

Research on Application of AMT in Modern Machinery

Zhao Xiangjie

Xi'an Aeronautical Polytechnic Institute, Shannxi, China

Keywords: AMT; modern machinery; application

Abstract: Modern machinery industry can provide machinery facilities and equipment in all fields, which is an important prerequisite for social development and economic progress. Now, the modern machinery industry has become the pillar industry, and it plays a very important role in the national economic construction. In the modern mechanical industry, in order to improve the performance and quality of modern mechanical facilities, it is necessary to apply advanced processing technology and manufacturing technology. Only by constantly researching and innovating China's advanced manufacturing technology (AMT), can we guarantee that the mechanical facilities and equipment can meet the needs of social development. Facing the market economy of global competition, the development of enterprises must rely on AMT. Only by achieving high quality, efficiency and low consumption, can Chinese manufacturing industry gain a foothold in the global competition. Chinese manufacturing industry must explore AMT, formulate practical implementation plans and use AMT to upgrade traditional manufacturing technology.

1. Introduction

In the 1990s, countries recognized the strategic status of AMT. Countries have agreed to measure a country's scientific and technological development by its manufacturing and manufacturing technologies. In the future market competition, any country has first occupied the AMT, who has grasped the initiative of the competition. So, many countries believe that the four pillars of science and technology in the 21st century are AMT, information science and technology, materials science and technology and biological science and technology. As the modern machinery industry has become one of the leading industries in China, AMT and technology have become an important index to measure a country's comprehensive strength.

Because of the late start, there is still a gap between China's manufacturing industry and the international advanced level. In order to meet the challenge of economic globalization, China must draw on the advanced international experience and combine with China's manufacturing industry, and then seek the development path of Chinese manufacturing enterprises in the 21st century.

According to Chinese third national industrial census, half of the country's more than 900 major industrial products use less than 60% of their capacity.

According to the survey of 770 major industries, 19.8 percent of them reached the international advanced standards and 41.5 percent reached the international general standards. Compared with second national industrial census, the first-grade rate increased by 3.5 percentage points and the first-grade rate by 16.0 percentage points. However, there is a certain gap between the product quality and the world's advanced level. According to Chinese third national industrial census, the capacity utilization rate of Chinese machinery industry is shown in Table 1.

Table 1 The capacity utilization rate of Chinese machinery industry

Machinery industry	Capacity utilization	Machinery industry	Capacity utilization
Mechanical	51.86%	Large and medium-sized tractors	60.6%
Electronic	54.45%	Small tractor	65.9%
Chemical	54.9%	Steel	62.0%
Building materials	64%	Domestic washing machine	43.4%
Light industry	46.09%	The bicycle	54.5%
Metallurgical	35.55%	The internal combustion engine	43.9%

2. Features of AMT in modern machinery

2.1 Applicability of AMT

Since the new China, many industries, such as construction industry, food manufacturing industry, medical treatment industry, textile industry and automobile industry, have been linked to machinery manufacturing industry. In the 21st century, China has applied advanced processing technology and special processing technology to gradually break through the key technologies of intelligent manufacturing. China has broken the traditional mechanical manufacturing mode and realized the perfect integration of traditional and new manufacturing technology. Advanced manufacturing technology greatly improves the efficiency of mechanical manufacturing and provides guarantee for mass production of mechanical products. The wide application of CAD/CAM integration realizes the simultaneous utilization of computer-aided design and computer-aided manufacturing.

2.2 Integration of AMT

The development of modern mechanical manufacturing technology has entered a new era. Modern factories use numerical control machine tools to produce large quantities of products, which greatly saves the production time of products, and improves the production efficiency through advanced manufacturing technology. Today's industrial production can't be accomplished on one hand, but the comprehensive application of various kinds of work. In order to build the whole national economy on the basis of modern manufacturing technology, it is necessary to carry out technological transformation on all sectors of national economy. Machinery manufacturing industry is the service industry of national economy. It should serve not only the heavy industries, but also agriculture, light industry and other sectors of the national economy.

2.3 Environmental protection of AMT

With the development of The Times, the traditional machinery has been gradually improved, such as large operating noise, more dust and poor sealing. In the modern machinery manufacturing industry, although the development of Chinese heavy industry has led to the development of Chinese economy, it still has a negative impact on the environment. High mechanical noise mainly refers to the sound generated by the operation of the internal parts of the machine. By optimizing the design of the internal parts of the machine tool, the smoothness is enhanced so as to control the noise. Dust operated by machinery has an adverse effect on human health. The stability of mechanical drive can avoid spatter of metal slag, dust and so on. During the design and manufacture of modern machinery, the design of mechanical system sealing device should be optimized.

2.4 Technical virtualization of AMT

Virtual manufacturing technology is the unified modeling of product design and production process based on virtual reality and simulation technology. Realize the simulation and simulation of the whole life cycle of the product on the computer. In modern mechanical manufacturing industry, there is a trend towards manufacturing virtual technology. Virtual product design and manufacturing will also become the future of mechanical design development direction. In the design of complex systems, virtual technologies are used to check the design results in order to detect problems early. Virtual product design technology saves scientific research funds, shortens the development cycle and directly speeds up the product design process. Computer simulation technology can be used to model and simulate parts, including machining method, process sequence, tooling selection and process parameters. With this technology, engineers can find out the manufacturing defects and problems during assembly in advance, so as to optimize the manufacturing process and improve the processing efficiency.

3. Theory and application of AMT

3.1 Theory of AMT

In the long research process, scholars have established a reliable and effective index measurement system based on their different understanding of the meaning of AMT, and then formed the index measurement methods with different styles. AMT research is often divided into Hardware Technologies and Software Technologies. Hardware technology includes production and equipment related technologies, such as CAD and CAM. Software technology is mainly about production management methods, such as JIT, TQM and the combination of material demand plan. In 1988, Burgess and Gules combined the use of AMT in enterprise reality. They designed a two-dimensional index measurement system for both hard and soft technologies. Specific indicators measure content is shown in table 2.

Table 2 AMT index measurement method

Index method	Hardware - software	Design - manufacturing - management
Representative	Rike (1988)	Boyer and Pagell (1996)
Main contents of indicators	Hardware technology	Design
	Digital control Settings	Computer-aided design
	CAD	Computer aided engineering
	CAM	Computer aided process planning
	FMS	Manufacturing
	Robotics	Computer-aided manufacturing robotics
	Software technology	Real-time process control system
	TQM	Group technology
	The JIT production	Flexible manufacturing system
	JIT purchasing	Computer numerical control machine tool
	Computer aided processing plan	Whitening raw material processing system
	MRP	Environmental control system
		Barcode use/white motion identification
		Management
		The electricity email
		Electrical data exchange
		Office whitening
		Knowledge management system
		Decision support system
		Material requirements planning
		Manufacturing resource planning

Back in 1996, Boyer and Pagell obtained the 3D definition of AMT through empirical analysis, namely, Design-Based AMT, Manufacturing AMT and Administrative AMT. The Design-Based AMT can shorten the design cycle time and reduce the product design cost, so as to occupy the market's advanced technology, such as CAD. Managing AMT is a technology that ensures faster and more economical communication within enterprises and between supply chains, such as Electronic Data Interchange. Managing AMT and Design-Based AMT are about improving the competitiveness of manufacturing enterprises by improving many processes of production. Manufacturing AMT is the actual production Technology, such as Flexible Manufacturing System and Group Technology.

3.2 Application of AMT

There are four main application areas of AMT, including planning and control, information resource management, product design and development, and factory automation. China's AMT, which is most used in product design, aims to get rid of "manufacturing power" rather than "manufacturing power". AMT applies most in information resource management, and information

sharing is the main feature of enterprise AMT integration. The international level of AMT integration is relatively high, and in this regard, Chinese enterprises still need to make efforts. Application of advanced manufacturing technology is shown in Figure 1.

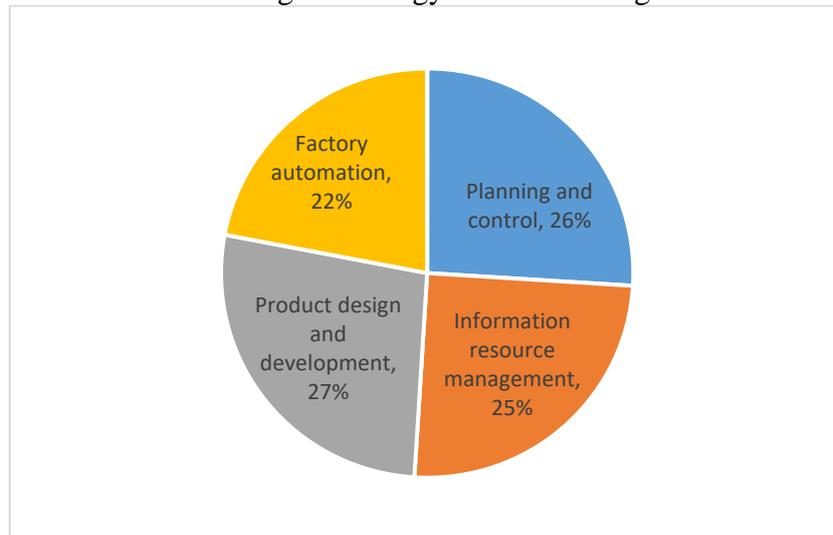


Figure1. Application of advanced manufacturing technology

4. Conclusions

With the improvement of science and technology, technology development and application in China's industrial field are more and more extensive. The development and application of advanced manufacturing technology will change the modern mechanical engineering design and change the traditional manufacturing mode. Advanced manufacturing technology can realize the advantages of product performance prediction, improve product quality, production efficiency and shorten manufacturing cycle. Which has a broad prospect of development.

References

- [1] K. Abdul Ghani, V. Jayabalan. Advanced Manufacturing Technology and Planned Organizational Change. *The Journal of High Technology Management Research*, 2001,11(1):89-89.
- [2] Mark Frohlich. How Do You Successfully Adopt an Advanced Manufacturing Technology? *European Management Journal*. 2008, 16(4): 282-283.
- [3] Virmani B R. Automation and Changing Technologies: Issues and Concerns for Manpower Planning and Industrial Relations. *Indian Journal of Industrial Research*. 2010, 25(4): 323-333.
- [4] Stuart Orr. *International Journal of Manufacturing Technology and Management* 2012, 4(6): 441-454.