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On Technical Support for Live Television Broadcast Events (Postprint)

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Abstract

This paper presents the operational experience of technical support for television live broadcast events from three stages: pre-broadcast, during-broadcast, and post-broadcast.

Full Text

Preamble

Title: A Brief Discussion on Technical Support Work in TV Live Broadcast Activities

Abstract: This paper introduces operational experience in technical support for TV live broadcast activities from three stages: pre-broadcast, during broadcast, and post-broadcast.

Keywords: TV program live broadcast; lighting; sound; large screen

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Lishui Radio and Television Station is a prefecture-level municipal broadcaster. Prior to 2008, the station had no dedicated TV broadcast van. In 2008, a new radio and television center building with a total floor area of 26,433 square meters was completed and put into operation, featuring two variety show studios (260 square meters and 630 square meters) and equipped with an 8+1 channel SD large-scale digital TV broadcast van and a 4+1 channel SD microwave news live van. These facilities objectively enabled the station to conduct live broadcasts of important large-scale events, significant news stories, and variety shows. Through on-site filming and audio capture, TV live broadcasts provide audiences with authenticity, immediacy, and real-time delivery, making them

highly popular among viewers. By 2017, our station had successfully broadcast and recorded over a hundred live programs, achieving notable social and economic benefits. As the head of the station's TV production department, I am responsible for technical coordination and management for each TV live broadcast. This paper shares my personal work experience regarding technical support for TV program live broadcasts, which requires coordination across multiple departments including technical divisions, program production teams, and venue rental providers. The overall quality of a live broadcast is directly related to the effectiveness of technical support work.

1. Pre-Broadcast Considerations

A detailed work plan is essential before any live broadcast. This includes planning broadcast content, determining broadcast format, preparing necessary equipment, and—based on available technical conditions—standardizing and refining the entire broadcast process to develop a comprehensive broadcast plan. Finally, the division of labor and responsibilities among all departmental personnel must be clearly defined.

1.1 TV Broadcast Van

The TV broadcast van plays a crucial role in TV program live broadcasts and is an indispensable tool for both live transmission and recording. The key to whether a broadcast van can function properly at a live event lies in its parking location. Three aspects require attention:

1. The length of on-site camera, audio, and power cables must be compatible with the broadcast van's parking position, with appropriate safety margins reserved.
2. The broadcast van must be parked on level ground without any tilt to ensure stability.
3. It should be parked in areas with minimal pedestrian traffic to avoid equipment damage caused by crowding.

Daily maintenance of broadcast vans is also critical, requiring attention to four aspects: 1. Timely annual vehicle inspections. 2. Checking whether the uninterruptible UPS power supply is fully charged. 3. Replacing side-slide box batteries after four years of use and monitoring their charge status. 4. Inspecting the condition of hydraulic supports, which require regular checks as they are prone to issues during use. Proper maintenance ensures broadcast van stability.

1.2 Power Distribution System

The normal operation of all equipment depends on a reliable power supply, which is not only directly related to equipment safety but also significantly impacts broadcast security. Insufficient power supply can directly cause equipment failure and broadcast interruption, resulting in adverse consequences. Therefore,

the safety and reliability of the power supply system are paramount to live broadcasting. Four key aspects require attention:

1. **Power load capacity, load balancing, and emergency backup power:** Our station's 8+1 channel SD large-scale digital TV broadcast van has a power rating of 20kW and requires 380V power with circuit breakers of at least 60A or 100A. The 4+1 channel SD microwave news live van has a 5kW rating and can use either 220V or 380V power with 20A circuit breakers. The large broadcast van requires three-phase five-wire power cables of at least 10 square millimeters. Dual power supply (one municipal power line and one diesel generator backup) should be used during live broadcasts. The automatic transfer switch must be checked for proper operation, as it directly affects broadcast success. One factor affecting load balance is the condition of the neutral wire—switches and fuses must not be installed on the neutral line, as this can cause neutral line breakage, preventing stable load distribution and potentially damaging broadcast equipment.
2. **Lighting power must not share circuits with audio, display, or signal systems** used in TV live broadcasts, as this can cause interference.
3. **Proper shielding and grounding of signal lines** enhance broadcast stability. Grounding of audio equipment and signal system devices is also crucial. Various external audio interferences can occur during live broadcasts, and proper grounding of audio equipment is key to maintaining audio stability.
4. **Critical equipment should use UPS power supplies** with regular testing. To avoid adverse effects from power switching surges and maintain equipment in optimal condition, power should not be cycled after equipment debugging is completed.

1.3 Lighting System

Many live programs take place in the evening, making the lighting system essential for creating stage atmosphere and providing illumination. Normal operation of the lighting system depends on several factors:

1. **Safe and secure hanging of lighting fixtures.**
2. **Weather considerations during installation** to avoid exposure to rain, snow, or other adverse conditions.
3. **Power distribution for the lighting system**, which consumes significant electricity during broadcasts. It is crucial to minimize rated voltage fluctuations on each phase and reduce neutral line resistance to avoid poor neutral connections or disconnections. Daisy-chaining power outlets is strictly prohibited in lighting equipment. Lighting directors must maintain consistent color temperature across all lighting zones.

4. **Cable routing for lighting power** should avoid audience contact, with proper installation protection to prevent cable damage and accidents.

1.4 Sound System

1. **Sufficient audio power** is necessary due to audience noise and different indoor/outdoor environments, avoiding issues like unclear sound quality or insufficient volume.
2. **Multiple backup audio sources** should be prepared. Storing audio sources in computers for playback can prevent many unexpected playback failures.
3. **Proper audio signal conversion:** Laptop audio signals should normally be connected to stereo inputs on the mixing console. For long-distance transmission, signals should preferably be converted to balanced signals before transmission to reduce noise interference.
4. **Use of isolators** during signal transmission can reduce potential differences between equipment and instruments, minimizing interference. Good isolators are expensive and require proper maintenance.
5. **Wireless signal interference:** Various wireless signals exist during broadcasts, and frequency conflicts can cause mutual interference (e.g., between walkie-talkies and audio equipment). Equipment frequencies should be identified before broadcast to avoid overlapping frequencies.
6. **Microphone preparation:** Checking microphone functionality before broadcast and distributing them in an organized sequence is important. Proper arrangement allows sound engineers to handle emergencies calmly.

1.5 Large Screen Display

TV background large screens display many video images during broadcasts and significantly enhance on-site atmosphere. Their normal operation is closely related to technical staff. Technical support for large screens involves three aspects:

1. **Signal source types:** HD screens use 16:9 aspect ratio installation, while SD uses 4:3.
2. **Regular maintenance:** Screens should be kept clean and dry with periodic inspection and repair.
3. **Primary and backup signals** are typically used for large screens to handle emergencies.

1.6 Communication System

Teamwork is essential for rapid fault resolution. Smooth communication during broadcasts enables quick understanding of emergencies and development of reasonable solutions. Therefore, ensuring smooth communication between departments is critical for complete live broadcast effects. Communication methods

include wired and wireless systems, with wireless systems comprising walkie-talkies, headsets, and telephone couplers.

1.7 Signal Transmission

Signal transmission between the live broadcast site and the broadcast control center, as well as for multi-venue or multi-regional interactions, can employ fiber optic cables, microwave, and satellite transmission as appropriate.

1.8 Rehearsal

Rehearsal is an essential pre-broadcast procedure that allows continuous adjustment of lighting and audio to achieve optimal conditions and enables coordination among all departments, ensuring performers can work in sync. For a successful broadcast, all departments and positions must understand the broadcast process, be familiar with the broadcast plan, and follow procedures. Reasonable plans should be formulated promptly to handle unexpected issues.

2. During-Broadcast Considerations

1. **Signal monitoring:** Before on-air transmission, audio, video, and their synchronization must be monitored to ensure good viewer experience.
2. **Emergency handling:** When emergencies occur (e.g., equipment or cable damage) that disrupt normal broadcasting, rapid emergency response is required. Broadcast delay devices are commonly used and must function properly. Dedicated monitoring personnel should be assigned for real-time signal monitoring during live programs.
3. **Inter-departmental communication:** Smooth communication between departments is crucial for successfully handling emergencies. All departments must maintain communication during broadcasts and fully utilize its function.
4. **Large screen signal switching:** As long as large screen switching is not performed directly in front of cameras, signal feedback and image ghosting can be effectively avoided.

3. Post-Broadcast Considerations

1. **Power shutdown:** When the live program ends, the broadcast van and some equipment continue operating. Staff must be careful not to disconnect power to equipment still in operation. Backup power should be used appropriately during this period.
2. **Equipment protection:** After the program concludes, orderly audience exit should be arranged, and protective measures for equipment and cables should be implemented.
3. **Equipment inventory:** A careful equipment checklist is essential—everything brought must be returned. In the chaotic post-show

environment, small items like walkie-talkies, microphones, and headsets can easily be lost and must be collected by designated personnel according to serial numbers. After shutdown, equipment should be maintained in good condition for future use.

4. **Documentation:** Throughout the broadcast, technical personnel must carefully document all fault phenomena and solutions, analyze causes, and learn lessons to handle similar issues calmly in the future.

4. Conclusion

With today's rapid development of television technology, TV professionals face increasing challenges. Only by adapting to technological developments and continuously improving themselves can they successfully complete their work. All departmental personnel must enhance their comprehensive capabilities—directors should learn more about technical aspects, while technical staff should improve their artistic understanding. To excel in their duties, personnel must thoroughly study broadcast systems theoretically, keep pace with new technological developments, and practically explore bravely while confronting difficulties. Only through accumulating experience and combining knowledge with practice can one become a qualified television professional.

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