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Design and analysis of a portable Free piston Stirling deep freezer

Content :

The increased environmental hazards due to the use of CFCs in the conventional vapour compression technology has led to the need for an alternative refrigeration technology. In this view point the Stirling refrigeration using free piston is a promising alternative. The advantage with this is that it can even operate at the cryogenic temperatures. Hence this cooler can have dual purposes acting as a deep freezer at 193K and at the cryogenic temperatures. Since the design is concentrated on a cooler which can operate upto 193K a 10L deep freezer is designed. A free piston using Helium as working fluid is designed and studied using the Sage software. Based on the operating conditions the energy flow in the free piston is obtained and dimensions for the freezer is determined. The heat from the refrigeration space is absorbed using a CO₂ capsule which acts as a thermosyphon. These CO₂ capsules are kept in contact with the cold side of the free piston. The freezer is modelled using solidworks and it is fabricated. The deep freezer is then tested for its efficiency, cooling capacity.

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