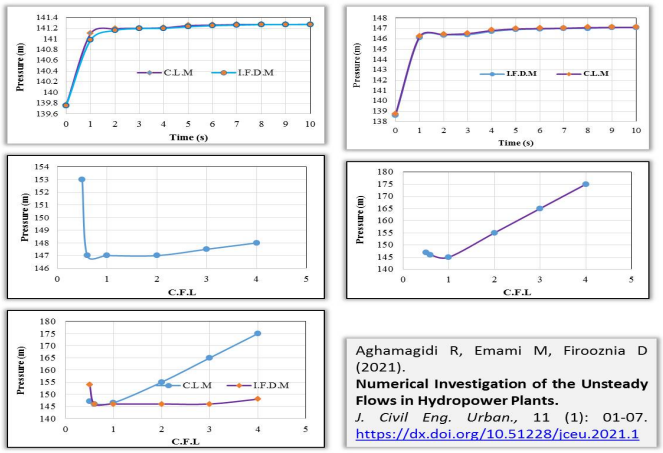
Previous issue | Next issue | Archive

Volume 11 (1); 25 January, 2021



Research Paper

Numerical Investigation of the Unsteady Flows in Hydropower Plants.

Aghamagidi R, Emami M, Firooznia D.

J. Civil Eng. Urban., 11(1): 01-07, 2021; pii:S225204302100001-11

DOI: https://dx.doi.org/10.54203/jceu.2021.1

Abstract
One of the most important hazards that threatens the stability of power plant buildings is the phenomenon of water hammer, which can occur in the Penstock pipe of a turbine due to the rapid opening and closing of a valve. Fluid Descriptive Equations in this situation, there are two hyperbolic partial nonlinear partial differential equations that are very difficult and complex to solve analytically and are possible only for very simple conditions. In this study, by examining the two numerical methods of characteristic lines and implicit finite difference with Verwy & Yu schema, which are widely used in the analysis of instabilities, their disadvantages and advantages are clearly clarified and a suitable comparison basis for use. They should be provided in different conditions in hydropower plant. The results of the characteristic method in terms of maximum and minimum pressure show more and less values than the implicit finite difference method. In the characteristic method, perturbations and fast wave fronts are presented with more accuracy than the implicit finite difference method. At points near the upstream, downstream and middle boundaries, the accuracy of the characteristic method in presenting pressure and flow fluctuations is higher than the implicit finite difference method. In the characteristic method, it is recommended not to use certain time steps and try as much as possible avoid interpolation by selecting the appropriate time step. The results of examining the amount of changes in coefficient of friction in both methods show that it is not correct to take its value constant (proportional to the value obtained in stable conditions) and coefficient of friction should be calculated in proportion to changes in velocity at different times and used in the governing equation.
Keywords: Hydraulic Flow, Hydroelectric Power Plant, Water Hammer Phenomenon

[Full text- PDF] [HTML] [ePub] [XML]

Previous issue | Next issue | Archive