Automation Technology in Equipment Installation Technology and Quality Management

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Abstract. The rapid development and continuous advancement of technology promote people's quality of life to get better and better. People are paying more and more attention to highly intelligent automation. Long-term development is achieved by automation technology because of the promotion of science and technology. Under the premise of this kind of development, the construction process of my country's construction projects has become more and more complicated, which has greatly increased the difficulty of my country's construction project management and control. In order to better coordinate the construction project links and accelerate the construction progress, it is necessary to continuously improve, improve and innovate the existing construction project management control strategies. The level of control will also be continuously improved in terms of construction project quality management. At the same time, precision and efficiency are high, and highly automated equipment is gradually increasing, and the investment cost of equipment is getting higher and higher. The proportion of equipment-related costs in product costs has also increased. Therefore, strengthening equipment technology management to reduce equipment life cycle costs and many other aspects occupy a very important position. This article first outlines automation technology, then analyzes its impact on mechanical design and manufacturing, and analyzes the current status of construction engineering quality management. On this basis, it focuses on the application of automation technology in equipment installation and quality management for reference.

Keywords: Automation Technology, Equipment Installation Technology, Quality Management, Application

1. Introduction
With the development of society and the continuous updating of science and technology, good management is essential for the survival and development of enterprises. Equipment is an important factor that constitutes the productivity of an enterprise, is the main foundation of modern enterprise operation and production, and plays a very important role.
In recent years, the development of automation equipment has been very rapid. The trend of automation and intelligence in our country has become more and more obvious. The installation of automated machinery and equipment is also becoming more and more important. It has also received attention from all walks of life. The installation technology of original automation equipment is carried out. Improve to better adapt to the trend of the intelligent age. At the same time, in terms of construction engineering, it has become indispensable to improve the level of quality management and control. In terms of automation technology, Merrett HC and Dey S are respectively concerned with the available technologies in water quality management applications and how to deploy Robotic Process Automation (RPA) as technical solutions in business processes and services, as well as the transformation beyond traditional business process management and outsourcing Leverage [1-2]. Asensio J A proposed a solution for simulating the home automation environment. The solution is based on the KNX standard and can be represented by the architecture of the device [3]. Harris AD and Giustina DD mentioned automation technology. The latter emphasized that the distribution network has always been and still is the center of technological innovation leading to the so-called smart grid and that this technological innovation mainly revolves around the installation of medium voltage (MV) automation systems to improve the quality of service and the use of electronic meters to remotely read customer consumption [4-5]. Zhang Wanbin described that the technical level of electromechanical equipment installation has a significant impact on the performance, safety and stability of mining equipment [6]. Fereidunian A proposed a new idea for the implementation plan of distribution automation (DA) [7]. Liu G introduced that in terms of equipment installation, by analyzing the complex electromagnetic compatibility environment and related specific problems in the unprotected field installation of the power distribution site IED, the design proposal of the distributed equipotential grounding grid was put forward [8]. Europ Ing Albert Lester CEng and Wang Zhichao respectively mentioned related issues in quality management and analyzed and studied the actual situation of thermal control automation control equipment in thermal power plants, and took targeted measures to conduct scientific and reasonable debugging and installation. The quality of power generation provides an effective guarantee [9-10].

This article starts with the explanation of automation technology under the new situation, introduces the far-reaching significance of using automation technology in mechanical design and manufacturing, and reveals the application of automation technology in mechanical design and manufacturing at this stage. Through the analysis of the current situation, we learned about the problems of the construction unit in the project quality management, introduced the quality and quality management theory, explained the principles of construction quality management of the construction project, and discussed the key points of the construction project. Through the analysis of practical application in the aspects involved in electromechanical equipment management information technology, effective resource allocation and information transmission will be discussed by us and let it play an important role.

2. Method

2.1 Automation Technology

Automation technology is an emerging discipline based on information technology. It uses computers and information technology to manufacture machines and equipment in accordance with preset procedures, without manual operation or requiring very few people to participate. Production operations can be performed, and planned tasks can be completed through automation (such as information processing). From the perspective of development history, the United States first proposed the term "automation" in the 1940s. After that, through the development and advancement of science and technology and its promotion, considerable development has been achieved by automation technology, involving various fields, and achieving cost reduction and efficiency improvement. Automation technology greatly reduces the consumption of manpower and material resources,
enabling people to get more benefits. At the same time, through integration with different fields, automation technology has gradually begun to be subdivided, forming a different technical situation of automation in machinery manufacturing, process control, management and education, showing a trend of diversified development and interdisciplinary technology. In addition, the technology also has very strong scalability, using the advantages of automatic control to replace or assist people to complete related tasks.

2.2 Equipment Management Technology

Automatic equipment installation technology is mainly used in the installation process, with the help of computers and other technologies to optimize the installation process to complete the installation work. Therefore, this method not only has the advantage of high accuracy, but also greatly shortens the installation time and improves the installation of mechanical equipment. Efficiency and quality are conducive to the normal use of mechanical equipment. In addition, when installing mechanical equipment, you can also use computer software for installation and trial operation. This method of installation and operation reduces the possibility of installation errors, reduces mechanical wear, and helps maintain good equipment performance.

2.3 Quality Management

Quality is the characteristic of the basic attributes of a substance to satisfy the required ability. The extent to which the inherent characteristics of these substances meet the requirements is mainly defined or implied in the contract, specifications, standard documents and drawings in terms of organizational practices, general customs, industry rules, laws and regulations. In addition to the interests of other related parties, in addition to customer requirements, the organization's own interests, raw material suppliers and social interests must also be considered. The quality management of the measurement automation system must strictly follow the following quality management principles:

(1) Adhere to the first principle of safety and quality

The one-century plan is regarded as the first safety and quality first. Electric power construction, including measurement automation systems, has an important position in the construction of the national economy. The quality of the project not only affects the efficiency and reputation of the company, but also affects the life and property safety of residents, and even affects the harmony and stability of the society. Therefore, it is necessary to strengthen the quality and safety awareness of construction personnel during the construction process, and always put safety and quality management in the first place.

(2) Adhere to the principle of people-oriented and prevention first

Adhere to people-oriented, subjective initiative needs to be grasped; handle all aspects of the relationship; improve people's professionalism, enhance people's sense of responsibility, and strive to avoid man-made work errors. At the same time, we must adhere to the prevention-oriented strategy, do a good job of monitoring and prevention, avoid project quality problems, and minimize the losses caused by possible quality problems.

(3) The principle of respecting science and objective facts

In the process of monitoring and problem handling, managers should treat management with an objective and fair attitude; reflect scientific and objective facts in the construction process and maintain a fair, just and objective attitude.

3. Experiment

3.1 Description of Practical Application of Automation Technology

Coal mining work has a very complex and harsh environment. This is due to the complexity of the underground structure. During the construction process, dust, groundwater, gas, carriers, etc. all have certain safety hazards. A slight negligence can lead to a safety accident. Therefore, while paying attention to mining efficiency, we must also pay attention to mining safety. The application of
automation technology in coal mining systems has greatly improved the efficiency and safety of coal mining. Mining equipment is essential equipment for coal mining. The application of automation technology in mining equipment, such as the use of electric traction shearsers, has greatly improved the efficiency of coal mining. The multiple and excellent features are embodied in the electric traction shearer. First of all, it has a strong traction ability. The completion of the mining task, even if the shearer drops, electric traction will be used to complete its task. Sometimes coal mining is in a specific environment, and inclined angle mining often occurs. If a traditional mining machine is used, it is easy to lack power and cause shutdown; the complete solution of this problem requires the use of electric traction shearsers, which can solve this problem. With the help of sensors, the electric traction shearer completes the control of mining equipment by installing automatic monitoring equipment, and the mining efficiency and safety are very high. In the past ten years or so, the independent innovation research of coal mining technology and equipment that has made significant progress has shown an increasingly better situation in my country, and major breakthroughs have been made in many technological levels. The application of the underground industry test has achieved good results, and the international advanced level has also appeared in my country's coal mining technology and equipment as a whole.

3.2 Data Sources
When the engineering quantity and labor efficiency are known, the following formula can be used to calculate the duration of the activity. Its calculation method is shown in formula (1).

\[ T_i = \frac{Q_i}{R_i \times S_i \times N_i} = \frac{P_i}{R_i \times N_i} \]

Among them: \(T_i\) represents the duration of completion of work \(i\); \(P_i\) represents the amount of labor or number of shifts required to complete work \(i\); \(N_i\) represents the number of work shifts per day to complete work \(i\); \(S_i\) represents the production quota (labor efficiency), that is, the completion of unit time Engineering quantity; \(Q_i\) represents engineering quantity; \(H_i\) represents time quota (labor efficiency); \(R_i\) represents the number of professional teams or the number of machines.

4. Result
4.1 Quality Management Process and Principle Analysis
The construction project quality management process includes the following key links as follows, as shown in Figure 1.

![Figure 1. Quality management process](image-url)
Total quality management emphasizes the precautionary principle. The existing quality management has been malignantly developed into a problem-oriented, passive quality problem management process. The quality management process lacks dynamic preventive measures, or the preventive measures formulated are not comprehensive enough to conform to actual projects. Total quality management emphasizes the principle of using data to speak. Analyzing the status quo is the first step in the PDCA cycle of total quality management. Quality problems need to be identified and data are used to speak, as shown in Figure 2.

4.2 Equipment Application Analysis
As one of the key equipment, the hydraulic support is the longwall working face of the coal mine. In recent years, based on the research on the interaction between support and surrounding rock, modern optimization design, 3D CAD dynamic parameter optimization design and system reliability design are used as means. Regarding automatic and electro-hydraulic control as the goal, it is used as a means to improve the strength and welding performance of steel. After a long period of unremitting persistence, we have been striving to innovate independently. The hydraulic support structure has also successfully matched the complex geological conditions in our country. Including light, thin and large angle brackets. Coal seam support as a full-height support used for one-time mining of thick coal seams, high caving roof supports are placed in extra-thick coal seams, three-layer soft coal seams and hard-to-mine coal seam supports, etc. The height requirement range is 0.65~7.20m hydraulic support, the center distance of the support is 1.50, 1.75, 2.05m, and the maximum working resistance is 18800kN. The support fully realizes electro-hydraulic control, and the cycle time of the support falling, moving and rising is less than 10s. At present, hydraulic supports have been completely localized, completely replaced and in difficult coal seams, the height is maximized, the resistance is working, and the adaptation of hydraulic supports far exceeds foreign products. The related parameters are shown in Table 1.
Table 1. Bracket parameters

| Parameter                                      | Value       |
|-----------------------------------------------|-------------|
| Stand height/mm                               | 3200-7200   |
| Stand weight/mm                               | 1960-2210   |
| Center distance of bracket/mm                 | 2050        |
| Support strength/Mpa                          | 1.60/1.47   |
| Specific pressure of bottom plate tip/MPa     | 2.6-5.6     |
| Setting force/k N                             | 12364       |
| Work resistance/k N (P = 47.8 /43.3 MPa)      | 18800/17000 |
| Operation method                              | Electro-hydraulic control |
| Pump station pressure /MPa                    | 31.5        |
| Length×width×height/( mm × mm × mm)          | 9200*1960*3200 |
| Quality/t                                     | 69.79       |

From the modern meaning, equipment management is covered in equipment life cycle management. Among them, the entire process of asset and equipment management, from the input period, output period and decline period to a series of processes are covered. In the process of value change, equipment management also penetrates into it. Therefore, the complete life cycle of the equipment considered by us must be carried out in conjunction with equipment operating costs and economic benefits. From the perspective of automation technology, the equipment installation life cycle is shown in Figure 3.

![Figure 3. Equipment installation life cycle](image)

5. Conclusion

In summary, the extraordinary role of automation technology is reflected in my country's rapidly developing mechanical design manufacturing industry. In the new era, the improvement of efficiency and quality should be taken as our goal and be introduced into modern manufacturing, and promote the sustainable development of my country's industrial economy. Development has important practical significance. Equipment management is a process of continuous optimization, improvement and development, continuous enrichment of equipment management content, and deepening of the connotation of equipment management. With the development of new technologies, more and higher demands will be demanded on the accuracy of mechanical products. The application of mechanical engineering automation equipment installation technology can not only improve product quality, but also improve equipment assembly efficiency, which is conducive to the sustainable development of the industry.

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