Mathematical research of gas-dynamic processes in pulse ejector

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Steady gas ejectors are widely used in aircraft industry, in aerodynamic experiments, in energetic sector, in oil and gas and other areas.

It is currently known, that ejection process involving pulse active jet allows obtaining significantly higher determinant process efficiency parameters values. Existing experiments have shown considerable impulse increase and entrainment ratio in the pulse ejector compared to the steady ejector with the same controls values.

This work is dedicated to pulse ejector characteristics mathematical research and pulsed process optimal controls choice. Mathematical model is based on non-steady 3D Navier-Stokes equations with periodically changing boundary conditions at the inlet of the active duct. Moving operating environment is considered as compressible, viscous, heat-conductive, flow is turbulent. Bilayer parametric $\kappa - \omega$ SST turbulent model is used for additional Reynolds-averaged Navier–Stokes equations. Created algorithms and program unit allow a detailed research of gas-dynamic parameters in time and space, as well as compute device integral characteristics that define its efficiency.

Ejector pulse drive has a large number of controls, which can carry out device optimization effectively. Wide using of ejectors in various fields allows opportunity for significant increase of economic benefit. Researches have shown, that pulse ejector augment engine thrust more than two times in case of control parameters optimal choice.