COMPARISON AND SELECTION OF ARCH DAM BUCKET IN SKI-JUMP ENERGY DISSIPATION

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The basic principle of ski-jump energy dissipation is that gigantic kinetic energy carried by high velocity flow leads flow to the downstream river far away from the structures and that avoids structures from damage of the falling nappe. One of the key steps of dissipation is the selection of body type of bucket lip. In this paper, the hydraulic model tests of Kuaizehe hydroelectric plant were conducted, which compared the effects of continuous bucket and differential bucket, and expecting to choose a appropriate bucket for the dam.

The experiments about design flood and check flood were performed to test the two buckets, respectively. The maximum time-averaged dynamic pressure measured in the plunge pool is showed in table1:

Table 1. Maximum time-averaged dynamic pressure in plunge pool of differential buckets

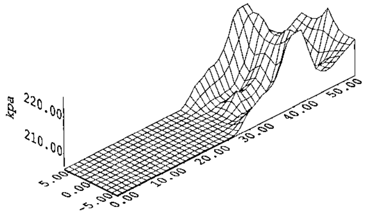
Engineering situation	Designed flood level/kpa	Checked flood level/kpa
Differential bucket	225.4	240.1
Continuous bucket	254.8	264.6

The results showed that the time-averaged dynamic pressure in the plunge pool both during design flood and check flood was bigger than that of using differential bucket and the flow was concentrated. The differential bucket in flood discharging divided the flow into streams staggered up and down .After aerating and crashing nappe was separated longitudinally, while the area of influent flow was enlarged and unit discharge was reduced. Therefore, the dynamic pressure in downstream plunge pool was diminished tremendously and also the scouring and destroying action to downstream river was decreased. The plunge pool in downstream diminished the remainder kinetic energy of outlet flow and insured the safety of dam foundation. The situation of time-averaged dynamic pressure at the bottom of plunge pool during design flood is showed in fig.1.

In this experiment using differential bucket ,the water depth in the plunge pool of design level and check level were respectively :21.5m and 22m. The maximum time-averaged dynamic intensity of pressure were 225.4kpa and 240.1kpa, respectively. Subtracting the hydrostatic the dynamic intensity of pressure forming on the bottom board was small, when the flow injected into the plunge pool. Its value can be caculated according to:

$$\Delta p = p - \rho g h_t \qquad (1)$$

The maximum dynamic shock intensity of pressure was just 24.5kpa and it created little scouring damage on the downstream rocks. Moreover, the construction of differential bucket was simpler than that of narrow joint bucket or other compound buckets. Therefore differential bucket was the better choice for Kuaizehe hydroelectric plant.



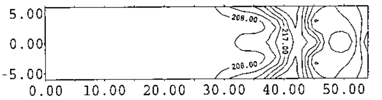


Fig. 1 The solid distributing charts and contours of time-averaged dynamic pressure of plunge pool bottom in design flood of differential bucket

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