**Analyze the technical functions of OBT campus intelligent broadcasting**

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Product and technical analysis

All manufacturers are publicizing their own public broadcasting system products from different angles and different levels. However, in the construction of campus intelligent broadcasting system, what kind of technology and solutions should be adopted, and what kind of products and manufacturers should be selected? For the school, it is like looking at the flowers in the fog. It is difficult to distinguish the campus intelligent broadcast products with advanced technology and stable performance. The following is an analysis of the campus intelligent broadcast products according to their working principles and transmission methods, for the reference of schools in the construction of campus broadcasting.

1. Intelligent broadcasting with constant voltage transmission

Technical background analysis: Constant pressure broadcasting is the earliest public broadcast into the campus. Its working principle is to directly amplify the audio signal and transmit it based on the power signal. In order to reduce the transmission loss of the line, the 4~16Ω matching impedance is converted to 100V constant voltage mode by the step-up transformer for transmission. After the terminal is stepped down, the step-down transformer is switched to the matching impedance of 4~16Ω to drive the horn. The general transmission distance is several tens of meters. To a few hundred meters.

Advantages: mature technology, simple structure, stable performance, easy maintenance and low terminal. It is widely used in the background music of public broadcasting buildings in stations, docks, schools and factories, and many manufacturers have developed emergency broadcasts that can be linked with fire protection systems.

Disadvantages: 1 poor sound quality, high distortion: constant pressure transmission is affected by factors such as transformer bandwidth between the line, speaker size, cable diameter, etc. The frequency response range is 200Hz~12KHz, the distortion is ≤10%, and stereo transmission cannot be realized.

2 program capacity is small, can not be addressed control: one line can only transmit one set of programs. For the current school, foreign language listening training requires multiple years of simultaneous synchronization. It is not enough to transmit a set of programs, and it cannot meet simultaneous broadcasting and partitioning. Broadcast, point-to-point addressing broadcasts are not possible. For example, if the principal wants to speak to a class or speak to a certain class, the constant pressure broadcast cannot be done, and only all the speakers can be broadcast at the same time, which affects the normal class of other classes. Eye exercises only need to be played in classrooms and offices. Broadcasting exercises only need to be played on the playground. Background music only needs to be inserted into dormitory and restaurant. Constant pressure broadcast cannot realize class broadcast for single or random grouping.

3 technology behind, simple function, poor scalability: the sound source is basically using analog audio sources such as deck, can not play digital format audio files, can not achieve automatic playback, automatic control. Constant voltage broadcasting is designed according to the principle of power matching and impedance matching. Once the system wiring is installed, the capacity of power expansion is very limited, and the program capacity cannot be expanded.

At present, some manufacturers have introduced intelligent players, which can realize automatic broadcasting on the basis of constant pressure broadcasting, and can also control the switching of power amplifiers at regular intervals. However, its storage space is limited, the program capacity is too small, and the low 16KHz, 8-bit audio sampling frequency is used, and the sound quality is poor. The general storage program capacity is 8, 16, 32, 64 minutes, with automatic timing playback and switching power amplifier power control function, which can basically meet the daily ringing and operation of the school, but can not meet the foreign language listening teaching training and examination Requirements.

Second, closed-circuit FM intelligent broadcast

Technical background analysis: FM radio adopts the method of frequency modulation modulation, which carries the audio signal to the high frequency carrier for audio signal transmission, and describes the audio signal change with the frequency variation of the high frequency carrier. Different carrier frequencies can carry different audio programs at the same time. China divides 87~108MHz into FM radio frequency bands. At this stage, closed-circuit broadcasting in urban broadcasting and cable television networks in China adopts FM radio broadcasting. FM radio can be transmitted with cable TV, which is the main development direction for expanding broadcast coverage in China.

Advantages: 1 FM radio audio range: 30Hz~7KHz, distortion ≤0.7%, FM radio has the advantages of wide frequency response, rich treble, strong anti-interference ability, small distortion, etc., and can transmit stereo.

2 Mature technology and large program capacity: Closed-circuit FM broadcasting is based on the frequency division and frequency division multiplexing of cable TV. Cable TV has experienced a history of nearly 20 years in China, the technology is very mature, and the price of supporting equipment is very low. In the frequency division of cable TV, China divides the frequency band of 87-108MHz into FM radio frequency band, which is specially used for the transmission of FM radio. The bandwidth of FM radio is 16KHz, and more than 60 sets of FM radio programs can be transmitted simultaneously in this frequency band, which can meet the requirements of multi-level and multi-partition simultaneous broadcasting in schools.

3 Compatibility and scalability: FM radio can be transmitted with cable TV signals in a coaxial network, and is compatible with cable TV and HFC opto-electric hybrid networks for long-distance transmission of tens of kilometers and hundreds of kilometers. Closed-circuit FM radio programs have large capacity and good scalability. When you need to add programs, you only need to increase the FM modulator, and you don't need to make any changes to the wiring structure. When adding terminal speakers and receiving devices, you only need to find an RF interface anywhere on the original line to meet the receiving level (45~65)dB. You don't need to re-wire and add power amplifier.

Disadvantages: FM radio transmission is based on weak signal transmission. Each receiving device must be an active device, that is, each speaker and terminal must be connected to a 220V power supply. For schools with fire broadcast requirements, pure FM radio can not meet the requirements of fire codes. On the basis of FM radio, manufacturers have developed special equipment for frequency-modulation and constant voltage, and have a fire-fighting interface. This allows FM radio to not only realize multi-channel broadcasting, but also has a fire-fighting broadcast function, which basically meets the school's broadcasting requirements.

For the intelligentization of FM radio, manufacturers have been more mature in this respect. The program is compiled and broadcasted in digital formats such as MP3 and WAV. Based on this, the campus intelligent broadcast multi-channel broadcast and control software has been developed. A master computer is used to simultaneously broadcast 1-8 sets of audio programs. At the same time, the software also has the function of setting the playlist to automatically time and play the broadcast tracks according to the year, month, week and day modes.

The manufacturer's software also has an addressable control function, which controls the switch, volume, frequency, input selection, emergency broadcast and other functions of the terminal speaker through software in the broadcast room, and can set some play tasks through software, which basically satisfies Commonly used playback and control functions on campus.

In terms of intelligent control, each manufacturer adopts carrier or subcarrier control technology. Common methods include SCA FM subcarrier, MSK, and FSK carrier control. The transmission theory is to use the digital modulation method to modulate the control signal to the high frequency carrier, and to transmit the cable with the modulated audio signal, without the need to control the signal line. The technology of digital modulation is very mature in the field of industrial automatic control. Remote sensing, telemetry and remote control all adopt this technology, and it has a wide range of applications in railway, transportation, hydrology and meteorology.

Third, digital audio network broadcast

Technical background analysis: Before introducing digital audio, let's take a look at analog audio. The concept of analog audio: the audio signal reacts in the circuit as a voltage (flow) signal y = f (t), which is a time function, which is what we usually call analog audio, the frequency range is 20Hz ~ 20KHz . In an analog circuit, an audio signal is directly processed, amplified, recorded, transmitted, or modulated. Recorders, radios, constant pressure broadcasts, and FM broadcasts all directly process analog audio.

The concept of digital audio: Digital audio is a description of the continuous analog audio segmentation from the time component (x-axis) and the amplitude component (y-axis). The segmentation on the x-axis is called sampling and is described by the number of samples per second, that is, the sampling frequency. The higher the sampling frequency, the shorter the sampling interval is, the more favorable it is to describe the real situation of the original sound. The segmentation on the y-axis is called quantization and is described by the bit Bit (n is 2n in the bit, 16bit=216=65536 copies, that is, the amplitude of the audio is described by 65532 discrete steps). The larger the bit value is, the larger the bit value is. The finer the quantification.

The sampled and quantized audio signal generates a series of discrete "010101........." binary codes, so that the computer can recognize the binary code, and then edit, transfer, and copy the digital signal. It is the masterpiece of the computer. The analog audio is affected by the characteristics of the electronic components (each component has thermal noise), and each time it is processed, it will be distorted once (the waveform is distorted), and a noise accumulation will occur. The more the number of processing, the greater the noise accumulation. The lower the noise ratio (S/N).

Digital audio is stored and transmitted in digital format. The error rate is quite low or even avoidable, so it can be copied and transmitted multiple times. No matter how you edit or process it will not generate extra noise. Usually 16Bit, 44.1KHz stereo (two-channel) sampling, is the CD sound quality standard.

The amount of data in digital audio sample quantization (A/D conversion) is quite large. One audio file (stereo two-channel) is sampled with 44.1KHz and 16BitCD sound quality per second, then 16×2=32Bit, 44.1KHz× 32Bit=1411200(Bit), a Chinese character occupies 2 bytes (1Byte=8Bit) in the computer, then 1 second of music occupies storage space=1411200/(8×2)=88220 Chinese characters, by The amount of data that results in a digital audio file is quite large.

Direct processing and transmission of such a large amount of data is obviously not easy to achieve, so that according to the acoustic principle characteristics of the human ear, some useless data (which is inaudible to the human ear) is compressed, so that the amount of data can be greatly reduced. Does not affect the sound quality. At present, audio compression has various formats such as WAV and MP3, which will not be described in detail here.

After the digital audio is digitally processed, it is finally restored to a sound signal (D/A conversion process). First, the digital audio signal described by a large number of digital characters is sent to a digital-to-analog converter (DigitaltoAnalongConverter, DAC) line, which restores the digital signal to a series of voltage values that change as a function of time, and then passes through the shaping circuit. Low pass filter output. This relatively smooth and realistic analog ripple voltage signal is sent to the amplifier or speaker and converted into an acoustic signal.

Usually A/D conversion (acquisition) and D/A conversion (reduction) of digital audio are performed by computer sound card and professional audio card, and compression, transmission, decompression and decoding are all performed by dedicated software or dedicated chips. Audio editing is done by professional audio editing software.

I have learned the basics of digital audio and know the advantages of digital audio. For campus broadcasting, digital audio must be transmitted and played on the campus network to realize the functions and requirements of intelligent broadcasting. At present, most schools in China have built a campus network system with Ethernet structure (TCP/IP protocol). In terms of speed, it is 1000M fiber trunk line, 10M/100MUPT (Super Category 5) to the terminal network architecture. I talked about the benefits of so much digital audio. Will there be a better solution for campus broadcasts on campus?

In terms of working principle, network audio broadcasting is sent by a host computer (audio server), a set of broadcast software or server software to the remote network terminal in the form of IP stream. Each terminal should have a Fixed IP address and network module, a professional digital audio decoding device (software or hardware), power amplifier control unit. At present, manufacturers have begun to develop network audio broadcasting, and have launched products and promoted them at the same time. The author believes that network audio broadcasting is a new thing after all. At present, it is only in the research and development stage, and there are few practical applications and success stories.

Advantages: 1 The network broadcast realizes digitalization and networking from the production to the transmission of the program. The system has high signal-to-noise ratio and will not generate noise in the process of processing and transmission, so that better sound quality can be obtained, and stereo transmission can also be performed.

2 It is easier to implement intelligent broadcasting. Ethernet itself is a two-way network. The timing, addressing, grouping and other functions of intelligent broadcasting can be easily realized by software on the Ethernet.

3 Multi-channel broadcasting can be achieved when network speed allows. Since audio files are transmitted in the network in the form of data packets, it is easy to implement multi-channel broadcasting, and different data packets can be sent to different terminals.

4 Implement interactive mode broadcast and remote AOD. Because Ethernet is a two-way network, the control host can fully monitor the working status of each terminal and can control it. The terminal can also talk to the server through the LCD screen and directly order from the server, which greatly facilitates foreign language teaching.

5 Convenient management: The operator can realize all the management and operation functions of the host computer by any computer on the campus network, and can also realize the production and transmission of the program on any computer on the campus.

Disadvantages: 1 is easily limited by network bandwidth and network speed. The campus network is a comprehensive public network that may be used for educational administration, multimedia teaching, e-library, and distance learning. Ethernet uses code division multiple access technology. When a network jam occurs on a certain node, the broadcast of the broadcast terminal will be delayed, and in severe cases, it will be intermittent. Because of the above reasons, the reliability of network broadcasting is difficult to guarantee.

2 expensive: For the decompression of digital audio files, it must be PC+ special software, or dedicated decompression chip, and each terminal must have its own IP address. At present, there is no professional chip-level developer in China, which can only be decoded by embedded microcomputer + dedicated decompression chip, so the product price is high, and the domestic general school can't bear it. Suggestions and Suggestions for Campus Broadcasting Construction In summary, the three campus intelligent broadcast technologies and products have their own advantages and disadvantages, and different schools have different functional requirements for campus broadcasting. When schools choose campus intelligent broadcast products, they must first define their functional needs, and do not blindly pursue "the most advanced technology and the most powerful functions." New technologies are good, but they may not be useful for some users, and may even cause unnecessary trouble. When manufacturers promote their products, they often highlight or even exaggerate the advantages of the products, avoiding some shortcomings and shortcomings. Therefore, when selecting products and technologies, we should make a number of comparisons and select products with "mature technology, practical functions, and high cost performance". It is also possible to adopt different advanced technologies from the three links of "sound source, transmission and terminal", and the advantages are complementary.