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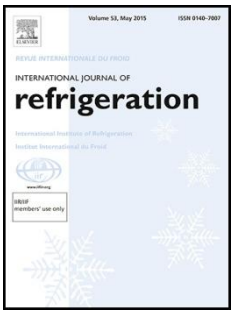


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# Thermodynamic comparison of ejector cooling cycles. Ejector characterisation by means of entrainment ratio and compression efficiency

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HIGHLIGHTS

- An ejector cooling cycle model has been implemented to study the performance of the cycles.
- Comparison between different typologies of ejector cooling cycles and refrigerants have been assessed.
- A good agreement between experimental data found in literature and the ejector model has been obtained.
- A new ejector efficiency has been proposed as a function of the area ratio and the entrainment ratio.
- The results show a methodology which makes easier the simulation of the working conditions of an ejector cooling cycle.
- Thanks to the model proposed, the best combination between the cycle configuration, the refrigerant and the working conditions have been found.

**Abstract**
Most of the energy consumed in cooling cycles comes from fossil fuels, whose reserves are becoming depleted.The aim of this article is to show the potential benefits of using ejectors in cooling systems to improve its energetic efficiency. A review of different configurations of ejector cooling systems has been carried out for being compared against a conventional compressor cycle. The same cooling capacity and working conditions were imposed by using refrigerants R134a, R1234yf and R600a. The results showed that the Coefficient of Performance could increase up to 26%. Ejectors have been characterised by correlations of entrainment ratio and a new definition of ejector compression efficiency. Those correlations have been obtained by means of a pseudo-one dimensional method of ejector analysis. Ejector cooling systems were proved to be a potential alternative to conventional vapour compression cycles.

*Keywords:* Ejector cooling systems, entrainment ratio, compression efficiency, COP

**Nomenclature**

| | |
|---|---|
| is $A$ | area, $m^2$ |
| $a$ | speed of sound, $m\,s^{-1}$ |
| $AR$ | area ratio between the constant area section |

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