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CALCULATING DETECTION OF FLOW'S GAS DYNAMIC PARAMETERS LEAP BY METHOD OF TRACKING ZONES.

Abstract

For the numerical solution of the equations of gas dynamics, the scheme proposed by S.K. Godunov is traditional. This mathematical method for the end-to-end calculation of complex discontinuities gas flows, consisting of rarefaction zones, shock waves of varying intensity and gaps in the contact zone, allows to achieve a high level of reliability and accuracy of the solution, which makes it the best for use. However, to achieve an exact solution, even if it is an ideal gas, it requires a time-consuming solution of a fairly complex system of nonlinear gas-dynamic equations by the iteration method. If we talk about solving problems with multicomponent or multiphase flows, chemical reactions or flows with variable thermophysical properties, then it is difficult to obtain an exact solution of the Riemann problem. In this connection, we propose a method for isolating "strong" waves or contact surfaces in the pressure-exchange cells of the wave pressure exchanger, based on the introduction of a local computational domain that follows the transfer of the gap, as a particular solution of the "decay of an arbitrary discontinuity" method. The four-port reverse flow wave rotor, a typical configuration, also called "Comprex", is taken as the basis of the mathematical model of the gas-dynamic cycle. To calculate the flow characteristics within the channels, one-dimensional and two-dimensional analytical gas-dynamic models are used. The main modern methods of the mathematical solution of the equations of gas-dynamics, the so-called particular solutions of the Riemann's problem or Riemann-solver's scheme, are briefly considered. A presentation of the Godunov scheme implemented under the rotor of the wave pressure exchanger is proposed. As part of testing the effectiveness of the method of tracking zones, the calculation results are compared with the data obtained during three-dimensional modeling. According to the results the "tracking cells" method shows a high accuracy of mathematical modeling (from 94% to 98%), which makes possible to use it for solving various gas dynamics problems, especially those related to the direct modeling of flows in channels. The results show that under the given experimental conditions the calculated curve obtained by the "tracking cells" method is fairly well approximated to the experimental curve, which emphasizes not only the general accuracy of the calculations, but also the fact that our method takes into account the nature of the process.