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**Sealed Tube Comparisons
of the Compatibility of Desiccants
with Refrigerants and Lubricants**

Final Report

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I. Abstract

Continuing environmental concerns mandate replacement of CFC's with alternate refrigeration fluids. Until now, relatively little testing had been reported in the literature for compatibility of desiccants in these new working fluids. Using bench scale test methods generally accepted throughout the industry today, this work provides data necessary to assess the compatibility of virtually all of the currently used desiccant types - both bead and molded core, with thirteen refrigerant/lubricant combinations. The desiccants have been tested by exposure to refrigerant and lubricant in sealed, glass tubes in accordance with ASHRAE/ANSI Standard 97-1989. After aging, the liquid phase was evaluated for acid anion formation, change in color, and presence of halide ions, the gas phase was analyzed for refrigerant decomposition by gas chromatography, and the desiccants were evaluated for changes in crush strength and for retention of acids and halide ions. Metal catalysts, also present in the sealed tubes, were visually examined for corrosion, copper plating, and appearance changes.

II. Scope

This project determines the compatibility of sixteen desiccants in thirteen refrigerant/lubricant combinations using bench-scale sealed tube tests. There are eight desiccant categories, as shown in Table II.1. In each category samples have been obtained from two suppliers to yield a total of sixteen desiccants. There are ten refrigerants and four lubricants combined to give the thirteen combinations shown in Table II.2. The tests are conducted with two levels of moisture - less than fifty parts per million moisture and at one thousand parts per million moisture.

Table II.1. Desiccants Under Study

1. 4A Molecular Sieve	7. Core Type without Carbon
2. 3A Molecular Sieve	15 to 30% molecular sieve type 3A
3. Alumina	Alumina
4. Silica Gel	10 to 20% phosphate binder
5. Core type with Carbon	8. Core Type without Carbon
10 to 25% molecular sieve type 3A	15 to 30% molecular sieve type 4A
Alumina	Alumina
5 to 15% carbon	10 to 20% phosphate binder
10 to 20% phosphate binder	
6. Core type with Carbon	
10 to 25% molecular sieve type 4A	
Alumina	
5 to 15% carbon	
10 to 20% phosphate binder	

Table II.2. Refrigerant/Lubricant Combinations Under Study

1. R-11 with naphthenic mineral oil
2. R-12 with naphthenic mineral oil
3. R-22 with naphthenic mineral oil
4. R-123 with naphthenic mineral oil
5. R-134a with penta erythritol mixed acid polyolester lubricant
6. R-134a with penta erythritol branched acid polyolester lubricant
7. R-152a with alkylbenzene lubricant
8. R-32 with penta erythritol mixed acid polyolester lubricant
9. R-32 with penta erythritol branched acid polyolester lubricant
10. R-124 with alkylbenzene lubricant
11. R-125 with penta erythritol mixed acid polyolester lubricant
12. R-125 with penta erythritol branched acid polyolester lubricant
13. R-143a with penta erythritol branched acid polyolester lubricant

III. Methodology

A. Sample Preparation

The test tubes were cleaned by rinsing first with deionized water, followed by two rinses with methanol and one rinse with toluene. The tubes were then dried at 175°C. Cleaned tubes were kept dry in desiccators prior to use.

Lubricants were tested for moisture and dried by evacuation to below 50ppm prior to use. Refrigerants were tested for moisture content prior to use. Those high in moisture were rejected and replaced. No attempts were made to dry the refrigerants on-site.

The metal catalyst coupons were prepared by punching 3.3x19.3mm coupons from thin sheet. The coupons were held together by aluminum wire such that the steel and copper were separated by the aluminum. These prepared coupons were thoroughly cleaned and kept dry prior use.

The desiccant samples were activated at 260°C (500°F) for four hours prior to sealing in the tubes. Desiccant samples in bead form were weighed to within one bead of 0.5 gram. Core type desiccants were cut into small pellets prior to drying. Three, or more, pellets were chosen and weighed to yield the specified 0.5 gram.

B. Tube Preparation and Aging

First, the desiccant and metal catalysts coupon were placed in the tube. A small wad of glass wool was inserted on top of the desiccant to keep the lubricant and desiccant from violently boiling from the tube when later opened for analysis. The tube was then necked down to a size through which a standard cannula could fit. Next the 1.0 cc of lubricant was added accurately using a syringe and cannula. The tube was then evacuated to 30 microns followed by accurate charging with refrigerant, and moisture if required, using a calibrated gas handling system. Finally, the

tube neck was sealed and annealed. This procedure minimizes oil contamination of the seal area, and most importantly, produces a minimally stressed glass seal which can better withstand the high pressure encountered at the aging temperature. Three tubes were made for each moisture condition, desiccant, and refrigerant/lubricant combination.

The sealed tubes were placed in drilled holes in large aluminum blocks which were heated in air circulating ovens for 28 days. The aluminum blocks served two purposes. The first was safety. Had any tube broken at elevated temperature, the aluminum block would contain the pieces. Secondly, the large mass of the blocks provided stable temperature environments for the tubes during the aging period. Tubes containing R-11 and R-123 were aged at 105°C. Tubes containing any of the other refrigerants were aged at 149°C. Initial tests with R-11 and R-123 at 149°C resulted in nearly complete decomposition of the refrigerants producing extremely high pressures and black tar from what had been clear mineral oil.

C. Analysis

1. Visual Inspection

Visual inspections were made on each tube after fourteen days and after 28 days of aging. The lubricant in each tube was compared to standard liquid color references, which give a numerical value for the amount of color change from water white to jet black. Similarly, changes in presence of solid particulates, and formation of copper plating was noted and scaled numerically. Also noted and recorded was the appearance of the metal catalysts and the desiccant. For permanent record, the tubes were video taped after aging.

2. Refrigerant Decomposition

GC analyses were performed on a Gow-Mac Series 550P Thermal Conductivity Detector instrument using a Poropak "Q" column of 2.44 m (8') length. Gas samples were injected through a six-way Valco gas sample valve. Aged sealed tubes to be analyzed were connected to the gas handling manifold with a "tube breaker" assembly. After freezing of the tube contents in liquid nitrogen, the tube tips (scratched with a sharp file) were broken off. The tubes were then warmed slowly and all volatile tube contents were expanded into the manifold, which has a free volume of 1058 ml (64.4 in³). A sample of gas from this volume was injected through the sample valve into the GC column. The vapor pressure of the gas sample normally was in the 100 to 200 millitorr range, depending on the vapor pressure of the test refrigerant.

The column was operated under the following conditions:

Column and injector temperatures: 120°C

Detector temperature: 200°C

Detector current: 150 mA

Carrier gas: Helium

Gas flow rate: 27 ml/min.

Sample size: 500 microliter

GC results, i.e. peak retention times, peak areas, and peak heights for each measurable peak in a chromatogram, were obtained on an AI 450 Digital integrator from Dionex. GC elution peaks

of known identities have been reported by their chemical designations, while those unknown to us have been referred to by their peak retention times. Percent decomposition was calculated by peak area ratios. This method assumes the detector has equivalent sensitivity to all the species of interest. Additional peaks appeared in some chromatograms from decomposition of the lubricant - species such as CO and CO₂. These species were not considered as refrigerant decomposition products and not included in calculations of percent refrigerant decomposition. It is evident that many of the refrigerant decomposition products have retention times very close to those for non-condensable gases and for CO₂. In these cases the estimate of refrigerant decomposition was grossly underestimated. However, relative refrigerant decomposition can be obtained from halide concentrations in the lubricant and desiccant.

3. Lubricant Total Acid Number

The total acid number was determined for the lubricant in one tube from each group of three. The procedure used follows that for ASTM 664. The method was modified to accommodate the small 1cc sample size from the sealed tubes by reducing the alcoholic KOH titrant concentration from 0.1 Normal to 0.01 Normal. This yielded sufficient sensitivity to determine acid numbers down to 0.1 with the 1cc sample size.

4. Halide Ions and Acid Anions

Anion concentrations were determined for the tube liquid phase and desiccant by ion chromatography (IC). After aging, the liquid and vapor phase of one tube was separated from the desiccant. The desiccant was washed with hexane. This hexane wash was added to the liquid phase from the tube, which was then extracted in 30cc of deionized water for 24 hours. The washed desiccant was extracted in another 30cc of deionized water. The aqueous phases from these two extractions were then analyzed by IC for fluoride ion, chloride ion, organic anions (such as formate, acetate, butyrate) and inorganic anions (such as nitrate, sulfate). Concentrations of the various anions were obtained by calibrating the ion chromatograph with standard solutions so that the peak area was proportional to the anion concentration.

In the development of this method, acidic and basic aqueous solutions were studied as extractants. Both caused degradation of some unaged lubricants producing the very same acid anions that are produced by aging. Also, methanol was tried as an extractant, but this produced severe interference in the IC chromatogram. Methanol elutes from the IC column in a very broad peak covering most of the time period that the anions of interest elute.

The only reason for considering alternate extractants was for cases where water would not effectively extract the anions of interest. To determine if water was an effective extractant. A sample of lubricant was doped with hexanoic acid. The doped lubricant was extracted with deionized water and the aqueous phase from the extraction was analyzed for hexanoate anion. The method yielded a concentration representing 85% of the total hexanoic acid that was originally added to the lubricant. Of the anions of interest in this study, hexanoic acid is one of the least water-soluble and least sensitive anions to the IC detector. Based on these results, deionized water was considered to be satisfactory for extraction of these samples.

5. Desiccant Crush Strength

Desiccant crush strength was determined on freshly activated material and then on material that had been aged. The change in crush strength was of most importance. For bead type materials, the crush strength was determined for at least ten individual beads, with the average and ~95% confidence (2 σ) limits reported. For core type desiccants fewer pieces were used in each tube. Consequently, the statistical data is not as good as that for the bead desiccants. The method utilized a digital force gauge which displayed peak force achieved while the specimen was slowly pressed between two parallel plates. It is recognized that this technique is limited. It does not distinguish between two close contenders for instance. It does, however, point out gross losses in structural integrity of the desiccant, which could possibly render it a system contaminant.

D. Distribution of Tests Between Sealed Tubes

Table III.1 below shows which of the analyses was conducted on each of the three tubes in a group. The reasoning behind this distribution resulted from the nature of the tests and the condition of the specimens after the tests. For example, the test for Total Acid Number, shown for tube #3 in the table below, completely consumed the tube contents. Thus, no other analyses could be performed with the contents of this tube.

Table III.1. Distribution of Tests Between Sealed Tubes.

Test	Tube #1	Tube #2	Tube #3
Visual Inspection	✓	✓	✓
Desiccant Crush Strength	✓		
GC Refrigerant Decomposition	✓		
Lubricant Total Acid Number			✓
Liquid Phase Halide Ion/Acid Anion		✓	
Desiccant Halide Ion/Acid Anion		✓	

IV. Data For As-Received Materials

A. Desiccants

As mentioned above, there were 8 categories of desiccants studied in this work. In each category one sample from two suppliers was obtained. Table IV.1 lists the desiccants obtained along with the manufacturer's published contents, and the desiccant code letter that is used throughout this report to identify the various desiccants.

After completion of some of the preliminary tests to develop methods for this work, it was discovered that many of the desiccants contained appreciable levels of fluoride and chloride ion. Consequently, each desiccant was tested for anion concentration in the "as-received" state. Table IV.1 includes the anion concentrations found for each desiccant. This information is repeated in the "Summary Test Results" tables in Section V below.

Table IV.1 Desiccant Specifications

Code	Desiccant Type	Published Contents		Anions Found		Crush Strength
A	4A Molecular Sieve	4Å zeolite MgAl(SiO ₃) Quartz	75-85% 23-15% 2-0%	Fluoride Chloride Heptanoate Sulfate	190 ppm 15 ppm 1740 ppm 160 ppm	17.3 lbs
E	4A Molecular Sieve	Al ₂ O ₃ Na ₂ O SiO ₂ MgO	<30% <30% <50% <5%	Fluoride Chloride Heptanoate Sulfate	10 ppm 11 ppm 430 ppm 100 ppm	30.9 lbs
F	3A Molecular Sieve	3Å zeolite MgAl(SiO ₃) Quartz	75-85% 23-15% 2-0%	Fluoride Chloride Heptanoate Sulfate	160 ppm 23 ppm 1260 ppm 410 ppm	20.0 lbs
H	3A Molecular Sieve	Al ₂ O ₃ K ₂ O Na ₂ O SiO ₂ MgO	<40% <15% <30% <50% <5%	Fluoride Chloride Heptanoate Sulfate	18 ppm 4 ppm 184 ppm 260 ppm	34.6 lbs
I	Alumina	Al ₂ O ₃ Fe ₂ O ₃ Na ₂ O SiO ₂	93.6% 0.02% 0.35% 0.02%	Fluoride Chloride Formate Acetate	2 ppm 59 ppm 110 ppm 3760 ppm	11.9 lbs
J	Alumina	Al ₂ O ₃ Fe ₂ O ₃ Na ₂ O SiO ₂	90+ % <0.1% <0.6% <0.2%	Fluoride Chloride Formate Acetate Heptanoate Sulfate	7 ppm 56 ppm 64 ppm 91 ppm 240 ppm 17 ppm	22.6 lbs
K	Silica Gel	SiO ₂ ·xH ₂ O	>95%	Fluoride Chloride Sulfate	3 ppm 14 ppm 47 ppm	76.4 lbs
L	Silica Gel	SiO ₂ ·xH ₂ O	>95%	Fluoride Chloride Sulfate	14 ppm 22 ppm 860 ppm	22.9 lbs
M	Core type with Carbon and 3A molecular sieve	3Å zeolite Carbon Phosphate Binder	22% 4% 17%	Fluoride Chloride Sulfate	9 ppm 71 ppm 427 ppm	4.9 lbs
N	Core type with Carbon and 3A molecular sieve	3Å zeolite Carbon Phosphate Binder	9% 19% 27%	Fluoride Chloride Sulfate	8 ppm 110 ppm 672 ppm	4.9 lbs
T	Core type with Carbon and 4A molecular sieve	4Å zeolite Carbon Phosphate Binder	19% 28% 19%	Fluoride Chloride Sulfate	22 ppm 98 ppm 768 ppm	7.3 lbs
V	Core type with Carbon and 4A molecular sieve	4Å zeolite Carbon Phosphate Binder	8% 26% 15%	Fluoride Chloride Sulfate	4 ppm 110 ppm 1,388 ppm	6.3 lbs
W	Core Type No Carbon and 3A molecular sieve	3Å zeolite Phosphate Binder	10% 18%	Fluoride Chloride Sulfate	13 ppm 85 ppm 92 ppm	4.0 lbs
X	Core Type No Carbon and 3A molecular sieve	3Å zeolite Phosphate Binder	20% 15%	Fluoride Chloride Sulfate	1 ppm 48 ppm 168 ppm	6.8 lbs
Y	Core Type No Carbon and 4A molecular sieve	4Å zeolite Phosphate Binder	15% 13%	Fluoride Chloride Sulfate	14 ppm 71 ppm 126 ppm	6.1 lbs
Z	Core Type No Carbon and 4A molecular sieve	4Å zeolite Phosphate Binder	17% 13%	Fluoride Chloride Sulfate	45 ppm 54 ppm 223 ppm	3.8 lbs

B. Refrigerants

As-received refrigerants were tested for moisture content by Karl-Fisher titration and for impurities by Gas Chromatography. Table IV.2 lists the refrigerants with their moisture content and the GC detected impurity peak-area percents and retention times, if any. "NCG" indicates all non-condensable gases.

Table IV.2 As-Received Refrigerant Properties

Refrigerant	Moisture Content	GC Peaks		
		Peaks Found		Peak Area Percents
R-11	5 ppm	0.37 9.20	NCG R-11	1.1% 98.9%
R-12	< 1 ppm	0.32 min 1.98 min	NCG R-12	0.5% 99.5%
R-22	< 1 ppm	0.33 1.52	NCG R-22	0.2% 99.8%
R-32	2 ppm	0.37 0.73 1.43	NCG R-32 Unkn	0.2% 99.4% 0.4%
R-123	36 ppm	0.37 13.35	NCG R-123	0.8% 99.2%
R-124	16 ppm	1.25 2.78	R-134a R-124	0.1% 99.9%
R-125	< 1 ppm	0.38 1.05	NCG R-125	0.1% 99.9%
R-134a	8 ppm	0.33 1.28	NCG R-134a	0.2% 99.8%
R-143a	46 ppm	0.35 1.05 1.55	NCG R-143a Unkn	0.1% 99.7% 0.2%
R-152a	4 ppm	0.35 1.37	NCG R-152a	0.2% 99.8%

C. Lubricants

Lubricants were tested for acid number, ion concentration, and moisture content. These properties are listed in table IV.3 below for the four lubricants used in this work. All lubricants were dried to less than 30 ppm moisture before using. The moisture values listed below are for the lubricants "as-received". Moisture content was determined by Karl-Fischer titration.

Table IV.3 Lubricant Properties

Lubricant	Moisture Content	Total Acid Number	Species Found
Naphthenic Mineral Oil	18 ppm	<0.1	Tin 9 ppm Phosphorus 14 ppm Zinc 2 ppm
Alkylbenzene	51 ppm	<0.1	Aluminum 1 ppm Lead 1 ppm
penta erythritol mixed acid polyolester	366 ppm	<0.1	Tin 9 ppm Phosphorus 17 ppm Antimony 13 ppm Pentanoate 4 ppm
penta erythritol branched acid polyolester	162 ppm	0.1	Acetate 0.07 ppm Formate 0.005 ppm Pentanoate 0.6 ppm

V. Test Results

Test results are tabulated in appendices at the end of this report. The results are organized by desiccant type in individual appendices which are identified with the same letter designations used throughout this report. In short the results for desiccant "E" are in appendix "E", and those for desiccant "T" are in appendix "T". In each appendix there is a one page summary sheet with statistical data on the crush strength, ppm concentrations of each organic acid anion found, and peak areas and retention times for each GC peak found. Please read the "Code Key For Test Results" for information necessary to decipher the data in the "Summary Test Results" tables. Following are brief, "overall", comments for each of the eight desiccant types.

4Å Molecular Sieve (See Appendices A and E)

Both desiccants performed the same in ability to contain the various anions. Desiccant A, however, started out with a significantly higher concentration of fluoride ion, and consequently, shows higher concentrations after aging. The crush strength for sample E was almost twice that of sample A, and this difference remained in effect after aging in the various environments. Crush

strength was reduced the most after aging in R-32. Both desiccants contained high levels of fluoride ion and organic anions after aging in R-32. Both desiccants contained high levels of chloride ion after aging with R-22.

3Å Molecular Sieve (See Appendices F and H)

Sample F started out with higher fluoride ion content than did sample H. This difference persisted after aging in the various environments. Sample F allowed higher levels (40-50 ppm) of fluoride ion in the liquid phase for R-12 and R-22 than did any of the other molecular sieve desiccants. Crush strength for sample H was double that for sample F. Both desiccants contained high concentrations of chloride ion after aging with R-22. Both of these 3Å molecular sieves showed high reactivity with R-32. The evidence for this is consistent in total acid number, and anion analysis results.

Alumina (See Appendices I and J)

The surprisingly low crush strength for sample I is due to the small bead size for the sample. Whereas the other bead desiccants are nominal 1/8" in diameter, this material is only 1/16" diameter. These desiccants also caused high reactivity with R-32.

Silica Gel (See Appendices K and L)

These materials, when new, had low concentrations of anions. The difference in crush strength for the two materials (at 76 and 23 pounds) was the highest for any desiccant type. When aged with R-134a, these desiccants released high concentrations of organic acid anions to the lubricant.

3Å Core with Carbon (See Appendices M and N)

These desiccants retained most of the fluoride and chloride ion concentration produced in the aging environment. The fraction of organic anion released to the lubricants compared to that retained was quite high for both desiccants in many refrigerants. Total acid numbers were high for cases where the desiccant was aged in R-134a, R-32 and R-125. Corrosion of the steel coupon was just about universal for these desiccants, and white gel-like solids formed in some cases. Darkening of the desiccant was also common.

4Å Core with Carbon (See Appendices T and V)

As with the desiccants M and N above, these desiccants retained most of the fluoride and chloride ion concentration produced in the aging environment. The fraction of organic anion released to the lubricants compared to that retained was again quite high for both desiccants in many refrigerants. Total Acid Numbers were high when aged in R-134a and R-32. And again, corrosion of the steel coupon was almost universal.

3Å Core without Carbon (See Appendices W and X)

Levels of fluoride and chloride produced in the presence of these desiccants were high with some refrigerants - especially R-22 and R-32. Lubricant acid numbers were again very high when R-32 was present. Also acid numbers were high for R-134a and R-125. The POE lubricants produced high levels of organic anions in the presence of these desiccants. Crush strengths of these

desiccants were not reduced after aging in any of the environments. Steel corrosion was also prevalent for these desiccants.

4Å Core without Carbon (See Appendices Y and Z)

Results for these desiccants were similar to those for the other core desiccants. Halide ion concentrations were again high for cases involving R-32 and R-22. Steel corrosion was high for these desiccants. And again, acid numbers were high for cases with R134a and R-125 and very high when R-32 was present. Also, the POE lubricants produced very high levels of organic anions when aged in the presence of these desiccants.

Video Tapes

Four video tapes with combined length of approximately eight hours were produced during the course of this investigation. The tapes show the condition of the tube contents after aging and before analysis. Attempts were made to reveal the color of the lubricant, the color of the desiccant, the surface appearance of the metals and the presence of any solid residues after aging. The tapes are arranged by refrigerant/lubricant combination. Each tube, or pair of tubes, was taped for one minute, following the order used throughout this report (Desiccant A, E, F, H, I, J, K, L, M, N, T, V, W, X, Y, and Z). The tapes are standard VHS with NTIS format, playable on any domestic video cassette recorder. These tapes are available upon request on a loan basis from the *Air-Conditioning and Refrigeration Technology Institute*.

VI. Conclusions

Following are some general trends in the data that developed during the course of this investigation.

1. The addition of 1000 ppm moisture to the sealed tubes produced no significant difference in the test results, as compared to those tests conducted with only 50 ppm moisture.
2. For the molecular sieve desiccants, comparison of the anion analyses of the liquid and solid phases reveals that the desiccant solid phase contains most of the fluoride and chloride. This trend does not hold for all cases when the alumina and silica gel desiccants were present either alone or as part of a core desiccant.
3. The desiccants do not perform as well in retaining the organic anions as they do for the inorganic anions. For refrigerants R-134a, R-152a, R-32, R-125 and R-143a, the concentration of organic anion in the liquid is sometimes higher than that in the desiccants.
4. All of these desiccants contained chloride and fluoride ions when received. Sulfate ion was also present on most of the desiccants. Other anions detected on new desiccants were acetate, formate, and an unknown organic anion, which is possibly heptanoate.
5. For most refrigerants, the bead desiccant crush strengths were reduced by about 20% after

aging. The addition of 1000 ppm moisture to the environment caused no greater change in crush strength than that observed for the desiccants aged at 50 ppm moisture. R-32 caused significant reductions in crush strength for all of the bead desiccants except for the alumina samples. There was no loss in crush strength for the core desiccants.

6. All of the desiccants tested show high reactivity when aged with R-32. Increased total acid number, high refrigerant decomposition, high fluoride ion concentrations, and organic anion concentrations all attest to this.

7. Steel corrosion is prevalent when the core type desiccants are aged with POE lubricants.

8. In consideration of all of these results, it should be noted that the aging was conducted at 149°C. In most actual applications, desiccants are located in the refrigerant systems where temperatures rarely reach 100°C. Thus, many of the reactions seen here may not occur in actual systems operating at much lower temperatures.

Compliance with Agreement

The tasks specified in the Work Statement for this project have been completed. 16 desiccants (2 samples for each of 8 desiccant types) have been exposed to 10 refrigerants and 4 lubricants (13 refrigerant/lubricant combinations) and two moisture levels for 30 days at 149°C in triplicate sealed glass tubes. This yielded a total of 416 material combinations and 1248 sealed tubes. After aging the tube contents were analyzed with four methods to reveal changes in the desiccants, refrigerants, lubricants, and metals. The collective results of these analyses are presented in sixteen Summary Results tables - one for each desiccant. Supporting each Summary Results table are three tables that list all of the crush strength data, every gas chromatography peak, and every ion chromatography peak observed during this investigation. In all there are over 16,500 data points presented in the 64 data tables.

Principal Investigator Effort

Dr. Jay E. Field, the principal investigator, applied 35% of his time during the course of this investigation, obtaining materials, directing research technicians, organizing and summarizing results, preparing presentations, and writing reports.

Code Key For Summary Test Results Tables

Liquid Color

Colors follow ASTM Standard D1500. However, 8 mm internal diameter is much less than that specified. Therefore, colors "0" through "2" appear the same.

The first number listed is the color before aging and the second number is the color after aging.

- 2.0 Water clear
- 2.5 Very Faint Yellow
- 3.0 Pale Yellow
- 3.5 Light Yellow
- 4.0 Yellow
- 4.5 Yellow-Orange
- 5.0 Light Orange
- 5.5 Orange
- 6.0 Orange-Brown
- 6.5 Brown
- 7.0 Dark Brown
- 7.5 Brown-Black
- 8.0 Black

Desiccant Color

- 0 No change
- 1 Darker
- 2 Very Dark
- 3 Black

Copper Plating

- 0 none
- 1 spots on edges
- 2 edges covered
- 3 spots on surface
- 4 Partially coated surface
- 5 Fully coated surface

Solids Formation

- 0 None
- 1 small amount
- 2 medium amount
- 3 heavy amount

Steel Corrosion

- 0 None
- 1 Spot darkening
- 2 Complete darkening
- 3 Pitting or coating

Crush Strength

The value entered is the average Crush Strength in pounds.

GC % Refrigerant Reacted

Based on peak area ratios for largest decomposition product detected.

Total Acid Number

mg of KOH per gram of oil.

F ion in Liquid

The ppm by weight for the concentration of F ion in the liquid phase from the aged tube.

F ion on Desiccant

ppm based on weight of desiccant.

Cl ion in Liquid

The ppm by weight for the concentration of Cl ion in the liquid phase from the aged tube.

Cl ion on Desiccant

ppm based on weight of desiccant.

Organic Acid in Liquid

Sum of the ppm results for all organic anions found in the liquid phase from the aged tube

Organic Acid on Desiccant

Sum of the ppm results for all organic anions found based on the desiccant weight.

Appendix A

Desiccant A: 4Å Molecular Sieve

Table A.1. Summary Test Results

Desiccant; A - 4Å Molecular Sieve

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Pitting (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion in Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion in Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic on (ppm)
A-New	None	2.5	0	-	-	-	17.3	-	-	-	190	-	15	-	0
50 ppm Moisture															
A-11	R11/mineral oil	3.5	2	0	0	2	9.3	0.0	0.2	4	130	63	140	41	24
A-12	R12/mineral oil	4.0	1	0	0	0	13.3	0.00	<0.1	4	670	28	1,560	4	570
A-13	R22/mineral oil	3.5	2	0	0	1	17.0	0.00	<0.1	6	3,680	370	50,000	0	7,750
A-14	R123/mineral oil	4.5	1	0	0	0	16.7	0.88	<0.1	1	230	48	720	4	8
A-15	R134a/mixed ester	2.5	1	0	0	0	14.7	0.00	0.5	0	85	0	0	2,310	9,120
A-16	R134a/branched ester	2.5	0	0	0	0	17.4	0.00	0.4	0	92	3	32	1,240	6,090
A-17	R152a/alkylbenzene	4.0	2	0	0	0	5.7	1.24	<0.1	2	3,140	0	0	2,210	1,300
A-18	R32/mixed ester	3.0	2	0	0	1	9.2	0.55	5.6	4	5,340	5	18	11,630	6,070
A-19	R32/branched ester	2.5	0	0	0	0	8.6	0.20	1.2	6	6,960	6	19	4,460	13,800
A-20	R124/alkylbenzene	3.0	0	0	0	0	15.6	0.41	<0.1	1	160	9	120	6	3,070
A-21	R125/mixed ester	2.5	0	0	0	0	12.3	0.00	<0.1	1	130	4	15	1,840	11,500
A-22	R125/branched ester	2.5	0	0	0	0	12.6	0.00	0.1	1	100	3	18	730	8,080
A-23	R143a/branched ester	2.5	0	0	0	0	12.1	0.00	0.3	0	75	5	50	810	4,510
1000 ppm Moisture															
A-41	R11/mineral oil	4.5	2	0	0	2	14.0	0.00	0.1	4	330	64	2,540	15	66
A-42	R12/mineral oil	4.0	1	0	0	0	13.1	0.00	0.1	2	1,240	21	1,390	10	820
A-43	R22/mineral oil	3.5	2	0	0	1	20.1	0.00	<0.1	12	3,830	670	51,700	0	7,870
A-44	R123/mineral oil	4.5	1	0	0	0	14.6	0.68	<0.1	1	260	23	840	4	31
A-45	R134a/mixed ester	2.5	1	0	0	0	11.1	0.00	0.5	0	84	0	11	1,950	8,880
A-46	R134a/branched ester	2.5	0	0	0	0	12.8	0.00	0.3	0	74	1	32	430	6,390
A-47	R152a/alkylbenzene	4.0	2	0	0	0	4.8	1.30	0.2	1	2,420	0	36	2,060	1,210
A-48	R32/mixed ester	3.0	2	0	0	1	8.8	0.42	4.6	0	5,840	3	18	12,410	6,800
A-49	R32/branched ester	2.5	0	0	0	0	7.2	0.48	1.4	6	4,130	0	32	3,360	17,900
A-50	R124/alkylbenzene	3.0	0	0	0	0	14.4	0.35	<0.1	1	280	11	110	18	2,860
A-51	R125/mixed ester	3.0	0	0	0	0	13.1	0.00	<0.1	1	80	6	25	2,760	6,700
A-52	R125/branched ester	2.5	0	0	0	0	11.0	0.00	0.1	1	110	6	17	1,300	9,000
A-53	R143a/branched ester	2.5	0	0	0	0	9.8	0.00	0.6	0	95	8	35	2,030	10,200

Table A.2. Crush Strength Test Results

Desiccant: A - 4Å Molecular Sieve

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
A-New	None	13.0	17.3	25.9	14.4	16.4	13.6	17.7	21.0	15.5	18.6	10.0	17.3	3.9	25.1	9.6
50 ppm Moisture																
A-11	R11/mineral oil	10.2	10.6	13.1	8.0	4.9	10.9	9.8	9.9	8.7	6.8	10.0	9.3	2.3	13.9	4.7
A-12	R12/mineral oil	14.5	15.9	12.1	10.8	12.9	11.4	12.6	16.4	10.8	15.1	10.0	13.3	2.1	17.4	9.1
A-13	R22/mineral oil	16.9	13.6	14.5	16.0	21.6	13.8	14.8	29.9	14.2	14.2	10.0	17.0	5.1	27.2	6.7
A-14	R123/mineral oil	28.0	18.7	11.7	15.3	14.9	22.5	16.4	11.5	13.7	14.0	10.0	16.7	5.2	27.0	6.4
A-15	R134a/ mixed ester	14.4	20.2	10.2	13.0	16.1	11.8	14.5	20.4	13.4	13.4	10.0	14.7	3.3	21.4	8.1
A-16	R134a/branched ester	18.5	12.1	18.5	19.9	15.7	16.7	24.0	18.7	13.5	16.5	10.0	17.4	3.4	24.1	10.7
A-17	R152a/alkylbenzene	8.9	2.7	3.1	7.5	7.0	6.7	3.5	5.0	6.9	6.1	10.0	5.7	2.1	9.9	1.6
A-18	R32/mixed ester	13.5	6.0	9.7	9.9	6.6	8.3	9.4	7.3	9.8	11.4	10.0	9.2	2.3	13.7	4.7
A-19	R32/branched ester	9.4	4.3	8.5	6.0	11.8	10.5	7.4	8.8	11.2	8.2	10.0	8.6	2.3	13.2	4.0
A-20	R124/alkylbenzene	14.0	18.3	24.2	10.6	21.0	12.0	11.9	14.0	17.4	12.9	10.0	15.6	4.4	24.5	6.7
A-21	R125/mixed ester	11.6	18.8	14.8	11.2	11.7	13.8	11.8	11.0	13.3	5.1	10.0	12.3	3.5	19.2	5.4
A-22	R125/branched ester	10.7	15.2	11.3	12.3	10.1	10.8	15.1	10.7	13.7	15.9	10.0	12.6	2.2	17.0	8.2
A-23	R143a/branched ester	14.5	7.9	13.0	14.3	12.1	15.3	7.0	12.6	12.6	11.8	10.0	12.1	2.7	17.5	6.7
1000 ppm Moisture																
A-41	R11/mineral oil	17.6	14.1	11.9	14.3	17.0	11.0	11.3	12.9	16.2	14.0	10.0	14.0	2.3	18.7	9.4
A-42	R12/mineral oil	13.5	13.3	9.6	16.2	10.1	9.1	10.8	14.6	25.4	8.1	10.0	13.1	5.1	23.2	2.9
A-43	R22/mineral oil	18.8	15.6	18.3	18.2	18.5	28.8	24.1	25.2	16.4	16.8	10.0	20.1	4.4	28.9	11.3
A-44	R123/mineral oil	23.1	13.9	10.2	16.5	17.6	13.7	13.4	14.0	11.5	12.4	10.0	14.6	3.7	22.0	7.3
A-45	R134a/ mixed ester	11.1	8.1	9.0	6.8	8.4	9.7	13.1	13.2	15.1	16.3	10.0	11.1	3.2	17.5	4.7
A-46	R134a/branched ester	9.6	16.4	18.7	10.5	16.1	13.1	8.5	12.8	10.5	11.8	10.0	12.8	3.3	19.4	6.2
A-47	R152a/alkylbenzene	4.6	6.4	3.8	1.8	3.9	8.3	3.9	6.5	4.9	4.0	10.0	4.8	1.8	8.5	1.2
A-48	R32/mixed ester	6.7	9.2	8.8	7.1	8.8	9.0	8.5	12.3	9.7	8.0	10.0	8.8	1.5	11.9	5.7
A-49	R32/branched ester	6.8	5.8	6.6	12.9	7.7	8.0	5.2	3.1	7.0	8.8	10.0	7.2	2.6	12.3	2.1
A-50	R124/alkylbenzene	15.7	18.4	17.8	16.0	15.9	11.4	9.3	15.6	14.7	9.2	10.0	14.4	3.3	21.0	7.8
A-51	R125/mixed ester	5.5	10.4	13.7	17.5	13.0	16.6	20.8	14.3	11.6	8.0	10.0	13.1	4.5	22.2	4.0
A-52	R125/branched ester	8.5	10.3	11.3	11.7	17.0	9.2	13.2	10.1	6.9	11.4	10.0	11.0	2.8	16.5	5.4
A-53	R143a/branched ester	12.3	12.5	8.6	9.9	9.8	12.1	6.8	7.9	8.1	10.3	10.0	9.8	2.0	13.8	5.8

Table A.4. Gas Chromatography Analysis

Desiccant: A - 4Å Molecular Sieve

Code	Peak ID >> Reten. Time >>	GC Peak Areas																	
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NGC	C02	Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		50 ppm Moisture																	
A-11	R11/mineral oil	269,433										531							
A-12	R12/mineral oil	273,689										2,303							
A-13	R22/mineral oil			315,660								14,835	2,069						
A-14	R123/mineral oil					340,444						375							
A-15	R134a/mixed ester								272,202			1,179							3,007
A-16	R134a/branched ester								291,010			525							
A-17	R152a/alkylbenzene										257,600	1,139	1,457	3,495					
A-18	R32/mixed ester				323,272							575	10,916		1,010	767			
A-19	R32/branched ester				316,953							1,297	7,286		638				
A-20	R124/alkylbenzene						287,669		1,186			405							
A-21	R125/mixed ester							273,740				2,211							
A-22	R125/branched ester							272,534				813							
A-23	R143a/branched ester									139,765		286							
1000 ppm Moisture																			
A-41	R11/mineral oil	276,311										14,174							
A-42	R12/mineral oil		256,698									5,869							
A-43	R22/mineral oil			316,485								13,055	1,971						
A-44	R123/mineral oil					343,100						407							
A-45	R134a/mixed ester								264,100			3,169							2,337
A-46	R134a/branched ester											306							
A-47	R152a/alkylbenzene										249,672	1,113	1,245	3,244					
A-48	R32/mixed ester				330,639							1,749	12,183		864	513			
A-49	R32/branched ester				275,755							3,473	7,288		1,328				
A-50	R124/alkylbenzene						291,474		1,022			473							
A-51	R125/mixed ester							128,549				2,288							
A-52	R125/branched ester							139,283				429							
A-53	R143a/branched ester									143,364		219							

Appendix E

Desiccant E: 4Å Molecular Sieve

Table E.1. Summary Test Results

Desiccant; E - 4Å Molecular Sieve

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
E-New	None	2.5	0	-	-	-	30.9	-	-	-	10	-	11	-	0
50 ppm Moisture															
E-11	R11/mineral oil	3.5	2	0	0	0	12.2	0.00	<0.1	3	130	110	1,570	0	28
E-12	R12/mineral oil	3.5	1	0	0	0	27.0	0.00	<0.1	1	440	18	660	3	272
E-13	R22/mineral oil	4.0	2	0	0	1	27.4	0.12	<0.1	2	6,230	340	49,900	0	6,920
E-14	R123/mineral oil	3.5	0	0	0	0	35.6	0.00	<0.1	1	54	24	390	1	12
E-15	R134a/mixed ester	2.5	1	0	0	0	21.9	0.00	<0.1	0	91	0	14	480	2,130
E-16	R134a/branched ester	2.5	0	0	0	0	23.2	0.00	<0.1	0	630	2	64	89	4,280
E-17	R152a/alkylbenzene	4.5	2	0	0	1	23.7	3.42	3.0	3	5,590	0	0	3,320	1,880
E-18	R32/mixed ester	3.0	2	0	0	1	21.0	0.35	4.7	0	5,270	0	0	10,000	5,170
E-19	R32/branched ester	2.5	0	0	0	0	17.7	0.40	1.5	14	7,810	0	0	7,480	18,700
E-20	R124/alkylbenzene	2.5	0	0	0	0	25.2	0.16	<0.1	2	83	6	43	4	24
E-21	R125/mixed ester	2.5	0	0	0	0	22.0	0.00	0.1	1	4	5	17	685	1,250
E-22	R125/branched ester	2.5	0	0	0	0	25.5	0.00	<0.1	0	2	2	13	100	1,220
E-23	R143a/branched ester	2.5	0	0	0	0	17.8	0.00	0.2	0	7	9	16	850	490
1000 ppm Moisture															
E-41	R11/mineral oil	4.5	2	0	0	1	29.1	0.00	0.1	23	210	150	230	5	28
E-42	R12/mineral oil	3.0	1	0	0	0	23.6	0.00	<0.1	1	570	18	720	19	220
E-43	R22/mineral oil	2.5	2	0	0	1	33.8	0.00	<0.1	1	5,820	87	51,600	0	6,530
E-44	R123/mineral oil	3.0	1	0	0	0	27.7	0.22	0.7	1	57	20	490	1	5
E-45	R134a/mixed ester	2.5	1	0	0	1	25.8	0.00	0.2	0	84	0	0	150	1,690
E-46	R134a/branched ester	2.5	0	0	0	0	23.0	0.00	0.3	3	28	6	10	350	510
E-47	R152a/alkylbenzene	4.5	2	0	0	2	20.1	2.20	2.0	8	6,670	0	14	2,770	1,160
E-48	R32/mixed ester	3.0	2	0	0	1	17.2	0.48	5.1	0	4,970	0	0	14,260	5,130
E-49	R32/branched ester	2.5	0	0	0	0	18.4	0.32	1.5	18	7,000	0	0	7,330	9,250
E-50	R124/alkylbenzene	2.5	0	0	0	0	30.6	0.29	<0.1	3	55	9	39	19	200
E-51	R125/mixed ester	3.0	0	0	0	0	24.3	0.00	<0.1	1	2	2	64	230	1,400
E-52	R125/branched ester	2.5	0	0	0	0	22.9	0.13	0.1	0	2	5	12	180	1,420
E-53	R143a/branched ester	2.5	0	0	0	0	19.2	0.00	<0.1	0	400	8	57	170	3,520

Table E.2. Crush Strength Test Results

Desiccant: E - 4 Å Molecular Sieve

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
E-New	None	25.3	20.5	26.8	23.2	26.4	45.6	46.2	35.5	28.3	30.9	10.0	30.9	8.9	48.7	13.1
50 ppm Moisture																
E-11	R11/mineral oil	11.2	8.3	10.1	12.9	12.0	20.1	14.5	10.0	9.4	13.2	10.0	12.2	3.4	18.9	5.4
E-12	R12/mineral oil	38.7	27.2	20.5	10.6	28.6	34.4	31.3	16.8	38.4	23.1	10.0	27.0	9.3	45.5	8.4
E-13	R22/mineral oil	34.0	36.5	21.2	14.0	23.1	25.2	25.7	38.8	19.9	35.4	10.0	27.4	8.3	44.0	10.8
E-14	R123/mineral oil	40.6	50.0	37.9	35.9	37.0	40.2	35.3	28.9	23.7	26.9	10.0	35.6	7.6	50.9	20.4
E-15	R134a/mixed ester	17.7	11.5	15.0	20.8	27.1	34.2	22.1	27.4	12.9	29.8	10.0	21.9	7.6	37.1	6.6
E-16	R134a/branched ester	26.6	16.1	20.0	35.0	26.2	26.3	23.0	21.8	16.9	19.9	10.0	23.2	5.6	34.4	12.0
E-17	R152a/alkylbenzene	26.7	26.9	29.4	13.9	26.9	17.6	19.0	13.7	31.9	30.8	10.0	23.7	7.0	37.6	9.8
E-18	R32/mixed ester	26.1	31.0	10.1	24.4	24.0	24.9	18.9	11.7	21.2	17.6	10.0	21.0	6.5	34.0	7.9
E-19	R32/branched ester	23.2	23.2	21.3	19.2	15.9	23.7	10.1	17.8	8.9	14.0	10.0	17.7	5.4	28.6	6.9
E-20	R124/alkylbenzene	21.9	10.0	19.6	28.8	38.2	30.8	35.4	19.5	22.8		9.0	25.2	8.9	43.0	7.5
E-21	R125/mixed ester	18.8	11.3	34.4	32.7	14.8	30.0	19.3	18.2	19.8	20.4	10.0	22.0	7.7	37.4	6.5
E-22	R125/branched ester	10.8	22.8	24.0	27.0	14.1	24.2	36.0	28.3	20.7	47.5	10.0	25.5	10.5	46.5	4.6
E-23	R143a/branched ester	19.2	11.7	24.9	20.5	20.1	16.7	8.1	15.8	16.7	24.0	10.0	17.8	5.2	28.1	7.4
1000 ppm Moisture																
E-41	R11/mineral oil	37.9	62.1	31.2	21.7	24.7	20.9	24.6	18.9	26.1	22.9	10.0	29.1	12.8	54.8	3.4
E-42	R12/mineral oil	17.4	27.7	19.8	27.5	34.9	12.2	22.6	24.3	33.1	16.0	10.0	23.6	7.4	38.3	8.8
E-43	R22/mineral oil	20.8	33.9	55.2	21.7	41.2	44.4	16.0	35.2	40.5	28.8	10.0	33.8	12.2	58.1	9.5
E-44	R123/mineral oil	32.7	36.2	23.0	28.9	23.6	29.2	27.2	18.0	24.4	33.5	10.0	27.7	5.6	38.8	16.5
E-45	R134a/mixed ester	26.9	31.6	25.7	20.5	30.0	25.1	24.1	27.8	27.7	18.2	10.0	25.8	4.1	33.9	17.6
E-46	R134a/branched ester	24.9	16.9	23.0	21.7	26.3	28.3	23.4	12.8	27.5	24.7	10.0	23.0	4.8	32.6	13.3
E-47	R152a/alkylbenzene	16.3	17.9	11.7	28.6	18.0	18.0	14.5	23.0	33.6	19.3	10.0	20.1	6.6	33.3	6.9
E-48	R32/mixed ester	19.4	19.2	20.4	17.2	17.5	15.8	10.5	17.1	18.7	15.8	10.0	17.2	2.8	22.7	11.6
E-49	R32/branched ester	13.7	20.2	25.1	13.0	17.8	17.5	27.4	15.5	19.5	14.7	10.0	18.4	4.8	28.0	8.9
E-50	R124/alkylbenzene	33.0	35.3	25.8	27.5	30.4	42.2	33.2	27.4	29.5	22.1	10.0	30.6	5.6	41.9	19.4
E-51	R125/mixed ester	15.4	29.1	30.1	22.3	18.4	25.5	25.9	20.4	24.4	31.8	10.0	24.3	5.3	34.9	13.8
E-52	R125/branched ester	21.7	28.4	20.7	18.3	14.1	25.1	28.4	22.7	27.0	22.3	10.0	22.9	4.6	32.0	13.7
E-53	R143a/branched ester	4.8	21.3	18.3	25.8	23.0	22.7	11.2	15.8	18.8	30.1	10.0	19.2	7.3	33.7	4.6

Table E.4. Gas Chromatography Analysis

E - 4Å Molecular Sieve

Code	Peak ID >> Reten. Time >>	GC Peak Areas																	
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2	Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
50 ppm Moisture																			
E-11	R11/mineral oil	312.711										846							
E-12	R12/mineral oil	294.866										965						2,462	
E-13	R22/mineral oil			273.565								17,644	1,152	315					
E-14	R123/mineral oil					339.035						361							
E-15	R134a/mixed ester								260.386			3,133							
E-16	R134a/branched ester								285.659			601							
E-17	R152a/alkylbenzene										216.371	1,075	927	5,040		3,048			
E-18	R32/mixed ester				308.777							2,145	8,399		1,006	686			
E-19	R32/branched ester				313.795							1,977	5,138		606	522		138	
E-20	R124/alkylbenzene						278.763		454			452							
E-21	R125/mixed ester						129.907					6,473							
E-22	R125/branched ester						265.813					690							
E-23	R143a/branched ester									138.747		132							
1000 ppm Moisture																			
E-41	R11/mineral oil	218.034										36,077							
E-42	R12/mineral oil		259.753									909							
E-43	R22/mineral oil			209.933								20,115	1,321						
E-44	R123/mineral oil					335.635							500						732
E-45	R134a/mixed ester								261,706			1,913							
E-46	R134a/branched ester								186,446			32,773							
E-47	R152a/alkylbenzene									216.282		924	909	4,759					
E-48	R32/mixed ester				329.849							3,416	9,451		959	611			
E-49	R32/branched ester				313.297							1,581	4,827		1,004				
E-50	R124/alkylbenzene						281.378		817			1,132							
E-51	R125/mixed ester						140.532					283							
E-52	R125/branched ester						278.217					1,194				354			
E-53	R143a/branched ester									135.798		1,362							

Appendix F

Desiccant F: 3Å Molecular Sieve

Table F.1. Summary Test Results

Desiccant; F - 3 Å Molecular Sieve

Code	System Fluids	Liquid Color (2-8)	Desicc Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desiccant (ppm)
F-New	None	2.5	0	-	-	-	20.0	-	-	-	160	-	23	-	0
50 ppm Moisture															
F-11	R11/mineral oil	5.5	2	0	0	0	17.5	0.16	<0.1	8	490	95	8,080	130	42
F-12	R12/mineral oil	4.5	1	0	0	0	18.0	0.13	1.3	41	1,580	130	6,500	17	820
F-13	R22/mineral oil	2.5	1	0	0	0	10.2	0.00	0.1	47	2,350	220	33,400	4	3,700
F-14	R123/mineral oil	3.5	0	0	0	0	21.7	0.38	<0.1	6	220	12	2,150	0	13
F-15	R134a/mixed ester	2.5	1	0	0	0	16.1	0.00	0.3	0	130	0	19	740	10,950
F-16	R134a/branched ester	2.5	0	0	0	0	14.3	0.00	0.3	0	120	4	41	1,320	7,570
F-17	R152a/alkylbenzene	3.0	0	0	0	0	14.3	0.86	<0.1	3	2,510	13	33	300	1,990
F-18	R32/mixed ester	3.0	2	0	0	1	9.5	0.31	0.2	14	5,670	5	110	6,040	8,400
F-19	R32/branched ester	2.5	1	0	0	0	11.9	0.20	1.9	17	3,460	0	120	1,880	2,810
F-20	R124/alkylbenzene	2.5	1	0	0	0	20.3	0.00	<0.1	3	240	8	1,010	97	2,380
F-21	R125/mixed ester	2.5	1	0	0	0	13.8	0.00	0.3	0	70	2	22	570	6,920
F-22	R125/branched ester	2.5	1	0	0	0	11.8	0.00	<0.1	0	120	2	34	560	8,560
F-23	R133a/branched ester	2.5	1	0	0	1	12.7	0.00	<0.1	1	150	7	72	880	5,900
1000 ppm Moisture															
F-41	R11/mineral oil	3.0	2	0	0	2	10.2	0.00	<0.1	1	75	43	690	75	8
F-42	R12/mineral oil	4.5	0	0	0	0	18.6	0.10	<0.1	52	1,390	76	5,770	26	820
F-43	R22/mineral oil	2.5	1	0	0	0	11.6	0.00	<0.1	25	1,810	92	21,000	0	1,910
F-44	R123/mineral oil	3.5	0	0	0	0	18.5	0.06	0.2	1	200	22	2,190	0	5
F-45	R134a/mixed ester	2.5	1	0	0	1	13.8	0.00	0.2	0	120	0	26	1,210	1,410
F-46	R134a/branched ester	3.0	0	0	0	0	16.6	0.00	0.5	0	50	4	37	1,100	3,880
F-47	R152a/alkylbenzene	3.0	0	0	0	0	12.6	0.87	<0.1	12	2,370	15	47	710	920
F-48	R32/mixed ester	3.0	2	0	0	1	8.4	0.27	0.3	70	1,960	2	148	2,920	3,940
F-49	R32/branched ester	2.5	0	0	0	1	13.2	0.23	1.0	17	2,840	0	110	2,380	2,980
F-50	R124/alkylbenzene	2.5	1	0	0	0	20.5	0.28	<0.1	4	210	15	740	1	2,150
F-51	R125/mixed ester	2.5	1	0	0	1	10.7	0.00	0.4	2	270	9	87	1,290	17,700
F-52	R125/branched ester	2.5	1	0	0	0	12.8	0.00	0.1	1	110	8	22	1,240	8,320
F-53	R133a/branched ester	2.5	1	0	0	1	13.4	0.00	0.2	0	120	4	85	1,040	6,240

Table F.2. Crush Strength Test Results

Desiccant: F - 3Å Molecular Sieve

Code		System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
														Avg	Std Dev	Upper 95%	Lower 95%
			1	2	3	4	5	6	7	8	9	10					
F-New	None		22.8	23.2	17.7	23.8	22.5	13.0	19.0	25.3	15.1	18.0	10.0	20.0	4.1	28.2	11.9
50 ppm Moisture																	
F-11	R11/mineral oil		13.7	14.3	15.7	18.8	15.7	18.4	19.7	19.1	21.9	17.3	10.0	17.5	2.6	22.6	12.3
F-12	R12/mineral oil		16.4	16.0	16.2	21.6	15.4	18.6	18.5	22.9	14.5	19.9	10.0	18.0	2.8	23.6	12.4
F-13	R22/mineral oil		10.4	9.7	12.6	8.8	10.8	14.3	8.0	12.8	8.4	5.7	10.0	10.2	2.6	15.3	5.0
F-14	R123/mineral oil		25.5	26.4	25.8	12.5	18.4	20.6	23.8	21.8	19.5	23.1	10.0	21.7	4.2	30.2	13.3
F-15	R134a/ mixed ester		19.8	19.2	16.7	17.6	15.4	8.5	14.6	16.3	13.0	19.6	10.0	16.1	3.5	23.0	9.1
F-16	R134a/branched ester		14.2	17.0	11.9	20.0	17.3	15.3	10.5	11.1	13.9	11.4	10.0	14.3	3.1	20.5	8.0
F-17	R152a/alkylbenzene		16.5	12.2	19.3	10.7	14.2	19.1	15.6	13.1	10.6	11.4	10.0	14.3	3.3	20.8	7.8
F-18	R32/mixed ester		7.6	9.1	13.8	12.6	7.2	9.0	8.4	11.0	5.5	10.3	10.0	9.5	2.5	14.5	4.4
F-19	R32/branched ester		15.1	10.9	11.8	16.3	9.1	12.5	15.1	7.2	13.1	7.6	10.0	11.9	3.2	18.2	5.5
F-20	R124/alkylbenzene		20.5	31.5	14.6	25.0	14.4	19.3	16.0	20.6	19.9	21.4	10.0	20.3	5.1	30.6	10.1
F-21	R125/mixed ester		17.1	10.6	16.8	10.5	11.4	12.3	12.4	14.3	19.4	13.1	10.0	13.8	3.0	19.9	7.7
F-22	R125/branched ester		8.2	8.8	6.7	11.7	13.9	8.9	17.5	11.4	19.9	10.6	10.0	11.8	4.2	20.2	3.3
F-23	R143a/branched ester		8.5	9.5	11.6	12.1	12.0	18.8	14.3	14.0	18.0	8.0	10.0	12.7	3.7	20.0	5.3
1000 ppm Moisture																	
F-41	R11/mineral oil		13.7	12.3	7.7	12.0	8.6	10.7	9.3	11.6	4.7	11.6	10.0	10.2	2.7	15.6	4.9
F-42	R12/mineral oil		14.8	21.1	14.7	19.8	16.6	23.2	25.4	14.6	16.6	19.4	10.0	18.6	3.8	26.2	11.0
F-43	R22/mineral oil		6.5	15.1	14.1	11.5	9.1	14.3	13.1	10.6	7.3	14.1	10.0	11.6	3.1	17.8	5.4
F-44	R123/mineral oil		13.2	21.6	23.1	12.8	23.1	19.4	24.7	13.8	18.4	15.1	10.0	18.5	4.5	27.6	9.4
F-45	R134a/ mixed ester		12.9	9.4	17.9	13.2	13.8	13.5	19.8	9.1	14.3	13.8	10.0	13.8	3.3	20.3	7.2
F-46	R134a/branched ester		15.2	19.2	15.9	20.6	21.8	10.5	21.7	17.4	14.3	9.1	10.0	16.6	4.4	25.5	7.7
F-47	R152a/alkylbenzene		6.1	15.4	12.2	13.3	12.1	12.6	14.2	14.9	11.6	14.3	10.0	12.6	2.9	18.4	6.7
F-48	R32/mixed ester		7.6	9.6	9.9	9.2	7.4	6.5	9.0	8.3	6.9	9.9	10.0	8.4	1.3	11.0	5.9
F-49	R32/branched ester		13.6	16.2	12.0	13.3	17.7	9.8	9.1	11.5	14.4	14.6	10.0	13.2	2.7	18.6	7.8
F-50	R124/alkylbenzene		26.3	21.7	26.1	15.6	19.9	25.8	23.2	12.5	19.5	14.3	10.0	20.5	5.1	30.6	10.4
F-51	R125/mixed ester		13.7	11.1	10.5	17.6	13.0	11.2	4.6	7.1	12.1	6.4	10.0	10.7	3.8	18.4	3.0
F-52	R125/branched ester		11.9	11.3	17.8	13.4	9.4	10.8	17.2	8.4	12.0	16.0	10.0	12.8	3.2	19.3	6.4
F-53	R143a/branched ester		13.7	15.9	8.8	18.8	9.6	11.0	19.4	9.8	13.1	13.7	10.0	13.4	3.7	20.9	5.9

Appendix H

Desiccant H: 3Å Molecular Sieve

Table H.1. Summary Test Results

Desiccant; H - 3Å Molecular Sieve

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Reacted (wt %)	Total Acid Number (mg KOH)	F Ion in Liquid (ppm)	FI Ion on Desiccant (ppm)	Cl Ion in Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid in Liquid (ppm)	Org Acid on Desic (ppm)
H-New	None	2.5	0	-	-	-	34.6	-	-	-	18	-	4	-	0
50 ppm Moisture															
H-11	R11/mineral oil	4.5	2	0	0	0	1	23.6	<0.1	4	140	95	1,580	0	75
H-12	R12/mineral oil	3.5	1	0	0	0	0	24.4	<0.1	4	1,020	24	1,600	5	532
H-13	R22/mineral oil	3.0	0	0	0	0	1	24.2	<0.1	10	4,000	550	45,400	0	5,280
H-14	R123/mineral oil	3.5	1	0	0	0	0	31.1	<0.1	1	61	31	460	11	6
H-15	R134a/mixed ester	2.5	1	0	0	0	0	18.6	0.00	0	18	0	11	1,490	3,970
H-16	R134a/branched ester	2.5	0	0	0	0	0	18.6	0.00	0.3	23	13	23	1,400	3,190
H-17	R152a/alkylbenzene	3.5	2	0	0	0	0	15.7	0.92	15	3,430	0	0	750	640
H-18	R32/mixed ester	3.0	2	0	0	0	0	15.6	0.69	0.4	8,530	0	0	11,400	9,650
H-19	R32/branched ester	2.5	0	0	0	0	0	16.4	0.41	16	8,530	0	0	5,700	10,600
H-20	R124/alkylbenzene	2.5	0	0	0	0	0	25.3	<0.1	2	110	6	170	41	580
H-21	R125/mixed ester	2.5	0	0	0	0	0	22.7	0.00	0	11	3	16	1,230	3,130
H-22	R125/branched ester	2.5	0	0	0	0	0	19.8	0.00	0.4	13	5	12	1,090	3,260
H-23	R143a/branched ester	2.5	0	0	0	0	0	15.7	<0.1	1	17	8	26	1,310	2,070
1000 ppm Moisture															
H-41	R11/mineral oil	4.5	2	0	0	0	0	26.0	0.00	5	79	88	2,730	9	85
H-42	R12/mineral oil	3.5	1	0	0	0	0	24.5	<0.1	2	430	21	750	13	500
H-43	R22/mineral oil	3.0	0	0	0	0	1	15.2	<0.1	4	3,480	350	32,800	0	5,120
H-44	R123/mineral oil	3.5	1	0	0	0	0	29.7	0.00	0.3	63	26	410	0	11
H-45	R134a/mixed ester	2.5	1	0	0	0	1	20.6	0.00	0	12	0	0	1,760	3,380
H-46	R134a/branched ester	2.5	0	0	0	0	0	15.2	0.00	0.6	19	12	16	1,740	3,080
H-47	R152a/alkylbenzene	3.5	2	0	0	0	0	17.4	<0.1	14	2,180	0	9	2,390	330
H-48	R32/mixed ester	2.5	2	0	0	1	1	15.2	0.35	0.4	9,570	0	0	12,000	12,400
H-49	R32/branched ester	2.5	0	0	0	0	0	17.2	0.00	13	8,250	0	0	5,390	9,730
H-50	R124/alkylbenzene	2.5	0	0	0	0	0	30.3	0.00	0.2	87	8	140	110	640
H-51	R125/mixed ester	2.5	0	0	0	0	0	19.7	0.10	1	10	0	11	2,420	3,180
H-52	R125/branched ester	2.5	0	0	0	0	0	20.9	0.00	0.6	8	0	10	2,080	4,080
H-53	R143a/branched ester	2.5	0	0	0	0	0	15.9	0.00	0.6	60	13	51	1,030	3,300

Table H.2. Crush Strength Test Results

Desiccant: H - 3Å Molecular Sieve

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
H-new	None	43.2	43.6	35.6	38.5	34.6	29.4	36.4	42.5	25.5	16.4	10.0	34.6	8.7	51.9	17.2
50 ppm Moisture																
H-11	R11/mineral oil	22.6	30.7	30.6	20.0	33.8	20.8	22.3	23.0	8.1	24.2	10.0	23.6	7.2	38.0	9.2
H-12	R12/mineral oil	26.4	29.6	35.3	32.7	15.0	28.7	19.4	11.2	17.8	27.5	10.0	24.4	8.0	40.4	8.3
H-13	R22/mineral oil	22.6	27.3	27.1	20.2	20.0	18.6	29.4	19.3	30.2	27.3	10.0	24.2	4.5	33.2	15.2
H-14	R123/mineral oil	34.9	19.6	27.0	40.5	29.9	44.5	37.9	19.0	31.4	26.1	10.0	31.1	8.5	48.1	14.1
H-15	R134a/mixed ester	20.0	24.6	17.5	24.3	17.3	16.7	17.6	14.5	16.3	17.4	10.0	18.6	3.4	25.3	11.9
H-16	R134a/branched ester	22.3	19.2	28.4	16.7	21.7	17.2	19.3	11.1	13.5	16.6	10.0	18.6	4.9	28.3	8.9
H-17	R152a/alkylbenzene	17.7	16.4	17.0	15.3	12.7	16.3	16.0	16.3	17.6	11.2	10.0	15.7	2.1	19.9	11.4
H-18	R32/mixed ester	15.5	18.3	10.3	17.3	18.8	13.5	14.2	17.1	16.6	14.8	10.0	15.6	2.6	20.8	10.5
H-19	R32/branched ester	16.4	21.0	19.9	15.4	18.5	17.5	15.8	11.1	14.5	13.7	10.0	16.4	3.0	22.3	10.4
H-20	R124/alkylbenzene	23.9	28.5	25.5	19.4	20.8	24.6	28.7	28.5	28.0	24.9	10.0	25.3	3.3	31.8	18.7
H-21	R125/mixed ester	29.5	27.9	16.1	28.1	25.7	21.2	26.3	22.4	16.5	13.3	10.0	22.7	5.7	34.2	11.2
H-22	R125/branched ester	18.6	28.6	23.7	18.9	12.4	24.5	12.2	21.5	22.5	14.9	10.0	19.8	5.4	30.6	9.0
H-23	R143a/branched ester	16.8	13.5	17.5	10.3	11.6	17.3	23.0	17.7	10.5	18.4	10.0	15.7	4.1	23.8	7.5
1000 ppm Moisture																
H-41	R11/mineral oil	40.6	29.8	23.0	28.4	25.6	24.0	20.4	25.4	13.2	29.2	10.0	26.0	7.1	40.1	11.8
H-42	R12/mineral oil	22.6	18.3	16.0	28.6	23.9	25.8	25.2	17.9	31.8	34.9	10.0	24.5	6.1	36.8	12.2
H-43	R22/mineral oil	29.7	14.9	23.4	15.1	21.0	13.7	9.5	10.2	8.9	6.0	10.0	15.2	7.4	30.1	0.4
H-44	R123/mineral oil	32.1	34.1	30.6	24.1	22.7	40.2	36.9	27.8	27.7	21.2	10.0	29.7	6.2	42.2	17.3
H-45	R134a/mixed ester	23.0	24.4	11.3	17.3	25.8	21.9	17.7	19.2	20.5	25.1	10.0	20.6	4.4	29.5	11.8
H-46	R134a/branched ester	18.0	19.1	20.3	12.3	19.6	13.9	12.5	13.1	14.2	9.0	10.0	15.2	3.8	22.8	7.6
H-47	R152a/alkylbenzene	17.3	12.8	23.8	15.3	22.2	16.1	17.2	16.7	18.0	14.2	10.0	17.4	3.4	24.1	10.6
H-48	R32/mixed ester	17.3	16.2	14.9	11.9	20.6	18.0	9.2	13.2	14.9	15.5	10.0	15.2	3.2	21.6	8.7
H-49	R32/branched ester	22.4	21.4	17.2	18.4	12.9	15.5	14.7	17.0	16.4	15.6	10.0	17.2	2.9	23.0	11.3
H-50	R124/alkylbenzene	26.2	27.6	39.2	26.2	30.6	24.6	34.7	29.7	37.7	26.3	10.0	30.3	5.2	40.7	19.9
H-51	R125/mixed ester	28.7	23.9	15.1	23.4	22.8	13.3	25.0	20.9	11.7	11.9	10.0	19.7	6.1	31.9	7.4
H-52	R125/branched ester	29.7	24.0	20.2	22.6	19.8	15.3	18.5	21.4	22.4	15.5	10.0	20.9	4.2	29.4	12.5
H-53	R143a/branched ester	17.5	13.2	12.6	15.1	22.4	13.7	21.9	14.7	14.3	13.1	10.0	15.9	3.6	23.0	8.7

Table H.4. Gas Chromatography Analysis

Desiccant: H - 3Å Molecular Sieve

Peak ID >> Reten. Time >>		GC Peak Areas											Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
Code		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NGC	CO2					
50 ppm Moisture																		
H-11	R11/mineral oil	264.822										26.639						
H-12	R12/mineral oil		259.376									1.879						
H-13	R22/mineral oil			317.180								12.263	6.351					
H-14	R123/mineral oil					340.444						375						
H-15	R134a/mixed ester							268.629				536						
H-16	R134a/branched ester							289.741				806						
H-17	R152a/alkylbenzene										274.739	981	249	2.517				
H-18	R32/mixed ester				305.725							1.063	9.598		774	1.350		
H-19	R32/branched ester				308.232							370	7.847		545	714		
H-20	R124/alkylbenzene					155.352						134						
H-21	R125/mixed ester						234.063					266						
H-22	R125/branched ester						271.774					1.492						
H-23	R143a/branched ester								16.577			183						
1000 ppm Moisture																		
H-41	R11/mineral oil	209.290										34.050						
H-42	R12/mineral oil		276.250									846						
H-43	R22/mineral oil			317.830								437	1.949					
H-44	R123/mineral oil					315.366						197						
H-45	R134a/mixed ester							253.440				1.274						
H-46	R134a/branched ester							150.189				219						
H-47	R152a/alkylbenzene								286.565			918	294	2.307				
H-48	R32/mixed ester				337.060							617	10.174		1.164			
H-49	R32/branched ester				168.401							795	1.628					
H-50	R124/alkylbenzene					140.723						225						
H-51	R125/mixed ester						139.291					647						140
H-52	R125/branched ester							280.461				355						
H-53	R143a/branched ester									145.071		463						

Appendix I

Desiccant I: Alumina

Table I.1. Summary Test Results

Desiccant; I - Alumina

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
I-New	Note	2.5	0	-	-	-	11.9	-	-	-	2	-	59	-	3,900
50 ppm Moisture															
I-11	R11/mineral oil	2.5	0	0	0	0	12.0	0.00	0.1	1	1	77	3,960	11	800
I-12	R12/mineral oil	3.0	1	0	0	0	9.5	0.00	<0.1	3	10	21	4,630	4	1,550
I-13	R22/mineral oil	6.0	3	0	2	1	10.2	0.00	<0.1	1	9,600	220	20,300	7	5,800
I-14	R123/mineral oil	2.5	1	0	0	0	11.6	0.67	0.3	2	38	33	4,690	0	670
I-15	R134a/mixed ester	2.5	0	0	0	0	10.7	0.00	3.1	0	0	0	20	4,970	33,900
I-16	R134a/branched ester	2.5	0	0	0	0	11.1	0.00	12.8	0	0	2	31	1,880	19,300
I-17	R152a/alkylbenzene	4.5	1	0	0	3	9.3	0.42	4.2	51	410	48	150	1,600	4,320
I-18	R32/mixed ester	7.5	2	0	3	3	14.3	5.30	>30	2,950	10,650	10	19	5,250	4,580
I-19	R32/branched ester	3.5	2	0	0	1	17.7	0.26	20.9	1,250	20,300	12	0	42,600	10,000
I-20	R124/alkylbenzene	2.5	0	0	0	0	12.8	0.08	<0.1	2	65	7	3,650	72	2,840
I-21	R125/mixed ester	3.0	0	0	0	1	9.3	0.00	1.0	0	0	3	36	3,470	29,800
I-22	R125/branched ester	2.5	0	0	0	1	22.7	0.00	2.0	0	4	4	39	2,320	27,100
I-23	R143a/branched ester	2.5	0	0	0	1	8.8	0.00	2.2	0	0	5	105	2,300	19,500
1000 ppm Moisture															
I-41	R11/mineral oil	3.0	1	0	0	2	8.9	0.00	1.6	0	72	110	4,580	230	940
I-42	R12/mineral oil	3.0	1	0	0	0	12.3	0.00	0.1	2	12	45	4,060	80	970
I-43	R22/mineral oil	6.0	3	0	0	1	11.6	0.00	<0.1	9	6,520	740	19,300	76	3,230
I-44	R123/mineral oil	2.5	1	0	0	0	14.1	0.42	0.5	2	77	22	5,000	0	900
I-45	R134a/mixed ester	2.5	0	0	0	2	12.2	0.06	3.8	0	0	4	22	5,060	26,100
I-46	R134a/branched ester	2.5	0	0	0	1	15.1	0.00	12.6	0	12	3	22	2,330	22,400
I-47	R152a/alkylbenzene	5.0	1	0	0	0	16.7	0.84	4.7	7	1,200	10	140	1,830	3,150
I-48	R32/mixed ester	6.0	1	0	0	1	19.6	2.87	>30	4,430	8,310	105	0	52,400	16,900
I-49	R32/branched ester	4.5	2	0	0	1	17.8	3.60	24.8	730	8,140	0	89	15,384	24,100
I-50	R124/alkylbenzene	2.5	0	0	0	0	17.7	0.06	0.1	7	10	28	2,610	30	9,290
I-51	R125/mixed ester	2.5	0	0	0	1	11.3	0.00	14.3	0	0	0	40	3,350	26,500
I-52	R125/branched ester	2.5	0	0	0	0	14.2	0.03	2.2	0	0	4	33	1,860	19,100
I-53	R143a/branched ester	2.5	0	0	0	1	9.3	0.00	3.5	5	160	4	220	4,870	27,600

Table I.2. Crush Strength Test Results

Desiccant: I - Alumina

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
I-New	None	16.3	11.8	15.3	11.8	9.5	10.2	7.6	9.8	8.3	18.2	10.0	11.9	3.6	19.0	4.7
50 ppm Moisture																
I-11	R11/mineral oil	15.4	10.6	13.1	7.1	18.5	16.5	12.2	11.4	8.3	6.7	10.0	12.0	4.0	20.0	4.0
I-12	R12/mineral oil	18.0	6.2	11.6	11.5	5.2	8.2	13.9	6.8	3.6	9.5	10.0	9.5	4.4	18.2	0.7
I-13	R22/mineral oil	6.5	14.8	10.1	11.8	15.4	14.5	4.6	7.6	6.9	9.5	10.0	10.2	3.8	17.8	2.5
I-14	R123/mineral oil	8.0	8.4	22.4	6.0	16.8	11.4	10.6	9.2	11.8	11.0	10.0	11.6	4.8	21.1	2.0
I-15	R134a/mixed ester	15.1	13.6	6.5	12.5	8.3	6.9	17.6	5.8	9.8	10.6	10.0	10.7	4.0	18.6	2.7
I-16	R134a/branched ester	11.9	18.4	8.0	9.0	5.4	10.3	13.8	11.1	11.8	11.4	10.0	11.1	3.5	18.1	4.2
I-17	R152a/alkylbenzene	6.5	7.3	7.2	9.2	8.4	13.3	11.0	10.4	9.1	10.9	10.0	9.3	2.1	13.5	5.1
I-18	R32/mixed ester	17.9	13.7	16.5	10.4	10.2	21.1	9.1	17.4	9.2	17.6	10.0	14.3	4.3	23.0	5.6
I-19	R32/branched ester	20.9	21.6	12.9	16.5	18.0	9.0	19.8	16.9	24.1		9.0	17.7	4.6	27.0	8.5
I-20	R124/alkylbenzene	13.6	12.1	8.4	17.4	18.7	8.8	14.7	11.1	10.4	12.3	10.0	12.8	3.4	19.6	5.9
I-21	R125/mixed ester	17.0	5.6	7.4	10.9	8.1	13.8	11.1	4.7	4.8	9.7	10.0	9.3	4.0	17.4	1.3
I-22	R125/branched ester	15.2	15.5	8.6	12.4	11.7	15.4	13.8	20.5	100.6	13.5	10.0	22.7	27.5	77.8	-32.4
I-23	R143a/branched ester	10.9	10.6	9.8	7.7	17.0	8.2	9.0	4.8	5.8	4.3	10.0	8.8	3.7	16.2	1.4
1000 ppm Moisture																
I-41	R11/mineral oil	9.9	3.5	4.4	9.1	12.5	7.5	9.5	15.8	8.7	7.8	10.0	8.9	3.6	16.0	1.7
I-42	R12/mineral oil	23.0	12.6	20.1	11.5	4.7	10.9	10.8	8.3	8.9	12.4	10.0	12.3	5.4	23.2	1.5
I-43	R22/mineral oil	8.8	20.5	16.7	21.3	10.4	9.6	8.5	11.6	2.3	7.9	10.0	11.8	6.0	23.7	-0.2
I-44	R123/mineral oil	9.9	22.0	9.9	9.1	12.4	15.9	23.1	15.2	9.7	13.7	10.0	14.1	5.1	24.2	4.0
I-45	R134a/mixed ester	12.5	11.8	10.1	11.4	13.6	8.7	12.5	8.4	18.5	14.9	10.0	12.2	3.0	18.2	6.2
I-46	R134a/branched ester	19.6	13.6	9.3	11.5	16.2	17.8	19.8	14.7	14.2	14.5	10.0	15.1	3.4	21.8	8.4
I-47	R152a/alkylbenzene	7.8	17.9	22.2	21.1	22.5	21.0	8.7	15.2	17.9	12.8	10.0	16.7	5.4	27.6	5.9
I-48	R32/mixed ester	16.2	17.8	15.6	21.9	22.4	16.7	21.5	32.2	14.6	17.5	10.0	19.6	5.2	30.1	9.2
I-49	R32/branched ester	16.1	30.1	17.0	22.0	28.5	18.4	14.1	10.1	14.0	7.2	10.0	17.8	7.4	32.5	3.0
I-50	R124/alkylbenzene	23.4	28.6	6.4	21.3	16.6	15.8	23.8	17.9	11.4	12.0	10.0	17.7	6.7	31.2	4.3
I-51	R125/mixed ester	20.1	5.1	16.5	14.3	9.3	10.5	9.5	7.2	10.9	9.5	10.0	11.3	4.5	20.2	2.3
I-52	R125/branched ester	28.5	13.4	14.8	12.2	9.3	8.0	15.5	15.2	11.8	13.3	10.0	14.2	5.6	25.4	3.0
I-53	R143a/branched ester	9.3	19.3	9.1	15.1	5.8	9.6	5.5	6.2	3.8		9.0	9.3	5.0	19.3	-0.7

Table I.4. Gas Chromatography Analysis

Desiccant: I - Alumina

Code	Peak ID >> Reten. Time >>	GC Peak Areas													CO2	NCG	R-152a	R-143a	R-134a	R-125	R-124	R-123	R-32	R-22	R-12	R-11																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Appendix J

Desiccant J: Alumina

Table J.1. Summary Test Results

Desiccant; J - Alumina

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
J-New	None	2.5	0	-	-	-	22.6	-	-	-	7	-	56	-	155
50 ppm Moisture															
J-11	R11/mineral oil	2.5	1	0	0	0	22.3	0.00	<0.1	2	4	46	3,120	0	600
J-12	R12/mineral oil	3.5	0	0	0	0	33.4	0.00	<0.1	3	64	12	3,910	250	690
J-13	R22/mineral oil	6.0	3	0	0	1	22.2	0.00	<0.1	16	5,480	880	14,300	220	4,070
J-14	R123/mineral oil	2.5	0	0	0	0	20.7	0.48	<0.1	2	51	19	3,810	6	120
J-15	R134a/mixed ester	2.5	0	0	0	1	21.4	0.00	2.1	0	0	3	11	3,990	19,600
J-16	R134a/branched ester	2.5	0	0	0	1	19.4	0.00	1.9	0	0	3	14	2,580	16,300
J-17	R152a/alkylbenzene	5.0	0	0	0	1	29.0	1.13	2.8	28	220	160	66	2,900	2,660
J-18	R32/mixed ester	7.5	3	0	3	3	25.1	1.34	>30	4,990	4,940	59	59	67,600	60,200
J-19	R32/branched ester	4.5	2	0	0	1	25.8	0.00	>30	1,080	9,530	0	26	15,800	12,700
J-20	R124/alkylbenzene	2.5	0	0	0	0	31.8	0.00	0.1	2	45	8	2,610	17	6,820
J-21	R125/mixed ester	2.5	0	0	0	1	21.8	0.00	7.2	0	0	0	27	2,690	15,200
J-22	R125/branched ester	2.5	0	0	0	1	24.4	0.00	2.1	0	0	3	0	2,110	13,300
J-23	R143a/branched ester	2.5	0	0	0	1	27.1	0.00	4.4	0	0	7	48	1,780	14,600
1000 ppm Moisture															
J-41	R11/mineral oil	2.5	1	0	0	0	22.4	0.00	0.3	2	8	34	3,310	0	470
J-42	R12/mineral oil	3.0	0	0	0	0	30.5	0.00	<0.1	1	6	30	3,580	80	800
J-43	R22/mineral oil	5.5	2	3	0	2	17.2	0.48	<0.1	5	4,630	420	13,300	260	3,300
J-44	R123/mineral oil	2.5	0	0	0	0	20.5	0.57	<0.1	2	120	24	3,980	0	210
J-45	R134a/mixed ester	2.5	0	0	0	1	16.6	0.06	2.8	0	0	0	22	5,050	22,400
J-46	R134a/branched ester	2.5	0	0	0	1	23.7	0.00	5.9	0	13	3	49	4,670	12,000
J-47	R152a/alkylbenzene	5.0	0	0	0	0	23.6	0.78	2.0	1	420	9	0	3,260	3,790
J-48	R32/mixed ester	7.5	3	0	3	3	25.0	1.60	>30	4,960	4,520	110	58	75,800	56,200
J-49	R32/branched ester	4.5	2	0	0	1	29.4	5.90	>30	1,300	11,900	0	70	23,600	44,600
J-50	R124/alkylbenzene	2.5	0	0	0	0	27.9	0.00	<0.1	2	35	7	2,470	93	7,000
J-51	R125/mixed ester	2.5	0	0	0	0	14.4	0.00	12.7	0	0	0	43	7,720	20,400
J-52	R125/branched ester	2.5	0	0	0	1	21.5	0.00	1.9	0	0	2	9	2,000	11,600
J-53	R143a/branched ester	2.5	0	0	0	1	24.4	0.06	4.2	0	3	4	15	1,970	15,400

Table J.2. Crush Strength Test Results

Desiccant: J - Alumina

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
J-New	None	27.8	23.6	26.2	23.7	23.8	31.2	17.5	24.8	14.8	12.4	10.0	22.6	5.9	34.4	10.8
50 ppm Moisture																
J-11	R11/mineral oil	25.9	24.3	27.5	18.6	22.5	19.7	14.2	18.7	18.2	33.0	10.0	22.3	5.5	33.3	11.2
J-12	R12/mineral oil	38.6	31.8	24.6	39.1	26.3	40.8	32.6	32.1	38.1	30.0	10.0	33.4	5.6	44.6	22.2
J-13	R22/mineral oil	19.9	26.1	16.9	27.2	35.3	23.0	21.5	16.5	15.3	20.3	10.0	22.2	6.1	34.3	10.1
J-14	R123/mineral oil	30.3	26.5	30.9	20.5	25.2	17.4	15.8	10.8	15.0	14.2	10.0	20.7	7.1	34.9	6.4
J-15	R134a/mixed ester	33.1	25.7	20.2	17.2	30.2	18.7	21.3	12.7	19.1	16.1	10.0	21.4	6.4	34.2	8.6
J-16	R134a/branched ester	20.6	12.8	21.5	24.6	21.7	24.2	13.8	20.4	18.9	15.9	10.0	19.4	4.1	27.6	11.3
J-17	R152a/alkylbenzene	27.4	28.7	14.1	30.3	19.8	24.8	37.1	45.4	42.2	20.5	10.0	29.0	10.1	49.1	8.9
J-18	R32/mixed ester	27.1	27.7	30.6	24.3	27.5	24.7	16.1	32.8	21.8	18.0	10.0	25.1	5.3	35.6	14.5
J-19	R32/branched ester	28.3	14.6	26.6	39.0	31.0	25.5	23.3	16.9	32.8	19.9	10.0	25.8	7.5	40.7	10.8
J-20	R124/alkylbenzene	44.3	35.0	30.4	25.9	29.4	31.5	28.4	43.8	26.4	22.9	10.0	31.8	7.2	46.3	17.3
J-21	R125/mixed ester	23.3	17.9	31.9	18.9	11.2	18.7	19.5	16.8	34.3	25.8	10.0	21.8	7.1	36.0	7.7
J-22	R125/branched ester	19.7	28.0	34.2	22.9	26.7	26.4	19.6	25.4	21.6	19.8	10.0	24.4	4.7	33.8	15.1
J-23	R143a/branched ester	19.5	37.9	34.0	30.1	26.2	20.2	19.3	25.2	27.8	31.1	10.0	27.1	6.3	39.8	14.5
1000 ppm Moisture																
J-41	R11/mineral oil	18.2	17.6	17.4	21.4	20.1	23.4	32.8	25.3	28.0	20.2	10.0	22.4	5.0	32.5	12.4
J-42	R12/mineral oil	25.1	31.6	41.5	27.5	31.5	30.0	26.6	47.4	19.2	25.0	10.0	30.5	8.3	47.1	13.9
J-43	R22/mineral oil	11.4	10.7	14.0	19.5	29.3	23.4	15.1	16.0	16.1	16.3	10.0	17.2	5.6	28.4	5.9
J-44	R123/mineral oil	18.8	22.6	21.3	20.1	21.5	23.0	17.0	20.5	25.1	14.7	10.0	20.5	3.0	26.5	14.4
J-45	R134a/mixed ester	14.9	15.1	15.7	12.7	15.8	19.2	14.5	15.6	25.6	16.5	10.0	16.6	3.6	23.7	9.4
J-46	R134a/branched ester	13.7	16.9	18.1	29.0	33.4	24.6	30.3	24.9	22.8	22.9	10.0	23.7	6.2	36.1	11.2
J-47	R152a/alkylbenzene	12.4	20.6	25.1	16.9	24.8	23.1	31.6	28.3	29.2	24.3	10.0	23.6	5.8	35.2	12.1
J-48	R32/mixed ester	15.7	18.9	36.2	22.7	25.4	24.2	29.0	22.3	31.3	24.1	10.0	25.0	6.0	36.9	13.1
J-49	R32/branched ester	19.6	30.0	32.5	41.0	18.9	34.4	20.6	42.4	31.7	22.5	10.0	29.4	8.7	46.7	12.0
J-50	R124/alkylbenzene	27.7	26.9	23.7	21.6	25.3	20.9	36.0	38.5	29.2	29.5	10.0	27.9	5.7	39.4	16.5
J-51	R125/mixed ester	21.4	14.4	17.6	11.8	8.2	10.0	20.3	17.2	11.7	11.2	10.0	14.4	4.5	23.4	5.3
J-52	R125/branched ester	21.9	22.7	16.7	16.0	21.1	29.6	23.4	19.6	22.9	21.4	10.0	21.5	3.8	29.1	13.9
J-53	R143a/branched ester	25.6	19.9	39.7	24.4	26.2	19.1	18.1	24.6	21.3	25.0	10.0	24.4	6.1	36.6	12.2

Table J.3. Acid Anion Analysis

Desiccant: J - Alumina

Code	System Fluids	Anion Concentration (PPM)																				Number Of Unknowns	
		Formate		Acetate		Propanoate		Butyrate		Pentanoate		Hexanoate		Heptanoate		2Ethylhexanoate		Benzoate		Sulfate			
		Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic	Liq	Desic		
J-New	None		64		91																17	1	
50 ppm Moisture																							
J-11	R11/mineral oil	0	533		64																		
J-12	R12/mineral oil	130	687	10																			
J-13	R22/mineral oil	211	4070	12																			
J-14	R123/mineral oil	1	35	5	81																		
J-15	R134a/mixed ester	204	275		33			25	49	3596	19265											3	
J-16	R134a/branched ester	174	826	4	14	33				2370	15437											1	
J-17	R152a/alkylbenzene	34	18	1445	1709							1416	929									1	
J-18	R32/mixed ester	3966	2208					39645		63651	18328											2	
J-19	R32/branched ester	5179	4407			3517				6268	6688	842		1333								1	
J-20	R124/alkylbenzene	8	655	9				142		2695	14679											2	
J-21	R125/mixed ester		456		64					2014	12642											1	
J-22	R125/branched ester	78	650			14																1	
J-23	R143a/branched ester	90	706	6	17	20				1667	13855											1	
1000 ppm Moisture																							
J-41	R11/mineral oil	0	466																			1	
J-42	R12/mineral oil	4	740	7	54																	1	
J-43	R22/mineral oil	240	3396	72																		1	
J-44	R123/mineral oil	0	26		187																	3	
J-45	R134a/mixed ester	16	294		40			40		5039	22011											1	
J-46	R134a/branched ester	203	477			7				4458	11571											1	
J-47	R152a/alkylbenzene	13	76	1368	2624							1884	1091									2	
J-48	R32/mixed ester	4312	2131		37554					71348	16206			170								1	
J-49	R32/branched ester	5061	7334	5409						11058	36140	1565	1282									2	
J-50	R124/alkylbenzene	8	647	12																		1	
J-51	R125/mixed ester	9	51	3	55							73										1	
J-52	R125/branched ester	114	536	1		15				1871	11063											1	
J-53	R143a/branched ester	92	753		34	17				1866	14663											1	

Table J.4. Gas Chromatography Analysis

Desiccant: J - Alumina

Code	Peak ID >> Reten. Time >>	GC Peak Areas													Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn6
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2							
		2.00	1.40	0.70	12.50	3.00	0.90	1.18	1.00	1.38	0.35	0.55								
50 ppm Moisture																				
J-11	R11/mineral oil	272.81										478								
J-12	R12/mineral oil	316.353										454								
J-13	R22/mineral oil		244.699									10,990	21,031							
J-14	R123/mineral oil				317.495							146	58		1,533					
J-15	R134a/mixed ester										139.558	115	315							
J-16	R134a/branched ester										216.437	30,226	435							
J-17	R152a/alkylbenzene											1,592	1,333							
J-18	R32/mixed ester				152.908							13,315	7,990		437	1,615				
J-19	R32/branched ester											1,596	15,752							
J-20	R124/alkylbenzene					136.652						1,471	118							
J-21	R125/mixed ester						261.265					1,779	889							
J-22	R125/branched ester						265.390					9,141	946							
J-23	R143a/branched ester											1,398	658							
1000 ppm Moisture																				
J-41	R11/mineral oil	70.455										97,850								
J-42	R12/mineral oil		308.832									226								
J-43	R22/mineral oil			246.708								9,741	22,238						1,168	
J-44	R123/mineral oil					310.104						122	244		1,782					
J-45	R134a/mixed ester										145.262	317	375							
J-46	R134a/branched ester										219.374	27,807	559							
J-47	R152a/alkylbenzene											9,760	27,289	649	715					
J-48	R32/mixed ester			157.676								12,274	7,535		937	1,583				
J-49	R32/branched ester					414.77						19,093	9,083		234	2,570				
J-50	R124/alkylbenzene						135.706					349	116							
J-51	R125/mixed ester											419	754							
J-52	R125/branched ester											253	772							
J-53	R143a/branched ester											248	562		158					

Appendix K

Desiccant K: Silica Gel

Table K.1. Summary Test Results

Desiccant; K - Silica Gel

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
K-New	None	2.5	0	-	-	-	76.4	-	-	-	3	-	14	-	0
50 ppm Moisture															
K-11	R11/mineral oil	3.0	3	0	0	1	90.0	0.00	<0.1	2	890	1,520	7,060	0	100
K-12	R12/mineral oil	2.5	0	0	0	0	50.8	0.00	<0.1	8	330	600	320	15	10
K-13	R22/mineral oil	2.5	1	0	0	2	61.9	0.00	0.1	2	1,280	330	660	0	390
K-14	R123/mineral oil	2.5	2	0	0	0	68.5	0.00	0.1	2	19	37	230	33	50
K-15	R134a/mixed ester	2.5	1	0	0	2	85.3	0.00	21.1	0	0	0	0	24,000	20,900
K-16	R134a/branched ester	2.5	0	0	3	3	60.3	0.00	15.7	0	0	5	0	15,100	11,900
K-17	R152a/alkylbenzene	2.5	2	0	0	0	36.2	0.00	<0.1	68	7,660	0	4	760	0
K-18	R32/mixed ester	2.5	0	0	0	3	11.9	0.24	14.3	4	11	3	0	22,100	11,100
K-19	R32/branched ester	2.5	1	0	0	2	12.3	0.00	17.8	2	44	0	0	18,500	13,400
K-20	R124/alkylbenzene	2.5	0	1	0	2	74.1	0.00	<0.1	3	20	17	55	130	9
K-21	R125/mixed ester	3.0	1	0	0	3	66.9	0.00	12.2	0	0	13	11	18,400	24,400
K-22	R125/branched ester	2.5	1	0	1	1	97.9	0.00	13.6	0	22	7	0	19,200	14,200
K-23	R143a/branched ester	2.5	1	0	0	2	47.7	0.00	13.7	1	0	33	32	12,900	8,310
1000 ppm Moisture															
K-41	R11/mineral oil	3.0	3	0	0	1	91.2	0.00	0.1	1	810	1,570	6,970	42	85
K-42	R12/mineral oil	2.5	2	0	0	1	86.1	0.00	<0.1	3	360	570	320	55	5
K-43	R22/mineral oil	2.5	0	0	0	1	66.5	0.00	<0.1	45	1,500	670	350	76	1,450
K-44	R123/mineral oil	2.5	2	0	0	0	45.2	0.16	<0.1	2	12	88	230	3	9
K-45	R134a/mixed ester	2.5	0	0	1	2	9.8	0.00	16.5	0	0	5	11	17,600	18,600
K-46	R134a/branched ester	3.0	0	0	2	1	51.6	0.00	21.6	0	0	5	9	14,000	14,200
K-47	R152a/alkylbenzene	2.5	2	0	0	0	48.5	0.05	<0.1	22	3,460	5	0	830	300
K-48	R32/mixed ester	2.5	1	0	1	1	28.0	0.22	17.1	94	60	7	0	480	14,000
K-49	R32/branched ester	2.5	1	0	2	1	50.5	4.45	18.2	110	283	19	0	10,900	12,700
K-50	R124/alkylbenzene	2.5	0	0	0	0	75.6	0.13	0.1	14	49	28	72	17	69
K-51	R125/mixed ester	2.5	0	0	1	2	58.0	0.00	25.6	0	0	10	0	16,800	16,400
K-52	R125/branched ester	2.5	0	0	1	1	65.9	0.66	>30	0	0	6	0	11,500	19,100
K-53	R143a/branched ester	2.5	0	0	3	2	56.5	0.00	23.0	0	59	25	93	11,900	27,100

Table K.2. Crush Strength Test Results

Desiccant: K - Silica Gel

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
K-New	None	79.5	74.4	44.3	105.0	105.9	118.4	57.9	36.7	58.2	83.7	10.0	76.4	27.5	131.4	21.4
50 ppm Moisture																
K-11	R11/mineral oil	63.2	83.8	59.5	95.1	118.0	82.6	111.8	88.8	82.4	114.3	10.0	90.0	20.2	130.4	49.5
K-12	R12/mineral oil	40.1	65.5	36.2	50.2	42.6	52.0	58.0	44.4	83.5	35.9	10.0	50.8	14.9	80.6	21.0
K-13	R22/mineral oil	87.6	60.5	48.7	60.1	24.1	59.6	98.5	58.7	74.7	46.1	10.0	61.9	21.2	104.2	19.5
K-14	R123/mineral oil	48.8	51.5	82.7	59.5	96.1	63.6	86.4	81.5	35.0	79.7	10.0	68.5	19.7	107.8	29.1
K-15	R134a/mixed ester	95.8	105.0	30.2	113.5	59.0	75.4	69.6	106.6	104.1	93.7	10.0	85.3	26.3	138.0	32.6
K-16	R134a/branched ester	110.1	9.7	108.7	115.3	12.0	79.6	61.3	55.5	45.9	4.7	10.0	60.3	42.7	145.7	-25.2
K-17	R152a/alkylbenzene	66.3	49.2	12.4	19.3	66.3	17.8	10.1	76.4	21.6	22.9	10.0	36.2	25.5	87.3	-14.8
K-18	R32/mixed ester	10.8	7.3	14.5	11.3	7.0	19.8	14.5	18.4	8.5	6.9	10.0	11.9	4.7	21.4	2.4
K-19	R32/branched ester	8.5	11.5	6.1	14.1	22.2	11.1	8.7	14.3	16.5	10.2	10.0	12.3	4.7	21.6	3.0
K-20	R124/alkylbenzene	87.2	118.8	106.5	106.8	49.3	107.6	47.4	54.5	20.4	42.0	10.0	74.1	35.0	144.1	4.0
K-21	R125/mixed ester	10.6	17.1	108.9	115.2	95.5	89.4	90.6	69.1	13.6	59.2	10.0	66.9	40.2	147.3	-13.5
K-22	R125/branched ester	100.8	98.8	91.8	111.1	111.0	106.2	65.4	96.8	111.4	83.8	10.0	97.7	14.5	126.8	68.7
K-23	R143a/branched ester	35.4	15.2	90.8	60.8	11.6	30.9	83.7	45.2	60.6	42.3	10.0	47.7	26.5	100.6	5.3
1000 ppm Moisture																
K-41	R11/mineral oil	65.4	71.0	105.3	104.3	87.4	97.8	84.7	115.1	100.6	79.9	10.0	91.2	16.1	123.3	59.0
K-42	R12/mineral oil	89.5	64.8	81.5	95.8	63.1	95.6	72.9	108.8	94.5	94.3	10.0	86.1	15.0	116.1	56.1
K-43	R22/mineral oil	5.2	101.5	68.3	115.0	87.1	17.9	99.2	79.5	17.1	74.6	10.0	66.5	39.3	145.1	-12.0
K-44	R123/mineral oil	57.0	53.0	48.8	28.3	14.2	41.1	70.1	54.6	58.1	27.0	10.0	45.2	17.3	79.7	10.7
K-45	R134a/mixed ester	20.3	14.9	11.0	10.0	5.4	5.5	10.3	7.4	6.4	7.1	10.0	9.8	4.7	19.3	0.4
K-46	R134a/branched ester	83.6	61.5	43.4	10.3	80.6	96.8	86.4	40.3	7.7	5.5	10.0	51.6	35.2	122.1	-18.8
K-47	R152a/alkylbenzene	75.1	77.3	34.4	24.7	28.1	56.1	44.1	60.5	62.3	22.6	10.0	48.5	20.6	89.6	7.4
K-48	R32/mixed ester	4.5	4.1	13.0	9.6	94.9	9.9	7.3	61.9	63.0	12.1	10.0	28.0	32.6	93.2	-37.1
K-49	R32/branched ester	7.0	96.6	20.0	113.6	102.4	4.9	114.1	20.0	20.0	6.2	10.0	50.5	49.0	148.4	-47.4
K-50	R124/alkylbenzene	103.6	69.5	87.9	55.8	66.7	76.5	63.6	98.2	54.1	80.0	10.0	75.6	16.9	109.5	41.7
K-51	R125/mixed ester	24.7	13.3	61.1	93.2	16.8	72.1	85.2	90.4	61.4	61.4	10.0	58.0	29.9	117.8	-1.9
K-52	R125/branched ester	65.2	80.3	84.4	86.3	69.6	7.1	67.9	65.8	44.1	87.9	10.0	65.9	24.5	114.9	16.9
K-53	R143a/branched ester	60.1	56.2	95.1	63.7	35.8	38.9	69.0	47.0	62.0	37.1	10.0	56.5	18.1	92.7	20.3

Desiccant: K - Silica Gel

[illegible]

Table K.4. Gas Chromatography Analysis

Desiccant: K - Silica Gel

Peak ID >> Reten. Time >>		GC Peak Areas												Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
Code		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2						
50 ppm Moisture																			
K-11	R11/mineral oil	185,817										32,649	376						
K-12	R12/mineral oil		247,806									1,126							
K-13	R22/mineral oil			300,296								422							
K-14	R123/mineral oil					314,855													
K-15	R134a/mixed ester								268,287			249	42						
K-16	R134a/branched ester								273,748			252	204						
K-17	R152a/alkylbenzene										223,969	431							
K-18	R32/mixed ester				371,106							391	126		889				
K-19	R32/branched ester				187,434							464	145						
K-20	R124/alkylbenzene					267,574						224							
K-21	R125/mixed ester						140,328					272							
K-22	R125/branched ester						265,312					367	202						
K-23	R143a/branched ester								144,616			322							
1000 ppm Moisture																			
K-41	R11/mineral oil	191,608										36,069	236						
K-42	R12/mineral oil		274,188									284							
K-43	R22/mineral oil			278,809								783							
K-44	R123/mineral oil					345,722						140							
K-45	R134a/mixed ester								149,332			154							554
K-46	R134a/branched ester								203,204			38,106							
K-47	R152a/alkylbenzene										212,462	14,955		104					
K-48	R32/mixed ester				378,611							1,278			845				
K-49	R32/branched ester				49,294							17,368	8,282		340				
K-50	R124/alkylbenzene					254,024			336			220							
K-51	R125/mixed ester						140,195					285							
K-52	R125/branched ester						338,667					548	264		2,234				
K-53	R143a/branched ester								259,786			8,979							

Appendix L

Desiccant L: Silica Gel

Table L.1. Summary Test Results

Desiccant; L - Silica Gel

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
L-New	None	2.5	0	-	-	-	22.9	-	-	-	14	-	22	-	0
50 ppm Moisture															
L-11	R11/mineral oil	3.0	3	0	0	1	12.5	0.12	0.9	2	1,040	2,050	6,600	0	100
L-12	R12/mineral oil	2.5	1	0	0	1	13.4	0.00	<0.1	0	290	350	190	4	0
L-13	R22/mineral oil	2.5	2	0	0	2	9.1	0.00	0.1	3	2,620	910	1,240	35	420
L-14	R123/mineral oil	2.5	2	0	0	0	36.3	0.00	<0.1	1	15	35	84	8	16
L-15	R134a/mixed ester	2.5	0	0	2	1	6.7	0.00	19.5	1	0	8	0	17,800	12,600
L-16	R134a/branched ester	2.5	0	0	2	1	24.0	0.09	12.9	0	1	3	4	9,990	13,000
L-17	R152a/alkylbenzene	3.0	3	0	0	1	30.2	0.00	0.1	1430	4,550	28	0	550	9,180
L-18	R32/mixed ester	2.5	0	0	2	2	12.0	0.61	>30	63	600	5	0	19,100	25,600
L-19	R32/branched ester	2.5	1	0	2	1	10.4	0.00	21.7	120	640	14	0	11,400	10,800
L-20	R124/alkylbenzene	2.5	0	0	0	0	30.2	0.43	0.1	13	110	50	43	78	85
L-21	R125/mixed ester	2.7	0	0	2	1	12.9	0.00	>30	0	0	8	0	17,100	16,200
L-22	R125/branched ester	2.5	0	0	1	1	21.8	0.00	17.6	1	21	11	0	12,600	11,500
L-23	R143a/branched ester	2.6	0	0	1	1	16.1	0.00	22.1	8	8	44	21	11,400	2,970
1000 ppm Moisture															
L-41	R11/mineral oil	2.5	3	0	0	1	26.0	0.00	0.1	4	1,210	1,730	10,570	0	53
L-42	R12/mineral oil	2.5	1	1	0	1	17.5	0.00	<0.1	0	490	5	1,600	200	22
L-43	R22/mineral oil	2.5	2	0	0	2	7.6	0.00	<0.1	4	1,640	470	1,000	200	720
L-44	R123/mineral oil	2.5	2	0	0	0	21.5	0.00	<0.1	1	16	56	60	1	25
L-45	R134a/mixed ester	2.6	0	0	2	1	17.0	0.00	17.6	1	17	11	0	14,300	17,500
L-46	R134a/branched ester	2.5	0	0	1	2	11.8	0.00	17.3	0	1	4	6	11,600	9,560
L-47	R152a/alkylbenzene	3.0	2	0	2	0	25.0	0.00	0.1	710	3,610	7	11	380	0
L-48	R32/mixed ester	2.5	1	0	1	1	6.9	0.25	20.2	28	679	8	0	13,800	8,640
L-49	R32/branched ester	2.5	1	0	2	1	11.0	0.12	16.3	120	120	10	0	15,100	15,300
L-50	R124/alkylbenzene	2.5	0	0	0	0	17.9	0.07	<0.1	14	110	48	74	48	82
L-51	R125/mixed ester	2.5	0	0	2	1	35.7	0.00	21.9	0	0	0	0	20,900	16,800
L-52	R125/branched ester	2.5	0	0	1	2	24.2	0.00	15.5	0	0	8	0	13,900	11,800
L-53	R143a/branched ester	2.5	0	0	1	1	13.1	0.00	21.7	12	1	64	28	15,300	6,580

Table L.2. Crush Strength Test Results

Desiccant: L - Silica Gel

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
L-New	None	54.7	60.7	24.9	4.5	5.6	10.0	11.3	31.8	16.6	9.3	10.0	22.9	20.2	63.4	-17.5
50 ppm Moisture																
L-11	R11/mineral oil	16.3	14.5	13.4	17.8	14.7	7.5	7.1	12.6	10.8	10.6	10.0	12.5	3.5	19.6	5.4
L-12	R12/mineral oil	15.2	19.1	9.6	14.7	10.1	8.7	14.6	15.4	9.3	17.6	10.0	13.4	3.7	20.9	6.0
L-13	R22/mineral oil	4.0	7.1	5.4	16.6	7.6	8.1	13.8	13.6	5.4	9.8	10.0	9.1	4.2	17.6	0.7
L-14	R123/mineral oil	50.7	96.8	66.3	12.6	10.9	13.2	44.4	10.9	17.1	39.6	10.0	36.3	29.1	94.4	-21.9
L-15	R134a/ mixed ester	8.5	5.0	5.1	3.6	4.7	3.9	12.7	12.6	5.5	5.0	10.0	6.7	3.4	13.5	-0.2
L-16	R134a/branched ester	17.1	23.6	72.4	22.2	7.4	21.6	8.5	19.2			8.0	24.0	20.5	65.0	-17.0
L-17	R152a/alkylbenzene	33.7	37.7	32.1	33.0	26.2	44.4	22.7	22.8	39.7	9.3	10.0	30.2	10.2	50.6	9.8
L-18	R32/mixed ester	15.4	10.5	14.1	15.3	17.9	7.9	8.2	7.0	11.8		9.0	12.0	3.9	19.8	4.3
L-19	R32/branched ester	11.5	11.5	9.9	8.9	11.1	9.9	7.1	9.9	13.5		9.0	10.4	1.8	14.0	6.7
L-20	R124/alkylbenzene	37.7	94.3	64.3	9.2	8.2	9.9	24.1	5.8	38.2	10.3	10.0	30.2	29.4	88.9	-28.5
L-21	R125/mixed ester	29.0	4.4	5.9	26.4	3.3	17.1	8.2	10.8	12.3	12.0	10.0	12.9	8.8	30.6	-4.7
L-22	R125/branched ester	19.3	50.9	11.8	52.8	13.6	6.0	10.6	28.8	7.8	16.6	10.0	21.8	17.1	56.0	-12.4
L-23	R143a/branched ester	7.2	24.9	6.3	12.2	13.9	10.5	10.0	31.2	20.4	23.9	10.0	16.1	8.5	33.0	-0.9
1000 ppm Moisture																
L-41	R11/mineral oil	15.0	15.1	70.2	12.6	13.5	57.6	18.8	25.1	18.8	13.6	10.0	26.0	20.5	67.1	-15.0
L-42	R12/mineral oil	37.3	16.0	20.3	20.2	4.7	10.1	25.1	12.7	5.7	22.9	10.0	17.5	9.9	37.2	-2.2
L-43	R22/mineral oil	9.6	5.3	5.6	6.3	12.5	9.5	4.3	9.8	9.4	4.0	10.0	7.6	2.9	13.4	1.9
L-44	R123/mineral oil	14.5	12.7	17.8	24.9	22.8	11.8	9.7	47.1	27.8	26.1	10.0	21.5	11.1	43.7	-0.6
L-45	R134a/ mixed ester	24.9	7.3	15.6	11.7	26.9	33.3	16.5	6.4	9.2	18.5	10.0	17.0	9.0	35.0	-0.9
L-46	R134a/branched ester	12.2	10.0	18.0	10.1	10.7	5.8	10.5	7.4	22.8	10.2	10.0	11.8	5.0	21.8	1.7
L-47	R152a/alkylbenzene	20.3	11.1	11.4	81.0	8.6	22.2	32.8	27.5	8.3	26.7	10.0	25.0	21.5	68.0	-18.0
L-48	R32/mixed ester	5.6	5.3	7.0	6.4	9.8	9.8	3.4	9.9	6.8	5.1	10.0	6.9	2.3	11.4	2.4
L-49	R32/branched ester	9.1	8.1	8.3	10.7	14.2	6.8	17.7	13.3	12.2	9.4	10.0	11.0	3.4	17.7	4.3
L-50	R124/alkylbenzene	21.0	17.5	8.8	8.5	15.5	70.6	4.3	5.4	13.2	13.8	10.0	17.9	19.3	56.4	-20.7
L-51	R125/mixed ester	22.0	9.7	20.6	27.2	26.9	85.7	75.8	33.6	27.6	27.6	10.0	35.7	24.7	85.0	-13.7
L-52	R125/branched ester	33.6	52.2	14.4	29.8	6.7	16.0	27.3	11.0	22.5	28.5	10.0	24.2	13.2	50.7	-2.3
L-53	R143a/branched ester	13.8	16.7	20.6	19.7	13.0	8.3	8.5	8.0	9.0		9.0	13.1	5.0	23.1	3.1

Table L.4. Gas Chromatography Analysis

Desiccant: L - Silica Gel

Code	Peak ID >> Reten. Time >>	GC Peak Areas													Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2							
	50 ppm Moisture																			
L-11	R11/mineral oil	281,709											604	618						355
L-12	R12/mineral oil		305,879										434	120						
L-13	R22/mineral oil			284,692									630							
L-14	R123/mineral oil					245,003							276							
L-15	R134a/ mixed ester												240							
L-16	R134a/branched ester												231	66						
L-17	R152a/alkylbenzene												33,556							
L-18	R32/ mixed ester				198,528								12,700	264		1,211				
L-19	R32/branched ester			153,162									798	169						
L-20	R124/alkylbenzene						231,339						245			376				
L-21	R125/ mixed ester							269,180					431	97						
L-22	R125/branched ester							278,908					750	154						
L-23	R143a/branched ester									193,243			20,380							
	1000 ppm Moisture																			
L-41	R11/mineral oil	266,552											1,896	582						
L-42	R12/mineral oil		288,433										518							
L-43	R22/mineral oil			303,640									856							
L-44	R123/mineral oil					314,794							272							
L-45	R134a/ mixed ester									246,080			1,209							
L-46	R134a/branched ester												29,358	211						
L-47	R152a/alkylbenzene												218,307	26,348						
L-48	R32/ mixed ester				388,526								1,233			974				
L-49	R32/branched ester			216,541									287	176		255				
L-50	R124/alkylbenzene						225,090			168			163							
L-51	R125/ mixed ester							272,097					1,988							
L-52	R125/branched ester							224,709					2,627	182						
L-53	R143a/branched ester									264,763			606	185						

Appendix M

Desiccant M: 3Å Core with Carbon

Table M.1. Summary Test Results

Desiccant; M - 3Å Carbon Core

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion in Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion in Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid in Liquid (ppm)	Org Acid on Desic (ppm)
M-New	None	2.5	0	-	-	-	4.9	-	-	-	9	-	71	-	0
50 ppm Moisture															
M-11	R11/mineral oil	3.0	1	0	0	0	5.3	0.00	0.5	6	37	140	3,310	0	150
M-12	R12/mineral oil	3.0	2	0	2	1	7.3	0.09	<0.1	5	66	33	3,300	3	940
M-13	R22/mineral oil	5.5	3	0	0	1	4.1	0.00	<0.1	21	4,730	340	15,700	240	2,170
M-14	R123/mineral oil	2.5	0	0	0	0	5.5	0.34	0.5	84	210	94	2,740	0	0
M-15	R134a/mixed ester	2.5	0	0	0	1	6.1	0.05	3.4	0	0	20	9	6,210	14,000
M-16	R134a/branched ester	2.5	2	0	1	1	8.2	0.00	3.9	24	0	3	8	8,620	11,700
M-17	R152a/alkylbenzene	4.5	1	0	0	1	7.1	0.69	1.9	26	940	44	0	2,990	570
M-18	R32/mixed ester	7.0	2	0	0	1	5.8	1.47	>30	4,540	9,080	5	45	39,700	28,800
M-19	R32/branched ester	3.0	2	0	2	3	4.7	1.70	>30	2,140	6,750	38	30	11,500	14,200
M-20	R124/alkylbenzene	2.5	0	0	0	0	6.5	0.05	<0.1	8	240	19	1,470	10	2,880
M-21	R125/mixed ester	2.5	1	0	1	1	7.9	0.00	5.9	2	11	6	14	9,970	17,600
M-22	R125/branched ester	2.5	2	0	0	1	6.3	0.00	4.3	0	0	8	9	4,290	16,600
M-23	R143a/branched ester	2.5	0	0	0	1	6.1	0.21	4.5	0	0	7	10	4,260	11,500
1000 ppm Moisture															
M-41	R11/mineral oil	3.0	1	0	0	0	5.7	0.00	0.2	3	40	130	3,980	0	95
M-42	R12/mineral oil	3.0	2	0	0	1	8.0	0.00	<0.1	8	75	64	3,460	230	1,060
M-43	R22/mineral oil	5.5	3	0	0	1	11.0	0.00	<0.1	49	5,160	600	17,900	60	1,340
M-44	R123/mineral oil	2.5	0	0	0	0	4.9	0.30	1.2	1	160	30	2,700	4	0
M-45	R134a/mixed ester	2.5	0	0	0	1	7.4	0.13	3.1	0	1	33	9	5,020	15,900
M-46	R134a/branched ester	2.5	2	0	1	1	9.6	0.00	3.3	0	1	2	0	3,510	11,400
M-47	R152a/alkylbenzene	4.5	1	0	0	1	5.1	1.29	0.7	170	2,390	79	18	4,810	1,350
M-48	R32/mixed ester	7.0	2	0	0	1	6.4	0.24	>30	3,280	9,980	10	40	26,900	27,000
M-49	R32/branched ester	3.0	2	0	2	3	3.9	0.00	>30	1,890	9,640	0	38	19,000	18,200
M-50	R124/alkylbenzene	2.5	0	0	0	0	6.5	0.00	0.9	7	230	14	1,730	20	3,830
M-51	R125/mixed ester	2.5	2	0	0	1	6.0	0.00	10.3	0	0	0	0	6,660	13,000
M-52	R125/branched ester	2.5	2	0	1	1	7.5	0.00	9.9	0	0	5	20	3,830	11,900
M-53	R143a/branched ester	2.5	0	0	0	1	6.9	0.17	6.4	0	0	5	9	3,840	10,500

Table M.2. Crush Strength Test Results

Desiccant: M - 3Å Carbon Core

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
M-New	None	2.5	6.9	7.6	1.0	3.5	9.3	2.6	6.2	7.2	1.8	10.0	4.9	2.9	10.7	-0.9
50 ppm Moisture																
M-11	R11/mineral oil	3.3	4.3	7.4	6.2							4.0	5.3	1.8	9.0	1.6
M-12	R12/mineral oil	6.2	8.9	7.8	9.5	4.2						5.0	7.3	2.1	11.6	3.0
M-13	R22/mineral oil	4.7	3.8	3.7								3.0	4.1	0.6	5.2	3.0
M-14	R123/mineral oil	3.7	7.5	5.3	8.2	4.2	4.0					6.0	5.5	1.9	9.3	1.6
M-15	R134a/mixed ester	6.1	5.5	7.2	5.9	5.8						5.0	6.1	0.7	7.4	4.8
M-16	R134a/branched ester	5.8	6.3	15.1	5.4							4.0	8.2	4.6	17.4	-1.1
M-17	R152a/alkylbenzene	6.3	7.8									2.0	7.1			
M-18	R32/mixed ester	6.4	7.6	5.5	4.0	5.8	5.5					6.0	5.8	1.2	8.2	3.4
M-19	R32/branched ester	4.5	2.0	6.6	5.1	1.5	3.4	7.8	3.6	7.6	4.8	10.0	4.7	2.2	9.0	0.4
M-20	R124/alkylbenzene	9.1	7.7	3.7	5.6							4.0	6.5	2.4	11.3	1.8
M-21	R125/mixed ester	7.6	8.3	7.0	6.9	8.8	6.8	10.4	7.2			8.0	7.9	1.2	10.4	5.4
M-22	R125/branched ester	8.5	5.1	9.3	8.7	5.7	3.6	3.5				7.0	6.3	2.5	11.3	1.4
M-23	R143a/branched ester	9.4	6.9	5.5	3.7	8.6	3.2	3.7	7.4			8.0	6.1	2.4	10.8	1.3
1000 ppm Moisture																
M-41	R11/mineral oil	4.3	4.4	6.4	6.2	4.7	8.2					6.0	5.7	1.5	8.8	2.6
M-42	R12/mineral oil	9.0	11.8	6.1	6.1	7.0						5.0	8.0	2.4	12.9	3.1
M-43	R22/mineral oil	13.9	6.7	14.9	8.4							4.0	11.0	4.0	19.0	2.9
M-44	R123/mineral oil	3.2	8.3	7.0	3.5	2.4	4.8					6.0	4.9	2.3	9.5	0.2
M-45	R134a/mixed ester	7.0	5.5	13.1	5.1	6.4						5.0	7.4	3.3	13.9	0.9
M-46	R134a/branched ester	4.2	6.4	3.6	5.6	16.0	17.0	14.7				7.0	9.6	6.0	21.6	-2.3
M-47	R152a/alkylbenzene	4.8	7.4	4.8	4.7	3.6						5.0	5.1	1.4	7.9	2.3
M-48	R32/mixed ester	5.0	6.6	4.5	3.2	4.6	6.7	8.3	8.8	4.8	11.0	10.0	6.4	2.4	11.2	1.5
M-49	R32/branched ester	2.8	3.7	3.1	4.5	3.8	3.3	5.1	5.4	3.4		9.0	3.9	0.9	5.7	2.1
M-50	R124/alkylbenzene	7.3	9.1	5.5	6.4	11.6	7.5	4.5	2.9	4.1		9.0	6.5	2.7	11.9	1.2
M-51	R125/mixed ester	3.3	7.3	3.9	9.6	7.6	5.5	4.6				7.0	6.0	2.3	10.5	1.4
M-52	R125/branched ester	7.0	13.5	6.6	8.2	3.5	4.6	8.9				7.0	7.5	3.3	14.0	0.9
M-53	R143a/branched ester	7.7	7.3	5.6								3.0	6.9	1.1	9.1	4.6

Table M.4 Gas Chromatography Analysis

Desiccant: M - 3 Å Carbon Core

Code	Peak ID > > Reten. Time > >	GC Peak Areas											CO2	NCG	R-152a	R-143a	R-134a	R-125	R-124	R-123	R-32	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2	Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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M-11	R11/mineral oil	269,406																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</

Appendix N

Desiccant N: 3Å Core with Carbon

Table N.1. Summary Test Results

Desiccant: N - 3 Å Carbon Core

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
N-New	None	2.5	0				4.9				8		110		0
50 ppm Moisture															
N-11	R11/mineral oil	3.0	1	0	0	0	4.9	0.00	0.3	9	19	150	3,850	0	680
N-12	R12/mineral oil	3.0	2	0	2	1	6.1	0.00	<0.1	11	43	36	4,080	270	1,220
N-13	R22/mineral oil	5.0	2	0	0	1	3.7	0.00	0.7	32	610	750	14,800	150	1,360
N-14	R123/mineral oil	2.5	0	0	0	0	4.6	0.25	0.2	2	70	81	3,350	0	360
N-15	R134a/mixed ester	2.5	0	0	0	2	3.8	0.00	4.2	0	0	7	14	6,790	20,200
N-16	R134a/branched ester	2.5	0	0	0	2	5.2	0.00	3.3	0	0	2	12	3,900	13,100
N-17	R152a/alkylbenzene	4.5	1	0	0	1	10.5	0.38	1.5	35	770	25	30	1,660	940
N-18	R32/mixed ester	6.0	2	0	0	1	4.2	0.20	>30	4050	8,350	0	36	30,200	21,600
N-19	R32/branched ester	2.5	1	0	0	3	3.9	0.23	>30	2270	5,620	0	0	10,800	7,900
N-20	R124/alkylbenzene	2.0	0	0	0	0	4.4	0.00	0.2	7	220	32	1,970	14	4,580
N-21	R125/mixed ester	2.5	1	0	0	2	5.0	0.00	8.1	1	69	4	0	6,920	20,800
N-22	R125/branched ester	2.5	2	0	1	1	4.7	0.00	7.9	0	0	5	18	3,630	16,100
N-23	R143a/branched ester	2.5	0	0	0	3	4.0	0.00	8.5	0	0	13	9	4,800	13,900
1000 ppm Moisture															
N-41	R11/mineral oil	2.5	1	0	0	1	5.7	0.00	0.1	7	50	170	4,090	0	0
N-42	R12/mineral oil	3.0	2	0	2	1	6.8	0.00	<0.1	7	33	34	3,550	240	1,100
N-43	R22/mineral oil	5.0	2	0	0	1	6.3	0.00	0.1	45	6,090	1,450	14,800	5	1,420
N-44	R123/mineral oil	2.5	0	0	0	0	5.8	0.38	0.4	3	37	64	3,220	22	440
N-45	R134a/mixed ester	2.5	0	0	0	2	4.8	0.00	4.4	0	0	6	49	8,880	21,700
N-46	R134a/branched ester	2.5	1	0	0	1	4.6	0.04	0.1	0	4	7	0	4,550	17,200
N-47	R152a/alkylbenzene	4.5	2	0	0	0	5.1	1.27	0.3	100	1,430	40	38	2,290	1,340
N-48	R32/mixed ester	6.0	2	0	0	1	7.5	0.43	>30	4040	9,700	14	43	40,600	23,500
N-49	R32/branched ester	2.5	1	0	0	3	5.5	0.08	>30	1960	9,830	0	21	30,900	15,300
N-50	R124/alkylbenzene	2.5	0	0	0	0	5.2	0.00	<0.1	2	340	7	2,100	74	4,220
N-51	R125/mixed ester	2.5	1	0	0	2	4.2	0.00	8.9	0	0	9	0	6,390	18,400
N-52	R125/branched ester	2.5	2	0	1	2	6.7	0.00	8.6	0	0	2	15	4,760	16,900
N-53	R143a/branched ester	3.0	2	0	0	2	5.3	0.00	6.9	0	1	6	16	4,100	11,800

Table N.2. Crush Strength Test Results

Desiccant: N - 3Å Carbon Core

Code		System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
			1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
N-New		None	5.5	5.8	2.2	2.2	7.8	5.2	4.3	1.9	5.5	8.6	10.0	4.9	2.3	9.5	0.3
50 ppm Moisture																	
N-11		R11/mineral oil	2.2	3.2	4.4	5.1	8.0	3.8	5.1	8.2	5.4	3.3	10.0	4.9	2.0	8.8	0.9
N-12		R12/mineral oil	3.5	7.7	4.8	8.2							4.0	6.1	2.3	10.6	1.5
N-13		R22/mineral oil	4.6	3.1	3.9	3.2							4.0	3.7	0.7	5.1	2.3
N-14		R123/mineral oil	4.5	2.8	5.2	4.3	6.7	4.1	3.3	5.4	4.7	4.5	10.0	4.6	1.1	6.7	2.4
N-15		R134a/ mixed ester	4.1	3.0	6.3	3.2	3.4	3.0					6.0	3.8	1.3	6.4	1.3
N-16		R134a/branched ester	5.7	5.2	6.0	3.2	5.2	4.9	5.6	5.6			8.0	5.2	0.9	6.9	3.4
N-17		R152a/alkylbenzene	11.1	13.1	8.9	8.9							4.0	10.5	2.0	14.5	6.5
N-18		R32/mixed ester	4.0	4.5	2.6	5.4	4.9	6.1	3.7	2.4	4.4		9.0	4.2	1.2	6.6	1.8
N-19		R32/branched ester	5.1	1.4	4.6	3.8	5.0	3.5					6.0	3.9	1.4	6.7	1.1
N-20		R124/alkylbenzene	4.8	4.4	4.1	4.4							4.0	4.4	0.3	5.0	3.9
N-21		R125/mixed ester	8.4	5.4	5.2	5.6	3.9	2.4	1.5	5.2	7.4		9.0	5.0	2.2	9.4	0.6
N-22		R125/branched ester	6.9	3.3	4.2	4.4							4.0	4.7	1.5	7.8	1.6
N-23		R143a/branched ester	3.6	3.7	4.3	2.4	1.0	6.4	5.8	4.3	4.3		9.0	4.0	1.6	7.2	0.7
1000 ppm Moisture																	
N-41		R11/mineral oil	4.3	4.4	6.4	6.2	4.7	8.2					6.0	5.7	1.5	8.8	2.6
N-42		R12/mineral oil	8.8	8.0	4.7	5.8							4.0	6.8	1.9	10.6	3.0
N-43		R22/mineral oil	5.3	7.5	6.5	4.7	4.5	6.9	8.6				7.0	6.3	1.5	9.3	3.2
N-44		R123/mineral oil	7.3	7.2	7.4	3.8	3.3						5.0	5.8	2.1	9.9	1.7
N-45		R134a/ mixed ester	5.2	4.9	4.4								3.0	4.8	0.4	5.6	4.0
N-46		R134a/branched ester	3.7	7.4	2.8								3.0	4.6	2.4	9.5	-0.2
N-47		R152a/alkylbenzene	6.9	5.7	4.4	3.5							4.0	5.1	1.5	8.1	2.1
N-48		R32/mixed ester	11.0	5.1	6.5								3.0	7.5	3.1	13.7	1.4
N-49		R32/branched ester	6.2	3.1	3.9	1.9	3.2	7.9	5.0	8.8	9.6		9.0	5.5	2.8	11.0	-0.0
N-50		R124/alkylbenzene	4.3	2.9	2.6	12.4	5.0	4.1	5.3				7.0	5.2	3.3	11.9	-1.4
N-51		R125/mixed ester	5.6	7.0	4.7	3.8	3.6	2.3	2.1				7.0	4.2	1.8	7.7	0.6
N-52		R125/branched ester	12.6	5.3	5.1	3.8							4.0	6.7	4.0	14.7	-1.3
N-53		R143a/branched ester	6.2	4.6	2.6	6.8	6.2						5.0	5.3	1.7	8.7	1.9

Table N.4. Gas Chromatography Analysis

Desiccant: N - 3 Å Carbon Core

Peak ID >> Reten. Time >>		GC Peak Areas													Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2							
Code		7.00	2.00	1.40	0.70	12.50	3.00	0.90	1.18	1.00	1.38	0.35	0.55	0.90	1.30	2.90	4.20	4.60	5.20	
50 ppm Moisture																				
N-11	R11/mineral oil	291.409										639								
N-12	R12/mineral oil		326.271									371	74							
N-13	R22/mineral oil			281.702								11,916	14,178							
N-14	R123/mineral oil					296.886						48,488			744					
N-15	R134a/mixed ester								281.866			251	228							
N-16	R134a/branched ester								291.231			636	377							
N-17	R152a/alkylbenzene										249.765	974	732	951						
N-18	R32/mixed ester				314.310							10,085	4,057		614					
N-19	R32/branched ester				162.194							5,685	4,180		378					
N-20	R124/alkylbenzene						293.854					194	124							
N-21	R125/mixed ester							281.182				949	328							
N-22	R125/branched ester							275.748				5,004	429							
N-23	R143a/branched ester								273.159			959	246							
1000 ppm Moisture																				
N-41	R11/mineral oil	274.603										562								
N-42	R12/mineral oil		326.085									565								
N-43	R22/mineral oil			266.061								5,292	19,770							
N-44	R123/mineral oil					315.643						176	143		1,213					
N-45	R134a/mixed ester								284.377			287	343							
N-46	R134a/branched ester											135	43							
N-47	R152a/alkylbenzene								270.217	104		216,662	521	764		2,172				
N-48	R32/mixed ester				338.425							9,116	521							
N-49	R32/branched ester											6,127	3,730		1,468					
N-50	R124/alkylbenzene						269.561					13,319	5,241		1,144					
N-51	R125/mixed ester											152	360							
N-52	R125/branched ester							261.271				669	377							
N-53	R143a/branched ester							242.148				12,519	235							
									224.553			35,220	271							

Appendix T

Desiccant T: 4Å Core with Carbon

Table T.1. Summary Test Results

Desiccant: T - 4Å Carbon Core

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
T-New	None	2.5	0				7.3				22		98		0
50 ppm Moisture															
T-11	R11/mineral oil	3.5	1	0	0	0	5.7	0.00	0.2	34	130	290	6,240	0	340
T-12	R12/mineral oil	3.0	0	0	0	0	7.9	0.00	<0.1	9	610	74	8,650	16	0
T-13	R13/mineral oil	2.5	0	0	0	1	5.0	0.00	<0.1	52	2,450	490	12,400	150	1,430
T-14	R123/mineral oil	3.5	0	0	0	0	7.8	0.26	1.4	3	82	38	3,560	24	830
T-15	R134a/mixed ester	2.5	0	0	0	2	6.5	0.00	8.6	1	3	7	52	10,200	20,100
T-16	R134a/branched ester	2.5	0	0	0	2	2.9	0.00	13.5	29	1	12	16	8,170	11,600
T-17	R152a/alkylbenzene	4.0	2	0	0	0	6.7	0.32	0.4	150	2,610	35	190	1,720	35
T-18	R32/mixed ester	2.5	0	0	1	1	7.9	0.28	>30	2850	9,810	0	44	22,800	41,100
T-19	R32/branched ester	2.5	1	0	0	3	5.1	0.00	>30	660	8,540	0	55	30,300	12,700
T-20	R124/alkylbenzene	2.5	0	0	1	0	9.5	0.00	<0.1	8	720	20	1,770	68	570
T-21	R125/mixed ester	2.5	0	0	0	3	7.0	0.00	4.6	0	0	4	0	8,170	13,900
T-22	R125/branched ester	2.5	0	0	0	2	3.0	0.80	8.2	0	4	4	26	5,640	12,600
T-23	R143a/branched ester	2.5	0	0	0	2	7.3	0.00	10.5	1	33	6	170	7,050	20,500
1000 ppm Moisture															
T-41	R11/mineral oil	3.5	1	0	0	0	5.5	0.00	0.2	7	220	180	6,680	0	340
T-42	R12/mineral oil	3.0	0	0	0	0	6.8	0.00	<0.1	8	360	80	8,350	59	540
T-43	R22/mineral oil	2.5	0	0	0	1	4.6	0.11	<0.1	120	2,260	890	14,500	160	1,880
T-44	R123/mineral oil	3.5	0	0	0	0	8.5	0.39	<0.1	3	84	120	3,120	28	850
T-45	R134a/mixed ester	2.5	0	0	0	1	7.9	0.00	8.7	0	0	16	13	11,000	14,500
T-46	R134a/branched ester	3.0	0	0	0	2	8.6	0.00	10.7	13	1	0	44	9,660	17,700
T-47	R152a/alkylbenzene	4.0	2	0	0	0	7.2	0.59	0.5	91	2,280	22	44	830	1,140
T-48	R32/mixed ester	2.5	0	0	0	2	6.1	0.19	>30	2770	9,290	16	0	22,700	28,100
T-49	R32/branched ester	2.5	0	0	0	2	6.1	0.32	25.1	560	5,670	24	41	14,600	16,200
T-50	R124/alkylbenzene	2.5	0	0	1	0	10.4	0.00	<0.1	3	810	30	1,960	17	2,830
T-51	R125/mixed ester	3.0	0	0	0	2	9.0	0.00	1.7	2	11	5	121	5,900	27,400
T-52	R125/branched ester	2.5	0	0	0	2	5.4	0.00	9.7	0	2	4	27	4,970	12,800
T-53	R143a/branched ester	2.5	0	0	0	3	10.3	0.00	3.1	0	22	1	30	3,750	9,450

Table T.2. Crush Strength Test Results

Desiccant: T - 4Å Carbon Core

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
T-New	None	10.5	14.0	5.8	6.9	7.6	7.3	4.0	2.7	9.3	4.8	10.0	7.3	3.3	14.0	0.6
50 ppm Moisture																
T-11	R11/mineral oil	6.7	9.5	4.5	5.6	2.1	8.3	3.3	6.4	7.7	3.2	10.0	5.7	2.4	10.6	0.9
T-12	R12/mineral oil	5.6	16.0	8.6	3.9	4.9	12.0	6.5	7.1	6.3		9.0	7.9	3.8	15.6	0.2
T-13	R22/mineral oil	6.5	5.0	5.9	5.0	2.7	6.0	4.5	4.7	4.8		9.0	5.0	1.1	7.2	2.8
T-14	R123/mineral oil	14.6	4.8	5.9	8.4	4.6	10.0	13.7	4.5	3.5		9.0	7.8	4.2	16.1	-0.5
T-15	R134a/ mixed ester	6.0	5.4	7.4	5.9	7.8	7.2	6.2	5.9	8.2	4.8	10.0	6.5	1.1	8.7	4.3
T-16	R134a/branched ester	1.0	3.8	3.9	3.3	2.3						5.0	2.9	1.2	5.3	0.4
T-17	R152a/alkylbenzene	3.1	5.5	8.3	8.0	8.8						5.0	6.7	2.4	11.5	1.9
T-18	R32/mixed ester	12.3	11.6	10.8	11.5	6.2	5.4	5.5	6.7	4.3	4.8	10.0	7.9	3.2	14.4	1.5
T-19	R32/branched ester	4.1	6.4	5.3	4.2	5.5	4.9	5.4				7.0	5.1	0.8	6.7	3.5
T-20	R124/alkylbenzene	11.8	10.8	7.3	9.5	8.0						5.0	9.5	1.9	13.2	5.7
T-21	R125/mixed ester	8.4	6.5	6.5	6.7	7.0						5.0	7.0	0.8	8.6	5.4
T-22	R125/branched ester	3.2	3.1	2.8								3.0	3.0	0.2	3.4	2.6
T-23	R143a/branched ester	9.6	9.3	8.3	6.3	5.6	3.7	7.0	4.5	10.7	8.4	10.0	7.3	2.3	12.0	2.7
1000 ppm Moisture																
T-41	R11/mineral oil	1.9	1.7	8.5	5.8	9.8	5.4					6.0	5.5	3.3	12.1	-1.1
T-42	R12/mineral oil	10.3	7.1	4.4	8.2	12.5	3.5	6.5	4.6	4.0		9.0	6.8	3.1	13.0	0.6
T-43	R22/mineral oil	6.1	5.3	6.0	3.1	6.4	2.2	3.2				7.0	4.6	1.7	8.1	1.2
T-44	R123/mineral oil	12.2	8.7	6.0	10.4	8.5	10.8	8.8	2.8	9.7	7.4	10.0	8.5	2.7	13.9	3.2
T-45	R134a/ mixed ester	8.9	4.8	11.6	3.9	11.3	7.5	9.4	5.6	7.8		9.0	7.9	2.7	13.3	2.4
T-46	R134a/branched ester	10.6	6.3	11.8	5.7	11.6	5.8					6.0	8.6	3.0	14.6	2.6
T-47	R152a/alkylbenzene	4.6	3.9	6.0	8.2	9.6	8.5	9.4				7.0	7.2	2.3	11.8	2.5
T-48	R32/mixed ester	3.5	8.2	8.5	5.5	6.5	5.3	6.0	5.9	4.9	6.6	10.0	6.1	1.5	9.1	3.1
T-49	R32/branched ester	5.7	5.6	4.2	7.6	7.5						5.0	6.1	1.4	9.0	3.3
T-50	R124/alkylbenzene	6.5	8.7	13.1	11.8	10.5	7.2	10.6	17.5	7.3	10.6	10.0	10.4	3.3	17.0	3.8
T-51	R125/mixed ester	7.3	12.5	9.2	6.8							4.0	9.0	2.6	14.1	3.8
T-52	R125/branched ester	4.7	7.4	4.2	4.5	6.3						5.0	5.4	1.4	8.2	2.7
T-53	R143a/branched ester	9.1	16.2	9.0	12.5	14.9	8.4	8.7	8.4	9.1	7.1	10.0	10.3	3.1	16.5	4.2

Table T.4. Gas Chromatography Analysis

Desiccant: T - 4Å Carbon Core

Code	Peak ID >> Reten. Time >>	GC Peak Areas												Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2						
		7.00	2.00	1.40	0.70	12.50	3.00	0.90	1.18	1.00	1.38	0.35	0.55						
50 ppm Moisture																			
T-11	R11/mineral oil	228.621										33.702							
T-12	R12/mineral oil		296.667									146	418						
T-13	R22/mineral oil			276.141								9.470	3.736						
T-14	R123/mineral oil				349.235							217	234		444				458
T-15	R134a/mixed ester											287	412						
T-16	R134a/branched ester										281.413	324	268						
T-17	R152a/alkylbenzene											798	691	718					
T-18	R32/mixed ester				358.522							3.613	7.151		986				
T-19	R32/branched ester				183.984							1.197	5.354						
T-20	R124/alkylbenzene						151.481					246							
T-21	R125/mixed ester							262.788				159	389						
T-22	R125/branched ester							269.322				11.393	437	210					
T-23	R143a/branched ester									209.715		40.617	371						
1000 ppm Moisture																			
T-41	R11/mineral oil	277.051										667	218						
T-42	R12/mineral oil		284.132									294	816						
T-43	R22/mineral oil			288.404								49.134	9.084	726					
T-44	R123/mineral oil				344.095							403	175		358				988
T-45	R134a/mixed ester											1.229	395						
T-46	R134a/branched ester											3.227	880						
T-47	R152a/alkylbenzene											276.373	1.275	9.14			1.637		
T-48	R32/mixed ester				368.166							3.116	7.291		693				
T-49	R32/branched ester				341.568							6.173	5.444		1.085				
T-50	R124/alkylbenzene						154.758					294							
T-51	R125/mixed ester							316.213				152	491						
T-52	R125/branched ester									244.579		413	415						
T-53	R143a/branched ester									258.536		2.384	80						

Appendix V

Desiccant V: 4Å Core with Carbon

Table V.1. Summary Test Results

Desiccant: V - 4Å Carbon Core

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
V-New	None	2.5	0				6.3				4		110		0
50 ppm Moisture															
V-11	R11/mineral oil	3.0	1	0	0	0	7.1	0.00	<0.1	7	130	160	5,750	0	240
V-12	R12/mineral oil	3.0	1	0	0	0	5.8	0.00	<0.1	11	200	76	7,080	0	0
V-13	R123/mineral oil	2.5	1	0	0	1	3.0	0.00	<0.1	19	2,380	1,250	10,900	25	730
V-14	R123/mineral oil	3.0	0	0	0	0	5.5	0.42	0.2	2	15	28	3,160	22	500
V-15	R134a/mixed ester	2.5	0	0	0	2	5.3	0.63	12.8	0	4	3	22	15,400	19,200
V-16	R134a/branched ester	2.5	0	0	0	1	7.9	0.00	19.5	1	0	11	25	10,100	21,000
V-17	R152a/alkylbenzene	4.0	2	0	0	0	4.8	0.17	0.3	79	1,780	42	45	1,620	44
V-18	R32/mixed ester	2.5	0	0	0	2	4.2	0.31	>30	980	7,220	4	29	34,500	20,100
V-19	R32/branched ester	2.5	0	0	1	2	5.2	0.15	>30	1040	7,750	3	16	19,800	11,500
V-20	R124/alkylbenzene	2.5	0	0	0	0	11.6	0.00	<0.1	88	140	63	460	1,530	910
V-21	R125/mixed ester	2.5	0	0	0	2	8.5	0.19	7.9	0	0	4	15	9,580	22,500
V-22	R125/branched ester	2.5	0	0	0	2	7.4	0.33	5.3	0	1	9	11	6,760	13,600
V-23	R143a/branched ester	2.5	0	0	0	2	6.8	0.31	8.0	9	14	15	37	7,570	13,700
1000 ppm Moisture															
V-41	R11/mineral oil	3.0	1	0	0	0	6.1	0.00	0.4	6	27	290	3,900	5	520
V-42	R12/mineral oil	2.5	0	0	0	0	9.7	0.00	<0.1	8	46	63	4,690	68	1,000
V-43	R22/mineral oil	3.5	0	0	0	1	6.2	0.00	<0.1	96	960	1,230	13,400	610	1,470
V-44	R123/mineral oil	3.0	0	0	0	0	10.1	0.33	0.1	3	89	125	4,100	12	670
V-45	R134a/mixed ester	2.5	0	0	0	2	7.5	0.03	12.6	0	0	11	14	14,000	15,700
V-46	R134a/branched ester	2.5	0	0	0	1	9.6	0.00	19.9	0	1	31	110	12,400	23,600
V-47	R152a/alkylbenzene	4.0	2	0	0	0	6.6	0.13	0.3	67	1,530	39	46	1,730	32
V-48	R32/mixed ester	2.5	0	0	0	2	4.5	0.17	>30	1300	8,100	14	37	30,800	24,100
V-49	R32/branched ester	2.5	0	0	1	2	4.9	0.28	>30	380	6,460	8	23	15,200	9,770
V-50	R124/alkylbenzene	2.5	0	0	0	0	11.8	0.00	<0.1	3	190	24	1,830	7	1,660
V-51	R125/mixed ester	2.5	0	0	0	2	6.9	0.00	7.8	0	0	6	10	9,250	20,800
V-52	R125/branched ester	2.5	0	0	0	2	8.8	0.00	10.9	0	0	0	0	7,240	15,700
V-53	R143a/branched ester	3.0	0	0	0	2	6.4	0.29	5.0	26	23	9	38	5,940	14,500

Table V.2. Crush Strength Test Results

Desiccant: V - 4Å Carbon Core

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
V-New	None	5.3	7.1	5.2	7.5	9.5	5.0	6.3	5.0	6.9	4.2	10.0	6.3	1.5	9.4	3.2
50 ppm Moisture																
V-11	R11/mineral oil	8.2	5.1	5.0	10.1	9.5	5.3	9.4	5.4	5.3	8.0	10.0	7.1	2.1	11.3	2.9
V-12	R12/mineral oil	8.4	7.3	3.6	3.7	5.9						5.0	5.8	2.1	10.1	1.5
V-13	R22/mineral oil	3.2	2.7	3.5	2.5							4.0	3.0	0.5	3.9	2.1
V-14	R123/mineral oil	7.8	5.7	4.2	6.4	5.2	6.4	5.2	3.4			8.0	5.5	1.4	8.3	2.8
V-15	R134a/mixed ester	4.5	7.7	3.6								3.0	5.3	2.2	9.6	1.0
V-16	R134a/branched ester	6.2	9.3	7.9	8.2							4.0	7.9	1.3	10.5	5.3
V-17	R152a/alkylbenzene	5.6	6.0	4.2	4.8	4.6	4.4	5.8	3.1			8.0	4.8	1.0	6.7	2.9
V-18	R32/mixed ester	5.0	2.9	3.4	5.4							4.0	4.2	1.2	6.6	1.8
V-19	R32/branched ester	5.2	7.3	5.5	3.8	5.6	4.4	4.9				7.0	5.2	1.1	7.5	3.0
V-20	R124/alkylbenzene	10.2	14.4	13.9	7.3	12.1						5.0	11.6	2.9	17.4	5.8
V-21	R125/mixed ester	8.0	6.9	9.9	9.1	8.6						5.0	8.5	1.1	10.8	6.2
V-22	R125/branched ester	7.4	7.5	8.3	6.5							4.0	7.4	0.7	8.9	6.0
V-23	R143a/branched ester	10.3	7.8	5.3	6.4	4.4						5.0	6.8	2.3	11.5	2.2
1000 ppm Moisture																
V-41	R11/mineral oil	5.0	8.6	4.7	6.6	5.4	4.6	5.4	8.3			8.0	6.1	1.6	9.3	2.9
V-42	R12/mineral oil	12.7	9.1	14.6	8.6	7.7	5.3					6.0	9.7	3.4	16.5	2.9
V-43	R22/mineral oil	6.6	10.8	5.5	2.8	3.5	7.5	10.3	2.5			8.0	6.2	3.2	12.6	0.3
V-44	R123/mineral oil	10.9	9.6	13.0	12.4	9.7	12.6	7.6	6.5	8.6		9.0	10.1	2.3	14.7	5.5
V-45	R134a/mixed ester	7.5	7.4	7.1	5.8	10.5	6.8	7.2				7.0	7.5	1.5	10.4	4.6
V-46	R134a/branched ester	7.0	13.8	11.1	4.1	11.8						5.0	9.6	3.9	17.4	1.7
V-47	R152a/alkylbenzene	5.2	6.0	9.5	6.0	6.5						5.0	6.6	1.7	10.0	3.3
V-48	R32/mixed ester	5.6	4.5	3.4								3.0	4.5	1.1	6.7	2.3
V-49	R32/branched ester	6.6	3.5	7.6	5.1	4.4	6.0	4.1	3.6	3.2		9.0	4.9	1.5	8.0	1.8
V-50	R124/alkylbenzene	9.9	14.5	13.7	9.5	11.2						5.0	11.8	2.2	16.2	7.3
V-51	R125/mixed ester	4.8	4.6	6.3	10.9	8.1	10.3	3.9	7.0	6.4	6.9	10.0	6.9	2.3	11.6	2.3
V-52	R125/branched ester	6.6	12.7	8.2	7.7							4.0	8.8	2.7	14.2	3.4
V-53	R143a/branched ester	10.0	6.6	6.9	5.9	7.5	6.0	4.0	3.9			8.0	6.4	2.0	10.3	2.4

Table V.4. Gas Chromatography Analysis

Desiccant: V - 4Å Carbon Core

Code	Peak ID >> Reten. Time >>	GC Peak Areas												Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		R-11	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2						
50 ppm Moisture																			
V-11	R11/mineral oil	214,176										27,813	217						
V-12	R12/mineral oil		296,994									587	304						
V-13	R22/mineral oil			267,760								5,079	8,911						
V-14	R123/mineral oil					343,633						236	208		905				
V-15	R134a/mixed ester									261,151	1,650	10,920	599						538
V-16	R134a/branched ester									267,908		314	715						
V-17	R152a/alkylbenzene										207,592	27,997	743	350					
V-18	R32/mixed ester				348,437							3,239	8,963		1,078				
V-19	R32/branched ester				180,612							1,774	5,709		276				
V-20	R124/alkylbenzene					145,122						172	146						
V-21	R125/mixed ester						244,709					735	341		461				
V-22	R125/branched ester						234,749			763		11,350	365						
V-23	R143a/branched ester										280,871	455	459			876			
1000 ppm Moisture																			
V-41	R11/mineral oil	201,636										35,523	169						
V-42	R12/mineral oil		306,348									580	597						
V-43	R22/mineral oil			358,724								1,805	7,565						
V-44	R123/mineral oil					357,694						330	307		823				348
V-45	R134a/mixed ester									265,507	90	371	663						
V-46	R134a/branched ester									278,237		338	590						
V-47	R152a/alkylbenzene										260,119	1,174	846	342					
V-48	R32/mixed ester				363,296							2,373	6,319		603				
V-49	R32/branched ester				330,814							3,554	8,734		932				
V-50	R124/alkylbenzene					148,840						152	178						
V-51	R125/mixed ester						248,052					301	390						
V-52	R125/branched ester						276,163					845	527						
V-53	R143a/branched ester									315,693		22,350	669			905			

Appendix W

Desiccant W: 3Å Core (No Carbon)

Table W1. Summary Test Results

Desiccant: W - 3Å Core (No Carbon)

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC% Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
W-New	None	2.5	0	-	-	-	4.0	-	-	-	13	-	85	-	0
50 ppm Moisture															
W-11	R11/mineral oil	2.5	1	0	0	0	5.3	0.00	0.1	9	0	110	3,340	23	1,190
W-12	R12/mineral oil	3.0	0	0	0	0	5.4	0.00	<0.1	8	280	73	3,430	1	0
W-13	R22/mineral oil	3.5	0	0	0	1	3.7	0.00	<0.1	19	4,250	480	10,500	4	3,280
W-14	R123/mineral oil	2.5	0	0	0	1	4.5	0.36	<0.1	3	7	75	3,840	3	300
W-15	R134a/mixed ester	2.5	0	0	0	2	7.8	0.00	7.9	0	0	3	52	9,490	21,700
W-16	R134a/branched ester	2.5	0	0	1	1	5.4	0.00	8.0	0	0	4	42	6,770	23,100
W-17	R152a/alkylbenzene	4.5	1	0	0	1	5.6	0.35	3.3	24	1,090	140	97	2,230	2,720
W-18	R32/mixed ester	7.0	2	0	0	2	5.0	0.22	>30	4,070	4,990	5	17	40,900	16,700
W-19	R32/branched ester	4.5	2	0	0	2	4.5	0.13	>30	3,090	6,330	13	32	34,400	16,200
W-20	R124/alkylbenzene	2.5	0	0	1	0	9.4	0.00	<0.1	3	8	14	2,470	4	1,400
W-21	R125/mixed ester	3.0	0	0	0	2	7.1	0.00	5.1	0	0	6	9	9,160	19,800
W-22	R125/branched ester	2.5	0	0	0	2	5.5	0.00	10.5	0	0	4	5	5,660	15,100
W-23	R143a/branched ester	2.5	0	0	0	1	7.9	0.28	6.3	1	1	9	210	6,100	26,400
1000 ppm Moisture															
W-41	R11/mineral oil	2.5	1	0	0	0	4.3	0.00	1.7	7	6	70	4,140	27	710
W-42	R12/mineral oil	3.0	0	0	0	0	5.2	0.00	0.1	7	7	62	3,060	12	890
W-43	R22/mineral oil	3.5	0	0	0	1	7.2	0.00	<0.1	64	4,080	750	10,300	16	3,780
W-44	R123/mineral oil	2.5	0	0	0	0	4.9	0.26	0.9	2	82	33	3,850	1	1,120
W-45	R134a/mixed ester	2.5	0	0	0	2	6.7	0.67	7.6	0	0	8	9	13,200	18,400
W-46	R134a/branched ester	2.5	0	0	0	2	5.8	0.00	9.1	0	0	0	14	11,600	17,100
W-47	R152a/alkylbenzene	4.5	1	0	0	1	7.2	0.42	2.8	67	1,320	200	32	5,410	2,400
W-48	R32/mixed ester	6.5	1	0	0	2	5.2	0.21	>30	3,720	8,880	0	0	43,600	38,900
W-49	R32/branched ester	3.5	1	0	0	1	5.0	0.26	>30	140	9,250	0	23	1,330	12,100
W-50	R124/alkylbenzene	2.5	0	0	0	0	8.9	0.00	<0.1	5	28	38	2,350	1	1,320
W-51	R125/mixed ester	2.5	0	0	0	2	6.4	0.00	8.1	1	0	9	17	11,000	19,000
W-52	R125/branched ester	2.5	0	0	0	2	8.3	1.27	5.7	0	0	0	10	6,540	16,900
W-53	R143a/branched ester	2.5	0	0	0	2	5.5	0.00	10.0	0	108	4	22	4,770	12,100

Table W.2. Crush Strength Test Results

Desiccant: W - 3Å Core (No Carbon)

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
W-New	None	7.3	4.5	4.1	3.7	2.0	2.9	3.2	3.0	4.1	5.2	10.0	4.0	1.5	6.9	1.1
50 ppm Moisture																
W-11	R11/mineral oil	6.7	3.9	5.8	8.3	6.7	5.6	4.3	2.6	4.1		9.0	5.3	1.8	8.9	1.8
W-12	R12/mineral oil	6.2	5.8	5.9	7.3	2.8	5.3	4.2				7.0	5.4	1.5	8.3	2.4
W-13	R22/mineral oil	5.2	3.3	4.6	3.3	4.8	3.1	3.2	3.3	2.7		9.0	3.7	0.9	5.5	1.9
W-14	R123/mineral oil	8.5	5.2	4.7	2.3	4.8	3.1	5.9	3.8	4.8	2.2	10.0	4.5	1.9	8.3	0.8
W-15	R134a/mixed ester	10.9	7.2	8.6	4.3							4.0	7.8	2.8	13.3	2.2
W-16	R134a/branched ester	7.6	6.9	5.2	4.6	2.9						5.0	5.4	1.9	9.2	1.7
W-17	R152a/alkylbenzene	5.8	6.8	5.6	6.8	4.4	2.5	7.5				7.0	5.6	1.7	9.1	2.2
W-18	R32/mixed ester	3.2	5.6	3.2	4.3	4.0	5.1	8.2	4.7	8.1	3.2	10.0	5.0	1.9	8.7	1.2
W-19	R32/branched ester	3.5	4.3	5.5	5.3	6.2	5.1	3.7	3.0	4.0		9.0	4.5	1.1	6.6	2.4
W-20	R124/alkylbenzene	9.9	12.3	5.0	6.1	18.2	5.1					6.0	9.4	5.2	19.8	-1.0
W-21	R125/mixed ester	8.1	7.3	7.5	5.8	6.8						5.0	7.1	0.9	8.8	5.4
W-22	R125/branched ester	6.0	3.1	6.9	3.9	2.3	5.4	6.5	6.6	8.9		9.0	5.5	2.1	9.7	1.4
W-23	R143a/branched ester	5.7	8.5	4.7	9.5	5.3	4.7	13.5	7.6	11.8		9.0	7.9	3.2	14.3	1.5
1000 ppm Moisture																
W-41	R11/mineral oil	6.8	3.5	3.1	3.9							4.0	4.3	1.7	7.7	1.0
W-42	R12/mineral oil	5.7	5.8	4.9	4.4							4.0	5.2	0.7	6.5	3.9
W-43	R22/mineral oil	4.4	7.0	5.1	7.5	13.5	5.6					6.0	7.2	3.3	13.8	0.6
W-44	R123/mineral oil	3.2	5.0	2.3	4.1	5.1	4.3	2.8	6.2	6.7	9.5	10.0	4.9	2.1	9.2	0.6
W-45	R134a/mixed ester	8.5	6.2	5.0	6.6	7.1						5.0	6.7	1.3	9.2	4.1
W-46	R134a/branched ester	6.2	8.3	4.3	6.9	3.5						5.0	5.8	1.9	9.7	1.9
W-47	R152a/alkylbenzene	13.1	8.2	6.2	2.7	5.8						5.0	7.2	3.8	14.9	0.5
W-48	R32/mixed ester	6.5	5.7	3.5	5.8	6.1	5.0	4.0	9.0	3.4	2.7	10.0	5.2	1.9	8.9	1.4
W-49	R32/branched ester	3.8	4.6	3.6	4.8	4.6	4.4	9.6	3.4	6.3	4.9	10.0	5.0	1.8	8.6	1.4
W-50	R124/alkylbenzene	9.5	7.5	10.7	9.5	7.2						5.0	8.9	1.5	11.8	5.9
W-51	R125/mixed ester	10.8	5.6	4.9	4.3							4.0	6.4	3.0	12.4	0.4
W-52	R125/branched ester	8.8	9.3	8.1	6.9							4.0	8.3	1.0	10.4	6.2
W-53	R143a/branched ester	10.5	6.1	4.1	6.5	7.1	5.7	2.8	4.0	4.9	3.7	10.0	5.5	2.2	10.0	1.1

Table W.4 Gas Chromatography Analysis

Desiccant: W - 3 Å Core (No Carbon)

		GC Peak Areas																	
Code	Peak ID >> Reten. Time >>	R-11 7.00	R-12 2.00	R-22 1.40	R-32 0.70	R-123 12.50	R-124 3.00	R-125 0.90	R-134a 1.18	R-143a 1.00	R-152a 1.38	NCG 0.35	CO2 0.55	Unkn 1 0.90	Unkn 2 1.30	Unkn 3 2.90	Unkn 4 4.20	Unkn 5 4.60	Unkn 6 5.20
50 ppm Moisture																			
W-11	R11/mineral oil	230.089										34.506							
W-12	R12/mineral oil		310.416									136	204						
W-13	R22/mineral oil			263.749								4.753	11.091						
W-14	R123/mineral oil					350.497						154	182		1.277				
W-15	R134a/mixed ester								277.787			762	464						
W-16	R134a/branched ester								279.002			208	438						
W-17	R152a/alkylbenzene										244.946	992	409	850					
W-18	R32/mixed ester				327.711							8.774	4.589		723				
W-19	R32/branched ester				140.875							7.441	4.180		185				
W-20	R124/alkylbenzene					149.022						224	174						
W-21	R125/mixed ester							240.927				719	348						
W-22	R125/branched ester							245.454				2.367	516						
W-23	R143a/branched ester									273.544		1.698	408			701			
1000 ppm Moisture																			
W-41	R11/mineral oil	266.787										721							
W-42	R12/mineral oil		317.314									620							
W-43	R22/mineral oil			295.553								3.315	5.867						
W-44	R123/mineral oil					365.256						2.127			934				
W-45	R134a/mixed ester									1.680		12.453	342						
W-46	R134a/branched ester								249.279			237	320						
W-47	R152a/alkylbenzene								270.306			276.765	923	939					
W-48	R32/mixed ester				334.185							6.836	3.983		715				
W-49	R32/branched ester				293.976							9.056	5.568		775				
W-50	R124/alkylbenzene					150.378						196	164						
W-51	R125/mixed ester							244.407				12.565	417						
W-52	R125/branched ester							234.645	2.971			11.790	433						
W-53	R143a/branched ester									274.537		38.027	344						

Appendix X

Desiccant X: 3Å Core (No Carbon)

Table X.1. Summary Test Results

Desiccant: X - 3Å Core (No Carbon)

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
X-New	Note	2.5	0	-	-	-	6.8	-	-	-	1	-	48	-	0
50 ppm Moisture															
X-11	R11/mineral oil	3.5	0	0	0	0	5.0	0.00	<0.1	1	270	290	5,690	2	49
X-12	R12/mineral oil	2.5	0	0	0	0	7.7	0.08	0.4	4	36	65	2,480	0	130
X-13	R22/mineral oil	3.5	0	1	0	1	6.7	0.00	<0.1	9	2,950	340	4,970	1	1,450
X-14	R123/mineral oil	2.5	0	0	0	0	4.7	0.12	<0.1	1	2	45	1,300	0	140
X-15	R134a/mixed ester	2.5	0	0	0	2	8.1	0.00	6.2	0	0	11	22	11,900	16,600
X-16	R134a/branched ester	2.5	0	0	0	1	7.2	0.00	9.4	22	0	7	15	6,400	12,300
X-17	R152a/alkylbenzene	5.0	2	0	0	0	6.6	1.83	2.4	80	780	110	33	1,430	12
X-18	R32/mixed ester	7.0	1	0	0	1	4.9	0.22	>30	4780	7,090	28	37	48,100	22,800
X-19	R32/branched ester	5.5	1	0	0	1	7.3	0.23	>30	3930	4,320	0	26	19,400	30,300
X-20	R124/alkylbenzene	2.5	0	0	1	0	9.2	0.00	<0.1	29	120	160	900	130	1,870
X-21	R125/mixed ester	3.0	0	0	0	1	5.3	0.00	4.4	0	0	10	19	7,330	16,700
X-22	R125/branched ester	2.5	0	0	0	1	4.0	0.00	9.7	3	0	6	19	4,810	11,000
X-23	R143a/branched ester	2.5	0	0	0	1	4.0	0.00	1.2	22	3	18	37	6,290	13,400
1000 ppm Moisture															
X-41	R11/mineral oil	3.5	0	0	0	0	5.1	0.00	0.5	4	190	300	5,370	0	0
X-42	R12/mineral oil	2.5	0	0	0	0	9.0	0.00	<0.1	7	72	78	2,360	2	590
X-43	R22/mineral oil	3.5	0	0	0	1	8.4	0.00	0.2	120	2,830	860	3,720	65	2,480
X-44	R123/mineral oil	2.5	0	0	0	0	5.7	0.15	2.7	1	10	47	1,340	60	150
X-45	R134a/mixed ester	2.5	0	0	0	2	7.0	0.00	8.7	0	0	10	20	9,840	30,700
X-46	R134a/branched ester	2.5	0	0	0	1	4.0	0.13	11.2	0	48	2	44	7,200	16,000
X-47	R152a/alkylbenzene	5.0	2	0	0	0	6.8	0.33	3.1	53	1,050	40	18	3,410	810
X-48	R32/mixed ester	7.5	1	0	0	1	7.5	0.25	>30	4110	6,150	23	39	26,100	23,900
X-49	R32/branched ester	5.5	1	0	0	1	11.0	0.27	>30	4050	9,170	0	13	15,300	23,880
X-50	R124/alkylbenzene	2.5	0	0	1	0	6.0	0.00	<0.1	7	36	15	1,060	6	1,580
X-51	R125/mixed ester	2.5	0	0	0	1	4.4	0.00	9	0	0	5	12	6,420	16,500
X-52	R125/branched ester	2.5	0	0	0	2	4.0	0.00	8.8	0	0	6	0	4,810	11,700
X-53	R143a/branched ester	2.5	0	0	0	1	4.2	0.00	4.8	0	0	18	62	4,260	8,450

Table X.2. Crush Strength Test Results

Desiccant: X - 3Å Core (No Carbon)

Code		System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
														Avg	Std Dev	Upper 95%	Lower 95%
			1	2	3	4	5	6	7	8	9	10					
X-New	None		9.9	8.3	4.3	6.0	6.5	8.4	8.1	3.8	6.8	6.1	10.0	6.8	1.9	10.6	3.0
50 ppm Moisture																	
X-11	R11/mineral oil		4.8	6.3	9.5	3.6	4.9	2.7	6.2	6.5	3.2	2.3	10.0	5.0	2.2	9.4	0.6
X-12	R12/mineral oil		6.1	10.6	7.1	6.9	8.0						5.0	7.7	1.7	11.2	4.3
X-13	R22/mineral oil		11.7	7.3	3.5	4.5	9.2	4.0					6.0	6.7	3.3	13.3	0.1
X-14	R123/mineral oil		4.5	3.7	2.4	6.4	2.8	3.5	6.4	7.3	4.3	5.7	10.0	4.7	1.7	8.0	1.4
X-15	R134a/mixed ester		8.3	8.9	8.6	4.4	8.6	5.0	13.1	6.1	5.6	12.6	10.0	8.1	3.0	14.1	2.2
X-16	R134a/branched ester		7.2	8.2	10.5	7.4	7.6	6.2	3.3				7.0	7.2	2.2	11.5	2.9
X-17	R152a/alkylbenzene		8.9	8.0	3.9	5.5							4.0	6.6	2.3	11.2	2.0
X-18	R32/mixed ester		7.9	4.9	2.9	8.7	3.2	5.4	4.0	3.7	3.9	4.1	10.0	4.9	2.0	8.8	1.0
X-19	R32/branched ester		7.7	5.4	8.3	5.1	8.0	9.3					6.0	7.3	1.7	10.7	3.9
X-20	R124/alkylbenzene		19.0	6.9	4.9	6.1							4.0	9.2	6.6	22.4	-3.9
X-21	R125/mixed ester		6.0	6.0	3.5	5.3	5.7						5.0	5.3	1.0	7.4	3.2
X-22	R125/branched ester		5.4	3.4	4.2	3.5	4.2	3.3					6.0	4.0	0.8	5.6	2.4
X-23	R143a/branched ester		3.2	4.3	5.3	4.0	3.1						5.0	4.0	0.9	5.8	2.2
1000 ppm Moisture																	
X-41	R11/mineral oil		3.9	4.3	6.6	5.2	4.4	4.0	3.9	3.7	9.8		9.0	5.1	2.0	9.1	1.1
X-42	R12/mineral oil		13.1	13.6	11.2	4.4	7.5	11.4	5.5	5.4			8.0	9.0	3.7	16.5	1.6
X-43	R22/mineral oil		7.2	11.9	7.3	7.3							4.0	8.4	2.3	13.1	3.8
X-44	R123/mineral oil		8.6	5.9	4.4	3.0	9.1	4.9	4.1	5.3	5.7		9.0	5.7	2.0	9.7	1.6
X-45	R134a/mixed ester		8.5	8.4	6.1	5.1							4.0	7.0	1.7	10.4	3.6
X-46	R134a/branched ester		4.5	4.5	3.5	3.4							4.0	4.0	0.6	5.2	2.8
X-47	R152a/alkylbenzene		8.2	6.5	6.0	7.6	5.6	8.5	6.9	5.2	7.6	5.8	10.0	6.8	1.1	9.1	4.5
X-48	R32/mixed ester		6.7	9.9	8.6	4.7							4.0	7.5	2.3	12.0	2.9
X-49	R32/branched ester		19.8	7.3	15.7	4.6	7.7						5.0	11.0	6.4	23.9	-1.8
X-50	R124/alkylbenzene		5.4	6.3	3.6	8.5							4.0	6.0	2.0	10.0	1.9
X-51	R125/mixed ester		4.0	3.3	2.0	6.4	2.2	5.2	3.7	6.6	4.5	6.1	10.0	4.4	1.7	7.7	1.1
X-52	R125/branched ester		5.4	3.6	3.0								3.0	4.0	1.2	6.5	1.5
X-53	R143a/branched ester		4.7	4.4	2.2	3.6	6.2	3.8	4.2				7.0	4.2	1.2	6.6	1.7

Appendix Y

Desiccant Y: 4Å Core (No Carbon)

Table Y.1. Summary Test Results

Desiccant: Y - 4Å Core (No Carbon)

Code	System Fluids	Liquid Color (2-8)	Desicc Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Reacted (wt %)	Total Acid Number (mg KOH)	F Ion In Liquid (ppm)	F Ion on Desiccant (ppm)	Cl Ion In Liquid (ppm)	Cl Ion on Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desiccant (ppm)
Y-New	None	2.5	0	-	-	-	6.1	-	-	-	14	-	71	-	0
50 ppm Moisture															
Y-11	R11/mineral oil	3.0	1	0	0	0	7.1	0.00	<0.1	4	22	79	4,530	13	1,150
Y-12	R12/mineral oil	3.0	2	0	0	0	4.9	0.00	<0.1	8	72	88	5,940	3	1,010
Y-13	R22/mineral oil	4.0	2	0	0	1	7.2	0.00	0.2	51	6,250	810	18,900	7	4,730
Y-14	R123/mineral oil	3.0	0	0	0	0	5.7	0.67	<0.1	3	13	120	4,230	16	250
Y-15	R134a/mixed ester	2.5	0	0	0	2	6.0	0.00	5.9	0	1	5	20	7,230	18,200
Y-16	R134a/branched ester	2.5	0	0	0	1	7.4	0.00	5.7	0	2	5	17	5,130	13,400
Y-17	R152a/alkylbenzene	5.0	2	0	0	1	4.2	0.54	3.0	31	430	180	51	1,670	310
Y-18	R32/mixed ester	4.0	1	0	0	2	4.7	1.16	>30	1790	11,700	9	24	29,400	83,300
Y-19	R32/branched ester	3.0	3	0	0	1	5.8	0.10	>30	990	7,650	17	29	16,600	7,190
Y-20	R124/alkylbenzene	2.5	1	0	0	0	4.3	0.06	<0.1	5	1,110	15	4,320	25	0
Y-21	R125/mixed ester	3.0	0	0	0	2	8.8	0.46	7.8	0	1	6	17	9,300	25,800
Y-22	R125/branched ester	2.5	1	0	0	2	8.0	0.00	6.3	0	0	6	41	5,620	19,400
Y-23	R143a/branched ester	2.5	0	0	0	1	5.1	0.00	9.1	12	93	6	100	6,890	17,000
1000 ppm Moisture															
Y-41	R11/mineral oil	3.0	1	0	0	0	6.0	0.00	<0.1	14	74	240	7,990	32	290
Y-42	R12/mineral oil	3.0	0	0	0	0	7.6	0.00	<0.1	7	220	68	8,260	4	2,240
Y-43	R22/mineral oil	4.0	0	1	0	1	5.7	0.00	<0.1	63	5,660	870	16,700	77	4,430
Y-44	R123/mineral oil	3.0	0	0	0	0	5.7	0.60	0.4	2	18	54	4,840	6	290
Y-45	R134a/mixed ester	2.5	0	0	0	2	6.5	0.00	10.9	0	2	4	28	7,000	18,200
Y-46	R134a/branched ester	2.5	0	0	0	1	6.4	0.00	13.0	0	0	8	71	4,640	19,800
Y-47	R152a/alkylbenzene	4.5	1	0	0	1	7.3	0.28	2.2	10	430	110	41	1,180	450
Y-48	R32/mixed ester	4.0	1	0	0	2	6.1	0.24	>30	3340	8,810	0	19	40,000	20,900
Y-49	R32/branched ester	5.5	2	0	0	1	3.8	0.32	>30	1350	10,100	4	36	16,800	11,800
Y-50	R124/alkylbenzene	2.5	0	0	1	0	7.2	0.00	<0.1	4	250	59	2,710	9	1,910
Y-51	R125/mixed ester	3.0	0	0	0	2	5.3	0.39	6.6	0	52	5	45	8,800	28,300
Y-52	R125/branched ester	2.5	1	0	0	2	4.9	0.00	13.7	0	0	8	27	8,100	19,000
Y-53	R143a/branched ester	2.5	0	0	0	2	3.1	0.00	9.9	6	1	4	210	4,950	28,100

Table Y.2. Crush Strength Test Results

Desiccant: Y - 4Å Core (No Carbon)

Code	System Fluids	Test #										Total # of Tests	Crush Strength (lbs)			
		1	2	3	4	5	6	7	8	9	10		Avg	Std Dev	Upper 95%	Lower 95%
Y-New	None	2.7	5.2	3.3	4.3	6.6	4.2	7.0	6.0	12.5	9.3	10.0	6.1	3.0	12.0	0.2
50 ppm Moisture																
Y-11	R11/mineral oil	8.5	9.2	8.6	4.3	10.3	6.3	5.7	4.1	5.9	7.8	10.0	7.1	2.1	11.3	2.8
Y-12	R12/mineral oil	3.1	8.4	3.3								3.0	4.9	3.0	10.9	-1.1
Y-13	R22/mineral oil	8.5	10.5	5.7	5.3	6.1						5.0	7.2	2.2	11.7	2.8
Y-14	R123/mineral oil	3.7	5.1	5.9	4.3	6.8	9.4	6.7	3.7			8.0	5.7	1.9	9.6	1.8
Y-15	R134a/ mixed ester	6.4	5.9	4.7	6.8							4.0	6.0	0.9	7.8	4.1
Y-16	R134a/branched ester	8.4	8.5	7.6	5.2							4.0	7.4	1.5	10.5	4.4
Y-17	R152a/alkylbenzene	3.4	7.8	2.2	4.1	3.5						5.0	4.2	2.1	8.5	-0.1
Y-18	R32/mixed ester	5.8	3.2	3.9	5.7							4.0	4.7	1.3	7.3	2.0
Y-19	R32/branched ester	9.3	4.8	5.4	5.1	4.5						5.0	5.8	2.0	9.8	1.9
Y-20	R124/alkylbenzene	4.7	3.6	5.9	2.8							4.0	4.3	1.3	6.9	1.6
Y-21	R125/mixed ester	7.8	8.8	8.9	9.3	7.6	6.1	10.1	11.6			8.0	8.8	1.7	12.1	5.4
Y-22	R125/branched ester	5.0	9.4	10.5	10.4	7.6	5.2					6.0	8.0	2.5	13.0	3.0
Y-23	R143a/branched ester	6.8	6.7	3.9	5.5	4.2	3.7					6.0	5.1	1.4	7.9	2.3
1000 ppm Moisture																
Y-41	R11/mineral oil	2.5	4.7	5.4	5.5	7.6	7.8	12.1	4.9	3.8	5.3	10.0	6.0	2.7	11.3	0.6
Y-42	R12/mineral oil	10.8	8.0	7.9	2.5	8.7						5.0	7.6	3.1	13.7	1.4
Y-43	R22/mineral oil	5.3	5.9	5.6	7.6	7.5	4.2	4.0	5.2			8.0	5.7	1.3	8.3	3.0
Y-44	R123/mineral oil	8.6	5.9	4.4	3.0	9.1	4.9	4.1	5.3	5.7		9.0	5.7	2.0	9.7	1.6
Y-45	R134a/ mixed ester	6.4	5.5	8.8	5.1							4.0	6.5	1.7	9.8	3.1
Y-46	R134a/branched ester	6.4	5.1	4.4	6.1	10.1						5.0	6.4	2.2	10.8	2.0
Y-47	R152a/alkylbenzene	8.2	6.5	6.0	7.6	5.6	7.8	9.3	6.3	8.8		9.0	7.3	1.3	10.0	4.7
Y-48	R32/mixed ester	11.4	7.3	4.6	3.4	2.4	5.7	9.8	4.4			8.0	6.1	3.2	12.4	-0.2
Y-49	R32/branched ester	1.6	2.6	2.1	1.5	7.9	9.3	4.7	1.8			8.0	3.9	3.1	10.1	-2.2
Y-50	R124/alkylbenzene	12.5	4.7	5.0	5.6	11.0	4.4					6.0	7.2	3.6	14.4	0.0
Y-51	R125/mixed ester	4.2	4.3	6.3	6.4	8.7	4.7	3.9	3.5			8.0	5.3	1.8	8.8	1.7
Y-52	R125/branched ester	5.6	5.3	4.1	5.7	5.0	2.8	5.8				7.0	4.9	1.1	7.1	2.7
Y-53	R143a/branched ester	3.7	2.0	4.8	2.0							4.0	3.1	1.4	5.9	0.4

Table Y.4. Gas Chromatography Analysis

Desiccant: Y - 4Å Core (No Carbon)

GC Peak Areas																			
Code	Peak ID > > Reten. Time > >	R-II 7.00	R-12 2.00	R-22 1.40	R-32 0.70	R-123 12.50	R-124 3.00	R-125 0.90	R-134a 1.18	R-143a 1.00	R-152a 1.38	NCG 0.35	CO2 0.55	Unkn 1 0.90	Unkn 2 1.30	Unkn 3 2.90	Unkn 4 4.20	Unkn 5 4.60	Unkn 6 5.20
50 ppm Moisture																			
Y-11	R11/mineral oil	198,410										28,094	220						
Y-12	R12/mineral oil		285,938									324	306						
Y-13	R13/mineral oil			280,097								5,969	13,354						
Y-14	R123/mineral oil					319,895						240	128		1,311				
Y-15	R134a/mixed ester								263,982			236	418						836
Y-16	R134a/branched ester								265,564			201	402						
Y-17	R152a/alkylbenzene										263,098	1,201	992	378			1,040		
Y-18	R37/mixed ester				130,101							18,155	3,481	1,085	429				
Y-19	R32/branched ester				144,779							6,727	5,799		145				
Y-20	R124/alkylbenzene						277,571					300	199						
Y-21	R125/mixed ester							276,009				226	438			1,278			
Y-22	R125/branched ester							210,828				170	276						
Y-23	R143a/branched ester									204,727		31,173	357						
1000 ppm Moisture																			
Y-41	R11/mineral oil	214,735										36,592							
Y-42	R12/mineral oil		281,288									172	270						
Y-43	R22/mineral oil			266,735								7,816	9,275						
Y-44	R123/mineral oil					350,612						158	86		1,091				1,016
Y-45	R134a/mixed ester								77,935			209	341						
Y-46	R134a/branched ester								221,843			27,559	486						
Y-47	R152a/alkylbenzene										219,204	14,515	853	672					
Y-48	R37/mixed ester				298,484							122,215	7,683		725				
Y-49	R32/branched ester				275,634							12,293	6,801		878				
Y-50	R124/alkylbenzene						131,602					182							
Y-51	R125/mixed ester							263,152				678	378		1,039				
Y-52	R125/branched ester							241,290				396	414						
Y-53	R143a/branched ester									213,374		38,719	266						

Appendix Z

Desiccant Z: 4Å Core (No Carbon)

Table Z.1. Summary Test Results

Desiccant: Z - 4Å Core (No Carbon)

Code	System Fluids	Liquid Color (2-8)	Desic Color (0-3)	Copper Plating (0-5)	Solids Formation (0-3)	Steel Corrosion (0-3)	Crush Strength (lbs)	GC % Ref Reacted (wt %)	Total Acid Number (mg KOH)	F Ion Liquid (ppm)	F Ion Desiccant (ppm)	Cl Ion Liquid (ppm)	Cl Ion Desiccant (ppm)	Org Acid In Liquid (ppm)	Org Acid on Desic (ppm)
Z-New	None	2.5	0				3.8				45		54		0
50 ppm Moisture															
Z-11	R11/mineral oil	3.0	2	0	0	0	2.3	0.15	<0.1	6	3	200	6,010	1	280
Z-12	R12/mineral oil	3.0	2	0	0	0	2.8	0.00	<0.1	4	280	34	3,190	0	1,120
Z-13	R22/mineral oil	2.5	1	0	0	0	2.1	0.11	<0.1	53	3,680	620	16,900	9	3,620
Z-14	R123/mineral oil	3.0	1	0	0	0	3.4	0.25	0.3	3	280	64	3,050	15	360
Z-15	R134a/mixed ester	2.5	0	0	0	0	3.5	0.00	7.1	0	1	4	18	8,080	18,400
Z-16	R134a/branched ester	2.5	0	0	0	0	3.3	0.00	6.1	0	0	3	93	5,810	24,500
Z-17	R152a/alkylbenzene	5.0	2	0	0	0	1.9	0.43	2.6	62	490	220	65	2,490	45
Z-18	R32/mixed ester	6.0	2	0	0	0	1.7	0.00	>30	4,330	15,500	16	18	32,200	30,400
Z-19	R32/branched ester	4.0	0	0	0	0	5.4	1.17	>30	1,690	16,400	6	44	23,900	10,800
Z-20	R124/alkylbenzene	2.5	0	0	0	0	4.2	0.49	<0.1	14	1,290	29	3,290	11	410
Z-21	R125/mixed ester	2.5	0	0	0	0	4.5	0.00	17.7	0	3	2	17	9,840	21,000
Z-22	R125/branched ester	2.5	0	0	0	0	4.8	0.00	13.9	0	0	2	13	8,870	16,300
Z-23	R143a/branched ester	2.5	0	0	0	0	3.4	0.00	7.4	3	300	5	40	5,080	15,100
1000 ppm Moisture															
Z-41	R11/mineral oil	3.0	1	0	0	0	4.4	0.00	<0.1	10	200	140	5,900	9	370
Z-42	R12/mineral oil	3.0	1	0	0	0	3.9	0.00	<0.1	6	130	63	3,850	5	1,360
Z-43	R22/mineral oil	2.5	0	0	0	0	3.9	0.00	<0.1	23	3,080	743	14,700	5	4,050
Z-44	R123/mineral oil	3.0	1	0	0	0	2.8	0.28	<0.1	5	420	53	3,250	4	800
Z-45	R134a/mixed ester	2.6	0	0	0	0	3.8	0.00	5.9	0	1	10	52	8,850	26,600
Z-46	R134a/branched ester	2.5	0	0	0	0	8.3	0.00	11.6	0	0	0	83	5,460	25,100
Z-47	R152a/alkylbenzene	5.0	1	0	0	0	4.0	0.43	3.2	600	830	70	36	770	250
Z-48	R32/mixed ester	7.5	2	0	0	0	4.0	0.22	>30	5,130	9,700	45	27	45,400	34,900
Z-49	R32/branched ester	3.5	1	0	0	0	3.0	0.17	>30	1,060	1,610	4	31	15,800	19,300
Z-50	R124/alkylbenzene	2.5	0	0	0	0	9.8	0.00	<0.1	3	75	24	220	1,370	33,200
Z-51	R125/mixed ester	3.0	0	0	0	0	4.7	0.00	19.2	0	0	10	28	8,330	26,300
Z-52	R125/branched ester	2.5	0	0	0	0	3.7	0.00	9.8	0	0	6	8	4,440	14,900
Z-53	R143a/branched ester	2.5	0	0	0	0	3.1	0.00	10.7	0	4	2	140	4,980	23,200

Table Z.4. Gas Chromatography Analysis

Desiccant: Z - 4Å Core (No Carbon)

Code	Peak ID >> Reten. Time >>	GC Peak Areas												Unkn 1	Unkn 2	Unkn 3	Unkn 4	Unkn 5	Unkn 6
		R-II	R-12	R-22	R-32	R-123	R-124	R-125	R-134a	R-143a	R-152a	NCG	CO2						
		7.00	2.00	1.40	0.70	12.50	3.00	0.90	1.18	1.00	1.38	0.35	0.55						
50 ppm Moisture																			
Z-11	R11/mineral oil	325.960										187	236		477				
Z-12	R12/mineral oil		250.980									107,489							
Z-13	R22/mineral oil			209.154								1,439	473		328				
Z-14	R123/mineral oil					278.551							118		687				
Z-15	R134a/mixed ester									252.974		4,436							
Z-16	R134a/branched ester									261.618		400	270						
Z-17	R152a/alkylbenzene										200.445	286	802		867				
Z-18	R32/mixed ester				95.669							33,692	4,168						
Z-19	R32/branched ester				196.468							7,270	1,916			2,300			
Z-20	R124/alkylbenzene						265.075					137	266			1,291			
Z-21	R125/mixed ester							258.429				1,687							
Z-22	R125/branched ester							241.439				729	148						
Z-23	R143a/branched ester								271.356			37,186	278						
1000 ppm Moisture																			
Z-41	R11/mineral oil	195.770										35,931	257						
Z-42	R12/mineral oil		276.866									700	216						
Z-43	R22/mineral oil			265.694								2,636	4,985						
Z-44	R123/mineral oil					289.832						314	210		819				
Z-45	R134a/mixed ester									243.566		357	176						
Z-46	R134a/branched ester									278.850		215	272						
Z-47	R152a/alkylbenzene										129.112	25,504	366		549				
Z-48	R32/mixed ester				277.976							16,461	5,358			616			
Z-49	R32/branched ester				127.415							9,630	5,332			218			
Z-50	R124/alkylbenzene						155.559					392							
Z-51	R125/mixed ester							274.844				178	278						
Z-52	R125/branched ester							233.375				13,003	228						
Z-53	R143a/branched ester								211.940			35,813							