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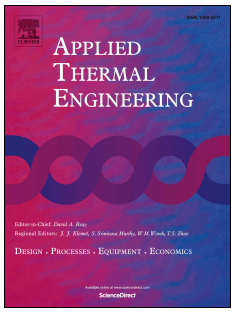

Evaluation of the non-linearities of a potential axially symmetric model for computing the entrainment ratio of supersonic ejectors

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Evaluation of the non-linearities of a potential axially symmetric model for computing the entrainment ratio of supersonic ejectors

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Abstract

The purpose of this investigation is to develop a mathematical procedure to solve the nonlinear axially symmetric potential flow equation applied to the prediction of the mass ratio of a ejector operating in the double choked regime. An iterative procedure based on adding error residuals upon the linearized solution has been devised as the solving scheme. Discrepancies between nonlinear and linear solutions and the application of the nonlinear method to experimental results, both from an in-house investigation and from elsewhere, are reported. The maximum deviation between the linearized and non-linearized solutions is below 2% for the cases considered, which confirms the validity of the linearized solution. On the other hand, the average deviation between the nonlinear and experimental mass ratio is below 7%, which proves the applicability of the model.

Keywords: Ejector, mass ratio, potential flow, mathematical model

Nomenclature

A	area
c	sound speed
d	diameter
$f(\xi, r)$	error function

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