

Compressible Flow Modeling in Pipes and Porous Media during Blowdown Experiment

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Abstract : A numerical model is developed to simulate gas blowdowns through a thin tube and a filter (porous media), separating a high pressure gas filled reservoir to low pressure ones. Based on a previous work, a one-dimensional approach is developed by using the finite element method to solve the transient compressible flow and to predict the pressure and temperature evolution in space and time. Mass, momentum, and energy conservation equations are solved in a fully coupled way in the reservoirs, the pipes and the porous media. Numerical results, such as pressure and temperature evolutions, are firstly compared with experimental data to validate the model for different configurations. Couplings between porous media and pipe flow are then validated by checking mass balance. The influence of the porous media and the nature of the gas is then studied for different initial high pressure values.

Keywords : compressible flow, fluid mechanics, heat transfer, porous media

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