

Numerical Investigation of a Supersonic Ejector for Refrigeration System

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Abstract : Supersonic ejectors have many applications in refrigeration systems. And improving ejector performance is the key to improve the efficiency of these systems. One of the main advantages of the ejector is its geometric simplicity and the absence of moving parts. This paper presents a theoretical model for evaluating the performance of a new supersonic ejector configuration for refrigeration system applications. The relationship between the flow field and the key parameters of the new configuration has been illustrated by analyzing the Mach number and flow velocity contours. The method of characteristics (MOC) is used to design the supersonic nozzle of the ejector. The results obtained are compared with those obtained by CFD. The ejector is optimized by minimizing exergy destruction due to irreversibility and shock waves. The optimization converges to an efficient optimum solution, ensuring improved and stable performance over the whole considered range of uncertain operating conditions.

Keywords : supersonic ejector, theoretical model, CFD, optimization, performance

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