Island Broadcasting Solution

一、Requirement Background

In the vast ocean, islands are like a small boat, constantly facing the severe tests of nature. In the harsh environment of island where natural disasters are frequent, once disasters such as tsunamis and typhoons strike, the residents and facilities on the island will face devastating blows if there is no timely and effective early warning. Many islands have previously suffered from personnel being trapped, houses being damaged, and even major casualties due to untimely warnings. The traditional broadcasting system has limited coverage in complex terrains and cannot meet the island-wide early warning needs. An island-wide coverage broadcasting system can quickly issue high sound pressure level voice warnings and alarm sounds when disasters strike, allowing people in all corners of the island to obtain information and take emergency refuge in the first place. At the same time, it can also carry out emergency command, transmit rescue information, and maintain order during disasters. This can not only significantly reduce disaster casualties and losses but also ensure the efficient development of rescue work, maintain social stability on the island, and build a solid barrier against disasters for the island.

二、Core Equipment

Omnidirectional Acoustic Device

The equipment adopts cutting-edge acoustic propagation technology, radiating sound waves 360° without dead angles to the entire island, weaving a dense "sound protection net" among complex terrains. This omnidirectional coverage characteristic completely eliminates the sound wave coverage blind spots of traditional directional equipment, ensuring that disaster warning information and alarm sounds can penetrate mountains and forests, cross

reefs, and reach every corner of the island, so that people in any position on the island will not miss key warning signals.

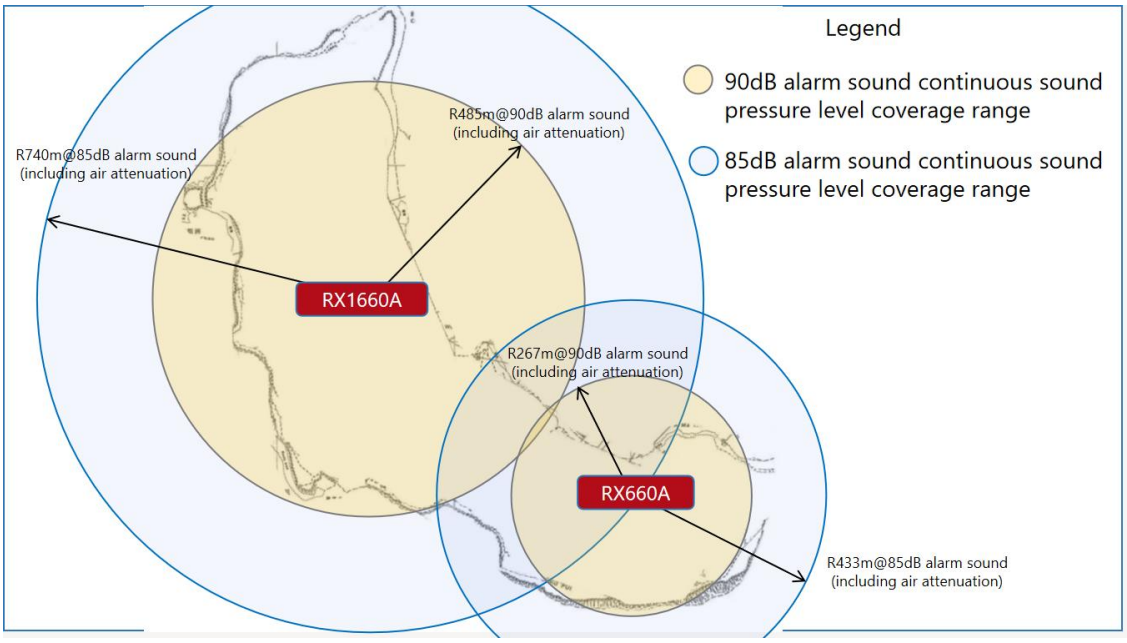
The equipment can output diversified disaster warning audio signals. On the one hand, it releases high-intensity alarm sounds that meet international standards. The sharp and highly penetrating sound waves can stand out in harsh environments such as tsunamis and typhoons, sounding at a sound pressure level of more than 85dB at the edge of the island. Through strong auditory stimulation, it can attract the attention of islanders at the first time. On the other hand, it plays clear and accurate voice warning information, with a stable sound pressure level of more than 75dB, broadcasting disaster types, evacuation guidelines, and evacuation routes in multiple languages in a loop. Combined with the human instinctive attention mechanism to dangerous information, it guides residents to quickly take correct response measures, building a reliable auditory early warning line across the entire island and striving for the golden response time against natural disasters.

The equipment has strong environmental adaptability and can still work stably in harsh weather conditions such as strong winds and heavy rains, ensuring the clear output of alarm signals. The equipment has been deeply optimized for the extreme climatic environment of the island, adopting multiple protection technologies to build a solid barrier for all-weather

stable operation. When strong winds are raging, the shell of the equipment is specially designed with fluid mechanics to effectively disperse the impact of wind. With the built-in wind noise filter, it can filter out the interference of howling wind on the alarm signal, ensuring that the sound pressure level fluctuation is controlled within ±2dB. When facing heavy rain, its IP56 protection level sealing structure can prevent rainwater from invading the core components of the equipment. At the same time, the special material of the waterproof sound-transmitting membrane can not only block the impact of rainwater but also ensure that sound waves penetrate without loss, making the voice and alarm sound clear and distinguishable.

Whether it is the strong wind and waves caused by a typhoon or the flood threat caused by continuous heavy rain, the Omnidirectional Acoustic Device can always maintain stable operation with its excellent anti-interference performance, allowing warning information to be transmitted to every corner of the island in the clearest and most timely manner, becoming a safety guardian that never "goes offline" during disasters.

二、Solution Implementation



1. Equipment Deployment

The deployment method of connecting two omnidirectional sound wave devices with two-point wireless bridges is adopted, giving full play to the convenience and flexibility of wireless transmission. The wireless bridge uses the microwave frequency band for data transmission, which has the characteristics of long transmission distance and strong anti-interference ability. In this solution, the two omnidirectional sound wave devices are respectively deployed at the high points of the north and south ends of the island, and a stable data connection is established through the wireless bridge to achieve seamless coverage of the entire island.

This deployment method not only avoids complex wired cabling, greatly reducing the construction difficulty and cost but also can effectively avoid the risk of system paralysis

caused by line damage during disasters. During the equipment installation process, technicians strictly follow the standard procedures, and accurately adjust the installation position, height, and angle of the equipment to ensure that the sound waves can cover the entire island with the best propagation effect.

2. Energy Guarantee

Considering the special geographical location and disaster environment of the island, the long-distance omnidirectional equipment is equipped with efficient solar panels and storage batteries, constructing a complete independent energy guarantee system. The solar panels are made of polycrystalline silicon with a conversion efficiency of up to 22%, which can quickly convert solar energy into electrical energy under sufficient sunshine conditions. The storage battery uses a large-capacity and long-life lithium iron phosphate battery with a storage capacity of up to 500Ah, supporting the equipment to supply power for 4 hours.

In actual operation, the solar panels convert solar energy into electrical energy and store it in the storage battery during the day. At night or on cloudy days, the storage battery provides stable power support for the equipment. Even in bad weather for consecutive days, the reserve power of the storage battery can meet the emergency power supply needs of the equipment during disasters, ensuring the normal operation of the early warning system.

3. Audio Input Modes

In order to adapt to the diverse scenarios on the island, the Omnidirectional Acoustic Device provides a variety of audio input modes. The built-in audio mode pre-stores a variety of standard disaster warning voices and alarm sounds, which can be quickly and automatically played when a disaster occurs; the microphone mode supports on-site personnel to carry out real-time voice broadcasting through a wired microphone, which is convenient for specific command and guidance in emergency situations; the broadcast/wireless microphone mode can be connected to the island's broadcasting system or wireless microphone to realize remote voice broadcasting and multi-area collaborative early warning.

These rich audio input modes can quickly switch between voice warnings and high-intensity alarms to meet the early warning needs in different scenarios. For example, wireless microphones can be used for simulated command during daily disaster drills; in the event of an actual disaster, it can quickly switch to the built-in high-intensity alarm sounds and standard warning voices to ensure the timeliness and accuracy of information transmission.

四、Solution Advantages

1. Low Cost

Compared with traditional directional broadcasting equipment and wired broadcasting systems, the wireless bridge connection and Omnidirectional Acoustic Device adopted in this solution greatly reduce the equipment procurement and construction costs. The wireless bridge avoids a lot of wired laying work, reducing expenses such as wires and construction personnel; the Omnidirectional Acoustic Device reduces the number of devices used with its

efficient coverage capability. According to preliminary estimates, the construction cost of this solution is reduced by about 40% compared with the traditional solution, saving a lot of capital investment for customers.

2. High Reliability

The 360° dead-angle-free propagation characteristic of the Omnidirectional Acoustic Device completely solves the problem of coverage blind spots existing in traditional directional equipment, ensuring that disaster warning information can be quickly and accurately transmitted to every corner of the island. At the same time, the energy guarantee system of solar panels and storage batteries carried by the equipment can achieve energy autonomy when disasters occur, avoiding system paralysis caused by external power outages. In addition, the redundant design of the wireless bridge and the high stability of the equipment further improve the reliability of the entire system. Even in harsh natural disaster environments, it can still operate stably, providing a solid guarantee for the life and property safety of the islanders.

3. Fast Response

A variety of audio input modes and efficient wireless transmission technologies enable this solution to achieve fast response when disasters occur. From the generation of disaster warning information to the island-wide release, the entire process only takes a few seconds, allowing islanders to obtain warning signals in the first place and strive for precious time for evacuation and refuge. At the same time, the system also supports remote control and real-time monitoring functions. Managers can remotely operate the equipment through mobile phones or computers and view the operating status of the equipment in real time to ensure that the early warning system is always in the best working condition.