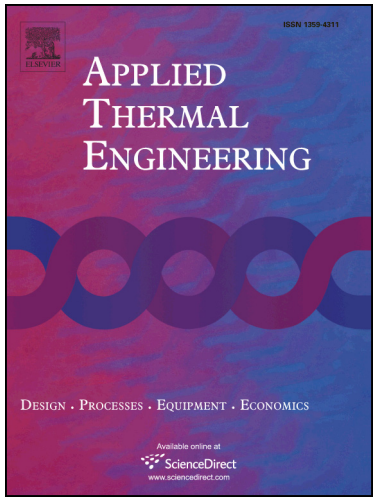

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Abstract

This work presents a compact vapor compression cooling system equipped with a small-scale oil-free R-134a compressor and a jet-impingement-based heat sink that integrates the evaporator and the expansion device into a single unit. At the present stage of the development, a single orifice was used to generate the high-speed two-phase impinging jet on the heated surface. The effects of the compressor piston stroke, applied thermal load and orifice diameter on the system performance were quantified. The thermodynamic performance of the system was evaluated in terms of the temperature of the heated surface, impinging jet heat transfer coefficient, several system thermal resistances, coefficient of performance, second-law efficiency and second-law ratio. The coefficient of performance of the new refrigeration system increased with the cooling capacity, justifying its application in the removal of large thermal loads. The maximum system cooling capacity with a single jet was approximately 160 W, which was achieved with an orifice diameter of 500 μm and operation at a full compressor piston stroke. This condition

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