The concrete application of lightning protection technology of electrical automation system in water conservancy and hydropower project

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Abstract: the development of science and technology has promoted the continuous progress of water conservancy and hydropower projects. Advanced equipment and advanced technology are widely used in water conservancy and hydropower projects, which improves the working efficiency and working level of staff in two directions, and also brings great economic benefits to the water conservancy and hydropower projects. Among them, electrical automation technology is widely used in water conservancy and hydropower projects as the basis of quality guarantee, therefore, correspondent research on it should be strengthened. The application of lightning protection technology in electrical automation system of water conservancy project is to provide guarantee for the stable operation of the electrical automation system of water conservancy project. This paper analyzes the lightning protection technology of electrical automation system used in water conservancy project from the practical point of view, and analyzes the main points of application of electrical automation in water conservancy and hydropower projects in detail.

1. Introduction
With the continuous development of science and technology in China, electrical automation technology has been widely used in all walks of life. The application of electrical automation technology in water conservancy and hydropower projects can fundamentally improve the economic benefits of the whole project. The construction of water conservancy and hydropower project is related to the national economy and people's livelihood, and has a great influence on the daily production and life of the people. The construction of water conservancy project has also been developed. Among them, the electrical automation system of water conservancy project, as one of the main contents to promote its development, should ensure its stable operation, it is necessary to improve the system continuously in the actual development process. But because of the influence of some objective factors, the electrical automation system of water conservancy project is easy to be affected by weather factors during the operation[1]. Therefore, in order to further ensure the stable operation of the automation system, this paper studies the lightning protection technology to ensure that the electrical automation technology is fully utilized in the construction of water conservancy and hydropower projects.

2. The importance of lightning protection technology in the electrical automation system of water conservancy engineering
In the context of the continuous development of science and technology, as one of the main contents to ensure people's production and life, water conservancy engineering should be increasingly invested to
strengthen the content control, the operation system should be improved, and the rational application of lightning protection technology should be strengthened. In the geographical area where lightning is high incidence, lightning protection technology should be effectively applied to automation system, which can not only ensure the stable operation of electrical automation system in water conservancy engineering, but also prevent other systems from being affected. In addition, because the water conservancy projects in China are generally built in the high incidence area of lightning, the electrical automation system of water conservancy project in actual operation should be effectively controlled with technology to prevent it from being easily attacked by lightning, thus leading damage to related equipment.

In order to guarantee the stable operation of the electrical automation system of water conservancy project in such a background, the staff should realize the importance of lightning protection technology, make lightning protection measures combined with actual situation, and strengthen the reasonable application of lightning protection technology in the operation of electrical automation system used in water conservancy project.

3. The harm of lightning strike to the electrical automation system of water conservancy project

3.1. hazards of direct lightning strike
If people, buildings and electrical equipment on the ground are directly hit by lightning in ordinary life, such lightning stroke is called direct lightning. When lightning strikes, there will be a huge lightning current. If the staff do not take measures to protect the electrical automation system of water conservancy project, it will have a serious impact on the stable operation of the system. High temperature of tens of thousands of degrees will be generated inside the object, which will cause objects to burn, and in serious cases, the overhead wire will be dissolved.

3.2. hazards of induced thunder
During this process of thundercloud discharging to the ground, the induced overvoltage will be generated on the conductor near the lightning point. At this time, the over-voltage amplitude can reach hundreds of thousands of volts, which will have a serious impact on the safe operation of the electrical automation system of water conservancy project, and lead to the breakdown of the insulation of power equipment. If measures are not taken to control, the power system will go through power failure, leading to insulation damage of power equipment, and seriously affecting the life safety of staff. In addition, there is also a kind of harm from lightning intrusion wave. The wave is mainly from the lightning falling on the overhead line, which will invade into the electrical automation system of water conservancy project along the line, and imposing direct impact on the equipment and staff.

3.3. lightning induction
According to the research on lightning induction, there are mainly two forms of electrostatic induction and electromagnetic. Electrostatic induction refers to the fact that the protruding object on the ground will induce current after the thundercloud discharge. At this time, it will conduct with lightning, and then it will cause certain influence and damage to the related equipment in the electrical automation system of water conservancy project. Electromagnetic induction is mainly due to the formation of certain electromagnetic fields around the lighting after the discharge of electricity, which will discharge the human body and equipment again, and leads to the abnormal operation of electrical equipment and the electrical automation system.

4. lightning protection measures in the electrical automation system of water conservancy project

4.1. improving grounding and shielding mode
In order to effectively solve the impact of lightning on the electrical automation system of water conservancy project, it is necessary to strengthen the application of lightning protection technology,
and formulate reasonable lightning protection measures combined with the actual operation of the electrical automation system. Because of the limitation of economic and other objective factors, grounding and shielding measures are often used to protect against lightning. Such measures can save economic cost to some extent, but its lightning protection effect is not particularly obvious[2].

Therefore, in order to improve the lightning protection effect under the background of continuous development of science and technology, the lightning protection technology is innovated and measures are taken to improve the grounding and shielding effect. In the process of research, technicians found that the key is the resistance value and life of the grounding resistance. According to the physics theory, the resistance value is proportional to the voltage value. Therefore[3], in order to further improve the effect of lightning protection, the technicians can reduce the resistance value of the grounding resistance under a safe condition, so that the voltage can be effectively controlled. At the same time, because the content of the electrical automation system of water conservancy project is relatively complex with many communication equipment and other systems. If the technicians want to strengthen the reasonable application of lightning protection technology, they must directly connect the lightning protection grounding network, and do well in shielding measures to strengthen the reasonable control of voltage.

The shielding measures are mainly to connect the metal floor in the middle of the electrical system, build a protective structure for the electrical automation system of water conservancy project, and shield the high voltage caused by lightning. However, in this process, technicians should remember that in the process of installing metal shielding network and other equipment, it is necessary to connect it with the grounding bus to prevent other problems, and provide certain guarantee for the safe operation of the electrical automation system[4].

As the most common lightning protection measure, grounding measures are also one of the effective measures to strengthen the lightning protection technology in the electrical automation system of water conservancy projects. The staff need to take measures to improve the effect of grounding constantly, and keep aware that the effect is related to the grounding resistance[5]. The operation can reasonably control the voltage in the electrical automation system of water conservancy project. In this process, the technician should also pay attention to the relationship between the resistance value and the price of the grounding resistance.

In order to improve the lightning protection effect and save the economic cost, it is necessary to take grounding measures to strengthen the automatic control in the actual control process, and to connect the lightning protection grounding network reasonably and to reduce the lightning electromagnetic interference when conditions permit. In addition, in the process of shielding, it is necessary to ensure that both ends of the cable should be grounded. Cables with both armor and shielding layer should be grounded simultaneously to achieve the lightning protection effect, so as to provide guarantee for the stable operation of the electrical automation system of water conservancy project.

4.2. reasonable use of lightning arresters
To improve the lightning protection effect in designing the electrical automation system of water conservancy project, designers can install the "three in one" lightning arrester in the system center according to the actual situation to achieve comprehensive lightning protection effect and protect the power supply and wire in the system. In this process, technicians should reasonably use the form of multi-stage series according to the principle of electromagnetic pulse to protect the related equipment in the electrical automation system.

When installing the lightning arrester, it can be used to protect the indoor. Because it is a comprehensive lightning protection measure, its lightning protection effect is better and its efficiency is higher. Lightning damage to electrical automation system of water conservancy project is consistent [6], which will have a certain impact on the internal and external of the system. Therefore, staff members should strengthen the application of lightning protection technology in it. In the process of lightning protection, a single measure cannot be used, and the actual working conditions must be
combined. In addition, the integrated and comprehensive lightning protection network can be constructed by using various lightning protection measures.

When designing distribution transformer, lightning arrester can be installed on high and low voltage side to form three point one line protection system so as to strengthen the protection and installation of electrical automation system of water conservancy project, and reasonably control voltage, and also further improve the safety of lightning protection.

4.3. strengthen the application of comprehensive lightning protection measures
The large destructive power of lightning can cause continuous damage to the electrical automation system of water conservancy project from multiple angles. Therefore, technicians must not use single measures to protect against lightning in the process of building lightning protection system. It is necessary to strengthen the application of comprehensive application of various lightning protection measures in combination with specific requirements for lightning protection. Three-dimensional and integrated lightning protection measures can be made to strengthen the application of lightning protection technology in the electrical automation system of water conservancy project, and eventually establish an effective protection network.

In the process of lightning protection, some other lightning protection equipment can be added on the basis of grounding and shielding measures. For example, when designing the lightning protection of distribution transformer, technicians need to install lightning arrester on the high and low voltage side. The main purpose of this is to realize the joint grounding of three points and improve the lightning protection effect. At the same time, other lightning protection equipment can be used to protect the voltage device.

According to the research, this comprehensive three-dimensional lightning protection system can not only effectively protect the electrical automation system of water conservancy engineering, but also protect the related equipment from the impact of lightning, and the lightning protection effect is very significant. Under the background of continuous development of water conservancy project at present, the electrical system of water conservancy project is also developing towards automation and intelligence. Therefore, to ensure the stable operation of electrical automation system of water conservancy project and reduce the impact of lightning on the system, it is necessary to strengthen the reasonable response to lightning protection technology [6], and to formulate the scientific lightning protection measures to make the water conservancy project have better operation performance. The automation and precision of equipment shall be strengthened, the service life of equipment shall be prolonged, the impact of lightning stroke on the equipment shall be avoided, and the application of comprehensive lightning protection measures shall be strengthened, so as to further improve the effect of lightning protection.

5. Conclusion
The relationship between electrical automation and hydropower production is close. It can effectively improve the quality and efficiency of hydropower production and achieve the effective development and rational utilization of water resources. To ensure the stable operation of the system, we must strengthen the rational application of lightning protection technology and reduce the impact of lightning factors on the system so as to lay a solid foundation to develop in a sustainable way to promote the social development of water conservancy projects in China.

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