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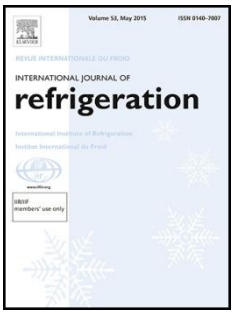

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Model-Based Optimizations of Packaged Rooftop Air Conditioners using Low Global Warming Potential Refrigerants

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Keywords: global warming potential; rooftop air conditioner; modelling; optimization; alternative refrigerants

Highlights

- Extensive drop-in tests of lower GWP refrigerants.
- Model-based optimizations for lower GWP refrigerants.
- Assess compressor and heat exchanger performances of lower GWP refrigerants.

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ABSTRACT

Based on laboratory investigations for R-22 and R-410A alternative low GWP refrigerants in two baseline rooftop air conditioners (RTU), the DOE/ORNL Heat Pump Design Model was used to model the two RTUs and the models were calibrated against the experimental data. We compared the compressor efficiencies and heat exchanger performances. An efficiency-based compressor mapping method was developed. Extensive model-based optimizations were conducted to provide a fair comparison between all the low GWP candidates by selecting optimal configurations. The results illustrate that all the R-22 low GWP refrigerants will lead to slightly lower COPs. ARM-20B appears to be the best R-22 replacement at normal conditions. At higher ambient temperatures, ARM-20A exhibits better performance. All R-410A low GWP candidates will result in similar or better efficiencies than R-410A. R-32 has the best COP while

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