

Research on Seepage Control Construction Technology of Reservoir Embankments in Agricultural Water Conservancy Engineering

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Abstract: In the process of social economic development, water conservancy projects play an important role. In the process of agricultural development, the embankments has played a great advantage in flood control, irrigation and water storage. However, if the embankments does not do a good job of anti-seepage device, it will cause very serious consequences. Because the application of anti-seepage technology of reservoir embankments will be affected by many factors, so many farmland reservoirs have occurred seepage phenomenon, resulting in a lot of adverse effects. In this paper, the seepage prevention technology of reservoir embankments in agricultural water conservancy project is studied.

Keywords: Agricultural Water Conservancy Engineering; Reservoir Embankments; Anti-Seepage Construction Technology

1. The Importance of Anti-Seepage Technology of Reservoir Embankments to Agricultural Water Conservancy Project

1.1 Reasonable Regulation and Application of Water Resources

The most commonly used functions of reservoir embankments are water storage and drainage^[1]. Due to differences in precipitation at different times of the year, there are both drought and flood periods. Whether the amount of water in farmland is low or high, it is not conducive to the growth of crops. Therefore, embankments are needed to regulate the water flow reasonably to meet the needs of crop growth. During periods of high rainfall, embankments can close valves to store excess precipitation in a timely manner. This not only reduces the impact of excess precipitation on crops, but also provides sufficient water for subsequent crop growth.

During periods of low rainfall, valves can be opened to release the stored water for crop growth. This not only reduces the use of agricultural water, but also enables the rational application of natural precipitation. It can promote the rapid growth of crops and meet the needs of agricultural economic development.[1]

1.2 Effectively Intercept Floods

In recent years, the probability of floods has increased. Floods can have a devastating effect on the growth of crops. And the construction of farmland embankments can well meet the needs of flood protection, so as to ensure the safety of crops. By constructing farmland embankments, when floods occur upstream of the river, the first level of embankments can provide a certain buffering effect on the water potential, thereby reducing the downstream water volume. If the water flows through a large area, it can also slow down the time when the peak water flow reaches, providing farmers with a certain opportunity for rescue, thereby protecting crop safety and reducing farmers' losses.

1.3 Ensuring the Normal Operation of Hydroelectric Power Units

The water storage and discharge functions of embankments are based on the normal operation of hydroelectric generating units. If the hydroelectric generating units fail, these functions of embankments cannot be achieved. The seepage of the embankments is the main reason for the failure of the generator set^[2]. Therefore, adding anti-seepage devices in the embankments of agricultural water conservancy engineering reservoirs can reduce the probability of water seepage, protect the safety of the generator set's line, avoid short circuits and other phenomena, and maintain the normal operation of the generator set.

2. The Harm of Embankments Seepage in Agricultural Water Conservancy Project

2.1 Affects the Harvest of Crops and Causes Economic Losses

The most obvious effect of the seepage of the reservoir embankments in agricultural water conservancy project is to make the function of the reservoir fail, thus failing to provide suitable water for the growth of crops, thus affecting the growth of crops and causing economic losses for farmers. The serious water seepage of the embankments will affect the water storage and discharge functions of the reservoir. If there is a large amount of precipitation in the upstream area of the farmland, the water storage function of the reservoir cannot be used normally, which will lead to a large amount of precipitation flowing into the farmland, resulting in a large amount of farmland water, which is easy to cause excessive water absorption of crops and affect the harvest. If the drainage function of the reservoir cannot be used properly during the dry season, it will cause crops to not absorb sufficient water and dry up. And when the function of the reservoir cannot be used normally, it cannot resist the flood in a timely manner during the temporary period, resulting in a large amount of flood flowing into farmland and causing widespread crop death. Drought or water logging caused by embankments seepage will affect the harvest of crops and cause certain economic losses.[2]

2.2 Causing Safety Accidents and Endangering People's Lives and Safety

Agricultural water conservancy engineering operation is based on the normal operation of the hydraulic generator set. When the generator set is running, once the phenomenon of moisture and water seepage occurs, it will greatly affect the operation of the generator set. If it is light, it will cause short circuit of the generator set, which will affect the quality of water conservancy projects, and if it is heavy, there will be safety accidents such as leakage and fire, which will bring great hidden dangers to people's life safety. When the staff in the maintenance, touch the place of leakage will affect the life safety of the staff. If the leakage is not found in time, it will cause short circuit of the line, which will lead to fire and cause

more casualties. Therefore, if the farmland reservoir embankments seepage prevention technology is not in place will cause certain safety accidents, endanger people's lives.

3. Causes of Water Seepage in Agricultural Water Conservancy Engineering Reservoirs and Embankments

3.1 The Quality of Impervious Water Material is not up to Standard

In the construction of the reservoir embankments of agricultural water conservancy project, some anti-seepage water materials will be used to reduce the occurrence of water seepage phenomenon of the embankments, so the anti-seepage water materials put forward certain requirements. However, in the construction process, in order to obtain higher benefits, some construction teams use some cheap and relatively poor quality materials, resulting in poor anti-seepage function, unable to play the role of anti-seepage. Since agricultural water conservancy projects are greatly affected by external factors, certain deformation joints will be reserved for the working hours of construction facilities to improve the stability of water conservancy projects. However, deformation joints are often fragile, especially those made of substandard materials, which are more likely to cause water seepage after long-term use, thus affecting the stability of the whole project and not conducive to the development of agricultural economy.

3.2 The Structure of Agricultural Water Conservancy Projects Has Changed

During the construction of agricultural water conservancy project, there will be seepage phenomenon caused by structural changes. In the process of construction of agricultural water conservancy projects, there are many links, each link needs to be carefully designed, and associated with the subsequent links, so as to ensure the quality of each link, so that the final construction of water conservancy projects can pass the quality, put into normal use. However, in the actual construction process, most of the engineering structure will change with the further advancement of the construction, so it will lead to the subsequent data calculation can not meet the needs of the actual construction, thus affecting the final

quality of hydraulic engineering. However, in the actual construction process, many construction teams did not timely conduct further measurement and calculation of the follow-up construction data when they found structural changes, and used the original measured data as the construction parameters, which greatly affected the accuracy of water conservancy project data, easy to lead to quality problems in water conservancy project, water leakage phenomenon.[3]

3.3 Embankments Reconstruction Is Unreasonable

Before the agricultural water conservancy project is officially put into use, it will be tested. Combined with the results of the test and the actual environment, the water conservancy project will be finally reformed, and finally put into use in production and life through the test. However, in the process of transformation, the technical personnel ignored the basic structure and supporting capacity of the whole project, resulting in inaccurate final calculation results, which made the quality of the final transformation of water conservancy project poor, difficult to meet the actual needs, increased the probability of project water seepage, which is not conducive to the development of agricultural activities. And some water conservancy projects have a long history, if you want to continue to put into use, also need to carry out further transformation. In the process of reconstruction, it is easy to appear structural instability, center of gravity imbalance and other problems, easy to lead to the seepage of concrete mechanism or structural deformation of the project, thus affecting the quality of hydraulic engineering.

4. Seepage Prevention Technology for Agricultural Water Conservancy Engineering Reservoir Embankments and Embankments

4.1 Grouting Technique

Grouting technology refers to the use of gas or liquid pressure to inject building materials with drainage function into underground building structures, thereby achieving the function of preventing water seepage. At present, there are four main grouting

anti-seepage technologies applied in China.

4.1.1 Splitting grouting technology of earth embankments body

In the application process of this technology, the staff needs to have an accurate grasp of the structure of the entire agricultural water conservancy project, accurately find the stress points everywhere in the project, and carry out construction activities based on the axis of the embankments^[3]. Construction personnel first need to mix the loess and mortar in a certain proportion, and then inject the mixture into the gaps reserved in advance of the water conservancy project, so as to fill the whole gap, and reasonably adjust the force of the whole project, so as to ensure the stability of the project. In the application of this technology, the construction personnel need to accurately grasp the size of the embankments body cracking degree, according to the size of the embankments body cracking degree to determine the type of grouting technology. If the cracking degree is small, partial grouting technology can be selected, if the cracking degree is large, it needs to choose all grouting technology, so as to ensure the quality of hydraulic engineering reservoir embankments and obtain a certain anti-seepage effect.[4]

4.1.2 Cobble curtain grouting technology

Cobble curtain grouting technology of gravel layer is mainly applied in some water conservancy projects where water seepage is serious. The technology is designed to reduce water seepage in water projects by mixing cement with clay in a certain proportion and injecting it into areas where water leakage is severe. This technology is mainly used in the repair treatment of the egg gravel layer. It is difficult to treat the egg gravel layer in hydraulic engineering. Due to the high strength of the egg gravel, it is necessary to use the lower pipe grouting technology to treat it, so as to achieve better anti-seepage effect.

4.1.3 Anti-seepage plugging technology of cyanide grouting

Cyanide coagulation is a new kind of grouting material developed now in our country which has very good anti-seepage effect. Cyanide coagulation is mainly composed of prepolymer, plasticizer, catalyst and emulsifier and other raw materials. In application, these raw materials need to be placed in the container in accordance with a certain proportion, and can be used after mixing

evenly. When the water conservancy project appears due to loose concrete internal, honeycomb and concrete construction in the presence of gaps and other reasons caused by water seeping phenomenon, can use the cyanide condensation grouting seeping prevention technology for maintenance. In the actual application of this anti-see-through technology, technicians need to wipe the place where the crack occurs, and then the crack is chiseled into a V-shaped edge groove, and a reasonable grouting hole is set up. In the case of ensuring no water leakage, the cyanide condensation is injected into the crack, and finally, after ensuring no water leakage, the grouting hole is sealed with cement mortar.

4.1.4 Chemical grouting anti-seepage technology

Chemical grouting anti-seeping technology is the use of chemical raw materials, configuration of the solution, with the help of chemical grouting pump equipment will be equipped into the solution into the cracks in the project, so that the solution with the crack penetration, diffusion, and finally fixed. The application of this technology can make the underground structure of hydraulic engineering more solid, and can make up for the cracks left by concrete. The technology mainly adopts the chemical principle, using the relevant knowledge of chemistry and engineering to deal with cracks, can improve the quality of hydraulic engineering. This technology can be applied to the seepage caused by cracks in the low-quality rock mass of the embankments, which can improve the stability of the embankments and ensure the smooth development of agricultural activities.

4.2 Cutoff Wall Technology

In the anti-seepage technology of agricultural water conservancy engineering, in order to achieve a more perfect anti-seepage effect, it is necessary to improve the quality of the cutoff wall. At present, there are three commonly used cutoff wall technology in China.

4.2.1 Water jet cutoff wall technology

This technique requires technicians to use a perforator to spray a high-pressure stream of water and then divide the water. Then the cutoff wall is rebuilt to make the surface of the cutoff wall more smooth. With the help of mixed loess mud, the wall is smeared to form a certain slot. Finally to input into the slots of

concrete materials, which completed the cut-off wall repair work^[4]. However, this technology needs to use a variety of mechanical equipment in the actual operation process. Once one of these devices failed, will produce very big effect to the whole wall repair work. Therefore, in the actual construction process, the construction team needs to increase the inspection of the equipment, so as to ensure the quality of the wall repair work, to achieve better anti-seepage effect.

1.1.1 Thin grab anti-seepage wall technology

This technology requires staff to punch holes with the help of thin grab work, and then use cement mortar to smear the hole wall, the concrete mortar into the hole, it can achieve the effect of anti-seepage wall. This technology is often applied in water conservancy projects with more sand and soil, which can not only improve the stability of concrete structure, but also improve the anti-seepage effect of the project, and the operation is relatively simple, so it has a strong practical significance.^[5]

4.2.2 Multi-head deep mixing cutoff wall technology

This technology uses a multi-head mixer to mix the cement mortar, and then the mixed cement mortar is injected into the soil, so that the cement mortar and the soil can be perfectly combined together to form a cement column. The function of anti-seepage wall can be obtained by carrying out lap and other activities on the basis of cement column. Since the cement mortar is completely solidified, it is relatively strong, so it can play a very good seepage effect. And through the use of multi-head mixer, the solidification of cement mortar can be further strengthened, so that the final water conservancy project has a good anti-seepage effect, to meet the needs of daily activities.

4.2 Asphalt Anti-Seepage Technology

In addition to the application of concrete, cyanide and other materials, through the use of asphalt materials can also play a very good seepage effect^[5]. But in the asphalt anti-seepage technology, the staff needs to pay attention to the following points of content. First, when the asphalt coagulant is used, the doping of debris will affect the effect of separation, so it is necessary to do a good job

of cleaning up the debris. Second, the bottom of the asphalt layer needs to be compacted to avoid cracks affecting the anti-seepage effect. Third, in the application process of raw materials, it is necessary to mix gravel, crushed stone and other materials in the asphalt, and appropriate heating, so as to increase the degree of integration of the materials and play a more perfect anti-seepage effect.

5. Conclusion

Reservoir embankment seepage prevention technology in agricultural production, can play a great advantage. Reservoir embankments can reasonably regulate local water resources and timely resist floods to avoid affecting crop growth. And anti-seepage technology can also protect the normal operation of hydraulic power generation units in water conservancy projects, avoiding the occurrence of short circuits. However, in recent years, due to some construction teams in the construction of the embankments in accordance with the requirements of the construction or technology is not in place, resulting in the phenomenon of water seepage in the reservoir embankments. This needs to arouse the attention of the society, improve the anti-seepage technology in order to guarantee the quality of water

conservancy projects.

References:

- [1] Zhang Yuan. Modeling of thermal expansion characteristics of concrete in agricultural water conservancy projects[J]. *Arabian Journal of Geosciences*,2021,14(7).
- [2] Health and Medicine - Diet and Nutrition; Investigators from Shihezi University Have Reported New Data on Diet and Nutrition (Application of Water Saving Irrigation Technology for Agricultural Products Nutrition and Agricultural Water Conservancy Project)[J]. *Ecology, Environment & Conservation*,2020.
- [3] Lei Yu, Tao Sun. The Influence of Agricultural Water Conservancy Project on Environment[J]. *Natural Resources Conservation and Research*,2018,1(1).
- [4] PA López Jiménez. Sustainability Challenges in Hydraulic Engineering for Agriculture[J]. *Agricultural Research & Technology: Open Access Journal*,2017,11(4).
- [5] Zhao Xinyu, Pei Qingbao, Gu Pengfei, Gao Jinlong. Research on Agricultural Water Conservancy Engineering Applied Talents Cultivation System[J]. *SHS Web of Conferences*,2015,14.