**Abstract:**

Bottom outlet of dams used to control the discharge of the reservoir, to control the primary impounding of reservoir, to supply demanding water and to discharge downstream flood during construction. Flow in bottom outlet tunnel is divided into free surface and pressurized flow by the service gate.In order to avoid negative pressures and cavitation phenomena, an air duct is installed immediately after the gate. Consequently, enough air comes into the tunnel through the duct and prevents cavitation occurring downstream of the gate. This study simulates two-phase flow in bottom outlet of dam using ANSYS CFX software. To simulate the hydraulic flow the Euler-Euler conceptual model was used and the grid of tunnel geometry was made by Gambit software. The k-ε turbulence model was used for simulation of turbulent flow. In addition, the volume of fluid and mixture models was used for modeling multi-phase flow. Different parameters for the gate different opening 20, 60 and 100% are obtained using this numerical model. Comparing the results obtained using numerical and physical models indicates the capability of the numeraical model to predict the flow pattern, to obtain the required parameters, determine the critical point and to analyze the flow in bottom outlets. The results showed that the numerical model can predict formation of rooster tail on the wall and also the jet length after the first and second step in comparison of physical model with high accuracy. Furthermore, the aeration rate and input air flow rate is calculated and compared. Determination of cavitation in the downstream tunnel indicates possibility of cavitation phenomena. Therefore, for prevent this damaging problem; the suitable solutions should be taken.

**Keywords:** Computational fluid dynamic, Flow aeration, Cavitation, Air duct, Multi-phase flow, VOF model, k-ε turbulence model.

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# Simulation of Two-Phase Flow in Bottom Outlet of Dam using ANSYS CFX Software

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