

## Numerical simulation of an unsteady flow in a hydraulic system with a cavitating ring plate

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This paper addresses the construction of an efficient mathematical model to be used in the numerical simulation of unsteady liquid flows in hydraulic systems with cavitating restrictors. Existing approaches to cavitation simulation are based either on accounting for a two-phase flow structure or on representing a cavitating flow as a homogeneous medium of variable density. In the latter case, the pressure and the density are related via the barotropic equation of liquid–vapor mixture state. The goal of this work is to verify the applicability of a cavitation model based on the barotropic equation of liquid–vapor mixture state to the numerical simulation of an unsteady flow in a hydraulic system with a cavitating ring plate. The method employed is a numerical flow simulation in the axisymmetric approximation using the complete averaged Navier–Stokes equations. It is shown that the use of the barotropic equation of liquid–vapor mixture state provides a satisfactory agreement between the computed results and the experimental data available in the literature. In agreement are the peak-to-valley values of the oscillating pressure on the pipe wall immediately downstream of the cavitating ring plate and the presence of a pronounced periodic component in the pressure vs. time relationship. It is shown that the parameters of the unsteady flow downstream of the cavitating ring plate vary when going from the ring plate to the cavity collapse location: the peak-to-valley value of the oscillating pressure on the pipe wall increases and so does the contribution of high-frequency periodic components to the pressure vs. time relationship. It seems desirable that the turbulence model employed be refined further to correctly simulate cavitation oscillations generated by periodically detached cavitation in Venturi tubes, which are used in various cavitation pulse plants.

**Keywords:** numerical simulation, cavitation model, barotropic equation of state, cavitating ring plate, oscillating pressure value.

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