

عنوان مقاله:

Pressure Fluctuations Investigation on the Curve of Flip Buckets Using Analytical and Numerical Methods

محل انتشار:

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خلاصه مقاله:

Flip buckets are one of the most important energy dissipating structures in the dams' downstream. The pressure on the surface of the flip bucket's curve is one of the most important design parameters. In these structures, the pressure fluctuations may cause a considerable lift force below the structure causing the rise and destruction of the floor slabs, fatigue of the used materials due to cyclic loading and unloading, floor destruction and the creation of cavitation, as a consequence. In this study, the computational fluid dynamics (CFD) is implemented for simulating the flow over the flip buckets. For this reason, the Flow-3D® code is used here. After validating the results of the software, the flip bucket of the Clyde dam spillway in New Zealand was investigated for different ratios of the spillway's design discharge (Q_d) and the numerical results associated with the pressure distribution over the flip bucket's structure were presented for $0.25Q_d$, $0.5Q_d$, $0.75Q_d$, Q_d , $1.25Q_d$, and $1.5Q_d$. Afterward, the pressure values were theoretically estimated along the flip bucket's curve. The results obtained showed that for different flow rates, the maximum pressure occurs near the midpoint of the horizontal length of the bucket's curve. For different flow rates, the theoretical and numerical results showed a difference of 23 to 41 percent. In addition, it was seen that the theoretical pressure distribution curve is less variable and changes with a slight slope, while the numerical results provide a nonuniform pressure distribution that is more consistent with the experimental results given by the previous studies.

کلمات کلیدی:

Flip bucket, Spillway, Pressure distribution, Computational fluid dynamics, Flow-3D

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