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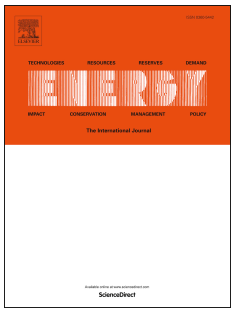

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Shape optimization of a long-tapered R134a ejector mixing chamber

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Abstract

The purpose of this investigation is to develop a computational methodology for the shape optimization of long-tapered mixing chambers of refrigerant ejectors based on the internal entropy generation. The workflow of the aforementioned methodology includes a one dimensional model to generate a baseline geometry. Then a design of experiments is performed around a parametrization of the baseline geometry and the resulting combinations are introduced in the CFD model. Based on the CFD entropy generation results, a surrogate model is trained and further used to determine the optimum geometry for the mixing chamber. The application of the surrogate model is not straightforward, but rather a loop style routine has been programmed in order to assure a global minimum rather than a local one.

The proposed methodology has been applied to a R134a ejector geometry previously studied by the authors both experimentally and numerically. It has been found that given a design critical point, the entrainment ratio may be increased up to a value of 16% with the shape optimization whereas the discharge pressure remains constant.

Keywords: CFD, ejector, mixing chamber, refrigeration, shape optimization

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