

## Accepted Manuscript

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Christopher Reddick, Mikhail Sorin, Hristo Sapoundjiev, Zine Aidoun

PII: S0894-1777(17)30391-6  
DOI: <https://doi.org/10.1016/j.expthermflusci.2017.12.008>  
Reference: ETF 9298

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 1 September 2017  
Revised Date: 28 November 2017  
Accepted Date: 10 December 2017

Please cite this article as: C. Reddick, M. Sorin, H. Sapoundjiev, Z. Aidoun, Effect of a mixture of carbon dioxide and steam on ejector performance: An experimental parametric investigation, *Experimental Thermal and Fluid Science* (2017), doi: <https://doi.org/10.1016/j.expthermflusci.2017.12.008>

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# Effect of a mixture of carbon dioxide and steam on ejector performance: An experimental parametric investigation

Christopher Reddick<sup>a,\*</sup>, Mikhail Sorin<sup>a</sup>, Hristo Sapoundjiev<sup>b</sup>, Zine Aidoun<sup>b</sup>

<sup>a</sup> Department of Mechanical Engineering, Université de Sherbrooke, 2500 boul. de l'Université, Sherbrooke, Québec J1K 2R1, Canada

<sup>b</sup> CanmetENERGY – Varennes, Natural Resources Canada, 1615 Blvd. Lionel-Boulet, P.O. Box 4800, Varennes, Québec J3X 1S6, Canada

\* Corresponding author. Tel.: +1 819 821 8000; fax: +1 819 821 7163

E-mail address: [J.Christopher.Reddick@usherbrooke.ca](mailto:J.Christopher.Reddick@usherbrooke.ca)

## ABSTRACT

The results of an experimental investigation characterizing the performance of a steam ejector when the secondary fluid is a mixture of steam and a non-condensable gas are presented. In the context of post-combustion carbon capture, carbon dioxide was chosen as the non-condensable for this work. In order to study the pure steam ejector over a wide operating range, performance curves were prepared for primary pressures of 350, 450 and 550 kPa, with secondary pressures of 50, 70 and 90 kPa. Effects of the primary nozzle position, the primary pressure, the secondary pressure, and the nozzle diameter were evaluated. For a reference primary pressure of 450 kPa and secondary pressure of 70 kPa, performance curves were prepared for four levels of entrained CO<sub>2</sub> in the secondary fluid mixture, up to 45% by mass, and for four nozzle throat diameters ranging from 4.03 to 5.09 mm. It was observed for the first time that in contrast with the pure steam ejector performance curves, increasing amounts of entrained CO<sub>2</sub> improved the critical entrainment ratio, but the critical pressure remained unchanged. This behaviour was in sharp contrast with that of a pure steam ejector. A linear relationship was observed between the increase in the entrainment ratio of a steam ejector and the mass fraction of CO<sub>2</sub> contained in the ejector secondary fluid.

*Keywords:* CO<sub>2</sub> capture; Carbon dioxide; Steam; Non-condensable; Ejector; Performance

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