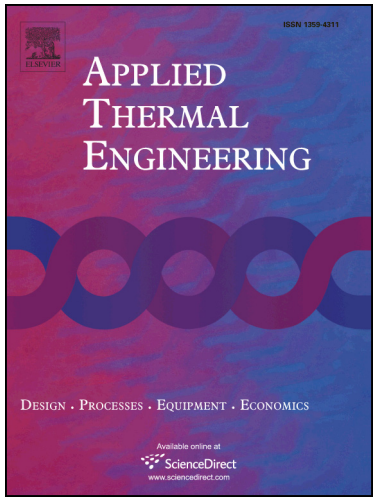

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Ejector Performance Prediction at Critical and Subcritical Operational Modes

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Abstract

Traditional ejector models are focusing on the ejector performance predictions at critical mode under design conditions. In reality, ejector systems cannot be operated under these conditions perfectly. Thus, the study of ejector performance at subcritical mode under off-design conditions is important. In this paper, novel models for ejector performance predictions at critical point and breakdown point are developed based on constant-pressure mixing and constant-pressure disturbing assumptions. Then, the two models are integrated as the model to predict ejector performance at critical and subcritical operational modes. In order to determine the ejector component efficiencies in the models, a novel concept, the effect of the change (EOC) of efficiency, is introduced to identify the efficiencies which affect ejector performance significantly. Then, the identified efficiencies are determined by sparsity-enhanced optimization method. The predicted results obtained by our model are much more accurate than those obtained by existing methods.

Keywords: Ejector performance prediction; Critical mode; Subcritical mode; Efficiency

1. Introduction

Ejector refrigeration systems (ERSs) driven by low-grade energy is an attractive solution to the reduction of electricity consumption in air-conditioning system [1]. The ejector is the key component of an ERS, and plays a significant role for the performance of ERS. Ejectors can be classified into two types: constant-area mixing ejectors, and constant-pressure mixing ejectors [2]. Generally, the performance of a constant-pressure mixing ejector is superior to that of a constant-area mixing ejector as claimed in [2] and [3]. For this reason, extensive studies focus on developing theoretical models of the constant-pressure mixing ejectors [3].

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