HiLL PUBLISHING

Mechanical Engineering and Manufacturing Technology, 2024, 1(1), 5-9
https://www.hillpublisher.com/Journals/memt/
ISSN Online:
ISSN Print:

Discussion on Application of Automation Technology in Mechanical Design and Manufacturing

Bing Feng, Jinshuang Dou, Yijia Song

Qingdao Victall Railway Co., Ltd., Qingdao 266108, Shandong, China.

How to cite this paper: Bing Feng, Jinshuang Dou, Yijia Song. (2024). Discussion on Application of Automation Technology in Mechanical Design and Manufacturing. *Mechanical Engineering and Manufacturing Technology*, 1(1), 5-9.
DOI: 10.26855/memt.2024.12.002

Received: October 16, 2024
Accepted: November 6, 2024
Published: November 28, 2024

***Corresponding author:** Bing Feng, Qingdao Victall Railway Co., Ltd., Qingdao 266108, Shandong, China.

Abstract

Over the past decade, countries around the world have become increasingly connected economically and culturally. In this context, mechanical design and manufacturing standards have changed accordingly. At present, China's mechanical design and manufacturing field is in the process of transformation from lower efficiency to higher efficiency. Therefore, automation technology has been widely used and achieved the expected results. However, considering that automatic machinery manufacturing often involves different professional technology and content, and has a relatively complex production process, so in the process of practical application of automation technology is still facing big problems. The author in the field of the mechanical design and manufacturing in China the present situation of the development of a comprehensive elaboration, and analyzes the application situation of the production process automation technology and the summary to the problems, based on the established effective strategies for promote automation machinery manufacturing, which could serve as the similar research and mechanical design and manufacturing automation practice of reference.

Keywords

Automation technology; Mechanical design and manufacturing; Application

Introduction

At this stage, China's economy and society are developing rapidly, which has greatly promoted the development and application of science and technology. Nowadays, computer technology is more widely used in both industrial production and people's daily life. As for mechanical design and manufacturing, only by constantly innovating production technology and introducing automation technology can industrial production capacity be further improved to meet the actual needs of China's social and economic development. By analyzing relevant research data, it can be seen that mechanical design and manufacturing technology plays an irreplaceable role in the industrial production process. By effectively introducing automation technology, production enterprises do not need to invest a lot of human resources, and at the same time greatly reduce the amount of manual work, thereby achieving higher quality and efficiency of industrial production. This requires relevant production enterprises to comprehensively study automation technology to ensure that it can be effectively applied in the process of mechanical design and manufacturing.

1. The significance of applying automation technology in mechanical design and manufacturing

(1) With the rational application of automation technology, the application utility of mechanical manufacturing technology will be further improved. In recent years, China has actively implemented and implemented an open-

Note: The article was originally published in the *Journal of Electrical Engineering and Automation*, and this is an authorized translation of it.

door policy. In this context, manufacturing enterprises are also facing greater market pressure. If they want to gain greater economic benefits and a larger market share, manufacturing enterprises should rationally apply automation technology to the mechanical design and manufacturing process to achieve more efficient mechanical manufacturing production. With the rational application of automation technology, relevant manufacturing enterprises can significantly reduce labor costs, and by setting specific production procedures, they can realize the entire process of mechanical manufacturing. Therefore, if manufacturing enterprises can avoid operational failures of mechanical facilities, they can achieve automated industrial production operations with higher quality and efficiency than traditional mechanical manufacturing.

(2) Through the rational application of automation technology, the manufacturing costs and labor input of mechanical design and manufacturing will be significantly reduced, which will further enhance the economic interests of production enterprises. Under the premise of adopting traditional mechanical design, industrial production is basically carried out manually, and a large amount of human resource costs are often incurred in this process. At the same time, considering that the efficiency of traditional mechanical design operations is generally low, its design and manufacturing costs will also increase accordingly. With the application of automation technology, mechanical design and manufacturing operations do not require a large investment in human resources, and the efficiency of mechanical design has also been significantly improved, which can help production companies obtain greater economic benefits, thereby providing benefits to production companies. Provide effective guarantee for further development.

(3) Based on the rational application of automation technology, the quality and efficiency of mechanical design and manufacturing can be greatly improved. Under normal circumstances, the final industrial product is an important indicator for measuring mechanical design and manufacturing, and is also closely related to whether the manufacturing company can obtain corresponding economic benefits. Relevant research data show that the rational application of automation technology can help staff control the production process and effectively improve the accuracy of product production, thereby ensuring that the products produced can meet relevant industrial production standards and quality requirements. At the same time, through the rational application of automation technology, staff should also centrally manage different mechanical facilities so that different mechanical facilities can play their due application value. In addition, it can also provide guarantees for the maintenance and maintenance of mechanical facilities.

2. Application characteristics of automation technology in mechanical design and manufacturing

2.1 Extensiveness

For the production of industrial products, the basis of its production line is various mechanical facilities. Moreover, most mechanical facilities can be applied to different industrial production fields, playing a positive role in China's social and economic development. This also means that automation technology can be applied to most industrial production processes. On the basis of combining automation technology with mechanical design and manufacturing, more efficient and accurate product design and manufacturing can be achieved. In addition, thanks to the further innovation and application of information technology, the quality and stability of mechanical automation design and manufacturing have also been further improved, so that safer industrial production can be achieved, and ultimately provide guarantees for the stable development of the industry and the economy.

2.2 Energy saving

In the past period of time, China's society and economy have been developing continuously, which has promoted the progress of the industrial field. However, through the analysis of relevant research data, it can be seen that there are still major problems in industrial production at this stage. Among them, there are aspects such as pollution and destruction of the natural environment. If you want to provide guarantees for the long-term development of industrial production, local governments and production enterprises should attach great importance to ecological protection and reduce resource consumption in industrial production. In the case of reasonable application of automation technology, it can reduce energy consumption and reduce the pollution of the natural environment by industrial production. For industrial production enterprises, after the reasonable introduction of automation technology, it can also achieve higher quality and accuracy of product production. At the same time, industrial production efficiency can be further improved, and it will help to achieve higher quality cost control. In addition, by configuring automation facilities,

relevant production enterprises can also achieve the goal of large-scale production, thereby further controlling production costs.

2.3 Security

Under the manual production mode, not only is the industrial production efficiency low, but the accuracy of industrial products is also low. With the introduction of automation technology, the quality and efficiency of mechanical design and manufacturing can be further improved, and the probability of safety hazards in the industrial production process can be effectively controlled. On the one hand, it can provide guarantees for the stable operation of mechanical facilities, and on the other hand, it can reduce the workload of staff and avoid threats to their personal and property safety. In addition, with automated mechanical facilities, industrial production companies can also carry out continuous production and eliminate problems such as production interruptions or shutdowns.

3. Application of automation technology and mechanical design and manufacturing

3.1 Technology integration

After introducing automation technology in the process of mechanical design and manufacturing, it can not only improve the quality and efficiency of industrial production, but also provide guarantee for the stable operation of mechanical facilities, and also help the staff to carry out the maintenance and maintenance of mechanical facilities. The detection work of mechanical facilities mainly includes the operation time and stability of the detection facilities. In the case of operating failures or safety risks in mechanical facilities, the staff should analyze the problems and formulate corresponding repair plans based on them to achieve stable and safe operation of mechanical facilities. Through the reasonable application of automation technology, relevant staff can also fully obtain the operation data of mechanical facilities, and realize data storage and processing, which can serve as a guide for the later detection of mechanical facilities. At this stage, thanks to the further optimization and application of automation technology and facilities, mechanical facilities have smaller size and lower energy consumption. On the one hand, it can improve the convenience of facility use and be applied to more industrial production processes. On the other hand, it can also effectively avoid industrial pollution and provide assistance for natural environment protection.

3.2 Integrated application

At this stage, advanced technologies including automation technology and computer technology have been widely used in the process of mechanical design and manufacturing. On the one hand, industrial production efficiency has been further improved, and on the other hand, it also meets the needs of economic and social development. Through the reasonable application of automation technology, various production technologies in the industrial production process can be effectively integrated. In addition, it can also be applied to various production factors and production enterprise business activities. Integration, ultimately further improve the quality and efficiency of industrial production.

3.3 CNC application

On the basis of reasonable application of CNC technology, manufacturing enterprises can control mechanical facilities more accurately. By analyzing industrial production practices, it can be seen that CNC technology is different from traditional mechanical manufacturing technology, and it is mainly manifested in the following aspects: (1) Through the reasonable application of CNC technology, CNC machine tools can be more effectively controlled, so that their accuracy can be further improved. At this stage, it has been well applied in the production process of complex parts. (2) Production deviations should be controlled to a minimum, and it is helpful to achieve high-quality human resource cost control. (3) Considering that CNC technology often has a strong repetitive characteristic, it can also further improve the quality of industrial production. (4) More efficient CNC machine tool tool changing operations should be achieved, thereby shortening the production cycle and reducing the proportion of manual operations, and ultimately achieving more efficient industrial production.

3.4 Virtualization application

At present, if we want to continuously promote the development of mechanical design and manufacturing, relevant manufacturing enterprises should further innovate automation technology and ensure that it can be effectively

implemented and applied in the actual industrial production process. At the same time, the existing industrial production process should be improved, and sufficient financial support should be guaranteed for technology research and development and industrial production. In addition, industrial virtualization technology should be actively introduced. On the one hand, it can effectively control the cost of automation technology development, and on the other hand, it can evaluate various problems that may arise in the actual production process through simulation and modeling. In the case of production problems, designers can effectively eliminate related problems based on simulation experiments, and ultimately ensure that manufacturing enterprises obtain greater economic benefits and continuously improve their market competitiveness [1].

4. Development prospects of automation technology in mechanical design and manufacturing

4.1 Green development

In the past period, China's society and economy have achieved rapid development. However, there are also certain problems in the development process. Considering that China's current production model has major flaws, it not only leads to a decrease in resource utilization, but also causes damage to the natural environment. And this problem is even more pronounced in the manufacturing industry. Especially at the current stage, the noise and dust pollution caused by industrial production have hindered environmental protection work, and also caused great harm to people's lives and health [2]. The Chinese government has now formulated a strategy aimed at promoting sustainable economic development, which also includes the sustainable development of machinery design and manufacturing, so that industrial production can meet the development needs of the times. By implementing the above strategies, relevant production companies can greatly improve the quality and efficiency of mechanical design and manufacturing, while ensuring the effective use of various resources. Based on this, they can avoid industrial production from damaging the ecosystem and lay the foundation for the development of China's environmental protection industry [3].

4.2 Diversity development

By analyzing China's current industries, we can see that most industries often involve many disciplines and professional knowledge, showing a significant cross -disciplinary phenomenon. In this case, the industrial production process requires the support of different knowledge systems. The intersection of disciplines contributes to the emergence of new science and promotes the progress and development of cutting-edge science. In addition, interdisciplinary research can also help researchers conduct in-depth research on major and complex social and economic issues. For mechanical design and manufacturing, the disciplines involved no longer only include mechanical structure and other aspects, but are developing in the direction of mechatronics. In this way, production accuracy can be maximized. At this stage, the Chinese government has introduced relevant policies aimed at further integrating the manufacturing industry and the Internet of Things. Various manufacturing companies further control every aspect of industrial production through the introduction of automation and digital technologies to achieve management goals such as intelligent decision-making and dynamic supervision.

5. Conclusion

From the above analysis, we can see that at this stage, both local governments and industrial production enterprises are actively exploring effective ways to control production and human resource costs and achieve more efficient industrial production. In this context, automation technology is gradually being introduced into mechanical design and manufacturing. On the one hand, it greatly improves the level of industrial production and meets the needs of market and economic development. On the other hand, it can also reduce the human resource cost investment of production enterprises and improve the accuracy of industrial product production. In addition, it can also achieve the stable operation of mechanical facilities to the greatest extent, providing effective protection for the personal and property safety of workers.

References

[1] Fan Xinyu. Analysis on the application of automation technology in mechanical design and manufacturing[J]. Science and Technology Outlook, 2016, 26(22):63.

[2] Liu Jianjun. Application of computer technology in mechanical design, manufacturing and automation[J]. Times Agricultural Machinery, 2017(7):22.

[3] Lin Lei. Exploring the application of automation technology in mechanical design and manufacturing--Review of "Mechanical Design"[J]. Electroplating & Finishing, 2020, 42(1):1.