Floater algorithm for optimal operation of hydropower station reservoir

Xueshan Ai, Yue Zhi, and Zuo Dong

Wuhan University, Water resources and hydorpower Engineering, wuhan, China (xsai@whu.edu.cn)

The optimal operation of hydropower station reservoir is an important non-engineering measure to improve the utilization efficiency of water resources and hydro-energy resources. Based on the characteristics of having more water energy in the situation of high water head and high flow rate, a floater algorithm for reservoir optimal operation is proposed in this paper. In the calculation of water resources in each period, the algorithm tries to maintain the operation of the reservoir at high water level, and finds the upper water level of the reservoir from forward and reverse directions under the given initial and end water levels. In the forward calculation, starting from the initial water level, according to the minimum discharge or minimum output requirements to the end of the time period, the maximum water level of each time period is obtained.In reverse calculation, starting from the end water level, the maximum water level at each time period can be obtained by inversely calculating at the beginning of each time period according to the maximum discharge or expected output at each time period.The lower boundary lines of the two maximum water levels are selected as the initial trajectories of the discrete differential dynamic programming (DDDP) and then calculated by DDDP in detail. The three gorges reservoir is taken as an example for simulation study and compared with the dynamic programming and discrete differential dynamic programming method. The floater algorithm has the characteristics of fast calculation speed and better calculation results. It has strong advantages in reservoir optimal operation.