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SKY GREEN ENERGY
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Test Report For:
SKY GREEN ENERGY
ALLTEMP R-404A Replacement
PERFORMANCE TEST
REFRIGERANT INFUSED WITH ADDITIVE


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Objective

The objective of this evaluation is to compare the saturation pressure vs temperature curves of Alltemp R-404A Replacement with that of standard R-404A.

Accuracy Needed Pressure: +/- 1psig
Temperature: +/- 1°C
Mass: +/- 0.005g

Parameters

The following parameters are controlled

Value	Description	Units	Method	MU @95% K=2
Temperature	Temperature of the Liquid Refrigerant	Deg C	Temperature Controller	0.31°F
Air Content	Air Content of Compressed Gas	% Volume	Analysis per AHRI 700	0.07% Volume

The following parameters are monitored

Value	Description	Units	Method	MU @95% K=2
Temperature	Temperature of the Liquid Refrigerant	Deg C	Temperature Data Logger	0.31°F
Pressure	Vapor Pressure of Refrigerant	Psig	Digital Pressure Gauge	0.06psig
Time	Time to achieve thermal equilibrium	S	Stopwatch	3.5spd
Air Content	Gas Chromatograph	%	AHRI 700 Appendix C	0.07% volume

Sample Acquisition

Sample #	Description	Serial #	Purchase Location	Date	Condition
COL1506101431-004	Alltemp R-404 Replacement	N/A	Provided by Sky Green energy	7/09/15	New

Hypothesis I

Alltemp M will show a > 10% reduction in saturation pressure vs temperature curve in the range of 25°C (77°F) to 75°C (167°F) compared to standard R-404A.

Equipment list

#	Equipment Description	Manufacturer's Name / Model # / Serial #	Intertek Asset #	Calibration Date	Calibration Due	Range Used
1	Balance	Ohaus/GT4100/2068	CE1030	8/20/14	8/20/15	0-1000g
2	Analytical Balance	Ohaus/AP210S/N79924	CE1017	8/20/14	8/20/15	0-210g
3	Stopwatch	Extech/42270/NA	CE1183	11/13/14	11/13/15	0-120s
4	Digital Thermometer	Omega/HH21A/T-285230	CE1184	11/13/15	11/13/16	25°C to 100°C
5	Pressure Gauge	Omega/DPG5600B-3KG	E509	2/3/15	2/3/16	75psig to 600psig
6	Pressure Vessel	Autoclave	CE2224	For Reference Only	N/A	N/A
7	Gas Chromatograph	Varian	CE1095	Verify Before Use	Verify Before Use	0.1% to 5% Volume
8	Temperature Controller	Digi-Sense/Controller R/S	CE2212	Verify Before Use	N/A	N/A

PROCEDURE:

Pressure vs Temperature Evaluation

A pressure vessel was evacuated to a pressure of < 100 microns and charged to 80% of capacity at 95°C as calculated by NIST Refprop with Alltemp R-404A Replacement. The system was allowed to stabilize at 25°C for a minimum of 2 hours. Following the equilibrium period, the pressure was measured and recorded to the nearest 1psig. Next the temperature of the system was increased by 10°C and once again following a minimum of a 2 hour equilibrium period the pressure was measured and recorded to the nearest 1 psig. This process was repeated for increasing 10°C intervals to a maximum of 75°C (20°C below the expected saturation temperature). Each time the pressure was measured and recorded to 1psig following a minimum of a 2 hour equilibrium period,.

Testing was conducted at:
INTERTEK
 1717 Arlingate Lane
 Columbus Ohio 43228

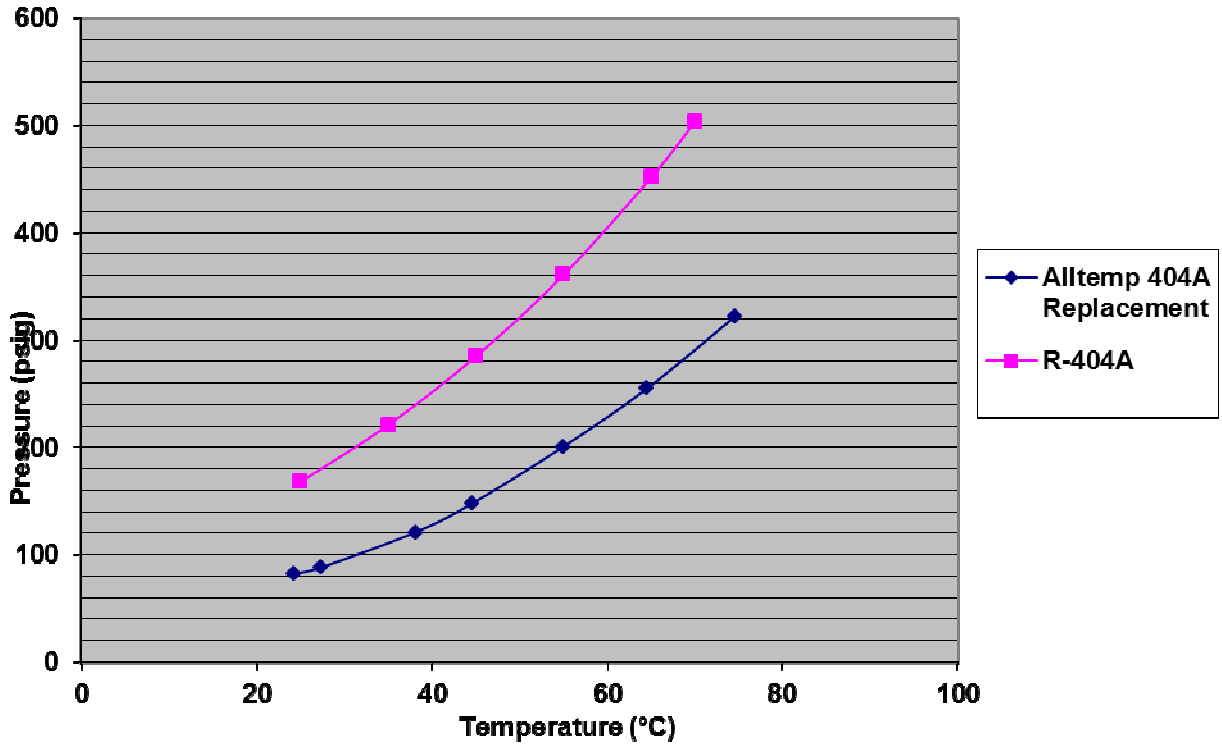
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Sample ID	Refrigerant Description	Temperature (°C)	Pressure (psig)	Control	Temperature (°C)	Pressure (psig)
COL1506101431-004	Alltemp R-404A Replacement	24.2	82	R-404A	25.0	168
COL1506101431-004	Alltemp R-404A Replacement	27.3	88	R-404A	35.0	221
COL1506101431-004	Alltemp R-404A Replacement	38.1	121	R-404A	45.0	285
COL1506101431-004	Alltemp R-404A Replacement	44.6	148	R-404A	55.0	361
COL1506101431-004	Alltemp R-404A Replacement	55.0	201	R-404A	65.0	452
COL1506101431-004	Alltemp R-404A Replacement	64.5	255	R-404A	70.0	504
COL1506101431-004	Alltemp R-404A Replacement	74.5	322	R-404A	85	Above the Critical Temp

- Air content of Alltemp R-404A Replacement compressed gas was purged to a NCG value < 1.5% volume as tested per AHRI 700
- Pressures for R-404A control were determined experimentally

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Pressure vs Temperature



Conclusion

Based on the data collected the Hypothesis I is **ACCEPTED**: Alltemp R-404A did demonstrate >10% reduction in saturation temperature vs pressure curve over the range of 25°C (77°F) to 75°C (167°F) compared to standard R-22.