

## Research on Maintenance Management System of Coal Mine Electromechanical Equipment Based on RCM

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**Abstract.** According to RCM(reliability-centered maintenance) of modern theory, maintenance management system of coal mine electromechanical equipment is mainly designed in this paper. The results showed that reasonable arrangements for equipment maintenance period, will help save maintenance costs, improve the running quality of the equipment, extend the lifetime of the equipment with RCM in the maintenance management system of coal mine electromechanical equipment.

### Introduction

In the mining and transportation process of coal, it often requires a lot of equipment to work together to complete production tasks. With the rapid development of science and technology, the coal mine electromechanical equipment shift rapidly in the direction of large-scale, automatic and intelligent. The relevance of the coal mine electromechanical equipment is closer and closer. The regular operation of a device or not is often related to the safe operation of the entire coal production equipment, and its fault could easily trigger downtime and stop the entire production process, leading to huge economic and substantial losses and a substantial increase in maintenance costs, and even casualties[1].

RCM theory was first applied in the field of civil aviation in the United States in the 1960s, later used for military systems and equipment, has now extended to all other industries [2]. For over 50 years, after the development and perfection, now RCM as the third generation of maintenance management model, has become the basis of maintenance management practice in the world.

RCM removes the irrational part from the traditional method of equipment maintenance, so that the maintenance management method of coal mine electromechanical equipment match toward a new stage of scientific management.

### RCM Theory and Decision Analysis

**The Concept of RCM.** RCM as a system analysis method is widely accepted at the international level. It makes a unique maintenance plan for each device[3].

**RCM Decision Analysis.** From the perspective of the specific conditions of RCM, it is mainly composed of the following three steps, the first step is to determine the important function of the system, the second step is for equipment failure mode and consequence analysis, the third step is to choose equipment maintenance.

RCM can make the right decisions or not that can accurately define and divide the system. Equipment system is divided into several functional system, and then further divided into various sub-systems, individual components as shown in fig. 1.

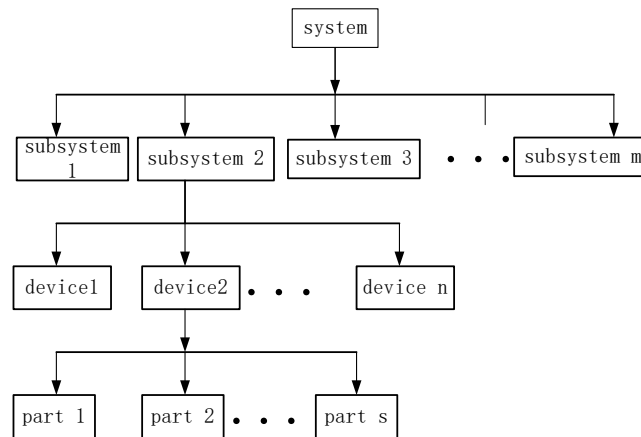


Fig.1 Partition function system schematic diagram

## System Design

According to the actual condition of coal mines, maintenance management system of coal mine electromechanical equipment consists of the following function modules: system login module, equipment information management module, user information management module, RCM analysis module, equipment maintenance information management module, spare parts information management module, manufacturer and supplier information management module, administration of statistic forms module, system information query module, system maintenance module.

**User information management module.** User information management module is used to manage the personnel of using the system. It has mainly the following functions: user to add, users to delete, user passwords to modify and user information changes.

**Equipment information management module.** Equipment information management module consists of equipment foundation information management and equipment status information management. Equipment foundation information management module is to manage basic information closely associated with the device. Equipment status information management is the actual operation information of the equipment.

**Equipment maintenance information management module.** Equipment maintenance information management module mainly includes equipment maintenance basic information, maintenance personnel information management and maintenance management program.

**Manufacturer and Supplier Management module.** Manufacturer and supplier management module includes manufacturer management, supplier management, supplier delivery management and supplier evaluation management. It is used to maintain and evaluate equipment manufacturers and suppliers information.

**Administration of statistic forms module.** Administration of statistic forms module is to output and display the data after analysis. The system can reorganize the data according to user needs and facilitate user RCM analysis.

**System information query module.** System information query module is used to query the information users need to know.

**RCM analysis module.** According to the existing data of the equipment, the best maintenance interval and repair mode of the equipment parts is analyzed.

## RCM Analysis Module Running Instance

In the home page of the system, click RCM analysis, you can enter the RCM analysis module. Select the device model and part model to query, click on the RCM analysis button, the system will select the device components of RCM analysis to calculate the best maintenance intervals and maintenance mode of the various components of the part. Take the traction motor YBQYS - 55 of the coal mining machine MG500/1130 - WD for example. RCM is used to analyze its various parts to calculate its optimal maintenance intervals and maintenance mode.

Select the equipment model MG500 / 1130-WD, Part model YBQYS-55 in the user interface, click the button of RCM Analysis to appear the results we want to get. As shown in Fig. 2.

RCM Analysis Module				
Equipment model: MG500/1130-WD		Part model: YBQYS-55		RCM Analysis
Part name	the actual repair interval	the repair interval after analysis	Actual repair mode	Repair mode after analysis
main pole	250h	250h	corrective maintenance	corrective maintenance
the front pole	400h	400h	corrective maintenance	corrective maintenance
the end pole	300h	400h	corrective maintenance	corrective maintenance
commutator	100h	200h	corrective maintenance	corrective maintenance
commutator pole	450h	450h	corrective maintenance	corrective maintenance
connecting chamber	400h	100h	periodic maintenance	status maintenance
control element	300h	500h	periodic maintenance	periodic maintenance
brush	100h	250h	corrective maintenance	corrective maintenance
bearing	200h	150h	corrective maintenance	status maintenance
winding	200h	150h	corrective maintenance	status maintenance
compensation winding	400h	200h	periodic maintenance	status maintenance
turn shaft	300h	400h	periodic maintenance	periodic maintenance

Fig. 2 RCM analysis interface

Table 1 the 400h detection information comparison of YBQYS-55

Maintenance features	Maintenance time	Maintenance personnel	Maintenance costs	Maintenance reliability
The Actual maintenance situation	30 days	five people	8201.2 yuan	92.36%
The results after systematic analysis	24days	three people	6703.4yuan	99.58%

From table 1, the application analysis results of maintenance management system of coal mine electromechanical equipment based on RCM are compared with the situation in practical work. It can be concluded that the maintenance is more reasonable, on the one hand, it reduces maintenance time, on the other hand also it greatly saves manpower, financial resources. After repair, there is obvious improvement in the reliability of the equipment.

## Conclusion

Maintenance management system of coal mine electromechanical equipment based on RCM is designed in this paper. Preliminary research results show that it overcomes the defects of the traditional mode, such as more maintenance and repair after faults occurred, reduces the maintenance costs, raises the scientific nature of the equipment maintenance management. Maintenance management system of coal mine electromechanical equipment based on RCM has extensive prospect in the field of modern coal mining electromechanical equipment maintenance management.

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