Application of digital technology in industrial production site

Liren Shi

Information Technology Department, Guangdong Zhongshan Technical Secondary School, Zhongshan, Guangdong 528400

Abstract: with the promotion and development of the Internet and information technology, modern industrial manufacturing is developing in the direction of digitalization and intelligence. For the industrial manufacturing industry, the construction of digital workshop has become an important development trend, and the real-time and complete collection of relevant data from the industrial production site and the promotion of intelligent management and production process have become the basic conditions for the construction of digital workshop. Under this background, this paper analyzes the main application of digital technology in industrial production site, and then puts forward the application path of digital technology in industrial production site, so as to provide important support for the construction of digital workshop.

Key words: digital technology; Industrial production site; Data collection; intelligent management

In the new economic normal environment, China's manufacturing industry has developed rapidly, and is constantly transforming and upgrading to modernization and digitization. However, at this stage, the application of digital technology in industrial production site has not yet reached the expectation, especially in data acquisition and intelligent management. In order to further promote its digital transformation, we must further deepen computer technology, create a virtual simulation working environment, form a production process of evaluation and optimization, and further improve the quality of productionEfficiency and safety level.

1 Digital technology applied in industrial production site

1. Workshop data acquisition technology

In the industrial production site, the data acquisition work is mainly completed by the implementation of automation equipment. First of all, relying on bar code reader, radio frequency identification (RFID) reader, embedded acquisition terminal and optoelectronic magnetic and temperature sensor technology, the information carrier can be actively identified. Secondly, through the internal analysis system of the system, the data collected by the reader and the sensor can be transmitted to the designated location for analysis and processing. In this process, the barcode reader can be used in the cost management process. The barcode is unique, and each industrial product can be given its unique production information after being defined. Third, in the development process of CNC servo system, operators can obtain relevant data with the help of device terminal interface. CNC machine tools, processing robots and programmable logic controllers have become important terminal equipment to realize digital production.

2. RFID technology of Internet of things

Automatic identification technology is one of the basic methods of data acquisition in the Internet of things, mainly including card identification, optical signal identification, radio frequency identification, bar code identification and other methods. Among them, the main advantages of the Internet of things radio frequency identification (RFID) technology are: first, the identification accuracy is higher, and it can quickly and accurately connect with the identification object to achieve the effect of efficient data collection and transmission. Second, radio frequency technology does not need a light source as a signal, and can directly identify all aspects of its data through external materials. Third, the technology can be embedded in different presentation forms and different types of industrial products, and then it can track RFID tags in real time and locate the corresponding products. Fourth, it has the function of multi-object recognition. It can identify multiple objects at the same time and reduce the problem of information collision. It has less interference and more ways to solve the interference. Fifth, its information storage capacity is very large, which can store and identify dynamic data. Therefore, in the industrial production site based on the Internet of things, the Internet of things radio frequency identification (RFID) technology shows its key application role.

2 Application of digital technology in industrial production site

1. Building intelligent management technology architecture

The application of digital technology in industrial production site must give priority to the establishment of intelligent management technology architecture to ensure the interconnection of various technologies. The architecture should be composed of application layer, transmission layer and perception layer. The application layer is divided into decision application and application support. Decision application mainly includes environmental monitoring, process coordination, fault alarm, equipment maintenance, energy conservation and emission reduction, production scheduling, etc; Application support mainly includes language and tools, middleware, and running environment. The transport layer is based on network technology, mainly including sensor network, industrial LAN, mobile communication network and industrial Ethernet. The perception layer is composed of networking, information processing and data collection. The former includes network self-organization technology, sensor middleware technology, information collaborative processing technology and short-range transmission technology, while the latter includes sensors, bar code scanning, detection equipment, PLC equipment, frid, DCS equipment, etc. Through the above technical architecture, the industrial production site can quickly collect, transmit and process different types of data, and then manage and optimize the production technology and process flow through CNC equipment.

2. Clarify the production situation of the manufacturing workshop

In recent years, the industrial manufacturing industry pursues the coordinated development of production application technology and management technology. In order to comprehensively control the production process of industrial workshops, it is necessary to ensure that the status data of CNC equipment in the industrial production process can be collected and transmitted in real time, so as to achieve the management goal through intelligent control. But there are also some problems in the current production situation of industrial production workshops. First, there is a lack of unified management. At present, there are few industrial machine tools with communication function, which makes the process of data collection more cumbersome, which makes the industrial machine tools unable to connect with the computer system, and has a great impact on the processing and production work and regulatory efficiency. Second, unified connection network. The development of digitalization and modernization of industrial production must rely on efficient data acquisition technology to ensure that each device in the industrial production site can upload and analyze data uniformly. However, at this stage, the industrial production workshop has not established a unified network system, and most of the machines and equipment also rely on serial server for data collection, which is not only more expensive, but also inconvenient to operate and inefficient. Third, it is difficult to supervise the running state of equipment. At present, when the equipment in the industrial production site is in working state, the employees can not control and supervise the equipment information in real time, so they can not monitor the failure and the processing quality.

3. Production site data analysis and management

(1) data analysis

Through the analysis of the current industrial production situation, it can be found that industrial equipment will generate different data types in the process of operation, which makes the data collection methods different, and classified collection and data management become one of the key steps. Generally speaking, the data types generated by industrial production site mainly include the following three types: first, static data. Static data is generally unchanged data, mainly including material information, product name, personnel information, etc. Second, dynamic data. Dynamic data is the data that will change constantly in the production process, mainly including production status, planning progress, etc. Third, intermediate data. This kind of data refers to the data formed after preliminary processing of the above two kinds of data, which can provide reliable and unified data content for the subsequent data analysis system.

(2) management requirements

The intelligent management system needs to understand the basic objectives of industrial manufacturing enterprises, and master the actual needs of the production site. Then it can control the actual operation process of CNC equipment in an all-round way, and can strengthen the collection of data generated in the processing process, so as to build an enterprise resource planning system. Generally speaking, the management system should have the following functions: first, the computer platform can be directly connected to the NC equipment in the production site workshop, and can collect data and issue management commands through the network, so as to improve the management efficiency and quality. Second, the data associated with CNC equipment can also be collected in real time, such as on-off status, fault information, alarm information, etc. Third, it can supervise the running state of CNC machine tools, so as to ensure the stable and efficient operation of the production workshop. Fourth, it can comprehensively count the control data of CNC machine tools, and thus develop more scientific intelligent decision-making solutions. Fifthly, when the numerical control equipment gives a warning, the management system can quickly respond and record and feed back the data information such as the location, type, frequency and occurrence time of the system fault, and then the manager can analyze it to complete the fault treatment faster.

4. Design of production site data acquisition and intelligent management system

(1) establish the overall system architecture

The overall architecture of the system is the foundation of the production site data acquisition and intelligent management system. It needs to analyze the relevant data of the digital workshop production site, and then build the architecture foundation based on the data and data acquisition technology system. The system architecture is similar to the intelligent management technology architecture described above, mainly including the workshop layer, data layer and management layer. The workshop layer is mainly responsible for the collection and transmission of data on the production site. The data layer is mainly used to integrate the data collected at the production site of the workshop, and obtain the corresponding data results through the processing procedures such as correlation operation, modeling, standardized packaging, etc., which are encapsulated, stored and shared according to the data characteristics. The management layer is mainly used to access the data in the database, which is generally used by enterprise managers, who can make correct decisions relying on data support.

(2) establish system software structure

The software structure of industrial production field data system mainly includes c/s and b/s. For the c/s architecture, it refers to the client / server architecture mode, which needs to be based on the correct design and use the client software to locally process the user's business logic, images, etc. For b/s architecture, it refers to the browser / server architecture mode, which needs to optimize the c/s architecture based on information technology. The main feature is that the server interaction can be completed with the help of the browser and the Internet. The UI interface and simple logic can be updated in the local browser. The server side is responsible for solving the logic processing of key things, and thus the new interactive interface is transmitted to the user side to realize the MVC structure.

(3) establish the network architecture of intelligent management system

In order to achieve the goal of intelligent management, the NC machine tools and equipment at the industrial production site will use RJ45 network port in the network wiring. However, in different types of equipment, the information and data collected mainly include electrical circuit signals, DNC network ports, serial port macroinstructions, etc., and also need to be transmitted to the server under the guidance of the switch. From this point of view, the data management server is the focus of system operation. In order to ensure real-

time interaction with machine tools, collectors and other equipment, and achieve data processing and storage functions, the data server needs to rely on Modbus protocol for operation. At the same time, the client software will send a request to the database server, so as to control the real-time working state of the CNC equipment, and can view the data information at different stages, so as to realize the control and adjustment of the enterprise system, machine tool information, employee information and other data, with the basic functions of modification, deletion, call and so on.

(4) design heterogeneous data acquisition hardware in workshop

Heterogeneous data generated by industrial production site is the key basis for digital transformation. In order to effectively collect this data, it also needs to rely on automatic identification technology, sensor technology, equipment Internet of things technology, etc., so as to build a complete data acquisition hardware system. First of all, automatic identification technology is the basic technology of data collection, which mainly relies on bar code technology, RFID technology, etc., so as to quickly and accurately identify the data content generated at the production site, and then provide the basis for subsequent collection. Secondly, sensor technology is an important technology to monitor the status of the production site. In the industrial production site, the external environmental parameters have a direct impact on the product quality. The sensor technology can detect the temperature, humidity, electromagnetic, pressure and other parameter data in the production process, and upload them through the connection network, so as to achieve the effect of intelligent supervision. Finally, the industrial equipment networking technology is the basic technology to realize the digital transformation of the workshop. It can be connected by using no communication interface, serial port, network port and other interfaces, so as to ensure the collection, transmission and connection of data information.

(5) design system physical architecture

In the process of digital workshop construction, a perfect physical architecture needs to be established in the field data acquisition system to ensure that different modules such as manufacturing workstations and warehouses in the workshop form related structures, and then different unit hardware devices can be connected through the network, which constitutes the internal LAN of the workshop, and can be connected to the enterprise backbone network through the switch. At the same time, the construction of the communication link can also ensure that the workshop layer can access the upper data, including the data in ERP server, capp/pdm data server and data collector. During this process, the middleware will submit the EPC code, and the ons server will parse the code. From this point of view, the lower computer in the management system of industrial production site is of great importance. It can not only provide the required page data for users at all levels, but also feed back the request and display the results. At the same time, it can also send user instructions and control the underlying hardware equipment, so as to achieve the effect and purpose of interconnection.

3 Conclusion

To sum up, with the development of modern information technology, digital technology shows vital value for the transformation and upgrading of industrial production. In the industrial production site, the digital workshop can be built with the help of data acquisition technology and intelligent management technology, so that workers can complete the control, supervision and management of industrial equipment through the network and software and hardware equipment, so as to truly advance towards modernization and digitization.

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