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A Preliminary Analysis of Storage Technology and Maintenance Management Strategies for Radio and Television Automatic Playout Systems (Postprint)

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Abstract

Automated broadcast television systems play an important role in ensuring television program quality and improving staff work efficiency, partially meeting audience demands for television programs. Focusing on research into storage technology and maintenance management strategies for automated broadcast television systems is crucial for ensuring their normal operation.

Full Text

Analysis of Storage Technology and Maintenance Management Strategies for Broadcast Television Automatic Playback Systems

Abstract: Broadcast television automatic playback systems play a crucial role in ensuring television program quality and improving staff work efficiency, partially meeting audience demands for television programs. Emphasizing research on storage technology and maintenance management strategies for these systems is of great significance for guaranteeing their normal operation.

Keywords: broadcast television; automatic playback system; storage technology; maintenance; management

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1. Composition of Broadcast Television Automatic Playback Systems

Broadcast television automatic playback systems collect signals from memory and hard disks under computer control, use automatic playback software to

schedule program broadcast tables, and output video and audio signals via broadcast cards. The system primarily consists of four components: optical transmission, upload, sub-control, and broadcast control systems. The optical transmission system—composed of optical cables, optical splitters, and optical transmitters—is responsible for transmitting broadcast television signals to network equipment rooms. The upload system can perform reviews using high-bandwidth channels or signal sources; because it can operate in half-duplex mode, it maximizes utilization of upload resources and continuously increases program storage capacity. The sub-control system mainly uses primary and backup control computers to manage primary and backup decoders, ensuring smooth broadcast of television programs. The broadcast control system is primarily responsible for controlling broadcast equipment, managing program playback across all channels, and handling broadcast emergencies. The broadcast television automatic playback system features resource sharing capabilities, which improves the efficiency of adding new channels, particularly by using playback files from the storage system to construct new channels.

2. Storage Technologies for Broadcast Television Automatic Playback Systems

Storage technology is a critical component of broadcast television automatic playback systems, providing essential support for program scheduling. Therefore, emphasizing research on storage technologies helps understand the working principles of playback systems, fully exploit their application value, and ensure stable, high-quality broadcast of television programs. Among these, online storage technology, data archiving storage technology, and RAIN storage technology are the most commonly used in the system.

2.1 Online Storage Technology

Online storage technology primarily includes DAS (Direct Attached Storage) and SAN (Storage Area Network). DAS uses an open direct-attach approach, connecting to server hosts via SCSI. It is relatively simple to operate and economical; however, expanding storage capacity is difficult, and performance can degrade due to SCSI limitations, giving it a declining trend in favor of SAN storage. SAN is a high-speed subnetwork or network storage area network that enables data transmission through arbitrary connections of separate devices. Using fiber optics as the data transmission medium, SAN storage technology offers excellent transmission performance, supports backup and recovery operations, and enables archival data retrieval and server data sharing.

2.2 Data Archiving Storage Technology

As is well known, broadcast television handles enormous volumes of information. To meet practical work requirements and obtain larger memory capacity, data archiving storage technology must be employed. This technology archives

not only infrequently used television programs but also important files, thereby increasing memory space without affecting normal system operation. For frequently used television programs, they are typically placed in front-end arrays to facilitate easy access and allocation.

2.3 RAIN Storage Technology

With the vigorous development of the broadcast television industry, the demand for storage space during program broadcasting has grown increasingly high, requiring not only large capacity but also convenient online access—requirements that RAIN (Redundant Array of Independent Nodes) storage technology precisely meets. RAIN storage technology integrates archival storage with online storage, consisting of multiple RAIN nodes. Each node can automatically and comprehensively examine stored files within a predetermined timeframe, particularly when data files are damaged, issuing replication requests to connected RAIN nodes to ensure the entire system continues operating normally.

3. Maintenance Management Strategies for Broadcast Television Automatic Playback Systems

Broadcast television automatic playback systems have complex compositions and require highly specialized maintenance management, which increases the difficulty to some extent. Therefore, functional departments of broadcast television stations should enhance their understanding, combine the characteristics of automatic playback systems, actively seek effective maintenance management strategies, and promptly identify and resolve operational issues to ensure normal broadcast of television programs.

3.1 Building a Professional Management Team

As mentioned above, broadcast television automatic playback systems are complex and incorporate multiple advanced technologies, demanding high professional competence from maintenance personnel. Therefore, broadcast television functional departments should establish a professional management team. On one hand, they should recruit outstanding graduates from society and renowned universities. Departments must change their hiring perspectives, seeking high-quality talent with solid professional skills and strong responsibility from well-known institutions. Simultaneously, they should raise hiring standards and implement reasonable salary systems that match personnel capabilities with compensation to enhance work motivation. On the other hand, they should strengthen professional talent development. To provide robust personnel support for system maintenance management, departments should regularly organize training activities for maintenance staff, explaining system composition and subsystem working principles, identifying common operational failures, analyzing their causes, and proposing effective preventive measures—all of which require diligent study from maintenance personnel. Additionally, regular main-

tenance management competitions should be held to facilitate mutual learning and exchange of experiences and techniques, achieving overall improvement in the professional level of the maintenance team.

3.2 Improving Maintenance Management Systems

Maintenance management of broadcast television automatic playback systems is a long-term endeavor. To enhance staff responsibility and proactively identify potential operational issues, broadcast television functional departments should actively improve maintenance management systems, increase troubleshooting efficiency, and restore normal operations as quickly as possible. First, they should improve daily maintenance management systems. Since system failures occur unpredictably and their impact can be immeasurable, departments must establish comprehensive daily maintenance management systems, requiring personnel to strengthen their understanding of system regulations and conduct thorough inspections of system operations in strict accordance with rules. They should clearly distinguish between software and hardware failures, summarize patterns and causes of common failures, and improve the targeting of maintenance management. Second, they should establish a maintenance management archiving system. This system requires maintenance personnel to meticulously document their work content, identified problems, and solutions used, creating written materials for archival purposes. This provides a basis for future maintenance work, particularly offering targeted references for system troubleshooting and avoiding blind maintenance efforts. Finally, they should implement a maintenance management responsibility system. To ensure maintenance personnel fully perform their duties with high responsibility, functional departments should implement a responsibility system that clearly defines individual responsibilities and corresponding penalties for issues that arise, applying appropriate pressure to enhance proactive maintenance management.

3.3 Strengthening Equipment Maintenance Management

Broadcast television automatic playback systems consist of numerous devices, and any single device failure can impact normal system operation. Particularly since some devices have stringent environmental requirements, broadcast television functional departments should enhance their awareness and actively implement measures to strengthen equipment maintenance management. First, they should clarify equipment maintenance management procedures. When conducting equipment maintenance, personnel must clearly understand different equipment types, models, and related workflows, particularly familiarizing themselves with key precautions. They should fully prepare and calibrate all instruments to ensure smooth maintenance operations. Second, they should perform regular performance inspections of system equipment. Maintenance personnel should thoroughly understand the operational status of each device and establish reasonable inspection frequencies based on equipment criticality and service time, particularly increasing patrol and inspection frequency for

critical equipment and devices with high failure rates to promptly identify and resolve potential issues. Finally, they should create a favorable equipment operating environment. To ensure optimal performance of broadcast television automatic playback system equipment, maintenance personnel must fully recognize the adverse effects of environmental factors, particularly maintaining ambient temperature within optimal working ranges. Simultaneously, they should maintain clean equipment rooms to prevent excessive dust from entering devices and causing electronic component contact failures.

3.4 Implementing Maintenance Management Details

Whether maintenance management details are properly implemented often threatens the safe and stable operation of the entire system. Therefore, broadcast television functional departments should develop relevant countermeasures based on maintenance management characteristics to ensure meticulous implementation of details. First, they should conduct thorough maintenance management summaries. Maintenance personnel should summarize their work, analyzing easily overlooked content and matters requiring attention, and clearly annotate details that must be conscientiously implemented to serve as constant reminders. Second, they should clarify channel fault resolution methods. Channel failures are common in broadcast television automatic playback systems, so maintenance personnel should categorize channel fault types and analyze resolution methods, such as establishing clear inspection procedures for channel modulators to quickly identify fault causes. Finally, they should emphasize backup of critical data. To prevent loss of important data due to system failures, maintenance personnel should perform regular backups and strengthen management to prevent backup loss, reducing damage from system failures and laying a foundation for better broadcast television program delivery.

4. Conclusion

Broadcast television automatic playback systems ensure smooth program broadcasting and have made significant contributions to promoting the vigorous development of China's broadcast television industry. To guarantee normal system operation and better meet audience demands for broadcast television programs, in-depth research on storage technology and maintenance management is essential. This study draws the following conclusions:

- (1) Broadcast television automatic playback systems offer numerous advantages, but their complex composition places high demands on maintenance management. Therefore, they should receive high priority from broadcast television functional departments.
- (2) Storage technology level significantly impacts system performance. Consequently, research should focus on online storage technology, data archiving storage technology, and RAIN storage technology, keeping abreast of

storage technology development trends and promptly expanding storage capacity to better meet broadcast television program requirements.

- (3) Normal system performance depends on effective staff maintenance management. Therefore, functional departments should establish high-level maintenance management teams, actively improve management systems, particularly strengthen hardware equipment management, and require maintenance personnel to conscientiously implement work details, laying a solid foundation for normal system operation.

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