Heat and Non-Heat Recovery Ventilation Performance in Energy-Efficient HUD-Code Manufactured Housing

DHW   PV   Sun Tempering

Ventilation Systems

Icynene Foam

Energy Gauge Simulation Energy Use Results

Case	Home	Type	Efficiency	Watts	Heat kWh/yr	Cool kWh/yr	Heat+ Cool
1	ZEMH	HEPA	56%	164	7124	286	7410
2	ZEMH	DUO	87%	70	5759	236	5995
3	ZEMH	NHRV	0%	20	7730	256	7986
4	ZEMH	None	0%	0	5045	204	5249
5	ESTAR	HEPA	56%	164	8523	455	8978
6	ESTAR	DUO	87%	70	7034	394	7428
7	ESTAR	NHRV	0%	20	9310	424	9734
8	ESTAR	None	0%	0	6268	358	6626

Run Time of the ZEMH and ESTAR Homes vs. Outside Temperature
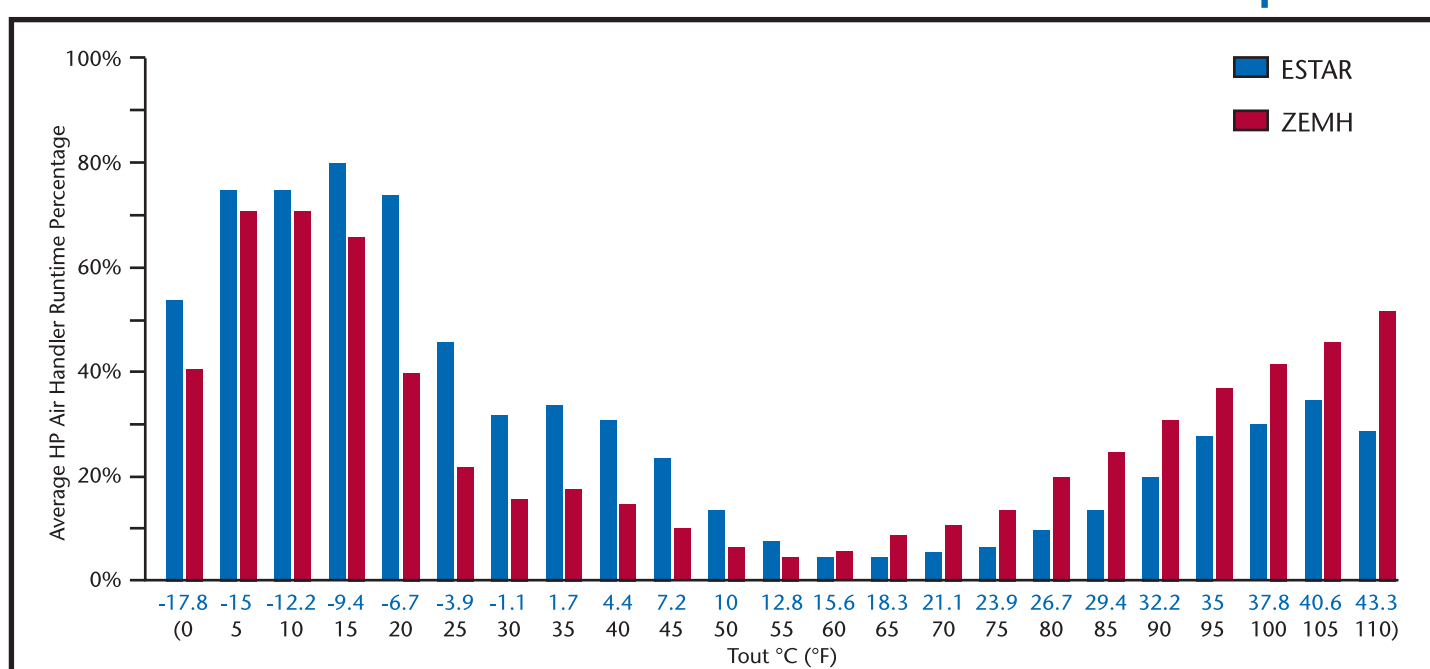
Duct and Envelope Leakage and Ventilation System Flow Rates

TEST	ZEMH	ESTAR
Envelope Leakage	2.0 ACH @ 50Pa	3.6 ACH @ 50Pa
Total Duct Leakage	145 CFM @ 25Pa (68 L/s @ 25PA) 15% of HVAC flow	211 CFM @ 25Pa (100 L/s @ 25PA) 20% of HVAC flow
Duct Leakage to Outside	37 CFM @ 25Pa (17 L/s @ 25PA) 4% of HVAC flow	150 CFM @ 25Pa (71 L/s @ 25PA) 15% of HVAC flow
Whole House Ventilation	70 CFM (33L/s)	78 CFM (37L/s)

Introduction

This paper presents the field testing and monitoring results of heat recovery and non-heat recovery ventilation system energy performance in energy efficient manufactured homes. Energy Gauge USA computer simulation software is used to compare energy performance from field testing.

Conclusions

- HRV systems improve energy efficiency in especially in manufactured homes with tighter duct and envelope systems.

- Low fan energy is critical for ventilation systems energy performance.

- HRV systems with HEPA filtration require additional fan energy, but provide non-energy related IAQ filtration benefits. Cost analysis is not an "apples-to-apples" comparison.

- Continuous operating ventilation provides effective IAQ filtration benefits with associated energy costs.

- Controls that reduce over-ventilation are needed especially in homes with leakier ductwork and envelopes.

- Innovative controls and duct components that integrate heating/cooling ductwork with the HRV may improve spatial and temporal ventilation effectiveness.

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