

## PERFORMANCE ASSESSMENT OF A DESICCANT COOLING SYSTEM IN A CHP APPLICATION INCORPORATING AN IC ENGINE

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### ABSTRACT

Performance of a desiccant cooling system was evaluated in the context of combined heat and power (CHP). The baseline system incorporated a desiccant dehumidifier, a heat exchanger, an indirect evaporative cooler, and a direct evaporative cooler. The desiccant unit was regenerated through heat recovery from a gas-fired reciprocating internal combustion engine. The system offered sufficient sensible and latent cooling capacities for a wide range of climatic conditions, while allowing influx of outside air in excess of what is typically required for commercial buildings. Energy and water efficiencies of the desiccant cooling system were also evaluated and compared with those of a conventional system. The results of parametric assessments revealed the importance of using a heat exchanger for concurrent desiccant post cooling and regeneration air preheating. These functions resulted in enhancement of both the cooling performance and the thermal efficiency, which are essential for fuel utilization improvement. Two approaches for mixing of the return air and outside air were examined, and their impact on the system cooling performance and thermal efficiency was demonstrated. The scope of the parametric analyses also encompassed the impact of improving the indirect evaporative cooling effectiveness on the overall cooling system performance.