Compressor Calorimeter Tests of Low GWP Refrigerants

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Tests performed in our lab:

- Testing Plan
  - Performance Results
  - Conclusion on Performance
PERFORMANCE ON RECIPROCATING COMPRESSORS (HBP)

a) Calorimetric tests on AE3425YAA1A (HBP) – R134a Vs. R1234yf

- Cooling capacity slightly better with R134a refrigerant for HBP application
- COP is better with R134a refrigerant
- Lower discharge temperature with R1234yf: gives better heat exchange that implies better motor performance.
Calorimetric tests on AE3425YAA1A (HBP) – R134a Vs. N-13a

→ N-13a is 5% lower in capacity and COP compared with R134a

→ Temperature of the compressor in general are similar to R134a.

→ Potential drop in on some applications.
PERFORMANCE ON RECIPROCATING COMPRESSORS (HBP)

a) Calorimetric tests on AE3425YAA1A (HBP) – R134a Vs. AC5X

- Cooling capacity slightly better with R134a refrigerant for HBP application
- COP is better with R134a refrigerant
- Discharge temperature similar to R134a.
Calorimetric tests on AE3425YAA1A (HBP) – R134a Vs. R1234ze

→ R1234ze is not a drop-in for refrigeration systems with R134a @ HBP application

→ Lower Discharge Temperature with R1234ze: gives better heat exchange that implies better motor performance. However, compressor can be designed to achieve better COP.

→ Potential application using on compressors that were designed for R-600a.
Calorimetric tests on AE4470Z-AA3C (HBP) – R404A Vs. N-40a

- N-40a has 6-8% lower capacity and 2-4% lower COP compared to R404A @ HBP application.

- N-40a has a Discharge Temperature 10-15° F higher than R404A.
PERFORMANCE ON RECIPROCATING COMPRESSORS (HP)

Calorimetric tests on AE4470Z-AA3C (HBP) – R404A Vs. D2Y-65

→ D2Y-65 has 2-4% lower Capacity and 8% lower COP compared to R404A @ HBP application

→ D2Y-65 has Discharge Temperature 18-25° F higher than R404A
• The R1234yf, AC5X and N-13a presented lower performance (capacity and COP) compared with R-134a applied on HBP. The discharge temperatures are the same or lower (R1234yf) to R134a (no concerns regarding reliability).

• The R1234ze is not an R134a Drop-in
  → 25% lower capacity than R134a
  → Potential use on compressors that were developed for R600a.

• The D2Y-65 and N-40a presented lower performance compared to R404A and discharge temperatures are higher than R404A. Need further evaluation of motor and mechanical parts reliability.
THANK YOU FOR YOUR ATTENTION

ANY QUESTIONS ?