Application of intelligent control in industrial process control automation

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Abstract: Based on the development background of industrial 4, the development status of industrial process control automation is analyzed, and the application of intelligent control is discussed. First, combined with the forefront of industrial process automation development, the current hot point intelligent control technology and means are summarized. Secondly, the specific application of intelligent control is controlled. Finally, the application development suggestions of intelligent control are put forward. The application of intelligent control has played an important driving role. Combined with the specific application and research, we summarized the application of intelligent control and shared it with the relevant personnel for reference.

From the point of view of the research on and application of industrial process control automation, the key is to realize intelligent production, the key is to realize the intellectualization of manufacturing process, and then to achieve the goal of high efficiency and green development, and to build an industrial manufacturing mode that can realize intelligent decision making and intelligent independent control of manufacturing equipment. It is necessary to optimize the control of industrial process, that is to optimize and control the intelligence and integration, realize efficient perception of production conditions change, adaptive decision-making, and track the setting value of control system to achieve the optimal target of operation index, that is, to improve the quality and efficiency of production, to reduce energy consumption and to promote the continuous development of industry. The following analysis is carried out.

1. frontiers of industrial process control automation

Industrial automation is one of the important technologies in the modern manufacturing field since twentieth Century. Based on the automation of industrial process control, the industrial iterative upgrading has been promoted, and the industrial production technology and efficiency and quality level have been improved. Meanwhile, the safety factor of industrial production has been improved. Based on the development and application of various new technologies such as cloud computing, IOT and AI, it promotes the development of industrial automation, develops towards intelligent direction, and gradually enters the era of industrial 4. Honeywell, the industry leader in the process industry, proposed the next generation process control technology of Experion PKS HIVE: in the 2019 Honeywell technology summit. This is the biggest highlight of its technological innovation. The proposed HIVE, based on Honeywell's Experion system, evolved from the LEAP virtualization project, mainly to change the execution mode of automation projects, from customized engineering to standardized engineering, to achieve the goal of improving implementation speed and efficiency, and to reduce risks. At the same time, Honeywell put forward the concept of interconnection factory. Emphasis is placed on the best operation of the project. The core of the interconnection plant lies in process interconnection, asset interconnection and personnel interconnection. In particular, process
interconnection is achieved through interconnection of the production execution system and interconnected operation services and real-time optimization, thereby enhancing the efficiency of the industrial process. At present, the automation of industrial process control is developing towards intelligence. At the same time, various new technologies are widely applied, such as the Internet of things and industrial robots, and the concept of interconnected factories, which promotes the development of industrial intelligence.

2. **Specific application of intelligent control in industrial process control automation**

2.1 **Field of information acquisition**

From the point of view of the realization of industrial process automation, the information analysis of production process can provide support for production automation control. At present, the low level of information control of industrial process control is an important issue affecting its development. Along with economic development and rapid social progress, the contradiction between production and employment and mechanical automation in industrial production is increasingly prominent. If we want to achieve the goal of industrial process control automation, it is necessary to reduce production and employment. To improve automation level of control, we need the support and cooperation of intelligent technology, and then promote the development of automation. Intelligent control technology is adopted to automatically obtain operation information of production equipment, based on intelligent control system. Through operation and processing, intelligent control of equipment operation can be realized, and industrial production can be reduced. Information technology is used to optimize the industrial production process control system, promote the realization of its intelligent control function, and obtain production information efficiently.

2.2 **System modeling**

In industrial process control automation, the application of intelligent control technology is also embodied in the aspect of system modeling [1-2]. The details are as follows: 1) collection of data information. With intelligent control system, data automation and intelligent acquisition can be completed efficiently. In addition, the a/d conversion unit can be used to complete data acquisition, use analog to digital converter to process analog signals, make them into digital signals, store them in data registers, use PLC, be able to print and read data, complete data transmission. 2, the application in the field of monitoring. It helps to ensure the safety and orderliness of the production process, and completes the automatic monitoring of production by means of intelligent control technology. The entire application process needs to play the function of PLC. Through monitoring the operation of the device and equipment, it can detect faults and transmit records in time. After analyzing the faults of the computer center, the causes of the faults are identified, and the cause of failure handling [3-4] is put forward.

2.3 **Dynamic control**

From the practice of industrial process control automation development, the application effect of intelligent control technology has been affirmed by people. Intelligent control technology can realize intelligent control and communication between production equipment, PLC and master control system, realize efficient transmission and sharing of production information, and realize intelligent control of production process. The monitoring of the running state of the equipment used in production can control the production process in real time and dynamically according to the production demand, and optimize the production process. At present, the application of intelligent control technology is more and more extensive, and the production efficiency has been improved. However, there are also technical limitations that affect the value of its production. Industry personnel are actively tackling technical difficulties [5-7].
3. common technology of intelligent control in industrial process control automation

3.1 industrial robots

From industrial 4.0 and the transformation of global enterprise intelligence, industrial robots occupy an important role. Robot control technology is used to realize intelligent control of robot in workspace, such as movement position and action time. It is not only simple in programming, but also convenient in software menu operation. Key breakthroughs have been made. This is due to the following technologies: 1) the architecture of control system with openness and modularity. It is designed as a distributed CPU computer structure, giving full play to the advantages of robot controller (RC) and motion controller (MC), enabling communication and motion planning control, etc. Supporting the intelligent control of industrial process. 2) A modular and hierarchical controller software system. The software system is designed by layering and modular structure to achieve the open requirement. The controller software system is developed in all levels according to the needs of industrial production automation control. To achieve the corresponding function. 3) networked robot control technology, fault diagnosis technology and safety maintenance technology. Based on communication technology and real-time monitoring, fault diagnosis and management of robot work, the dynamic control of robot operation is realized.

3.2 AI technology

In the intelligent control technology of industrial process control automation, artificial intelligence technology is a new technology, which promotes the development of industrial intelligence. It plays an important role in industrial intelligent chemical plants \[8\]. According to the analysis results of AI industry data, the scale of industrial robot intelligent engineering is expanding. It is expected to reach US $40 billion 100 million in 2020. As shown in Table 1, artificial intelligence is widely used in control systems and simulation systems. It provides technical support and guarantee for the realization of intelligent control of industrial processes, and promotes industrial development.

| Serial number | Field                          | Scale                        |
|---------------|--------------------------------|------------------------------|
| 1             | Sensor controller intelligent factory | 6 billion 100 million dollars. |
| 2             | Telecom Intelligent factory     | 5 billion 700 million dollars. |
| 3             | Logic and distributed control intelligent factory | 4 billion 700 million dollars. |

3.3 next generation process control technology

Honeywell's Experion PKS HIVE next generation process control technology, in the process of intelligent control, has adopted the following technologies: 1) automatic inquiry communication IO technology. With this technology, any controller can communicate with any IO channel, as long as the channel is connected with IO network. By using software for logic configuration, the IO signal can be obtained automatically, and the time for engineering configuration can be reduced effectively. In the control center, the control equipment is arranged on the IO side of the production site to realize the transfer of control strategy and transfer to the scene. It is very convenient. The field workers can use the wireless hotspots to receive production data dynamically, and use digital workflow to improve the efficiency of the operation. 2) control container technology. In order to realize the rational assembly of multiple physical controllers and form a single virtual HIVE controller, in practice, when the control strategy is sent to the Control HIVE container, the HIVE container can automatically carry out the scoring of the control strategy, so that it can be allocated to the available controller and automatically connect the general IO with the controller. Automatic balancing the load of each physical controller device not only reduces manual configuration and programming, but also facilitates the design and modification of. 3) virtualization technology. Virtualization technology is used to reduce the control system IT facilities on the one hand. On the other hand, it ensures the reliability and security of the control system and improves the applicability of virtualization technology. IT HIVE based on
Virtualization expands the scope of technology applications. It not only integrates IT devices into the data center, but also retains some of the local key server. If there is communication failure in actual operation, the IT HIVE redundancy technology can be used to automatically start the virtual machine image, and then realize the function to operate. It is suitable for a company to control the scene in multiple locations, or a site with multiple control centers. Ensure the failure control operation.

3.4 Internet of things technology
Using the Internet of things technology, we can realize the interconnection of things, personas and people, and provide effective technical support for the intelligent control of industrial processes. In the future, the continuous development and upgrading of industries requires strong support and support from the Internet of things technology. In the field of data collection and production dynamic control, with the help of Internet of things, Combined with the use of big data technology and AI technology, it can effectively improve the level of control [9].

4. Concluding remarks
To sum up, the realization of industrial process automation needs the support and guarantee of intelligent control. Combined with the practice of intelligent control and the development frontier of the industry, the application fields and hot technologies of intelligent control are summarized. The application principles and advantages of various technologies are analyzed, so as to provide reference for relevant personnel.

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