Analysis of Practical Application of PLC Technology in Electric Automation

Guohua Zhao, Hui Zheng
Sichuan Vocational and Technical College, Suining 629000, China
2003408665@dlvtc.edu.cn

Abstract—With the continuous development of science and technology, PLC technology has been applied in many industries. This also includes electrical automation control, which can better maintain the accuracy and stability of electrical automation control, and its development prospects are very broad. This article summarizes the application significance and advantages of PC technology in electrical automation control based on previous work experience. The author discusses the practical application of PLC technology in electrical automation from six aspects: air conditioning, coal mining, numerical control, transportation, power systems, and lathe electrical control systems.

1. INTRODUCTION
From the perspective of industrial production, electrical automation is of great significance, and it can also demonstrate the degree of national modernization and industrial production. In addition, the development of science and technology has provided great impetus for the progress of electrical automation. In particular, the application of computer technology can enable electrical automation to achieve full control of the industrial production process. Relevant staff should master all the contents of this technology when working so that PLC technology can be better applied to electrical automation. Related staff also need to solve the problems in time to create more conditions for industrial development and progress.

2. FEATURES OF PLC TECHNOLOGY
In general, PLC technology is an important part of computer technology. It can control the entire industrial production process to ensure the orderly progress of industrial production. The technical characteristics of PLC mainly involve the following three aspects. First, PLC technology itself has strong anti-interference ability, but also has self-diagnosis function. Once the wrong information is found, it can be identified in time, and the wrong information can be corrected by software such as filtering and isolation. In actual application, PLC technology can show strong stability and reliability to adapt to a more complex working environment. Second, PLC's own system functions are relatively complete. At the same time, it also has strong adaptability and can be combined with industrial production. It can play a role in a complex industrial environment, realize system function expansion and change the degree of control, etc. Third, PLC technology programming is in the form of ladder diagram. This method is relatively intuitive. The relevant staff can master the operation method in a short time. As the relay is replaced by related software, the wiring workload is greatly reduced. In addition, the staff does not need to consider the problem of node displacement. For those programs that need to be modified, you can modify them directly on the hardware or software. In contrast, such software itself has the characteristics of low energy consumption and light weight. Even if the relevant
staff do not have a wealth of computer knowledge, they can still complete various routine operations. The specific PLC technology operation logic diagram is shown in Figure 1.

![PLC Technology Operation Logic Diagram](image)

**Figure 1.** PLC Technology Operation Logic Diagram

3. **HOW PLC TECHNOLOGY WORKS**

3.1. **Cycle Scan**

In contrast, PLC operation is different from other microcomputers. The scanning method is mainly cyclic scanning. The actual PLC user running program time is the scanning period, which is generally less than 100ms[1].

3.2. **Create I/O Image Area**

The operation of PLC in input and output is mainly based on timing sampling and timing output. The sampling operation of the input points is mainly concentrated at the beginning or end of the scan cycle. After the sampling result is input to the RAM area, the system execution process can obtain the required field information, so that there is no need to perform sampling operations on site. Meanwhile, the control information output will not be used to generate the output form one by one, but the control information is stored in the image area to scan the control information of the image area in the later stage of the periodic element. The system can ensure that PLC becomes a true digital sampling system by constructing the I/O image area. Even if the PLC cannot achieve real-time input and output, the current sampling system can already meet the needs of industrial production. In order to make the final sampling result more accurate, relevant staff should control those short sampling periods and appropriately increase the sampling frequency. Only in this way can the industry's sound development be guaranteed.

3.3. **Special Function Module**

Despite the application of PLC technology, the user program length is limited. But in specific industrial production, many digital quantities can also be adapted to PLC technology. Industrial production is prone to many problems, which puts more demands on PLC such as network communication and analog quantity processing. The actual analog input and output and simple control require not only the main CPU and part of the hardware support of the PLC, but also the application of specific software. In special circumstances, such as when it involves calculations, CPU running time and other restrictions, it
is often applied to independent CPU templates and software systems. This is also the root of the control task. In addition, the module can cooperate with the PLC main CPU through the bus interface connection. More importantly, the main CPU can transmit its own state to the CPU while periodically sending commands to the template. This can create favorable conditions for the follow-up work [2].

4. **THE APPLICATION SIGNIFICANCE AND ADVANTAGES OF PLC TECHNOLOGY IN ELECTRICAL AUTOMATION CONTROL**

4.1. Expansion of Electrical Equipment Storage
The PLC system itself has an independent storage system, with different structures and obvious differences in content. The user memory can store related software and systems, which can ensure that the structure can expand the storage capacity of the electrical automation system. In the application of PLC technology, confidential data storage operations can be done according to actual needs. In this way, the key position can be determined in the shortest time in the actual equipment investigation.

4.2. Intelligent Improvement of Electrical Equipment
The comprehensive combination of PLC technology and electrical automation technology can greatly improve the response speed and efficiency of electrical equipment. The PLC technology is mainly used to realize the control operation by means of system software. In this process, it can help the staff to accurately judge and process the data. For example, the staff can introduce the concept of central air-conditioning in the application of these technologies, according to the actual environmental changes to achieve a comprehensive adjustment of indoor temperature. It can also be seen from this that under the action of this type of technology, PLC technology can strengthen the basic performance of electrical equipment and ensure that it works in a more stable environment.

4.3. Electric Automation Control Advantage
In contrast, the application advantages of this technology in electrical and automation are very obvious, and its specific content includes the following aspects. First of all, the reliability of PLC technology application is very significant. It needs to strengthen the anti-interference ability of the system based on the control system. It can also be seen from here that PLC technology is very reliable. It can play a role in different environments and avoid the system from being affected by various objective factors. Second, the response speed of PLC technology in the control system is very fast. It can transform the original mechanical electric shock relay in the control system into an auxiliary relay, completely remove the connecting wire part in the control system, and turn the relay node into time. PLC technology does not need to know the specific return coefficient content in the relay, only needs to ensure the corresponding speed increase of the control system, and simplify the main operating procedure [3].

5. **PRACTICAL APPLICATION OF PLC TECHNOLOGY IN ELECTRIC AUTOMATION**

5.1. Air Conditioning Field
It is extremely difficult to apply electrical automatic control to the field of air conditioning. For this reason, people need to take automatic control technology as a basic condition to avoid problems in the control process as much as possible. In contrast, there are many control methods for the actual air conditioning system operation. For automatic control of air conditioners, better control effects should be reflected. This type of automatic control system can shield the external undesirable factors during application. It can set specific program content according to user needs, and do follow-up operations. For example, the application of PLC technology to the central air-conditioning electrical automatic control system can further strengthen the central air-conditioning operation effect. This can also ensure that the different operating systems in the system are consistent with user needs, making the air conditioning system more practical.
5.2. Coal Mining
There are many mining equipments that need to be used in the actual coal resource mining construction process. Compared with the actual programmable control technology, it is more complicated than traditional mining machinery automation equipment and management. When it is used, it may be affected by many factors, which inspire some new safety hazards. For this reason, people can apply programmable control technology to the automation of mining machinery to strengthen the automation control capabilities of mining equipment. It is also with the help of the above operations that the complexity of the mining machinery and equipment in the control link is greatly reduced. At the same time, it can also reduce the probability of failure of electrical equipment in mechanical applications. In addition, when the programmable control technology is applied to coal mining machinery and equipment, the main content involved includes computer control, fault diagnosis, and sensor control. The mining of underground coal resources can also apply programmable technology to ensure that the ground control center can display dynamic control effects. This can create favorable conditions for the development of follow-up work [4].

5.3. CNC Field
The application of electrical automatic control system in the numerical control process can maximize the role of numerical control. The development and application prospects in this area are very broad. In addition, PLC automatic control technology itself has a strong programming function. It can not only ensure that the numerical control always maintains high accuracy, but the numerical control system can also complete the required programming work through the application of this type of technology. From the perspective of machine tool operation, each parameter will be strictly controlled when used. This can ensure that the machine tool can run in a pre-set trajectory to better complete the task. Applying this control technology to CNC electrical automatic control can strengthen the accuracy of the CNC system, avoid system operation errors, and reduce the chance of quality problems. Throughout the entire operation process of CNC automatic system, if similar technology is applied, specific functions can be displayed in CNC. To this end, the first thing relevant staff must do is to ensure the system, and then control the content according to the program to keep the editing function of the entire system in a stable state and maintain it in a high-quality interface. After the automatic control selection in the numerical control field is completed, the staff need to perform a comprehensive analysis operation to clarify the specific situation of the numerical control system. In this way, it can be ensured that the automatic control system can present higher use value, and the numerical control system is always in a good state of development.

5.4. Traffic Field
The electrical automatic control system is applied to traffic, and the main application object is traffic signal lights. This type of technology can make the logical control of traffic lights clearer, improve specific functions in the motor automatic control system, and maintain a further expansion of the control range. For example, when a traffic jam occurs on a certain road section, the electrical automatic control system can implement the collection of road information according to the specific requirements of the monitoring equipment, and timely transfer the information to relevant management personnel. In general, the above behaviors are all automatic control content, which does not require relevant personnel to operate. If this technology can be fully applied in the traffic electrical automatic control system, this will not only reduce the possibility of traffic accidents, but also make each traffic route clearer. This can also help people understand road conditions in time, and provide convenience for related work and travel [5].

5.5. Power Systems
In the operation of electrical systems, many auxiliary system applications such as water treatment systems are involved. These system processes need to carry out orderly control and switch control to present the role of the auxiliary control system during application. In recent years, with the gradual
decreasing energy conservation and emission reduction work, many industrial enterprises have gradually changed their thinking during the development process, insisted on implementing the scientific development concept and the sustainable development concept, and strengthened the economic benefits of the power system. In addition, in power production, we should truly achieve energy conservation and emission reduction. At this time, the improvement of the auxiliary control level is equally important. Up to now, many large enterprises in China have used PLC technology as an auxiliary system. In this way, the overall control of the entire production process can be achieved, and the communication system can be introduced into the PLC system. For example, the main content involved in the construction of the coal handling system is the main station floor and the remote IO station. Among them, the main station layer is generally designed in the disease control examples. Its main components are PLC system and man-machine interface. In addition, the master station layer will establish a connection relationship with the remote IO station through the optical fiber communication bus. This can ensure that the working environment is significantly improved.

5.6. Lathe Electrical Control System
Generally speaking, in the application of programmable logic controller, the internal processor is equivalent to the human brain, and its main structure mainly includes five aspects. In contrast, this type of system can play a great role in industrial production. Especially the application of PLC in CNC machine tools can not only ensure the smooth improvement of the automation level of CNC machine tools, but also ensure that the machine tools can be controlled more stably in accordance with the previously set standards. In addition, the application of PLC technology can ensure the steady improvement of the automation level of CNC machine tools, and ensure that the automation control level is fully enhanced in accordance with the pre-agreed procedures. This can reduce the occurrence of related risk issues and create more opportunities for the stable development of modern industry. In the metal cutting process, ordinary lathes are important tools. If you want to ensure product quality, the reliability of actual lathe equipment should be maintained at a high level. When applying electrical control systems based on traditional lathes, people need to apply relay control devices. In application, the system wiring process is more complicated, which also involves many mechanical electric shocks. This will have an impact on the reliability of the equipment, and the difficulty of fault diagnosis and troubleshooting is also higher. If you want to optimize the production process, production quality and efficiency should maintain a steady improvement. At this time, the system needs to carry out redesign and wiring operations, and the workload is relatively large. Moreover, we need to invest a lot of manpower and capital. With the continuous development of computer technology, PLC programmable controllers have been fully applied. In this way, it can provide more ways and methods for the subsequent solution of electrical control problems. Generally speaking, the completion of the technical transformation of the electrical system in the ordinary lathe can further improve the production efficiency and ensure the overall improvement of the quality. In fact, the advantages of PLC technology mainly include the following aspects. First of all, it can demonstrate strong practicability and versatility, and provide sufficient conditions for the subsequent optimization and transformation of the lathe electrical control system. Secondly, highlight the automatic fault diagnosis function. This can create favorable conditions for the development of routine maintenance and repair work. Thirdly, the reliability is very high. Moreover, it also has strong flexibility characteristics. Finally, from the perspective of practical applications, the value of small PLC equipment is more obvious, and the technical benefits are extremely high [6].

5.7. The Application Trend of PLC Technology in Electric Automation
The continuous development of PLC technology has promoted its functions and advantages to be gradually displayed, and the scope of application is also increasing. For example, in the development of central air conditioning technology, intelligent control has gradually become popular. The PLC technology also shows good application performance among them. It can compensate and improve the defects of the previous automatic control system, strengthen the application reliability of automatic
control technology in the field of central air conditioning, and avoid interference from external factors. In the future, actual PLC technology will be integrated with more advanced science and technology in application. Moreover, it can also be optimized in terms of system structure design and application operation. Especially in the man-machine interface design, in addition to the enhancement of the interface design, it can also improve the practicality and operability of the interface, and use more sophisticated communication equipment. This can also ensure in-depth integration with PLC technology and improve automation control scenarios. It can be seen from the current application that computer technology is the foundation of PLC technology. When computer technology is better developed and lags behind, the application effect of PLC technology will also be improved and the scope of application will be expanded. In the meantime, it can also ensure that the subsequent electrical automation control system becomes more intelligent. Simultaneously, PLC technology is very dependent on computer technology. Once there is a problem with the PLC technology operating environment, the electrical automatic control will also be affected. For this reason, the PLC technical analysis cannot be limited to the current application basis, but it is necessary to dig deeper into the advantages and disadvantages of its application performance, and formulate corresponding improvement measures.

6. CONCLUSION
In summary, the application of PLC in electrical automation control is a typical electric meter for technological development. It can all improve the defects of traditional electrical automation control and ensure the reliability of automatic control. With the continuous development and application of PLC technology, its technical performance is also in an increasingly perfect state. Furthermore, it can create basic conditions for the improvement of automation control efficiency.

REFERENCES
[1] Zhang Shu. The application of intelligent technology in electrical automation [J]. Electronic Production, 2020(24): 92-93.
[2] Fu Xiaoxia. The application of artificial intelligence technology in electrical automation[J]. Journal of Science & Technology Economics, 2020, 28(35): 44-45.
[3] Zhu Xiang. Discussion on Intelligent Technology in Electrical Engineering Automation[J]. Light Industry Science and Technology, 2020, 36(12): 47-48.
[4] Qu Shiqi. The application of PLC technology in the electrical automation of mining equipment [J]. Modern Mining, 2020, 36(11): 200+205.
[5] Wang Qilin. Application and innovation analysis of digital technology in industrial electrical automation [J]. Electronic Testing, 2020(20): 134-135.
[6] Zhao Yangpeng. Application of electrical control in electrical automation systems based on PLC technology [J]. Wireless Internet Technology, 2020, 17(17): 148-149.