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Design of a Portable Dual Purpose Pulse Tube Cooler

Content :

This paper gives the design of a portable dual purpose Stirling Type Pulse Tube Cooler. A pulse tube cooler is ideal for compact portable applications as there are no moving parts in its cold stage and the absence of a displacer eliminates mechanical vibrations. Moreover, this design uses Helium as the working fluid, making it environment friendly. The salient feature of this cooler is that it can operate in two modes – (i) as a cryocooler working at 80K temperature and (ii) as a portable deep freezer working at 240K which may be plugged into a 12V DC source available in automobiles. A preliminary model was developed in SAGE and the effects of variation of design parameters on cooler performance at both operating modes were studied. A 2-dimensional CFD analysis on the model was done using ANSYS Fluent. The heat lift, COP at and temperature profile of the working fluid at cold head temperatures of 80K and 220K were obtained as a result of CFD analysis.

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