

Comparison of Volume of Fluid Model: Experimental and Empirical Results for Flows over Stacked Drop Manholes

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Abstract : The manhole is one of the types of structures that are installed at the site of change direction or change in the pipe diameter or sewage pipes as well as in step slope areas to reduce the flow velocity. In this study, the flow characteristics of hydraulic structures in a manhole structure have been investigated with a numerical model. In this research, the types of computational grid coarse, medium, and fines have been used for simulation. In order to simulate flow, k- ϵ model (standard, RNG, Realizable) and k-w model (standard SST) are used. Also, in order to find the best wall conditions, two types of standard and non-equilibrium wall functions were investigated. The turbulent model k- ϵ has the highest correlation with experimental results or all models. In terms of boundary conditions, constant speed is set for the flow input boundary, the output pressure is set in the boundaries which are in contact with the air, and the standard wall function is used for the effect of the wall function. In the numerical model, the depth at the output of the second manhole is estimated to be less than that of the laboratory and the output jet from the span. In the second regime, the jet flow collides with the manhole wall and divides into two parts, so hydraulic characteristics are the same as large vertical shaft hydraulic characteristics. In this situation, the turbulence is in a high range since it can be seen more energy loss in it. According to the results, energy loss in numerical is estimated at 9.359%, which is more than experimental data.

Keywords : manhole, energy, depreciation, turbulence model, wall function, flow

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