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Shuangjiangkou Dam, Sichuan, China-Dam Monitoring

Client:四川大渡河双江口水电开发有限公司



Background

The Shuangjiangkou Dam, presently under construction, is projected to attain a height of 315 meters, thereby making it the tallest dam in the world. It has currently reached a height of 205 meters, with plans to extend an additional 110 meters. The total volume of earth and stone required for this world-class structure exceeds 46 million cubic meters. Currently, the dam filling and plant unit installation of the Shuangjiangkou hub project are progressing towards the goal of having the first unit operational and generating electricity within the year. After the Dam is completed and put into operation, the annual power generation will exceed 7 billion kWh. The Shuangjiangkou Dam serves as a controlling reservoir project in the upper reaches of the Dadu River. In addition to its primary function, it supports multiple downstream cascade power stations in generating 6.6 billion kWh of electricity annually. This output is sufficient to meet the yearly electricity needs of 3.26 million households.

Key Points

As the world's tallest dam (under construction), the dam's settlement monitoring is extremely important;
Construction period: By monitoring the settlement data, it is possible to compare the design expected value and evaluate whether the construction links such as foundation treatment and dam filling meet the requirements;
During the operation period: During the water storage and operation process, the dam will produce settlement within the normal range due to factors such as deadweight, water pressure, and changes in geological conditions. However, if the settlement rate is abnormal and the settlement exceeds the design allowable range, it may indicate problems such as uneven settlement of the dam foundation, deformation of the dam material, or instability of the foundation soil. Dam settlement monitoring is like a "health checkup" for the project. Through real-time collection, analysis and early warning of settlement data, it realizes the management transformation from "post-emergency" to "pre-prevention", and is the "lifeline" for the safe operation of water conservancy projects. Its importance runs through the entire life cycle of the project, and it plays an irreplaceable role from design and construction verification to operation and maintenance decisions, and then to responding to extreme disasters.

Implementation

From 2023 to date, more than 1,000 meters of array displacement meters have been deployed on the dam core wall and upstream rockfill area. Hundreds of meters of horizontal ADMs were laid in the core wall area, and the sensors at both ends were fixed to the pre-buried connectors of the concrete cover plates on the left and right banks through universal joints, which are used as benchmark to measure the overall settlement in the left and right bank directions.
Hundreds of meters of horizontal ADMs were laid were laid in the upstream rockfill area, and buried in the rockfill through the protection of the fine sand layer. The construction method has been verified, and the sensor can withstand the rolling of the upper rockfill, filling the problem of settlement monitoring in the rockfill area
QA/QC testing and verification protocols were developed and performed for each instrument prior to installation.
Our engineers were also on site at all stages to guarantee the highest standards during installation and cable routing control during backfilling activities. With frequent measurement control for establishing initial and baseline readings as well as ensuring good functionality and to prevent nonconformity.



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Outcome

Since installation, the ADMs sensors have been performing exceptionally well, demonstrating high reliability under extreme high-altitude conditions and meeting the contractor's expectations. Engineers on site have been remotely monitoring the data, and the reports indicate no concerning movements. Notably, the monitoring data has been validated by an academician from the Chinese Academy of Engineering (CAE) and shows remarkable consistency with theoretical calculations based on his research. Some monitoring data are shown in Figure 1.

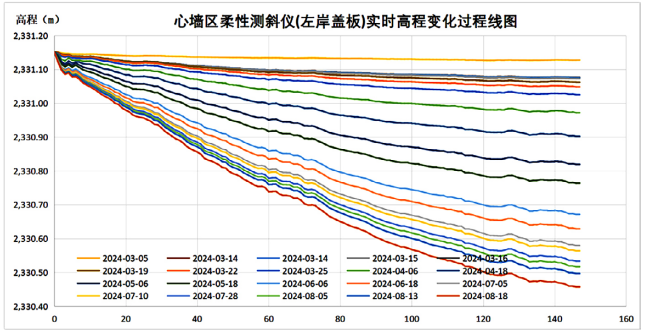


Figure 1: Real-time elevation change process line diagram of the flexible inclinometer (ADM) in the core wall area (left bank cover)

About Us

Structure Health Monitoring Intelligent Sensor Supplier

Beijing Zhonghongtaikexin Technology Co., Ltd was established in 2017. The company boasts a research and development team composed of senior industry experts, with significant research and development capabilities and extensive industry experience. Through continuous innovation and technological accumulation, our products lead in technology content, process level, and stability among domestic peers, and are widely utilized in the field of structures monitoring. The company advocates for customer-centricity to foster mutually beneficial development for both the company and its customers. Our subsidiary, SinoMarco Dyan Geotec (Beijing) Limited, is dedicated to overseas business development and technical support.

四川大渡河双江口水电站枢纽工程
大坝安全监测工程应用证明

Sichuan Dadu River Shuangjiangkou Hydropower Station Hub Project
Dam Safety Monitoring Project Application Proof

After our unit and the owner organized multiple manufacturers to conduct data accuracy and water pressure resistance (4.5MPa) comparison tests, we finally selected the flexible inclinometer(ADM) from Beijing Zhonghongtaikexin Technology Co., Ltd. for dam safety monitoring. The installation began in February 2024, and the core wall settlement monitoring and upstream rockfill area settlement monitoring were carried out at 3 elevations. The cumulative usage has exceeded 1,000 meters, and the equipment is operating normally so far. The flexible inclinometer(ADM) from Beijing Zhonghongtaixin Technology Co., Ltd. meets the project requirements in data accuracy, water pressure resistance, and product stability, which is very close to the manual measurement data. The data remains stable after the dam is filled with water.

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