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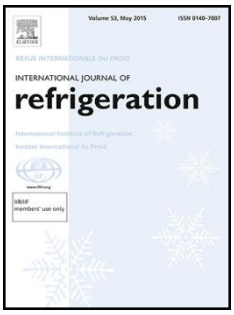

Title: Computational investigation of precessing vortex breakdown and energy separation in a ranque–hilsch vortex tube

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Computational Investigation of Precessing Vortex Breakdown and Energy Separation in a Ranque–Hilsch Vortex Tube

Comment [张博1]: The title has been modified to express the main content.

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ABSTRACT

The flow structure and energy separation considering the effect of cold mass fraction in a Ranque–Hilsch vortex tube were investigated computationally based on the vortex breakdown theory. The velocity distributions and pressure fields for nine different cold mass fractions were considered. A quasi-cylindrical approximation was adopted to predict the size of the vortex core size by considering the pressure gradient. Further, a novel analysis was conducted on the energy separation mechanism, in which the large-scale vortex structure plays an important role; for example, increasing the cold mass fraction within a certain range can result in bigger vortex cores, yielding better energy separation performance. Finally, the type of vortex breakdown was also discussed for further understanding the vortex structure. This paper offers a new idea on the manner in which the external conditions (here, cold mass fraction) affect the large-scale vortex structure and on the subsequent energy separation performance.

Comment [张博2]: Modified according to the Reviewer 1 and comment 1.

Keywords: Ranque–Hilsch vortex tube; vortex breakdown; flow structure; energy separation performance; cold mass fraction.