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Numerical Simulation of Cavitation Phenomenon in the Stepped Spillway with Fluent Software

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In the present research, the effects of different turbulence models and cavitation phenomenon in the stepped spillway of Siah Bisheh dam was investigated using the FLUENT model. Three standard K-Epsilon, Renormalization Group (RNG) K-Epsilon, and K-Omega turbulence models were employed for minimum, maximum, and flood discharge flows of 150, 170, and 203 cm3/s, respectively. The numerical method was validated by simulating a laboratory spillway, by which an appropriate consistency was observed. Also, the results showed that the probability of the cavitation phenomenon was more likely for a discharge flow of 203 cm3/s downstream of the stepped spillway area of the Siah Bisheh dam. Therefore, an appropriate aeration system can be utilized in suitable locations to reduce the probability of cavitation by decreasing velocity in the desired areas. Moreover, the cavitation index changed at each point of the spillway by changing the turbulence model type. Therefore, choosing the turbulence model to investigate the cavitation is of great importance. For example, the maximum velocities created in the investigated models with a discharge flow of 150 cm3/s for standard K-Epsilon, RNG K-Epsilon, and K-Omega turbulence models were 1.34, 2.32, and 1.32 m/s, respectively. The standard K-Epsilon and K-Omega models were very similar in all discharge flows and the results of the RNG K-Epsilon turbulence model were different from the other two models.

Keywords: Cavitation phenomenon,Turbulence Models, stepped spillway Siah bisheh Spillway.

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