Cable Television Network Equipment Room Construction and Renovation Blueprint

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Abstract

Cable television constitutes an essential medium for leisure and entertainment in daily life. As public expectations for cable television services escalate, the infrastructure development of cable television network machine rooms in certain regions of China remains significantly lagging, rendering them unable to satisfy contemporary demands. Consequently, the modernization of these facilities has become imperative, compelling key players in the broadcast television sector to pursue continuous innovation and exploration, align with technological advancement, enhance their competitive capabilities, and ensure successful execution of routine operations. This paper examines the evolution and present state of cable television network machine rooms, first summarizing pertinent configuration principles, then analyzing deficiencies in contemporary network machine room construction based on practical experience, and finally proposing corresponding improvement measures for identified issues.

Full Text

Construction and Renovation of Cable Television Network Rooms

Abstract: Cable television is an indispensable tool for leisure and entertainment in people's daily lives. As user demands continue to increase, the construction of cable television network rooms in some regions of China has fallen significantly behind, failing to meet public needs. Consequently, renovating these network rooms has become an inevitable trend, requiring enterprises in the broadcasting industry to continuously innovate and explore, keep pace with technological development, enhance their competitiveness, and ensure smooth completion of daily operations. This paper discusses the development and current status of cable television network rooms, summarizes relevant design principles, analyzes existing deficiencies in current network room construction based on practical experience, and proposes corresponding improvement solutions.

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1. Development and Current Status of Cable Television Network Rooms

Under the broader trend of diversified business development, CDN resource construction and high-definition interactive television have achieved significant progress. The front-end network equipment installed in conjunction with television facilities has undergone notable optimization. By integrating advanced equipment and mature technologies with cable television and continuously renovating systems, the full development potential of the entire system can be realized. This requires constant updating and learning of new technologies and operational methods to adapt to the industry's evolving characteristics and meet public expectations for cable television development.

The construction of cable television network rooms can, to a certain extent, ensure secure transmission of cable television networks, guarantee normal operation of various facilities, enable effective monitoring of equipment status during operation, reduce network incidents, and improve overall transmission quality. In today's networked society, network rooms have become the pulse of the cable television industry, controlling its overall development direction. Particularly in recent years, under the combined impact of informatization and networking, the development environment for cable television has become increasingly complex and diverse. Equipment maintenance and updates have grown more challenging, while television production volume has increased substantially compared to traditional models. The industry faces a rapid transformation from traditional to digital production modes. In this overarching trend, network room construction serves as the industry's lifeline, continuously updating technology to enhance system stability and security.

However, after expanding various front-end components to full capacity, they still fail to meet the high standards of the cable television industry, and traditional network rooms cannot support further business updates. This necessitates complete reconstruction of cable television network rooms and comprehensive renovation of basic network sub-front-end rooms. Only through continuous progress can the cable television industry maintain stable development.

2. Design Principles

2.1 Reliability Principle

To align with the general direction of broadcasting industry development, cable television network rooms should demonstrate reliable characteristics during actual operation while ensuring no single-point failures occur. In the overall layout of network rooms, particular attention must be paid to equipment selection and subsequent maintenance. Systems must provide safe and dependable performance while ensuring effective management of each device during actual operation, thereby improving network room reliability at the holistic level.

2.2 Advanced Principle

During cable television network room construction, the most advanced equipment and mature technologies available in society should be incorporated. Through continuous renovation and transformation, the development potential of the entire system can be maximized. This requires ongoing learning of new technologies and operational methods to adapt to the industry's development characteristics and satisfy public expectations and requirements for cable television development.

2.3 Scalability Principle

In cable television network room construction, emphasis should be placed on scalability—meaning future development possibilities must be considered. First, installed equipment and front-end room construction should form a unified, complete integrated system. Second, while retaining existing services, certain expandable space should be reserved. Sufficient attention must be paid to science and technology to ensure expansion of cable television into new fields.

2.4 Controllability Principle

Since various instruments and electronic products used in cable television network rooms feature intelligent characteristics, a complete set of systematic network room management and control systems should be established during actual construction. These systems enable centralized management and real-time monitoring of various devices, record fault causes, and fundamentally improve work efficiency. Such manual monitoring and recording provide the most basic guarantee for normal operation of cable television network rooms.

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3. Deficiencies and Existing Problems in Cable Television Network Room Construction

In this new development stage, the speed of cable television network room construction and renovation can no longer satisfy people's requirements. Most

cable television network rooms remain traditional facilities with cable television equipment and broadband devices added later. Cable television network optical cables are generally divided into three layers: the first layer is the trunk cable layer, the second is the access backbone cable layer, and the third is the access cable distribution layer, as shown in [Figure 1: see original paper].

Many devices were installed with unreasonable designs, leading to chaotic cable arrangements. Equipment placement in cable television network rooms is non-standardized, facility and cable labels are mismatched or contain insufficient information, and incoming/outgoing cables and distribution frames are disorganized—all of which increase management difficulty. There is generally insufficient awareness about infrastructure renovation for cable television network rooms, and power supply infrastructure cannot be effectively managed or controlled, greatly increasing the incidence of accidents.

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4. Improvement Solutions for Cable Television Network Room Construction

As high-definition interactive television gains acceptance and user numbers rise significantly, comprehensive network transformation of the original traditional Ethernet passive optical network integrated with Ethernet-over-Coax (EOC) data transmission becomes necessary (as shown in [Figure 2: see original paper]) to meet diverse customer demands. The following improvement solutions are proposed from the perspectives of supporting engineering construction and electrical technical requirements.

4.1 Supporting Engineering Construction

4.1.1 Anti-Static Raised Floor Anti-static technology is a critical component of security protection. Since static electricity can interfere with electronic products and equipment in cable television network rooms, directly causing failures and seriously threatening staff safety, it is necessary to cover the floor with a layer of aluminum foil. This allows the bottom of each static floor's metal support column to form an organic unity on the copper foil plate, connecting the room's safety protection ground terminal with the static leakage trunk line to effectively discharge static electricity.

4.1.2 Power Distribution System To maintain uninterrupted power supply, both a 50kW generator set and a 15kVA industrial-frequency UPS power system should be installed, with dedicated personnel responsible for overall power supply management. Additionally, online UPS power should be used during signal collection, processing, modulation, electro-optical mixing and conversion, and broadcasting to ensure power stability and quality. Television walls and air conditioning should operate using direct power supply.

4.1.3 Fire Safety System Cable television network rooms must be equipped with security monitoring and fire alarm systems. For security monitoring, a certain number of security personnel should be stationed at entrances and broadcasting control centers, supplemented with pinhole cameras or intercom doorbells. The entire control console should be monitored 24 hours a day to strengthen room management. For fire alarm systems, fire control boxes networked with smoke and temperature sensors should be installed, using heptafluoropropane and SDE gas to minimize equipment damage.

4.2 Electrical Technical Requirements

4.2.1 Grounding Configuration Cable television network rooms must install appropriate grounding equipment to meet system and equipment safety requirements and maintain normal operation. Safety protection grounding, lightning protection grounding, and AC/DC working grounding should all use the same grounding device as much as possible, with total resistance less than or equal to 5 ohms. Additionally, electronic information equipment grounding inside the room should adopt equipotential measures and single-point grounding, with associated devices powered by the same UPS.

4.2.2 Static Protection Static protection requires that all conductors inside the room be grounded, with no insulated independent conductors allowed. Conductive static-raising floors, ground surfaces, and work surfaces should be statically grounded, with connecting wires possessing sufficient mechanical strength and chemical stability. Raised floors in cable television network rooms should use flame-retardant materials with static-dissipative surfaces, ensuring no metal parts are exposed to guarantee effective static discharge.

4.2.3 Power Configuration Electrical technology for network rooms demands strict specifications. Under normal circumstances, the power distribution cabinet's power supply system must simultaneously satisfy 380/220V three-phase five-wire power supply, 50Hz AC power, and TN-S grounding method, with neutral and ground wires separated and voltage between them less than 1V. Single-phase loads should be evenly distributed across three-phase lines, with various electronic device power supplies selected according to actual equipment requirements. If overhead line entry is necessary, low-voltage surge arresters should be installed at low-voltage overhead power line entry points or dedicated motor transformer low-voltage distribution bus positions. Additionally, power sockets for professional equipment and non-professional equipment should be separately installed inside cable television network rooms to prevent safety accidents. Finally, UPS host power configuration should be determined based on the network room's total power requirements, with loads strictly controlled within 50% range when multiple devices start simultaneously to protect the host.

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5. Conclusion

In today's era of continuous information technology development, science and technology have become decisive factors for enterprise survival. Under economic development, people's quality of life continues to improve, presenting new challenges for the cable television industry. To avoid elimination in fierce market competition, enterprises must strengthen themselves from within, continuously explore and renovate cable network television rooms, ensure equipment is constantly updated and maintained, maintain stable operations, preserve expansion space, keep pace with development trends, and satisfy people's stringent requirements for the cable television industry.

References

[1] Tao Yongbo. Exploring the Construction and Renovation of Urban Building Wired Digital Television Information Networks[J]. Information System Engineering, 2017(05): 144.
[2] Yang Guangyu. Analysis and Selection of Cable Television Two-Way Network Construction and Renovation Schemes[J]. West China Broadcasting TV, 2016(07): 250, 256.

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