Analysis of Application of Numerical Control Technology in Mechanical Manufacturing

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Abstract. The continuous development of modern information technology has made numerical control technology widely used in mechanical manufacturing. The degree of mechanization of human society has also begun to gradually increase, and mechanical equipment can be seen in almost all social production activities. Numerical control technology is an effective technology in the machining process. Judging from the actual development of China’s machinery manufacturing industry, the application of numerical control technology has greatly improved the integration and automation of machining. Starting from the current development of CNC machining technology in our country, this paper specifically analyzes the application of Numerical control technology in the machinery manufacturing industry, and prospects the future development trend of CNC machine tools in this technology.

Keywords: Machine Manufacturing, Numerical Control Technology, Applied Analysis

Introduction
Numerical control technology is an engineering construction technology that integrates modern technologies such as computer technology, sensor technology, communication technology, and control technology. It can realize the processing of some high-precision and complex parts, thereby helping to effectively improve the production efficiency of the enterprise. In recent years, with the continuous development of my country's manufacturing and processing industries, data has begun to be used in my country's manufacturing and processing industries, and to a large extent helped to improve the overall level of China’s mechanical processing. However, compared with developed countries, China’s numerical control technology still has many shortcomings, and there is still much room for improvement in the future.

1. The Current Development of China’s Numerical Control Technology

1.1 The Application Rate of Numerical Control Technology is not High
Judging from the application situation of China’s current data (as shown in the figure 1), compared with developed countries, the rate of CNC lathes in China is still relatively low, which is also a key factor restricting the development of China’s manufacturing industry. With the continuous
Advancement of reform and opening up, some companies have begun to implement a policy of opening CNC products to the outside world, but from the actual development, many companies have not done enough to open up CNC products. Although some CNC products already have open functions, most of them are still in a semi-open state, which is not conducive to the increase in the application rate of Numerical control technology and the progress and development of China’s manufacturing industry [1].

Fig. 1 Domestic production rate of CNC machine tools

1.2 The Stable Performance of the CNC System Needs to be Strengthened
In recent years, with the continuous increase of CNC machining equipment in China, the overall quality of Chinese machining has been greatly improved. But at the same time, China’s machinery processing industry has also put forward new requirements for numerical control technology. Judging from the current actual application of CNC, the overall work efficiency of China’s CNC is still relatively low, which affects the production efficiency of enterprises to a large extent [2]. In addition, compared with developed countries, the stability of China’s current CNC system is still not high, and there is still much room for improvement in the future.

2. Lack of Innovation
Numerical control technology has a history of more than 40 years in China, and with the continuous advancement of China’s reform and opening policy, advanced foreign technologies have begun to be introduced into China. This has greatly promoted the development of China’s numerical control technology. However, judging from the overall situation of numerical control technology, due to the relatively short application time of numerical control technology in China, there are still many shortcomings exposed in the actual application of numerical control technology. And with the continuous progress of modern society, China’s numerical control technology must continue to innovate to better adapt to the development of modern society.
3. Application of Numerical Control Technology in Machinery Manufacturing

3.1 Application in Industrial Production
The progress of modern society is that numerical control technology has begun to mature. Specifically, numerical control technology mainly plays three aspects in industrial production: drive, control and execution. The coordination of these three aspects can ensure the smooth development of the whole process. At the same time, it can also effectively reduce the physical injury of employees caused by the operation of the machinery, ensure the personal and property safety of employees to the greatest extent, and comprehensively improve the overall level of machinery manufacturing on this basis [3].

3.2 Application in Aviation Production
The continuous advancement of economic globalization has gradually strengthened economic and trade exchanges between countries. Although there is still a certain gap between China and developed countries, it is undeniable that China's aviation industry has begun to receive extensive attention from countries around the world in recent years. In this context, the development of numerical control technology is particularly important. Therefore, relevant technical personnel must continuously learn to improve their professional qualities, and be familiar with relevant processing techniques and processing points of special materials. Only in this way can it provide strong technical support for the development of the aviation industry and comprehensively increase the speed of the development of China’s aviation industry.

3.3 Application in the Automotive Industry
With the improvement of people's living standards, the demand for automobiles in China has begun to increase sharply, and users’ requirements for automobile performance have become more specific. Many car owners not only pay attention to the speed of the car when choosing a car, but also pay attention to the environmental performance and practical performance of the car. The application of Numerical control technology in the automobile industry can greatly improve the efficiency and quality of the production of various parts, and can also effectively realize the manufacture of complex automobile parts and other precision parts. In this way, the quality of the car will be improved in an all-round way, and the requirements of car owners can be met to the greatest extent [4].

4. The Future Development Trend of Numerical Control Technology

4.1 Intelligent, Open and Networked
The continuous development of computer technology allows machine tool manufacturers to use network communication technology to establish a remote machine tool technical support system. It can identify general objects through various related algorithms and automatically generate corresponding processing parameters. In this way, the network can be used to realize data sharing, data transmission, transmission of working condition information between various workshops, as well as storage, query and display of working condition information, and remote intelligent diagnosis. In addition, users can also obtain remote data support provided by the machine tool manufacturer in a timely manner on the basis of network connection, so as to realize the open network monitoring service of the full production cycle of the lathe. Such a number of after-sales service efficiency will greatly improve, but also help lathe manufacturers to optimize the quality of the lathe, and continuously improve the efficiency of lathe processing and the quality of lathe processing. So that intelligent and automated operation can become the future direction of the development of Numerical control technology [5].

4.2 High Precision and High Speed
The precision and cutting speed of CNC is the main part that determines production efficiency and shortens the production cycle. It is also a key element to improve product quality and enhance market
competitiveness. With the continuous development of the machinery manufacturing industry, market competition has become increasingly fierce. At the same time, the requirements of machinery manufacturing for product accuracy have gradually become strict. High precision and high speed have also become the main trends in the development of numerical control technology. From the perspective of the development of numbers, high-speed and high-precision performance is very prominent in the speed of the shaft, the speed of calculation, and the rate of tool change. Related research results also show that the production efficiency of CNC machining can be improved by changing the cutting texture, which can also effectively reduce the cutting temperature and ensure the normal operation of the number.

4.3 High Degree of Flexibility
The flexibility mentioned here refers to the ability of the numerical control equipment to adapt to the processing object and adjust itself according to the actual processing object. In the process of continuous development of the number, the number of processing objects is also constantly changing. Therefore, the number is gradually developing in the direction of system flexibility and unit flexibility. Specifically, the high flexibility of Numerical control technology is mainly manifested in the following three aspects: On the one hand, people have begun to innovate numerical control technology so that it can complete various processing links on a machine tool. In this way, the efficiency of machining will be greatly improved, and the process of CNC machining will naturally become highly flexible; On the other hand, relevant technical personnel began to use mold design to improve the functions of the lathe, so that the CNC system can better meet the needs of different users. In addition, with the continuous development of numerical control technology, group control systems have begun to be applied in the digital production process. It can adjust the material and information flow according to the actual production situation, so that the manufacturing process can better adapt to the actual production needs, and the flexible management of the entire manufacturing process can be realized.

4.4 Multi-axis Simultaneous Machining
Multi-axis simultaneous machining is compared to three-axis simultaneous machining, and there is also a five-axis simultaneous machining. Although five-axis linkage machining can also guarantee production efficiency and the quality of products, the unit price of five-axis linkage is generally higher, and the composition of the numerical control system is also relatively complex, so it cannot be applied on a large scale in the machining process \[6\]. Multi-axis linkage is modified on the basis of five-axis linkage. It not only greatly simplifies the structure of the composite spindle head, but also greatly reduces the cost of machining and manufacturing, so that the price gap between CNC systems is gradually narrowing. From the perspective of the development of China’s numerical control technology, multi-axis machining will become a major trend in the development of China's Numerical control technology \[7\].

5. Green and Environmentally-friendly
In recent years, with the continuous changes in the world economic situation, energy issues have begun to become a major problem that plagues the world's development. People have also begun to pay more attention to environmental protection issues and put forward better requirements for their own quality of life \[8\]. At the same time, CNC machining, as an important part of China's manufacturing process, has also begun to place energy conservation and environmental protection at the top of its development. In addition, the increasingly severe resource utilization situation and the emergence of various resource and environmental problems have also made green environmental protection begin to consider the development concept pursued by machinery manufacturing. Judging from the current implementation of the concept of green environmental protection, the improvement of the environmental performance of CNC can protect the environment to a large extent. And in the process of continuous development in the future, greening of cutting technology and green manufacturing will become the main trend of China’s digital development, and energy-saving and
environmentally friendly lathes will also occupy more markets[9].

Conclusion
All in all, the progress of modern society has made the position of numerical control technology in China’s machinery manufacturing gradually improved[10]. At the same time, the level of numerical control technology has also begun to continuously improve, which is of great help to the development of China’s machinery manufacturing industry. However, judging from the actual development of numerical control technology, there are still many areas that need improvement, because CNC machining technology represents a country’s industrial technology level. Therefore, in the future development process, we should closely integrate the development trend of the times and continuously accumulate experience in the process of exploration. In addition, we must take effective measures to help improve numerical control technology, and related industries should continue to increase investment.

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