

## NU-22B® (R-422B) SYSTEM CONVERSION PERFORMANCE ANALYSIS - 2013

|                        |  |
|------------------------|--|
| <b>Study Location:</b> | Indianapolis, IN                       |
| <b>Equipment:</b>      | *Carrier 4ton RTU                      |
| <b>Model#:</b>         | 48TFE005                               |
| <b>Metering:</b>       | Refrigerant Expansion Device *Acutrol™ |
| <b>Compressor:</b>     | *Bristol Compressor w/Mineral Oil      |

|                                    | Pre-Conversion Data             | Post-Conversion Data            |
|------------------------------------|---------------------------------|---------------------------------|
| <b>Ambient Temp:</b>               | 77°F                            | 77°F                            |
| <b>Discharge:</b>                  | 225 psig                        | 215 psig                        |
| <b>Suction:</b>                    | 70 psig                         | 62 psig                         |
| <b>Suction Line Temp:</b>          | 59°F                            | 60°F                            |
| <b>Target Superheat:</b>           | 18°F                            | 18°F                            |
| <b>Compressor Superheat:</b>       | 18°F                            | 18°F                            |
| <b>Compressor Disch Line Temp:</b> | 125°F                           | 118°F                           |
| <b>Compressor AMPs:</b>            | L1-12.9 / L2 - 11.3 / L3 - 12.3 | L1-11.3 / L2 - 10.5 / L3 - 11.8 |
| <b>R-22 Name Plate Charge:</b>     | 6 lbs 4 oz                      | 6 lbs 4 oz                      |
| <b>ID Return Temp:</b>             | 77°F                            | 77°F                            |
| <b>ID Supply Temp:</b>             | 54°F                            | 53°F                            |
| <b>Delta T:</b>                    | 23°F                            | 24°F                            |

### SUMMARY

No system components were replaced or modified for this conversion. The original compressor charge of mineral oil was tested for quality and it was determined that no oil change was required.

Pre conversion data was taken after the system was charged with 6 lbs 4 oz of R-22. The reason for this was to make sure it had not lost any of the charge over time and to establish a target superheat. The data showed that 18° was the target superheat. The system charge of NU-22B was optimized and was 100% of the pre conversion, optimized charge, of R-22, and the superheat target of 18° was achieved.

Post conversion Compressor AMPs were reduced by 8%. Discharge Temps were reduced by 6%. Suction and Discharge Pressures were slightly reduced and the COP was improved by 2%. The Mass Flow rate was well within the range of the metering device, and the Cooling Capacities were within the application range. While the pre and post Inlet Temps were the same, the post conversion Outlet Temp was 1° colder.

The post conversion, NU-22B charged system used for this performance analysis, would provide the required performance, without compromising efficiency or mechanical integrity. A complete chart of the pre and post system conversion data is printed on the reverse side.

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|                   |   |   |
|-------------------|---|---|
| Trademark - Owner | - |   |
| Carrier           | - | United Technologies Corp                |
| Bristol           | - | Bristol Compressors International, Inc. |
| Acutrol           | - | United Technologies Corp                |

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| INPUT TO SIMULATION                |                     |       |       |
|------------------------------------|---------------------|-------|-------|
| Evaporating Pressure               | psig                | 70.0  | 62.0  |
| Evaporator Outlet Superheat        | °F                  | 18.0  | 18.0  |
| Compressor Volumetric Capacity     | ft <sup>3</sup> /hr | 598.6 | 598.6 |
| Condensing Temperature             | °F                  | 110.0 | 105.0 |
| Condenser Outlet Subcooling        | °F                  | 22.0  | 26.0  |
| Expansion Device Inlet Temperature | °F                  | 88.0  | 79.0  |

| PERFORMANCE PARAMETERS               |         |        |        |      |
|--------------------------------------|---------|--------|--------|------|
| Refrigerant                          |         | R22    | R422B  |      |
| GWP                                  |         | 1810.0 | 2526.0 |      |
| Mass Flow Rate                       | %       | 100    | 114    |      |
| Volumetric Cooling Capacity          | %       | 100    | 91     |      |
| Power                                | kW      | 4.1    | 3.7    | -10% |
| Cooling Coefficient Of Performance   |         | 4.5    | 4.6    | +2%  |
| Energy Efficiency Ratio              | Btu/W.h | 15.4   | 15.6   | +1%  |
| Subcooling At Expansion Device Inlet | °F      | 22.0   | 26.6   |      |
| Superheat At Evaporator Outlet       | °F      | 18.0   | 18.0   |      |
| Superheat At Compressor Inlet        | °F      | 18.0   | 18.0   |      |
| Condensation Temperature             | °F      | 110.0  | 108.1  |      |
| Evaporation Temperature              | °F      | 41.0   | 38.9   |      |