STUDY ON THE TYPE OF AERATION BUCKET AERATOR UNDER LOW FROUDE NUMBER SPILLWAY TUNNEL

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Pubugou hydropower station spillway tunnel is open channel flow and its length is about 2000m. The bottom slope i=0.058 and the type of cross section is circular-arch vertical wall, width 12.0m, height 15.0m. The design flood and verification flood discharge are 3309.0m^3/s and 3452.0 m^3/s respectively, cross section average flow velocity is over 30 m^3/s.

In order to avoid cavitation damage, the artificial aeration buckets are set in the bottom of spillway tunnel every other 200m. The original type of aeration device selected is aeration bucket. The relative slope between aeration bucket and bottom slope is 1:10, height of aeration bucket is 1.0m. In the experiment we discovered in this type of aeration bucket a lot of water-logging is appeared in the downstream cavity pocket and the surface is fluctuated intensively and water filled the cavity pocket intermittently. Water drainage is made in the experiment, but steady cavity pocket couldn't be formed still when the drainage discharge is 2.2m^3/s.

The reason of water-logging and unsteady cavity pocket is that the water depth of spillway tunnel is higher , the velocity is lower, and the Froude number is lower, range about in 3.0 ~ 4.0. According to the past practice experience, when the Froude number is over 6.0 ~ 7.0, the flow pattern and aeration effect could been realized. Therefore, this paper dedicates to solve artificial bottom aeration in low Froude number through hydraulic model experiments and obtains following research result.

Artificial aeration is difficult at the bottom of water flow under low Froude number, water-logging in the cavity pocket behind aeration bucket is unavoidable;

The height of "spacious splayed" aeration bucket affects on stability of cavity pocket and effect of aeration is unobvious. Excess height of aeration bucket will lead water surface rises and roof remaining space decrease. but Excess small height will cause the length of cavity pocket shorten and difficult to lay side and aeration hole and downstream chopping.

The location of downstream chopping, the slope of downstream and the local flow pattern downstream aeration bucket relate tightly for "spacious splayed" aeration bucket. Effect for xcess slight slope of downstream hold backwater into cavity pocket is unobvious. The results of experiment shows that appropriate the slope 1:4 ~ 1:5.

The aeration effect of "spacious splayed" aeration bucket is better relatively in low

Frude spillway tunnel;

In the optimization project of aeration bucket, the rectangle downstream of "spacious splayed" aeration bucket was changed into arc. The aeration cavity pocket is steady and aeration concentration can meet the need of water conservancy.

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