

A Siphon-Type Emergency Flood Discharging Technology

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Objectives

Many small reservoirs in China were built in the 1950's to 1970's. Some problems have emerged with the operation for several decades, which have reduced the flood discharge capacity and threaten the safety of relative structures and downstream residents, especially when the extreme storm is striking. In order to improve this situation, a light and easy to install technology which can significantly relieve the discharging pressure of the reservoir has been proposed, named siphon-type emergency flood discharging technology.



Methods

The new proposed emergency flood discharging technology is based on siphonage. Through physical model experiments and calculation, both the section length and the thickness are determined. For the pipe with the diameter of 300mm, the thickness is 6mm and the section length is no longer than 3m. For the pipe with the diameter of 400mm, the thickness should be thickened to be increased by 8mm and the section length should be no longer than 2m. Different sections should be connected by flanges which should be thickened and strengthened. Finally, a single valve is installed in the downstream vertical pipe, and an air suction pipe is set at the top horizontal pipe. Before the siphon is started, an external vacuum pump is used to withdraw the air in the system, and the water will be suctioned into the system through the upstream vertical pipe. After the water filling is finished, close the air suction pipe and open the valve installed in the downstream vertical pipe, then the siphon is formed. When the drainage is about to be finished, open the air suction pipe, then the siphon condition will be broken and the siphon is finished.

Results

Siphon-type emergency flood discharging technology has been proposed made of FRP and the diameter is chosen to be 300mm~400mm. It's light and easy to assemble and disassemble, but it's strong enough. It can convey a maximum total of about 70000 m³ of flood per day. It can significantly relieve the discharging pressure of small reservoirs. Besides, the newly proposed siphon-type emergency flood discharging system is running based on the siphoning which used the gravitational potential energy of the water in the flow and additional energy is needed only when the siphon flow is at the start, thus it's environmentally friendly.

Conclusions

Siphon-type emergency flood discharging technology has been proposed made of FRP, it's light and easy to assemble and disassemble. It's running based on the siphoning which used the gravitational potential energy of the water in the flow and additional energy is needed only when the siphon flow is at the start, environmentally friendly. It's also simple structure and light material, quick assembly, disassembly and wide applications and low operation and maintenance cost. After multiple tests and theoretical analysis were conducted, both in the lab and on site, a siphon-type emergency flood discharging technology was proposed suitable for the improvement of the hidden danger issues.

