Simulation of ideal gas flow in the variable geometry channel with mass and energy source

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Characteristics of gas flow in the variable geometry channel with mass and energy source are studied in this paper. The channel made of energy-intensive material (EIM), capable of independent combustion, is considered. The change of geometry occurs to a specific law of EIM combustion, dependent of the local static pressure and gas flow rate. The algorithm for calculating the gas flow in a channel within the quasi-steady approach is developed to solve this problem. The solution made by finite volume method.

Algorithm based on the integration of unsteady equations system, that describes one-dimensional gas flow in a channel with distributed mass, energy and impulse source. As a result, the equations in a discrete form allows obtaining a flow field for both subsonic and supersonic flow region.

The flow at various channel configuration, the law of EIM combustion and regime parameters are investigated by using the developed algorithm. Based on numerical experiment distribution of pressure, temperature and velocity of flow along the channel is calculated and time dependent variation of the momentum in the output section is obtained.

Result can serve as an estimate of energy-power plants during design stage.