## عنوان مقاله:

An Adaptively-damped Compressible-liquid Model for Non-cavitating Hydraulic Surges


## محل انتشار:

ماهنامه بین المللی مهندسی, دوره 33, شماره 10 (سال: 1399)

تعداد صفحات اصل مقاله: 10



## نویسندگان:

R. J. Chandran - *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India*

R. Raju - *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India*

A. Salih - *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India*



## خلاصه مقاله:

This research presents a compact and computationally-efficient two-equation compressible-liquid model. The model is specifically developed for the numerical computation of hydraulic surges in pipes under high fluid pressure where cavitation is absent. The proposed model aims to simplify the three-equation model of Neuhaus et al. for two-phase cavitational hammers. Compressible effects in liquid during the transients are considered by including a suitable equation of state into the model. A tunable function of the relative local pressure fluctuation called 'Variable Friction Coefficient' (VFC) for the flow transients is also incorporated into the model. For the accurate modeling of wave propagation, the split-coefficient matrix (SCM) method for characteristic-direction based splitting of eigenvalues is used in the study. The results show that the proposed two-equation model can reproduce the results from the three-equation model at a substantially reduced computational cost. The integration of the variable friction coefficient into the two-equation compressible-liquid model further improved the solver capability. The results computed using this aggregate solver are superior to the original three-equation model and the two-equation model without VFC. The results also suggest that the variable friction coefficient imparts adaptive damping capability to the solver model. This feature of the model is visible in the improved accuracy in the modeling of decaying pressure waves. The aggregate solver model, i.e., `the variable friction coefficient integrated two-equation compressible-liquid model,' offers a greatly simplified mathematical model and an inexpensive computational solver for the simulation of hydraulic surges in non-cavitating flow transients.



## کلمات کلیدی:

Two-equation Model, Hydraulic Surge, Compressible Liquid, Variable Friction Coefficient, Non-cavitating Flow, Adaptive Damping