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Integrated supermarket refrigeration for very high ambient temperature

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ACCEPTED MANUSCRIPT

1	Integrated supermarket refrigeration for very high ambient temperature
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11	Abstract
12	This paper analytically investigates and compares the performance of a proposed 'all-natural'
13	NH ₃ /CO ₂ cascaded booster system to a conventional R404A direct expansion system as well
14	as to an 'all-CO ₂ ' system with multi-ejector unit and flooded evaporator. Performance
15	comparison is made based on the annual combined COP and Life Cycle Climate Performance
16	(LCCP) for operation in selected cities of Middle East and India. Our results show that in
17	extreme warm climate, the energy efficiency of the proposed configuration exceeds that of all-
18	CO ₂ configuration by a maximum of about 12.23% and the total emissions are lower by up to
19	11.20%. However, the all-CO ₂ multi ejector system performs better in cold and mild warm
20	climate. In the NH ₃ /CO ₂ cascade, the high temperature NH ₃ system can be designed to be
21	isolated from the accessible locations of the supermarket. The work presented is expected to
22	help adoption of natural refrigerants such as CO ₂ and NH ₃ for commercial application in
23	extreme warm climate conditions prevailing in many cities of Middle East and India.
24	Keywords CO ₂ ; NH ₃ /CO ₂ cascade; Supermarket; Integrated; Natural; Warm climate
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