quality inspection and other links can be seamlessly connected and shared. This data exchange not only improves the efficiency of information transmission, but also provides a more comprehensive and accurate basis for decision-making. The application of product life cycle management system enables the unified management of the whole process data from product concept design to scrap recovery. This not only facilitates the traceability of product quality issues, but also provides valuable data support for product optimization and innovation.

In addition, the integration of enterprise resource planning system and manufacturing execution system realizes the information management of the whole process from order to production plan, from material management to finished product warehousing. Greatly improve the operation efficiency of enterprises, reduce management costs, and enhance the market responsiveness of enterprises.

2. Development strategies and trends of mechanical design and manufacturing and its automation technology under the background of intelligent manufacturing

2.1 Enhance the capacity for independent innovation

In the background of intelligent manufacturing, improving the ability of independent innovation is the core strategy of mechanical design and manufacturing and its automation technology development. This requires enterprises to increase investment in research and development, and establish a sound technological innovation system. First of all, we should pay close attention to the development of emerging technologies such as artificial intelligence, big data and the Internet of Things, and explore their application potential in the field of mechanical design and manufacturing[1]. For example, artificial intelligence technology is used to optimize product design, big data analysis is used to improve the accuracy of production decisions, and the Internet of Things technology is used to achieve device interconnection and remote monitoring. Secondly, in high-end CNC machine tools, precision instruments, intelligent sensors and other fields, there are still many "neck" technology. Enterprises should concentrate on overcoming these technical problems, reduce their dependence on imported technologies, and improve the independent and controllable ability of the industrial chain.

2.2 Improve the management and supervision system

In the background of intelligent manufacturing, improving the management and supervision system is crucial for the development of mechanical design and manufacturing and its automation technology. First, establish and improve a sound quality management system. Using big data analysis technology, establish product quality early warning mechanism to realize the preventive management of quality problems[2]. At the same time, strengthen the supply chain quality management, to ensure the quality stability of raw materials and parts. Secondly, optimize the production management process. The intelligent manufacturing execution system is used to realize the real-time monitoring and optimal scheduling of the production process. Through digital, network and intelligent means, improve the fine level of production management, and realize the efficient allocation of production resources.

In addition, the equipment health management system should be introduced to realize the real-time monitoring and predictive maintenance of the equipment status. By analyzing the equipment operation data, find out the potential faults in time, reduce the equipment failure rate, and improve the equipment utilization rate. Finally, strengthen information security management. With the improvement of digitalization and networking degree, information security is becoming more and more important. To establish a sound information security management system, the use of advanced network security technology, to protect the core technology data and production and operation data of enterprises.

2.3 Promoting sustainable development

Under the background of intelligent manufacturing, the development of mechanical design and manufacturing and its automation technology must take into account economic benefits and environmental protection to achieve sustainable development. First of all, in the product design stage, consider environmental factors, choose environmental protection materials, optimize the product structure, improve energy efficiency, extend the service life of products, and facilitate recycling. Use the life cycle evaluation tool to quantify the environmental impact of

the whole product life cycle and guide the product optimization design. Second, develop cleaner production technology. Adopt the advanced clean production process to reduce the pollutant emission in the production process. We will promote the use of energy-saving equipment and improve energy efficiency. Establish a resource recycling system to minimize the generation of waste and realize the efficient utilization of resources.

We will promote intelligent transformation. Through intelligent transformation, the precise control ability of the production process can be improved, and the raw material waste and energy consumption can be reduced. Using big data analysis and artificial intelligence technology, to optimize the production process parameters, reduce energy consumption and material consumption[4]. Finally, strengthen the full life cycle management. Establish the product life cycle management system to realize the whole process management from raw material procurement to product scrapping and recycling. Especially in the product use and scrap stage, through remote monitoring and intelligent diagnosis technology, to extend the service life of the equipment, improve the maintenance efficiency, and reduce the waste of resources.

3. Tag

In the background of intelligent manufacturing, mechanical design and manufacturing and its automation technology are facing unprecedented opportunities for development. By improving the ability of independent innovation, improving the management and supervision system, strengthening the training and introduction of talents, and promoting the sustainable development, mechanical design and manufacturing and its automation technology will certainly play a more important role in intelligent manufacturing. In the future, with the deep integration of the new generation of information technology and advanced manufacturing technology, mechanical design and manufacturing and its automation technology will continue to make breakthroughs and innovations, promote the development of manufacturing industry to a direction of higher quality, more efficient and greener, and make important contributions to the realization of the strategic goal of becoming a manufacturing power.

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