

Flexible Manufacturing Technology and Case Analysis

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Abstract

With the development of society, enterprises have more and more strong demand for production automation, and small batch and multi batch orders continue to emerge, which makes the traditional mass production mode face great challenges, and enterprises have more and more strong demand for production automation. Flexible manufacturing system has the ability to adapt to the changes of the external environment, that is, it can process different parts and install different products. At the same time, it also has the ability to adapt to the changes of the internal environment, that is, when the machine fails, the whole system can quickly adjust and reduce the impact on production. More importantly, the development of Internet and artificial intelligence has significantly improved the production efficiency of flexibility. This paper will use the parts analysis of drum washing machine to introduce the application of flexible manufacturing technology in advanced manufacturing technology.

Keywords

Flexible; Manufacturing technology; Washing machine; Example analysis.

1. Introduction

In the 1970s, flexible manufacturing technology began to step out of the laboratory and became the main equipment on the production line of some advanced enterprises. In 1985, China began to carry out relevant research on flexible manufacturing technology. Nowadays, the flexible manufacturing system has moved from the development stage to the actual promotion and application period, and the technology is becoming more and more mature. At present, the technology is mainly used in industries such as the automotive industry and manufacturing. This paper analyzes the flexible manufacturing technology of drum washing machine.

2. Flexible Manufacturing Technology

2.1. Introduction to Flexible Manufacturing

Flexible manufacturing technology means that the entire processing and production process has good variability, and can produce corresponding machines, parts and components according to needs, so as to reduce labor costs, increase safety in the production and processing process, and improve production efficiency and economic benefits. "Flexible" is the opposite of "rigid". The assembly line production operations produced in the second industrial revolution are "rigid" manufacturing. Its production mode and products were single, and its ability to adapt to the market was poor, which could not meet the individualized and differentiated needs of customers. Of course, this was also in line with the social and economic development at that time. With the progress and development of society, enterprises have increasingly strong demand for production automation, and small batches and multiple batches of orders are constantly emerging, making the traditional mass production mode a huge challenge. The development of the Internet and artificial intelligence has broken the contradiction between

flexibility and production efficiency in the past. This status quo determines that a single variety of customized equipment has been restricted by many conditions, so companies have begun to pay attention to flexible production equipment.

Flexible manufacturing technology, also known as flexible integrated manufacturing technology, is a general term for modern advanced manufacturing technology. It integrates automation technology, information technology and manufacturing technology, and forms an organic system covering the whole enterprise with the support of computer machine software and database.

The "flexible" of flexible technology is reflected in two aspects: one is the ability of the system to adapt to changes in the external environment, that is, it can process different parts and install different products; the other is the ability of the system to adapt to changes in the internal environment. In the event of a failure, the entire system can be quickly adjusted to reduce the impact on production.

2.2. Flexible Manufacturing Technology and "Made in China 2025"

Made in China 2025 proposes that in order to achieve the strategic goal of becoming a manufacturing power, the consensus of the whole society must be gathered, the transformation and upgrading of the manufacturing industry must be accelerated, and the development quality and core competitiveness must be comprehensively improved. One of the most important points is to promote the deep integration of informatization and industrialization. We should accelerate the integrated development of new generation information technology and manufacturing technology, and take intelligent manufacturing as the main direction of the deep integration of the two technologies. And we should focus on developing intelligent equipment and products, promote the intellectualization of production process, cultivate new production methods, and comprehensively improve the intellectualization level of enterprise R & D, production, management and service.

At the critical moment when major industrial powers are actively changing to "industry 4.0". As the coexistence of industry 1.0-3.0, China should seize this opportunity to achieve higher "quantity" production. It is worth noting that flexible manufacturing technology is the key technology to realize the "Made in China 2025" strategy. If the flexible manufacturing technology is combined with the Internet, big data and other technologies will be intelligent, automated, private, and customized.

The process is roughly that data platforms such as the Internet and big data input user information into the workbench. And then the workbench changes the production process, environment and mode, and obtains personalized products through flexible manufacturing technology.

3. Application and Characteristics of Flexible Manufacturing Technology in Drum Laundry Machine Manufacturing

3.1. Main Components of Drum Washing Machines

Drum washing machine is mainly composed of washing part, transmission part, support part, water inlet and drainage system, control system, etc. The washing part includes inner cylinder, outer cylinder, inner tube frame, rotating shaft, outer support cylinder frame and rolling bearing; The transmission part has motor belt and pulley; The supporting part includes beam hanging, spring installation, stiffener, two damping shock absorbers fixed by support, outer box, foot and rear cover, etc.; The water inlet and drainage system includes inlet pipe filter, inlet pipe, inlet solenoid valve, detergent material box, overflow pipe, drainage filter, drainage pump and drainage pipe.

The components of a drum washing machine are diverse, but in terms of installation, it will consume a lot of manpower, material resources, time and space. In terms of manufacturing alone, the parts of a drum washing machine need to be provided by different manufacturers, which increases the cost of the product. Flexible manufacturing technology can realize an assembly line by changing the instructions of the main control unit.

3.2. Manufacturing of Drum Washing Machines

The entire production process can be roughly divided into seven work units: loading inspection unit, handling unit, processing and inspection unit, installation unit, installation and handling unit, classification unit and main control unit. These seven working units are connected by a communication network to realize the linkage control of the entire production.

3.2.1 Communication Network

The communication network and each unit are directly connected independently to exchange information independently, and at the same time, the information and data generated in the processing and production process can be transmitted to the host computer to realize the linkage control of each work unit and ensure the correctness of the production parts. This not only ensures the connection between the various workbenches, but also enables rapid adjustment when the machine fails, reducing unnecessary waste, improving work efficiency and reducing costs.

3.2.2 Loading Detection Unit

Let's take the lifting spring of the support part of the drum washing machine as an example. The feeding inspection unit sends the raw materials from the rotary feeding table to the inspection station in turn. Lifting device to lift the workpiece. And detect the received raw materials, determine whether it is a suitable metal material, the size of the metal material and other relevant data. Through the communication network, the data of the material is fed back to the main control unit. The main control unit judges that the material is suitable for processing the lifting spring.

3.2.3 Handling Unit

After the main control unit receives the information, it matches the parts that can be produced, and transmits the data information to the handling unit through the communication network. The raw materials for processing the hoisting spring are transported to the waiting area of the processing unit.

3.2.4 Processing and Testing Unit

When the handling unit is carrying, the processing and inspection unit will also receive instructions for processing the lifting spring. The raw materials are processed by hard pressing, edging, shot blasting, coloring and baking, and processed into a shaped lifting spring. The quality and specifications of the lifting spring are tested to ensure that the spring can cooperate with other parts in order to make the entire drum washing machine more stable. When the spring processing and testing are completed, the processing and testing unit submits the data to the main control unit through the communication network.

Various parts manufactured by flexible manufacturing technology can be fully matched, and different parts can be processed according to different requirements, saving processing space.

3.2.5 Install the Handling Unit

The main control unit transmits the data to the installation and handling unit. The installation and handling unit picks up the workpiece and puts it on the installation platform, and waits for the installation unit to install the small workpiece.

3.2.6 Installation Unit

When the installation and handling unit receives the data, the installation unit will also receive the information that a qualified spring has been shipped. Choose the shell of the drum washing

machine of the corresponding model, and install and strengthen the shell of the drum washing machine and the hoisting spring reasonably according to the setting of the program. After the installation unit completes the installation of the entire drum washing machine, the data is fed back to the main control unit. The main control unit sends data to the installation and transfer station, so that it can remove the drum washing machine from the installation unit.

This step is operated by the machine, the installation is accurate, and the error rate is far from local manual installation, thus reducing the number of failures of the entire drum washing machine due to human error. At the same time, because of the high efficiency of the machine, processing time is saved.

3.2.7 Classification Unit

Due to a production line can produce different models of drum washing machines by changing the processing station and the installation station, a classification unit is also needed to classify the workpieces according to their types and push the workpieces into the silo.

3.3. Application Examples of Flexible Manufacturing Technology

3.3.1 Production of Drum Washing Machines

A brand of Tianjin washing machine Internet factory, the use of flexible manufacturing technology and the use of shunt form in the detection position, to ensure that a production line at the same time to produce wave wheel and roller washing machine. At the same time, the factory can be allocated according to customer order requirements, according to model, capacity, intelligent modular production, thereby improving mass customization.

3.3.2 Multiple Parts Applications

As a leading enterprise in the manufacture of high-end CNC lathe equipment in China, Zhejiang Headman Intelligent Equipment Co., Ltd. always aims to break the monopoly of the international machine tool giants. After years of intensive development, it has achieved many core components including spindles, turrets, and tailstocks. The autonomy of the company has successfully achieved import substitution for many companies, and accurately positioned specific industries, customers, and parts to carry out in-depth personalized services, and has also achieved significant competitive advantages in subdivided fields.

Jianlin Zhang, deputy general manager of Zhejiang Headman Intelligent Equipment Co., Ltd., said: "The parts that Headman needs to produce are not only in many types and small in batches, but also in small and medium-sized parts. The processing tempo of small and medium-sized parts varies greatly. It affects the processing efficiency. How to quickly complete the product switching on the production line and how to improve the utilization rate of processing equipment is our long-standing demand. At present, the Headman flexible production line has more than 120 product types and more than 200 processes. The number is still growing. We are full of expectations for the empowerment of flexible technology."

4. Conclusions

Although the traditional automatic manufacturing technology has high production efficiency, it can not meet the market demand for short cycle, multi variety and small batch products, that is, the demand for production flexibility. Therefore, flexible manufacturing technology has become a new direction of modern manufacturing industry.

Flexible manufacturing system should be combined with computer-aided technology and integrated into the whole computer integrated manufacturing system. As soon as the production order is issued, the factory can produce on demand and feed back in time. Nowadays, under the impact of industry 4.0, enterprises are facing the changing business environment. Only by mastering flexible manufacturing technology can they better adapt to the market, strengthen their competitiveness and meet the wave of the new industrial revolution.

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