



Experimental Investigation of Entering Flow Effects on the Intensity of Pressure Fluctuations over Compound Flip Bucket

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Abstract

Flip buckets are usually placed at the end of chute spillways or outlet conduits of high dams. The projected jets from these buckets jump into plunge pools which cause the dissipation of destructive energy of plunging jets. Compound flip bucket is a special design of bucket with a non-zero degree of cross sectional slope followed by a curvature in its longitudinal direction. These structures are very suitable for restricted geometries and conditional topographies. In case of high velocity flow, separation of flow the boundary also causes the local pressure to drop and as a result the resultant fluctuations may trigger cavitations. Sever hydrodynamic pressures are also associated with the vibration of structure. Therefore, in this study the hydraulic parameters such as pressure fluctuations, pressure, velocity and depth of flow on these structures are presented. Physical chute spillways with their flip buckets models of Gotvand dam were used to check the pressure fluctuations and its variation with different hydraulic characteristic along the compound flip buckets. The Froude numbers varies in the range of 3.5 to 7.5. The results were analyzed and presented in the form of Pressure coefficient corresponding to the mean pressure (C_p), which was calibrated based on the present results. The results consist of the statistical characteristics of Pressure fluctuations, its Variation of maximum and minimum dimensionless positive and negative values (C_p^+), (C_p^-) of pressure fluctuations along the compound flip bucket. It is hoped that the present results will help the designer of such structures.

Keywords: Compound Flip Bucket, Pressure Fluctuation, Coefficient Mean Pressure C_p , coefficients pressure fluctuations.

1. INTRODUCTION

Flip buckets are usually placed at the end of chute spillways and outlets of high dams to project the high velocity flows issuing from these structures. The outlet jet moves through the atmosphere and then enters into a plunge pool, which both help to dissipate the destructives energy of jet. Although it is claimed that a parabolic shape of the bucket results in a smoother water surface without increasing the size of the structure, but tends is in favor for a circular arc.

Special forms of buckets are sometimes provided to deflect the jet issuing from the bucket towards the main river course when the spillway is located on the flank. Buckets consisting of jet splitters are specially designed to affect lateral spreading of the jet in order to entrain air and dissipation of part of the energy before it strikes the river bed. The shape of the deflectors depends on the slope of the spillway chute, namely spillway chutes on flat slopes and those on steep slopes. The arrangements also differ according to whether the chutes are narrow or wide. Compound flip bucket is a special design of bucket with a non-zero degree of cross sectional slope followed by a curvature in its longitudinal direction. These structures are very suitable for restricted geometries and conditional topographies.