

Mechatronics technology is applied in coal mines

Zhicheng Yang, Xinjian Xu

Shandong Xiehe College, China

Shandong Xiehe College, China

Abstract

The safe and efficient production of coal mines can not be separated from high-performance mining equipment, the application of mechatronics technology can effectively reduce the labor intensity of workers, to ensure the safety of workers. This paper discusses the technology of mechatronics in coal mines, and discusses the application and development trend of mechatronics technology in coal mines.

Keywords

Coal Safety Monitoring Automation PLC.

1. Introduction

Coal also occupies a large proportion of China's energy structure, plays an important role in promoting economic development and ensuring energy security, the demand for coal has maintained a state of growth in recent years, the improvement of coal mine productivity can not be separated from the integration of mechanical and electrical technology, to enhance production efficiency, reduce labor strength and ensure safe production and other aspects have a positive role. The shearer has changed from the original hydraulic traction to the electric traction mode, the microcomputer control technology of hydraulic support, fault diagnosis technology, etc. have been applied to the mechanical equipment, the mechanical and electrical integration technology of coal mining equipment has made great progress, but there is still a certain gap with the world's advanced coal mining equipment, it is necessary to strengthen the research and development of integrated technology of coal mining machinery and equipment, and better serve China's coal mine production.

2. Mechatronics technology in coal mines

The mechatronics technology of coal mine is to combine electrical, hydraulic and mechanical technology to further improve the automation degree of coal mining equipment, facilitate the operation and post-maintenance of staff, and also require the coal mine machinery and equipment to have reliability, safety, has a long service life. The microprocessor control technology as the core, take electricity, liquid, gas with the way to control the operation of the executive, and then with the sensing technology to the operation of the executive body feedback to the controller. Through the fault detection program to monitor the operating status of machinery and equipment, with fault self-diagnosis function, the abnormal operation of the alarm, through the microcontroller, PLC as the core control part, combined with variable frequency control technology, electronic fluid technology to improve the performance of coal mining equipment, to meet the coal mine production of a variety of operating conditions.

3. Application of mechatronics technology in coal mines

3.1. Safety production monitoring system

Safety production monitoring system can best reflect the level of mechatronics, domestic coal mine safety production monitoring and research and development started late, in the 1980s has been foreign coal mine safety monitoring technology digestion and absorption, to promote the development of China's coal mine safety monitoring technology has played a very good role in promoting. Combined with the actual situation of Coal Mine Enterprises in China, coal mine researchers have developed KJ95X, KJ90X and other monitoring systems with high technical content, which further enhances the intelligent level of domestic coal mine safety monitoring system and plays a very good role in the application and management of coal mine production. The use of mechatronics technology to achieve three-phase asynchronous motors, transmissions, hydraulic control systems and brake devices, such as online monitoring, through monitoring procedures to detect the operating status of equipment, found faults in a timely manner to alarm staff, through the human-machine interface to provide the location of failures, can quickly repair the organization personnel, so that coal mining equipment can be quickly restored to operation, but also reduce the labor intensity of staff, so that coal mining equipment can run efficiently.

3.2. Application of mechatronics technology in belt conveyors

The major technical projects of mechanical and electrical integration of coal mines carried out in China have greatly improved the automation and intelligent performance of coal mine equipment, belt conveyors are important equipment for coal mine production, long-distance, high-power mine belt conveyors have been a great breakthrough, and many types of belt conveyors have been developed, such as long-distance large-inclination belt conveyors, retractable lane belt conveyors, etc., to carry out in-depth theoretical research on important control components and core components. Many key components have been successfully developed, the use of PLC controller, inverter and other devices to real conveyor CST soft start control, two belt transporters can be through one or more CST to achieve control, to achieve long-distance, large volume control, but also to the conveyor for good braking control, planetary gear reducer, hydraulic coupler and other advanced equipment applied to the belt conveyor, so that the conveyor has good control performance and power performance.

3.3. Mechatronics technology application of shearers

Electric traction shearer technology has made a great breakthrough, compared with the original coal mine production of hydraulic shearer, there is more adequate traction, if the shearer in the braking conditions, can be converted into energy re-application of electricity, play a good energy saving and consumption reduction effect. If in the large inclination coal seam traction conditions, can ensure that the equipment to run at a good efficiency, will not produce a lot of wear, has a good safety, reliability, maintenance workload is relatively small, dynamic characteristics are better, electric traction shearer transmission mechanism can be simplified, energy conversion rate has been greatly improved.

3.4. Mechatronics technology applications in lifters

The improvement of the automation level of coal mine production can reduce the labor volume of mining workers, improve the productivity of coal mine resources, and also prevent the lack of operator level and experience, which can affect the precision of production. For example, thin coal mining equipment using hydraulic support hydraulic fluid control system, through the control program to control the bracket action, to ensure that the bracket can operate without anyone, operators can use remote operation or automatic operation. Cross-straight digital lifter is a typical application of mechanical and electrical integration in coal mine, combining the

drive device with the drum, using power electronics technology, automatic control technology, communication technology, bus communication will improve the transmission quality of mathematical signals, no longer use traditional relay control, effectively simplify the number of electrical components, has a high reliability. The hardware of the lifter is very versatile, the communication protocol can also be compatible, and the configuration is simpler. Domestic research and development of digital cross-straight lifter, control core using dual-placer method, can better ensure the operational stability and reliability of the lifter.

4. The development trend of mechatronics technology in coal mine machinery

Drive motors, gearboxes and implementing agencies to establish the power system of coal mine production equipment, the traditional power transmission efficiency is not high, there is a lot of energy waste, there will be a lot of space, the reliability of the system can not be guaranteed. Mechatronics technology is not simply electrical control technology, mechanical technology for simple superposition, the need to make a variety of technologies for a high degree of integration, the construction of the most optimized mechanical and electrical systems, each element to maintain a high degree of dependence, in order to fully complete the collaboration, coal mine robots will be the future direction of mechatronics development.

5. Concluding remarks

To sum up, with the continuous progress of mechanical and electrical technology, coal mining technology has also been rapid development, the mechatronics technology and coal mine production equipment, etc. , can ensure the safety of operators under the premise of further improving the efficiency of coal mining, and promote coal enterprises to a sustainable and healthy development path.

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