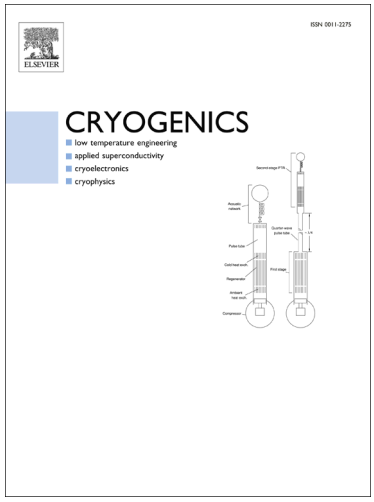

Research paper

Operating Characteristics of a Single-stage Stirling Cryocooler Capable of Providing 700 W Cooling Power at 77 K

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Operating Characteristics of a Single-stage Stirling Cryocooler Capable of Providing 700 W Cooling Power at 77 K

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Abstract: High cooling capacity Stirling cryocooler generally has hundreds to thousands watts of cooling power at liquid nitrogen temperature. It is promising in boil-off gas (BOG) recondensation and high temperature superconducting (HTS) applications. A high cooling capacity Stirling cryocooler driven by a crank-rod mechanism was developed and studied systematically. The pressure and frequency characteristics of the cryocooler, the heat rejection from the ambient heat exchanger, and the cooling performance are studied under different charging pressure. Energy conversion and distribution in the cryocooler are analyzed theoretically. With an electric input power of 10.9 kW and a rotating speed of 1450 r/min of the motor, a cooling power of 700 W at 77 K and a relative Carnot efficiency of 18.2 % of the cryocooler have been achieved in the present study, and the corresponding pressure ratio in the compression space reaches 2.46.

Keywords: Stirling; cryocooler; regenerator; cooling power

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