Maintenance Strategies for Digital Audio System Equipment in Radio and Television Broadcasting (Postprint)

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Abstract

In recent years, the development speed and overall standard of China' s television and broadcasting industry have been comprehensively enhanced, improving people' s quality of life and rationally innovating media models in response to people' s living needs. Concurrently, this rapid development has also imposed higher demands on the technical level of digital audio system equipment for radio and television broadcasting; the industry itself must place greater emphasis on the maintenance and management of digital audio system equipment, establishing corresponding maintenance schemes and measures. Furthermore, the application of new technologies and equipment contributes to the comprehensive development of China' s radio and television industry. Moreover, proactively addressing equipment failure issues during the maintenance process of digital audio system equipment for radio and television broadcasting, and enhancing the performance of such equipment, has a positive impact on the innovative development of China' s radio and television industry.

Full Text

On Maintenance Strategies for Digital Audio System Equipment in Radio and Television Broadcasting

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Abstract: In recent years, China' s radio and television broadcasting industry has achieved comprehensive improvements in development speed and quality, enhancing people' s quality of life and rationally innovating media models based on public needs. Simultaneously, this rapid development has imposed higher technical requirements on digital audio system equipment for radio and television broadcasting. The industry must prioritize the maintenance and management

of digital audio system equipment by establishing corresponding maintenance protocols and measures. Furthermore, the application of new technologies and equipment contributes to the comprehensive development of China' s radio and television industry. Proactive troubleshooting during maintenance of digital audio system equipment improves equipment performance and positively impacts the innovative development of the industry.

Keywords: Radio and television; Digitalization; Audio system; Equipment maintenance

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1. Requirements for Digital Audio System Equipment Maintenance

The stability of digital audio system equipment in radio and television broadcasting demands high reliability from power supply systems and integrated wiring craftsmanship. Traditional radio and television audio equipment often experienced program interruptions or signal loss during sudden power outages or lightning strikes, requiring manual restoration to initial working conditions after power recovery, which adversely affected broadcast quality and system stability. Recognizing these challenges, the industry has conducted systematic research on daily operational problems and innovated equipment design through new technologies.

To ensure operational stability, it is recommended to implement UPS (Uninterruptible Power Supply) backup power systems. UPS provides emergency power during outages or lightning incidents, ensuring uninterrupted program broadcasting and stable equipment operation while enhancing power supply security and reliability. When power failures occur, UPS systems activate "load power supply mode,"allowing backup capacity to be selected based on actual equipment operation, providing maintenance teams with adequate response time while preventing overcurrent or overvoltage charging issues.

Wiring craftsmanship represents another critical requirement, as both computer network lines and digital audio cables play vital roles in controlling transmission distance and enhancing anti-interference capabilities. Transmission distances should typically be limited to 80 meters to ensure system stability [2]. Wiring design must consider the overall independence of the equipment system, with dedicated conduits installed. Television stations should establish independent server rooms for local area networks. Power lines, network cables, and audio lines must be rationally designed using specialized casings to prevent connector-related signal transmission instability.

2.1 Maintenance Key Points

Maintenance focuses on two primary aspects: power supply maintenance and component maintenance. Digital audio system equipment has stringent power supply requirements that directly impact operational stability and overall performance. Regular inspections extend power supply lifespan, with immediate power cutoff when abnormalities are detected to prevent electrical accidents. Power supply stability testing should employ specialized instruments; when faults occur, backup batteries must be replaced and tested, controlling charge levels through 定点 (fixed-point) charging and discharging to resolve short-circuit issues.

Component maintenance follows industry-specific protocols to ensure standardization and consistency. Maintenance begins with inspecting configuration indicator lights to verify normal operation status. If indicator lights fail during functional testing, comprehensive line inspections are required. When line connections are intact but data import anomalies persist during operation, component issues must be diagnosed and addressed with targeted solutions to maintain system stability [5].

2.2 Maintenance Challenges

First, heat dissipation and radiation present significant difficulties. Digital audio system equipment incorporates numerous electronic technologies with complex internal structures and extensive component quantities, complicating maintenance efforts. During prolonged operation, voltage and current variations increase energy consumption and radiation levels substantially—approximately three times the energy consumption and ten times the radiation of conventional equipment, substantially increasing maintenance complexity.

Second, noise control represents another typical challenge. Unlike traditional equipment, digital systems must maintain noise levels between NR20-NR25. Operational state variations can increase background noise beyond these limits. While relocating equipment can help balance radiation values and work efficiency, such moves cause equipment wear and increase maintenance obstacles.

3.1 Detailed Data Recording and Maintenance Plan Adjustment

Due to the complex internal structure of digital audio system equipment, where components are both independent and interrelated, accurate data recording during maintenance and inspection is essential for understanding equipment operation and informing protocol development [4]. For switch equipment maintenance, two warning types must be documented: emergency warnings (where indicator lights activate with audible alarms) and general warnings (lights without sound). Emergency warnings require immediate comprehensive maintenance using professional knowledge and testing protocols, with prompt restoration to

operational status after fault resolution.

All maintenance data should be consolidated into an independent database using computer technology. The database can merge duplicate information, streamline processing workflows, and ensure data integrity and accuracy, thereby improving maintenance quality.

3.2 Rectifier Module Status Assessment and Core Maintenance Objectives

Rectifier module assessment constitutes critical maintenance content. Maintenance must consider module composition and enhance integrity based on operational conditions. Staff must accurately determine fault status through indicator lights—normal display indicates proper operation, while abnormal display signals faults requiring immediate repair. Daily management requires comprehensive rectifier module maintenance [6], with temperature control as the core focus. Overload operation can raise module temperatures to 40°C, necessitating regular inspection of radiator performance and cleaning of dust and debris. Radiator temperatures should generally be maintained below 20°C to ensure module stability and reduce fault rates.

3.3 Regular Maintenance to Enhance Equipment Performance

Stable operation of digital audio system equipment significantly impacts industry development and represents a prerequisite for program broadcasting. Relevant departments must conduct regular inspections and maintenance to enable timely problem identification, investigation, and resolution.

First, equipment requires regular, meticulous cleaning based on equipment characteristics and internal structures, including dust removal, index testing, and system detection. Multiple devices must be maintained simultaneously while ensuring consistency, with maintenance performed during pause or shutdown states to avoid data loss. Collected data should be transferred to backup systems to provide references for future work. Based on equipment usage, scientific and comprehensive maintenance plans should be developed to reduce staff difficulty while emphasizing detail control and management. Performance improvements through regular maintenance meet industry innovation requirements and promote sustainable development.

3.4 Professional Team Building and Quality Improvement

Given the high cost and complexity of digital audio system equipment maintenance, professional expertise and practical experience are essential. First, staff technical proficiency must be assessed to ensure comprehensive understanding of equipment internal structures and standardized maintenance procedures, preventing human-induced faults. Second, personnel experience is crucial for con-

trolling information integrity—data collection, consolidation, and storage across all workflow stages, particularly through network management software for real-time monitoring and accident prevention [8]. Finally, equipment wear must be minimized by avoiding prolonged use and developing application strategies based on broadcast requirements, ensuring both smooth program delivery and stable equipment operation. Incentive mechanisms should be established to attract skilled personnel, enable fair competition, and create specialized teams with clearly defined responsibilities for immediate problem resolution.

Conclusion

This study examined maintenance strategies for digital audio system equipment in radio and television broadcasting. The analysis covered equipment requirements, maintenance key points (power supply and component maintenance), and challenges (heat dissipation/radiation and noise). Based on these findings, the paper proposed maintenance strategies including detailed data recording with plan adjustments, rectifier module status assessment, regular maintenance scheduling, and professional team development to achieve maintenance objectives and enhance overall work quality.

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Note: Figure translations are in progress. See original paper for figures.