MODEL EXPERIMENTALS OF FAST-CLOSING-GATE FOR THE LAXIWA HYDROPOWER STATION

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Fast-closing-gate is a kind of structure which is placed in the inlet of the tube for water turbine generator unit and close fast in emergency. Its use refers to many hydraulic problems, such as holding forces, hydrodynamics, the speed of ventilation for the vents, and so on. The hydraulic phenomena in the process of closing gate are complex and the holding forces are much larger than the gravity of the gate because of the changes of some hydraulic parameters. Many researches were conducted about the gate hydraulics but holding forces, hydrodynamics, the speed of ventilation for the vents (Xie, 1982; Gao, 1981; Chen, 1983; Sagar, 1977). Liu Weiping (1994) got the pressure on bottom and top of gate, discharge through the gate and the process of water level by numerical simulation but the holding force, hydrodynamic pressure and wind velocity in vents and so on. The interesting areas of this work include:

(1) To test the reliability of closing the gate to use water-spout under the conditions of the combination of different intake water levels and tail water levels and to measure hydrodynamic pressures including the up and downstream face and the top and the bottom of the gate, and the water level of the gate well.

(2) To measure the critical opening and the corresponding effective action head behind the gate when pressure flows charge into free flows with the closing fast of the gate under the conditions of the combination of different intake water levels and tail water levels.

(3) To determine the maximum value of the holding force and the corresponding opening of the gate in the process of the closing fast of the gate.

(4) To check up the size and position of the vents behind the gate.

In this paper the special researches were conducted of hydraulics of the fast-closing gate for the Laxiwa Hydropower Station, a large scale engineering project, and the experimental investigations shown that the distribution and value of water pressure on the various parts of the gates were reasonable, that the amplitude changes of water level in gate wells have an acceptable range from 3m to 5m, that the sizes and positions of the vents ($2\times\Phi1450$mm) were suitable, that the value of n_k impacted by head of inlet apparently, for example, the changes of n_k from 0.18 to 0.52 when the head of the gates No.1 and No.2 changed from 102m to 20m, and the peak value of holding force appeared at the moment of n_k of 0.17 to 0.20.

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