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Mechanical Design and Manufacturing and Automation Equipment Management Based on the Internet of Things

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Abstract: With the advent of the industry 4.0 era, the application of the Internet of Things technology in mechanical design and manufacturing and automation equipment management is increasingly extensive. This paper first summarizes the application status of the Internet of Things in this field, and puts forward the optimization strategy of mechanical equipment management based on the Internet of Things, including the construction of data integration and sharing platform, security protection system construction, talent training and team building, as well as standardization and standardization promotion. Through the implementation of these strategies, it is expected to significantly improve the efficiency and quality of mechanical design and manufacturing and its automation equipment management, and promote the development of the industry to the direction of intelligent and network.

Keywords: Internet of Things; Mechanical design and manufacturing; Automation equipment management; Intelligent

Introduction

In the context of industry 4.0 and intelligent manufacturing, the Internet of Things technology is profoundly changing the way of mechanical design and manufacturing and automation equipment management. Through the combination of various information sensing devices with the Internet, the Internet of Things has realized the extensive interconnection of people, machines and things, and provided new ideas and methods for the whole life cycle management of mechanical equipment. This paper aims to explore the application status, challenges and optimization strategies of Internet of Things technology in mechanical design and manufacturing and automation equipment management, so as to provide reference and suggestions for the development of related fields.

1. Related overview of the Internet of Things in mechanical design and manufacturing and its automation equipment management

The Internet of Things refers to a huge network formed by collecting information in real time that needs to be monitored, connected or interacted with through various information sensing devices. In the field of mechanical design and manufacturing and automation equipment management, the application of Internet of things technology is mainly reflected in the equipment monitoring, through a installation of sensors on mechanical equipment, can real-time acquisition equipment running status, working parameters of data, and through the network transmission to the control center, remote monitoring and management of equipment. This not only improves the efficiency of equipment management, but also provides data support for predictive maintenance. In terms of the production process optimization, the Internet of Things technology can realize the data collection and analysis of each link on the production line, and help the managers to find the bottlenecks and problems in the production process, so as to optimize the production process and improve the production efficiency. In terms of supply chain management, the Internet of Things technology can realize the whole-process tracking of raw materials, semi-finished products and finished products, improve the accuracy and efficiency of inventory management, and reduce the supply chain costs.

2. Analysis of mechanical design and manufacturing and automation equipment management status

2.1 Limitations of the traditional equipment management mode

The traditional mechanical equipment management mode mainly relies on manual operation and paper record, which shows many deficiencies in the current rapidly developing industrial environment. First of all, there is an obvious lag in information acquisition, and the status of equipment often needs to be found after regular inspection or failure, which seriously affects the timeliness and effectiveness of equipment management. Secondly, the data of each link is often stored in different systems, and the lack of effective integration and sharing mechanism

leads to the value of data cannot be fully played, forming an information island. Due to the lack of real-time and comprehensive data support, it is difficult to achieve predictive maintenance of equipment, which is easy to cause unplanned shutdown or excessive maintenance of equipment, which increases the maintenance cost. Finally, the traditional model lacks the ability of in-depth analysis of massive data, which is difficult to provide powerful data support for management decisions, which limits the intelligent development of enterprises.

2.2 Improvement of the status quo after the introduction of the Internet of Things technology

With the introduction of the Internet of Things technology, mechanical design and manufacturing and its automation equipment management have been significantly improved in many aspects. First of all, by installing various sensors on the equipment, the operating status, working parameters and other data can be collected in real time, so as to realize the all-weather and all-round monitoring of the equipment, greatly improving the real-time and accuracy of the equipment management. Secondly, the Internet of Things platform can centrally store and manage the data scattered in various links, laying a solid foundation for the in-depth data analysis and value mining. Based on big data analysis and machine learning algorithms, managers can predict the future status of the equipment, realize predictive maintenance, and effectively reduce the equipment failure rate and maintenance costs. Finally, the Internet of Things platform can conduct in-depth analysis of massive data, providing strong data support for management decisions, and greatly improving the scientific nature and accuracy of decision-making.

3. Optimization strategy for mechanical design and manufacturing and automation equipment management based on the Internet of Things

3.1 Data integration and sharing platform construction

In order to give full play to the advantages of the Internet of Things technology, it is very important to establish a unified data integration and sharing platform. First, unified data collection standards should be formulated to ensure the same data formats from different devices and different links, so as to lay the foundation for subsequent integration and analysis[1]. Secondly, establish a centralized data storage system, such as data lake or data warehouse, to realize the unified management and rapid access of data, and break the information island.

In addition, a data sharing mechanism should be established, and data access rights and sharing rules should be formulated to promote the circulation and utilization of data in different departments and different systems and maximize the value of data. Finally, an intuitive and easy-to-use data visualization interface is developed to help managers quickly understand and use the data analysis results and improve decision-making efficiency. Through these measures, a comprehensive and efficient data ecosystem can be built to provide strong data support for mechanical design and manufacturing and its automation equipment management.

3.2 Talent training and team building

In order to cope with the talent demand brought by the application of the Internet of Things technology, it is imperative to strengthen talent training and team building. First of all, we should establish a close cooperative relationship with colleges and universities, jointly develop training programs, and directional cultivate compound talents with dual knowledge background of mechanical design and manufacturing and Internet of Things technology, so as to reserve talents needed for the future development of enterprises[3]. Secondly, a systematic Internet of Things technology training should be conducted for existing employees to improve their technical level and application ability, and realize the internal training and transformation of talents. Establish a cross-departmental project team, promote the cooperation and communication of talents from different backgrounds such as machinery, electronics and software, and cultivate the overall cooperation ability of the team.

In addition, experts in the field of the Internet of Things are hired as consultants to provide technical guidance and training for enterprises to help them quickly grasp the latest technologies and application trends. Finally, an innovation reward system should be set up to encourage employees to innovate and improve in the application of Internet of Things technology and create a positive atmosphere for innovation. Through these measures, a high-quality and interdisciplinary professional team can be built to provide talent guarantee for the in-depth application of Internet of Things technology in mechanical design and manufacturing and automation equipment management.

3.3 Promote standardization and standardization

In order to promote the wide application of Internet of Things technology in mechanical design and manufacturing and automation equipment management, it is very important to promote standardization and standardization[4]. First of all, enterprises should actively participate in the formulation of industry standards and national standards, contribute their own experience, promote the standardization process of the application of iot technology, and contribute to the development of the industry. Secondly, according to the actual situation of the enterprise, the internal application specifications and processes of the Internet of Things are formulated to guide the application of technology and ensure the consistency and controllability of technology application.

In addition, a scientific evaluation system for the application effect of the Internet of Things technology should be established to evaluate the effectiveness of the technology application from multiple dimensions such as technology, economy and management, so as to provide a

basis for continuous improvement. Finally, according to the actual application situation and technology development trend, the standards and norms are constantly optimized and improved to ensure that the technology development and actual needs, to maintain the competitive advantage of the enterprise in the industry. Through these measures, a perfect standardization and standardization system can be built to provide a guarantee for the healthy and orderly development of the Internet of Things technology in the mechanical design and manufacturing and the management of automation equipment.

4. Tag

The application of Internet of Things technology in mechanical design and manufacturing and automation equipment management is promoting the rapid development of the industry to the direction of intelligence and network. By establishing a data integration and sharing platform, building a security protection system, strengthening talent training and team building, and promoting standardization and standardization work, we can effectively deal with the current challenges and give full play to the advantages of the Internet of Things technology. In the future, with the continuous development of 5G, artificial intelligence and other emerging technologies, the application of the Internet of Things in the field of mechanical equipment management will be more extensive and in-depth, injecting new impetus into the innovation and development of the industry. As a new generation of engineering and technical talents, they should actively learn and master the relevant technologies, and contribute to promoting the development of the industry.

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