FLOW MECHANISM AND EXPRIMENTAL STUDY OF COMMUTATING MEASUREMENTS IN BRANCHED-CHANNEL IN PUMPING STATION

CHEN BAOHUA[1], CHANG YUFENG and ZHOU CHUNTIAN

[1]Senior Engineer, Institute of Taihu Hydraulic Engineering designation, Suzhou, 215000, China
(Tel: +86-25-86082910, Fax: +86-2583731332, e-mail: xiaowuwei0304@sohu.com)

Pumping station with branch-typed approach channel used tooverflow in one branch and another branch was closed. The inflow all must be veered. So the obviously drift flow in the fore bay would do harm to the operation of the units. In this paper, the hydraulic characteristic of branch-typed approach channel and the modification of flow pattern as to average the current velocity in fore bay are studied by physical experiment.

According to the flow characteristic of this project, the model was designed with gravity similarity criterion. The model scale is $\alpha_L = 20$. The discharge of the station, the inlet and outlet bay, the approach channel, the intake gate and one part of the lake were simulated in the model.

The main factors that affect the non-uniform of the current velocity are the geometry of the curved conduit and the depth of water. The relative velocity difference ($\triangle$V/V) is still used to judge the strength of the deflected flow. $\frac{\Delta V}{V} = f(V, h, B, R, \theta, L)$. V is the average current velocity in fore bay; h is the inlet deeper of the water in fore bay; B is the width of the fore bay; L is the length of the flat stage which is behind the stage of the two lake; θ is the corner of the passing the curved conduit of the two lake. Datum recorded from the model experiment is in table 1.

Diversion pier should be arranged in the middle and closer to back (near to the side of fore bay) of bend, and the number is chosen from 2 to n (n is the number of water pump). Generally speaking, increasing the number and length of diversion pier is conducive to make current velocity distribution in fore bay uniform, and the number and length of diversion pier can be complementary to each other.

In the condition that the radius of curved conduit and the width of stage is a constant, the effect of the curved conduit corner is obvious. The greater the corner is the greater the relative velocity difference is and vice versa. In the condition that the geometry is constant, the influence of the waterpower on the relative velocity difference in the fore bay is that the relative velocity difference in the fore bay ($\triangle$V/V) was correlate with the value of Fr. $\triangle$V/V increased with the increasing of the Fr.

Among the local measures to improve flow patterns in the fore bay such as ground- sill, fish trail shaped groin, diversion pier etc, the efficient of the diversion pier is the most remarkable.

It is worthy to point out that the efficient of diversion pier depended on the proper form and plan layout in particular, especially on the latter.

CONCLUSIONS

(1) For pumping station with branch-typed approach channel, the inflow in fore bay is not uniform in various working conditions. The mainstream deviated to one side. The relative velocity difference increased with the increase of Fr in the condition that the geometry is kept certain.

(2) The rectification effect of diversion pier is remarkable. The velocity distribution in the fore bay could be uniform by choosing appropriate pattern and arrangement of build. By doing so, the flow pattern in inlet of channel could be optimized.

(3) The rectification effect is wondrously sensitive to the plan layout of the diversion pier. For important projects, it is necessary to determine the proper pattern and plan layout of the project through physical experiment.

REFERENCE

ZUO Dongqi, 1984. Theory and Methodology of Physical Experiment. Beijing: Water conservancy and Hydropower Publishing House.