

Analysis the Sources of Water Pollution in Construction Area of Expressway around Shaoqing reservoir

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Abstract. Highway is an important national infrastructure and plays an important role in the development of national economy. Owing to the long construction period of the highway, across the surface water and other characteristics, many kinds of harmful substances are very easy to pollute the water and exert great disturbance to the environment and ecology. In order to further improve the "ecological civilization" of expressway construction and fully implement the requirements for the construction of low-carbon highway, this paper combines the changes of water quality in the construction stages of the Shaoqing reservoir in Kunming City, analyses the change of pollution sources on the water quality and gives the corresponding preventive measures for the construction of environmental protection.

1. Introduction

Wuyi highway passes through mountains, industrial area and residential community, and exert great disturbance to the eco-environment. In order to improve the "ecological civilization" and fulfill the low carbon requirements of the construction [1,2], it is necessary to monitor the construction area and evaluate the environmental status in real time during the construction process [3,4]. Thereby, the environmental pollution can be controlled, the coordinated development of engineering construction and environmental protection can be ensured, the protection of the environment during the construction period of the expressway can be guaranteed and provide support for the environment monitoring of the highway road domain in the future operation period [5]. Therefore, the research on environmental monitoring, assessment, early warning, and data collection and excavation around the highway construction and operation process has scientific and reasonable guiding significance and practical value for promoting the construction of green and low-carbon expressways and environmental sustainability.

Based on the Kunming Shaoqing reservoir (Figure 1), the ecomon inspection system imported from Japan has been used to monitor the water quality under different construction stage (Figure 2) and provides references to plan the construction schedule and construct water quality model.

2. Analysis the source of pollution

The two-row cofferdam method is adopted to construct the highway across the reservoir section, and two rows of steel sheet piles will be driven into the water. The pile uses its stiffness and strength to



form an integral retaining wall with the reclaimed soil, thus effectively isolating the water body during the construction process. The construction process and the pollution-producing aspects of the program are shown in Figure 3.



Figure 1. Shaoqing reservoir



Figure 2. Ecomon inspection system

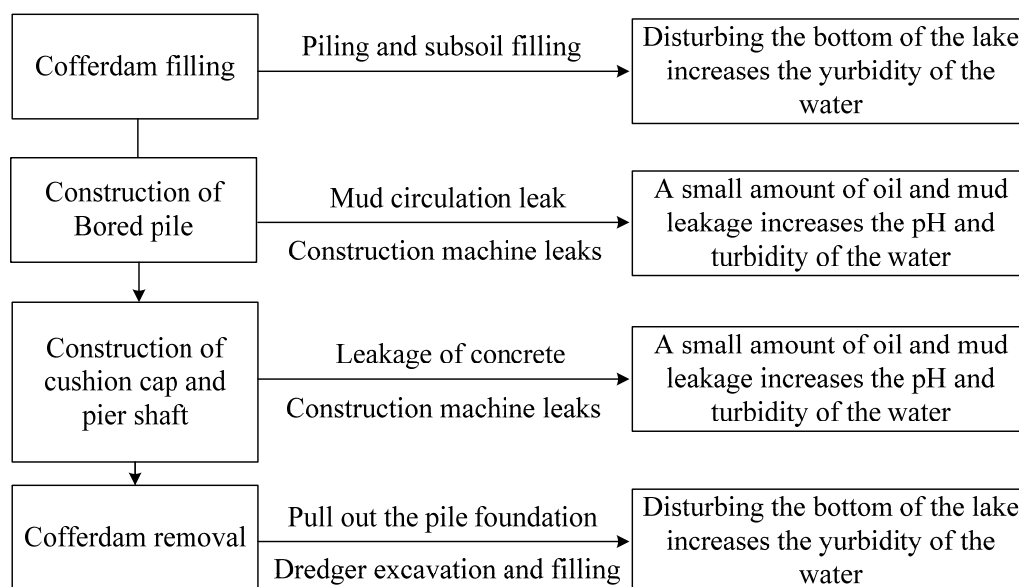


Figure 3. Analysis of pollutants in construction and demolition of cofferdam

As illustrated in Figure 3, the construction mainly affects the pH and turbidity (SS) of the water. Therefore, this paper uses ecomon detection system to monitor and analyze the changes of pH and SS during construction process and guide construction.

3. Influencing factors to pH and SS

The amount of rainfall will increase the water volume of the reservoir. Therefore, it can be seen from Figure 4 that, whether in construction or not, the rainfall will decrease the pH value, and did not cause any permanent damage to the water.

During the construction period, moisture evaporation, concrete, mud, and oil leakage will increase the pH value of water. When the pH is about to exceed the limit value, as shown in Figure 5, the pH can be decreased by controlling the construction speed and adjusting the construction scheme, so that

the pH is controlled within a certain range during the entire construction period, so as to meet the requirements of the green environmental protection construction. Since rainfall can reduce the pH, it is appropriate to increase the construction strength when the rainfall is abundant.

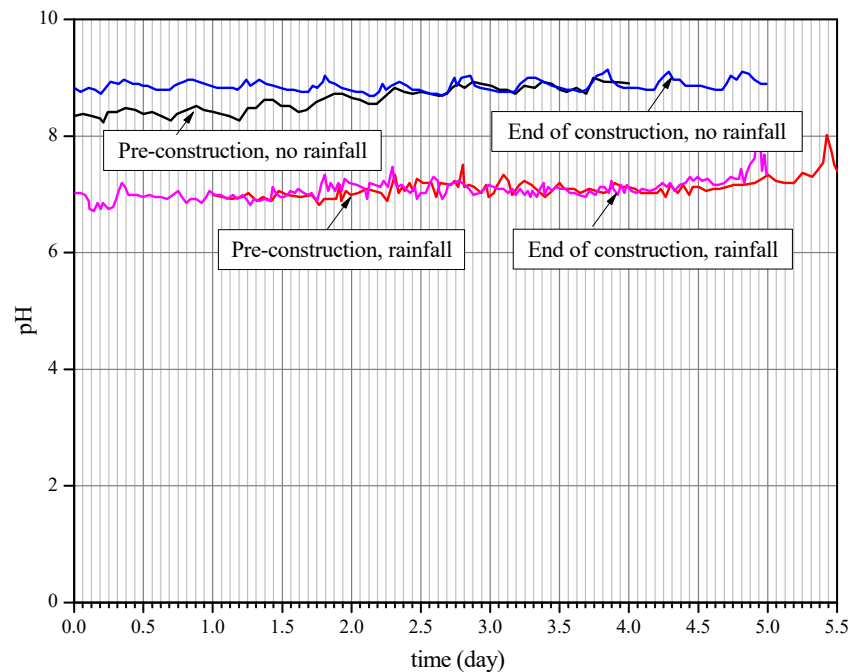


Fig.4. The relationship between pH and rainfall

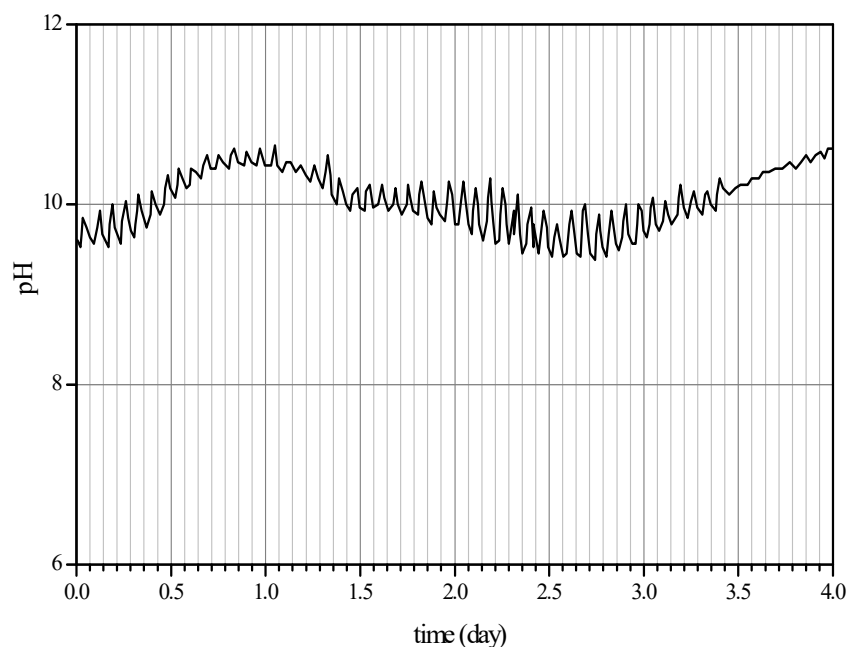


Fig.5. pH value during construction

As shown in Figure 6, before construction, the mean SS value of no rainfall was 22 mg/L, and the mean SS value was 50 mg/L in the rainfall. Even the construction has finished, the rainfall also

increase the SS value. During the construction period, cofferdam filling, bored pile construction, cofferdam demolition and rainfall will increase the value of SS. Construction speed and schedule should be adjusted to control SS in the range of limit value.

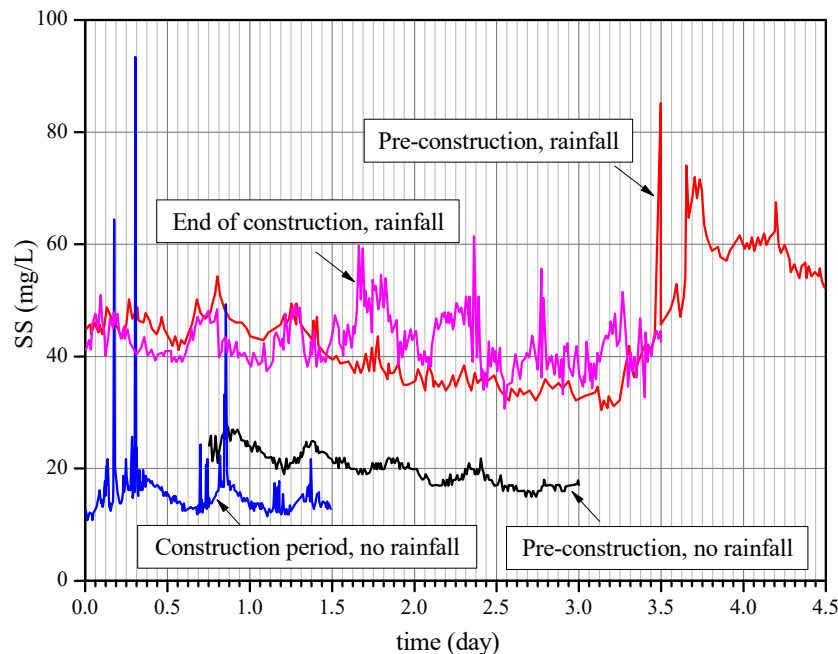


Fig.6. The relationship between SS and rainfall

4. Water quality protection measures and suggestions in the construction period of the reservoir

The impact of construction on water quality during construction should be given special attention. To reduce the impact of construction disturbance on water quality, the following measures can be taken:

- 1) Strengthen the real-time monitoring of water quality during the construction and operation period, optimize the construction organization design through monitoring results, and arrange the construction work strictly according to the relevant protection regulations to control the water quality within the standard requirements.
- 2) Strengthen the supervision and management at the construction stage, standardize the construction in accordance with the specifications, and strictly prohibit the discharge of sewage and living garbage from the construction site into the reservoir.
- 3) Large-scale construction machinery should be far away from the reservoir as much as possible. The machinery should be overhauled on time to reduce oil leakage and oil running.
- 4) At the end of construction, the site should be cleared in time, and afforestation measures such as afforestation and grass cultivation should be taken on the slope of the reservoir to prevent soil erosion.
- 5) Formulate environmental risk emergency measures.

5. Conclusion

Based on the water quality change during the construction period of the Shaoqing reservoir in Kunming city, the inspection system has been used to monitor the pH and SS value and the main source of pollution has been analyzed. The monitoring data has been used to optimize the construction design and control the pH and SS value within the scope of the regulations. Finally, the water quality protection measurement has been proposed for corresponding pollution sources.

References

- [1] K.W. Xi, S.H. Chen, J.J. Shi. Preliminary Study on Post-Evaluation of Environmental Impact

- of Expressway Construction Projects. Traffic Environmental Protection, 2003, (4): 101~103.
- [2] Q. Zhao. Research on Sewage Treatment Method for the Auxiliary Facilities of Highway in China. Changan University, 2003.
- [3] Y.J. Ding. Study on Treatment Technology of Tunnel Construction Wastewater: Jinan University, 2010.
- [4] Y.H. Zhu. Study on Coagulation Treatment of Construction Wastewater in Chongqing Mountain Tunnel: Southwest University, 2010..
- [5] K. Ikehata, R.S. Yangliu. Health Effects Associated with Wastewater Treatment, Reuse, and Disposal. Water Environment Research, 2009, 10(81): 2126-2146..