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**EXPERIMENTAL INVESTIGATION OF A SCROLL EXPANDER IN A  
CARBON DIOXIDE AIR-CONDITIONING SYSTEM**

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**ABSTRACT**

Carbon dioxide (CO<sub>2</sub>) is a potential substitute for HCFC refrigerants with favorable environmental properties compared to other HCFC alternatives. One of the major challenges with CO<sub>2</sub> in air-conditioning applications is the low energy efficiency of the system at higher temperatures of the heat sink. The energy efficiency of a transcritical carbon dioxide (CO<sub>2</sub>) air-conditioning system can be improved significantly when the throttling valve is replaced by a work-producing expansion device (expander). An automotive R134a scroll compressor has been modified for use as an expander in a 10 kW CO<sub>2</sub> air-conditioning system. The isentropic efficiency of the expander was in the range of (to be reported) %. The coefficient of performance increased by (to be reported) % and the system capacity increased (to be reported) % compared to the identical system with isenthalpic throttling valve.