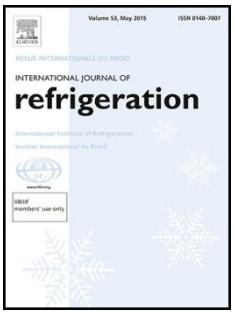
Accepted Manuscript



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PII: S0140-7007(17)30062-2
DOI: http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.02.010
Reference: JIJR 3554

To appear in: *International Journal of Refrigeration*

Received date: 6-8-2016
Revised date: 14-1-2017
Accepted date: 11-2-2017

Please cite this article as: Lei Wang, Jia Yan, Chen Wang, Xianbi Li, Numerical study on optimization of ejector primary nozzle geometries, *International Journal of Refrigeration* (2017), http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.02.010.

Numerical Study on Optimization of Ejector Primary Nozzle Geometries

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Highlights

- CFD simulation was conducted to seek optimum primary nozzle geometric parameters.
- Ejector performance is quite sensitive to the divergent portion's length and angle.
- RN can be recommended at 1 μm when processing ejector primary nozzle section.
- The findings of this work benefits for the design of ejector primary nozzle section.

Abstract: In an ejector refrigeration system (ERS), ejector acts as compressor but without using any moving parts. To some extent, ejector performances are subjected to primary nozzle's geometries with the action of shock waves. In this paper, CFD simulation was conducted to improve the ejector performance by varying following ejector primary nozzle's geometries and surface roughness: two angles of convergent and divergent portion, three lengths and surface roughness of throat, convergent and divergent portion. The CFD model was validated with the test results of an ERS experimental rig with working fluid of R134a. The optimum geometric parameters and surface roughness of the primary nozzle were obtained with the CFD analysis. The simulation results revealed that the throat and divergent portion of the primary nozzle should be paid more attention when designing ejector since the entrainment ratio of the ejector is rather sensitive to the length and surface roughness of these two portions.

Keywords: Numerical study; Ejector; Primary nozzle; Primary flow rate; Entrainment ratio; Surface roughness

Nomenclature

ρ	density, kg m^{-3}
u	velocity, m s^{-1}
E	total energy, J
P	pressure, Pa

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