

Impact of Refrigerants Transition on HVAC System Performance and Environmental Sustainability

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Abstract: *This study investigates the impact of refrigerant transitions on Heating, Ventilation, and Air Conditioning (HVAC) system performance and environmental sustainability. Through simulation-based analysis, the research evaluates the performance of three refrigerants: HFC-134a, R-410A, and HFO-1234yf. The study assesses cooling efficiency, energy consumption, and global warming potential (GWP) as key performance metrics. Results reveal that transitioning to low-GWP alternatives, particularly HFO-1234yf, enhances cooling efficiency and reduces energy consumption by 12% and 24% compared to R-410A and HFC-134a, respectively. HFO-1234yf also demonstrates a notable 98% reduction in GWP compared to HFC-134a. The discussion highlights the potential of low-GWP refrigerants to balance system performance gains with environmental concerns. Consideration of system design, operating conditions, and trade-offs further underscores the significance of responsible refrigerant choices in achieving sustainable HVAC practices. This research contributes to the ongoing discourse on sustainable technologies, offering practical insights for HVAC practitioners, designers, and policymakers striving to align efficiency with environmental responsibility in HVAC systems*

Keywords: Refrigerants Transition, HVAC System Performance, Environmental Sustainability

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