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C1Po1C-02 [04]: Wide temperature range test of high capacity Stirling cryocooler

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This paper describes the cooling performance test of a free piston Stirling cryocooler accompanied by a double acting linear compressor. Although, the aforementioned Stirling cryocooler had originally been subjected to 77 K applications, i.e. liquid nitrogen (LN₂), in this research, we have tried to figure out the cooling performance of the Stirling cryocooler operating above-110 K temperature range. The relevant targets are as the follows, i.e. high temperature superconducting (HTS), liquid natural gas (LNG) re-liquefaction and industrial ultra-low freezer applications. During the experiments, the instantaneous pressures, displacement of the piston and the displacer, current and voltage have been acquired as the cold-end temperature varied from 110 K to 190 K. The Stirling cryocooler has recorded the Carnot COP to be 25%, 27%, 28% and 29% at the cold-end temperatures of 110 K, 120 K, 150 K and 190 K, respectively. In this research paper, all the physical variables will extensively be analyzed by a 'dynamic model' and the relevant operational issues will also be discussed.

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