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COMPATIBILITY OF REFRIGERANTS AND LUBRICANTS WITH MOTOR MATERIALS

Quarterly Technical Progress Report

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COMPATIBILITY OF REFRIGERANTS AND LUBRICANTS WITH MOTOR MATERIALS

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Abstract

Equipment manufacturers are challenged to replace CFC-based refrigerants and their lubricants with environmentally acceptable alternatives. Information on the compatibility of motor materials with these alternative refrigerants and lubricants is a basic requirement for reliable performance. This report presents compatibility data for 24 commercially used motor materials exposed to 17 refrigerant/lubricant combinations. This compatibility data will enable the phase out of CFC's to continue at its current fast pace and insure the continued reliable performance of refrigerant-based equipment.

Scope

This project covers compatibility tests of 24 commercially used motor materials exposed to 11 pure refrigerants and 17 refrigerant-lubricant combinations. Materials were evaluated immediately after a 500 hour exposure and after a 500 hour exposure followed by an additional 24 hour bake at 150°C(302°F) in air to remove absorbed refrigerant. The effect of heat alone was determined by exposures in nitrogen gas. What follows is a listing of refrigerants, refrigerant-lubricant combinations, motor materials and tests performed on the motor materials, covering the entire motor materials compatibility project.

REFRIGERANTS AND LUBRICANTS

The 11 pure refrigerants and 17 refrigerant-lubricant combinations were exposed for 500 hours at the temperatures indicated below:

Refrigerants

HCFC-22 @ 90°C(194°F)
HCFC-123 @ 90°C(194°F)
HCFC-124 @ 90°C(194°F)
HCFC-142b @ 90°C(194°F)
HFC-152a @ 90°C(194°F)
HFC-134a @ 90°C(194°F)
HFC-134 @ 90°C(194°F)
HFC-32 @ 60°C(140°F)
HFC-125 @ 60°C(140°F)
HFC-143a @ 60°C(140°F)
HFC-245ca @ 121°C(250°F)

Refrigerant-Lubricant Combinations(exposed @ 127°C(260°F)

HCFC-22/Mineral
HCFC-124/Alkylbenzene
HCFC-142b/Alkylbenzene
HFC-152a/Alkylbenzene
HFC-134a/Ester, Mixed Acid
HFC-134a/Ester, Branched
HFC-32/Ester, Branched Acid
HFC-125/Ester, Branched Acid
HFC-143a/Ester, Branched Acid
HFC-134/Ester, Branched Acid
HFC-245ca/Ester, Branched Acid
HFC-134a/PAG, Butyl Monoether
HFC-32/PAG, Butyl Monoether
HFC-125/PAG, Butyl Monoether
HFC-134a/PAG, Modified
HFC-125/PAG, Modified
HFC-134a/PAG, Diol

MOTOR MATERIALS

The 24 commercially used motor materials evaluated were:

Magnet Wire

-Modified polyester overcoated with polyamide imide per Section MW 73 of NEMA Standard MW 1000
-Modified polyester overcoated with polyamide imide and epoxy saturated glass per Section MW 73 and MW 46 of NEMA Standard MW 1000
-Polyester imide over coated with polyamide imide

Varnishes

-U475EH solvent epoxy
-Y390PG solvent epoxy-phenolic
-ER610 93% solids epoxy
-Y833 100% solids VPI epoxy
-923 solvent epoxy
-Isopoxy 800 water-borne epoxy

Lead Wire Insulation

-Dacron/Mylar/Dacron
-Dacron/Teflon/Mylar/Dacron

Sheet Insulation, Slot Liners and Phase Separators

-Nomex/Mylar/Nomex
-Dacron/Mylar/Dacron
-Mylar MO
-Nomex 410
-Nomex Mica 418
-Melinex 228

Tapes

-Heat Cleaned Glass
-Heat Shrinkable Braid polyester
-Glass/acrylic

Spiral Wrapped Sleeving Insulation

-Nomex
-Mylar
-Nomex/Mylar

Tie Cords

-Polyester

EVALUATIONS PERFORMED

The evaluations, in addition to visual examination, performed on the 24 commercially used motor materials were:

Varnish
-Weight Change

Lead Wire
-Weight Change
-Dielectric Strength

Tie Cord
-Weight Change
-Break Load Strength

Magnet Wire/Varnish
-Bond Strength
-Burnout Resistance
-Dielectric Strength
-Weight Change

Spiral Wrapped Sleeving
-Weight Change
-Break Load Strength

Sheet Insulation
-Weight Change
-Tensile Strength
-Elongation
-Dielectric Strength

Tapes
-Weight Change

The third quarter report summarized the effects of 10 pure refrigerants on 24 motor materials. Absorption of HCFC-123 was higher than other refrigerants. However, absorption of HCFC-22, HFC-32, HFC-134 and HFC-152a followed by desorption of these refrigerants at higher temperatures resulted in greater damage to the insulation material than was observed with HCFC-123. This suggested that refrigerant desorption appears to be more important than the amount of refrigerant absorbed. Desorption of refrigerant caused blisters, cracking, internal bubbles and delamination. The measured effect on properties of some materials was a decrease of bond strength(as high as 95%), a decrease of dielectric strength(as high as 70%), and a decrease in the physical integrity of the material. Compared to the bond and dielectric strengths, burnout was less influenced by desorption prior to the test. This was because the burnout test causes desorption of refrigerant during the test. Magnet wire with polyester-glass serving had the best burnout resistance and was influenced much less by absorbed refrigerant when compared with the other types of wires. The sheet insulation, sleeving, lead wire and tape appeared to be less affected by the refrigerant than the varnished magnet wires. High extract of the glass-acrylic assembly tape was a concern. Of the 10 refrigerants tested, HCFC-22 appeared to produce the most deleterious effects on motor materials. Therefore, because of the excellent reliability history of HCFC-22 with many of these materials, the alternative refrigerants are expected to be compatible with most materials.

During the fourth quarter, the compatibility studies with the 24 motor materials were completed. This fourth quarterly report summarizes the effect of the 17 refrigerant-lubricant combinations on the 24 commercially used motor materials.

SIGNIFICANT RESULTS

INTRODUCTION

In order to develop an environmentally acceptable refrigerant molecule, it is necessary to include hydrogen to decrease atmospheric life and to remove chlorine to eliminate ozone depletion. The result is a more polar refrigerant that is less miscible with classical mineral or alkylbenzene lubricants. For the HFC refrigerants, it is necessary to use a polar synthetic lubricant such as an ester or a polyalkylene glycol to achieve acceptable miscibility. The effect

of new refrigerants coupled to the appropriate synthetic lubricant on motor materials is discussed in this report.

The results of tests on 24 motor materials exposed to synthetic lubricant containing dissolved refrigerants at 300 psi and 127°C(260°F) are presented in the Appendix Tables A-1 to A-42.

DISCUSSION

The compatibility results of the 17 refrigerant-lubricant combinations with motor materials are influenced both by the refrigerant and the lubricant. Results also differ from that of pure refrigerant because of the use of a higher exposure temperature of 127°C(260°F) versus 90°C(194°F) and 60°C(140°F) for the pure refrigerant. The amount of refrigerant in the lubricant was the equilibrium concentration at 300 psi refrigerant pressure at 127°C(260°F). The amount dissolved depends on the solubility of the refrigerant in the lubricant.

The data should be compared to a refrigerant-lubricant combination with a history of reliability. Since pure HCFC-22 showed the most deleterious effect on materials and had a well documented reliability history, results in the third quarterly report were compared to HCFC-22. Comparison of the compatibility data for refrigerant-lubricant combinations with that of pure refrigerants(summarized in the third quarter report) suggests that, in general, pure refrigerants exhibit a greater effect on materials than the refrigerant-lubricant combinations. This effect occurs even though exposures for pure refrigerants were at a lower temperature.

Materials are discussed in the same order as discussed in the third quarter report. Comparisons are made to the HCFC-22/Mineral oil and to the effect of pure refrigerant.

Varnishes

Absorption of most refrigerant-lubricants by the varnishes(A-1) was low (-1 to 11%) with the exception of the PAG Diol, which absorbed 7.9% to 25.9%. Baking the exposed samples at 150°C(302°F) removed most of the refrigerant-lubricant from the samples, but did not result in degradation of the varnish. Negative values(0 to -8.6%) were observed suggesting extraction. These negative values were similar in magnitude to that observed after exposure to pure refrigerants. The PAG Diol remained at a high level suggesting that most of the absorbed refrigerant-lubricant was retained. Positive values were also observed for the HCFC-142b and alkylbenzene lubricant suggesting the refrigerant-lubricant was also retained by the varnish.

Magnet Wire

Three types of magnet wire were tested, both alone and in combination with six varnishes. Tests were conducted that measured changes in weight, flexibility, bond strength, burnout resistance and dielectric strength. This report covers the last three tests while weight change(absorption) and flexibility will be covered in the final report.

Bond Strength

The effect of refrigerant-lubricant on the bond strength of the three magnet wires is discussed on pages A-3 to A-9. The helical coil bond strength test(ASTM-2519) is a measure of the ability of the motor varnish to hold the magnet wire coils together. This report is more concerned with the effect of the refrigerant-lubricant on the bond strength rather than the

unexposed bond strength itself. Results are presented on the top of the tables for the unexposed bond strength and in the table proper for the percent changes in the bond strength after exposure to refrigerant-lubricant. Changes in the bond strength of Y-833 varnish should not be compared to the other varnishes, because the Y-833 is used primarily for its electrical insulating properties on form wound coils rather than bonding magnet wire together.

For magnet wire A (polyester base with an amide imide overcoat), the lubricant showing the greatest overall decrease in bond strength is the alkylbenzene lubricant, -7.7 to -64.5% after the 500 hour exposure. After an additional 24 hours at 150°C(302°F) the same oil with HCFC-142b seems to show the greatest effect, -45.0% to -84.5% change. These results are less than that exhibited by the pure refrigerant, where bond strength was reduced by as much as -94.6% for HCFC-22, -91.2% for HFC-152a and -92.9% for HFC-32. The magnitude of the effect of HCFC-142b in the alkylbenzene oil may be due to the fact that approximately 50% HCFC-142b by weight was required to reach the 300 psi exposure condition. In general, the polyolesters and polyalkylene glycol's had relatively little effect on bond strength. This is especially true considering heat alone in a nitrogen atmosphere can reduce bond strength from -29.9% to -59.7% after the 500 hour exposure.

Refrigerant-lubricant exposures at 127°C(260°F) appeared to have less effect on varnished magnet wire B(polyester-glass served wire) than on magnet wire A(polyester with amide imide overcoat) and magnet wire C(ester imide with amide imide overcoat).

Because the effect of refrigerant-lubricant on bond strength is less than that exhibited by pure refrigerants(especially HCFC-22 with a good reliability record), compatibility of the three magnet wire types and six varnishes is not a major concern in regard to bond strength.

Burnout Strength

Exposure of varnished and unvarnished magnet wire to refrigerant-lubricant combinations(A-9 to A-14) showed similar effects on burnout strength to that exhibited by pure refrigerants. The alkylbenzene lubricants show somewhat greater effects than the other lubricants. Magnet wire B (polyester glass served) has greater burnout strength than the other two wires. The additional 24 hour bake at 150°C(302°F) does not adversely effect the burnout strength of the wire. Effect of refrigerant-lubricant combinations on burnout strength of varnished and unvarnished magnet wire is not expected to be a compatibility concern.

Dielectric Strength

Compared to the pure refrigerants, the refrigerant-lubricant combinations(A-15 to A-20) had less effect on the dielectric strength of the varnished and unvarnished magnet wire. In some cases the dielectric strength increased suggesting the lubricant was acting as an electrical insulator. This is especially true for magnet wire B (polyester-glass served) where most of the values are positive.

Sheet Insulation

Absorption of refrigerant-lubricant by the sheet insulation was somewhat higher than absorption of pure refrigerant. The porous Nomex-Mica absorbed the most refrigerant lubricant. Bakeout at 150°C(302°F) did not remove all the lubricant. There was a significant decrease in tensile strength and elongation, but this is due more to the effect of temperature than effect of refrigerant-lubricants. Exposure to nitrogen at 127°C(260°F) for 500 hours followed by 150°C(260°F) for 24 hours caused a decrease in tensile strength as great as

97.8% and decrease in elongation as great as 96.8%. Dielectric strength after exposures was good.

The HFC-134a/PAG Diol caused complete delamination of Nomex-Mylar-Nomex and the Dacron-Mylar-Dacron by dissolving the adhesive. A white precipitate was observed in cooled HCFC-22/mineral oil after the 500 hour exposure. Analysis of the precipitate by FTIR showed it was polyester dissolved from the Mylar, Dacron or Melinex materials. This polyester precipitate was not observed in the other lubricants.

Except for the effect of refrigerant-lubricant combinations on the adhesives for sheet insulation, compatibility appears acceptable for the combinations tested.

Spiral Wrapped Sleeving

The Nomex spiral wrapped sleeving insulation absorbed more refrigerant-lubricant than did the Mylar. This may be due to the fibrous structure of the Nomex. Absorption was not considered excessive and degradation was not observed. Unlike the sheet insulation, the spiral wrapped sleeving did not delaminate exposed to HFC-134a/PAG diol.

Lead Wire

Absorption of refrigerant-lubricant by the lead wire was moderate. Neither the Dacron-Mylar-Dacron or the Dacron-Mylar-Teflon-Dacron insulation showed excessive decrease in the dielectric strength. The dielectric strength of the DMTD increased after most of the exposures.

Tapes and Tie Cord

The tapes, especially the polyester and glass-acrylic tape, were affected by the refrigerant-lubricant combination to a greater extent than by pure refrigerants. Absorption as high as 47.9% was observed. A decrease in tensile strength of -78.6% was noted for the HCFC-22/mineral oil combination. This effect appears to be caused by the lubricant because controlled exposure in nitrogen at 127°C(260°F) did not result in the same effect. The tie cords were not adversely affected by the refrigerant-lubricant. The brittleness and decreased strength of the polyester and glass-acrylic tape is a concern. However the worst results were observed for HCFC-22/mineral oil which has a good reliability record.

Conclusion

The refrigerant-lubricant combinations appeared to have less effect on the motor materials than pure refrigerants, with the exception of the tapes. No evidence of insulation degradation due to desorption of refrigerant were observed in the presence of lubricants. The primary issues of concern were the delamination of the sheet insulation by the PAG Diol lubricant and decreased strength of the tapes. Precipitation of solid polyester materials extracted by the mineral oil was observed. No evidence of polyester precipitate was observed with the synthetic lubricants, suggesting sticking valves or clogged capillaries may be less of a problem with the new lubricants.

Results suggest that the new synthetic lubricants will present few compatibility problems with motor materials.

COMPLIANCE WITH AGREEMENT

The Trane Company complied with all terms of the grant agreement during the third quarter of calendar year 1992.

PRINCIPAL INVESTIGATOR EFFORT

Robert Doerr (Project Manager) devoted 110 hours(23% of his available work hours) to this program this last quarter.

Stephen Kujak (Principal Investigator) devoted 357 hours(76% of his available work hours) to this program this last quarter.

Technicians and other investigators worked approximately 480 hours on this project during the last quarter.

Appendix A.

COMPATIBILITY DATA FOR REFRIGERANT-LUBRICANT COMBINATIONS WITH MOTOR MATERIALS

Varnish Disks

% Change in Weight

Results after a 500-hour exposure @ 127°C(260°F)

Exposure with:	Varnish Type: U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
	% Change in Weight					
Nitrogen	1.6%	1.5%	0.0%	0.6%	-1.4%	-3.2%
HCFC-22/Mineral	4.6%	4.7%	6.0%	3.9%	0.6%	-3.0%
HCFC-124/Alkylbenzene	2.0%	0.6%	5.4%	2.9%	0.9%	-1.3%
HCFC-142b/Alkylbenzene	5.0%	6.3%	10.9%	6.7%	5.9%	-0.9%
HFC-152a/Alkylbenzene	4.6%	1.7%	6.8%	-0.7%	2.4%	-2.5%
HFC-134a/Ester, Mixed Acid	1.6%	0.6%	3.1%	1.3%	-0.2%	-3.3%
HFC-134a/Ester, Branched Acid	1.2%	0.7%	3.2%	1.6%	-0.1%	-5.4%
HFC-32/Ester, Branched Acid	0.8%	1.4%	-1.7%	-0.8%	-1.9%	-8.6%
HFC-125/Ester, Branched Acid	-2.2%	1.8%	0.8%	0.8%	-2.0%	-1.6%
HFC-143a/Ester, Branched Acid	-0.8%	3.1%	1.2%	0.0%	-2.0%	-2.7%
HFC-134/Ester, Branched Acid	0.1%	2.1%	2.8%	1.7%	-1.4%	-0.9%
HFC-245ca/Ester, Branched Acid	1.2%	0.1%	3.8%	2.7%	-0.9%	-1.4%
HFC-134a/PAG, Butyl Monoether	0.7%	0.4%	3.1%	2.4%	-1.9%	-2.0%
HFC-32/PAG, Butyl Monoether	-0.2%	0.3%	2.9%	0.7%	-3.0%	-1.1%
HFC-125/PAG, Butyl Monoether	-1.6%	2.0%	0.7%	-1.5%	-1.7%	-0.8%
HFC-134a/PAG, Modified	-1.2%	1.5%	2.2%	2.0%	-1.0%	-0.5%
HFC-125/PAG, Modified	0.7%	2.8%	3.9%	4.2%	2.6%	1.5%
HFC-134a/PAG Diol	10.7%	18.7%	7.9%	8.4%	13.4%	25.9%

Varnish Disks

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

Exposure with:	Varnish Type: U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
	% Change in Weight					
Nitrogen	-1.2%	-1.9%	-0.5%	0.7%	-1.3%	-3.1%
HCFC-22/Mineral	0.7%	-1.6%	2.4%	1.3%	-1.6%	-4.6%
HCFC-124/Alkylbenzene	0.0%	-0.5%	1.7%	1.6%	0.4%	-0.6%
HCFC-142b/Alkylbenzene	1.8%	2.0%	2.1%	4.4%	2.6%	-4.2%
HFC-152a/Alkylbenzene	-0.1%	-1.1%	1.9%	-4.4%	-0.7%	-4.1%
HFC-134a/Ester, Mixed Acid	-0.8%	-2.3%	0.5%	1.4%	-1.0%	-4.0%
HFC-134a/Ester, Branched Acid	-0.4%	-2.6%	0.0%	-3.1%	-1.5%	-8.8%
HFC-32/Ester, Branched Acid	-1.2%	-3.3%	0.3%	-3.5%	-3.2%	-8.4%
HFC-125/Ester, Branched Acid	-3.0%	-2.8%	-0.4%	0.4%	-2.2%	-2.3%
HFC-143a/Ester, Branched Acid	2.3%	-5.6%	-1.2%	-1.7%	-2.8%	-3.6%
HFC-134/Ester, Branched Acid	-3.4%	-2.6%	-0.4%	-0.4%	-3.1%	-3.3%
HFC-245ca/Ester, Branched Acid	-1.5%	-0.7%	0.7%	0.2%	-1.7%	-3.5%
HFC-134a/PAG, Butyl Monoether	-2.3%	-2.7%	0.0%	-0.6%	-2.6%	-2.6%
HFC-32/PAG, Butyl Monoether	-2.8%	-2.6%	0.1%	-3.9%	-4.3%	-2.8%
HFC-125/PAG, Butyl Monoether	-2.7%	-1.9%	0.0%	0.2%	-2.1%	-1.6%
HFC-134a/PAG, Modified	-2.9%	-3.1%	-0.7%	0.3%	-3.0%	-2.8%
HFC-125/PAG, Modified	-1.8%	1.4%	0.7%	-0.1%	1.1%	-1.1%
HFC-134a/PAG Diol	4.6%	17.8%	3.4%	4.3%	7.6%	12.9%

Varnish Bond Strength

Varnish Coated on Magnet Wire A(ester base with amide imide overcoat)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	73.7 lbs.	43.8 lbs.	51.8 lbs.	9.9 lbs	41.3 lbs	45.0 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-29.9%	-42.8%	-36.6%	-5.8%	-40.9%	-59.7%
HCFC-22/Mineral	-23.8%	-10.2%	-23.1%	184.8%	-24.8%	-7.4%
HCFC-124/Alkylbenzene	-47.4%	-33.8%	-62.6%	40.5%	-16.3%	-11.3%
HCFC-142b/Alkylbenzene	-51.4%	-34.7%	-36.1%	40.3%	-32.9%	-30.3%
HFC-152a/Alkylbenzene	-64.5%	-42.2%	-47.5%	78.2%	-20.2%	-7.7%
HFC-134a/Ester, Mixed Acid	-19.4%	-27.6%	12.8%	102.2%	-18.9%	-14.7%
HFC-134a/Ester, Branched Acid	-20.0%	-34.2%	11.1%	30.7%	-19.6%	-42.3%
HFC-32/Ester, Branched Acid	-61.3%	-36.4%	-8.1%	94.9%	-28.0%	-2.8%
HFC-125/Ester, Branched Acid	-9.8%	-27.7%	12.3%	172.3%	-22.6%	14.2%
HFC-143a/Ester, Branched Acid	-34.5%	-32.7%	-26.1%	149.1%	-29.4%	-15.9%
HFC-134/Ester, Branched Acid	-24.7%	-17.6%	18.0%	336.4%	-14.3%	10.9%
HFC-245ca/Ester, Branched Acid	-21.5%	-29.8%	6.7%	102.0%	-20.7%	-21.8%
HFC-134a/PAG, Butyl Monoether	-15.3%	-21.9%	0.9%	113.2%	-25.0%	-1.3%
HFC-32/PAG, Butyl Monoether	-26.9%	37.3%	25.5%	284.2%	-17.2%	7.1%
HFC-125/PAG, Butyl Monoether	-9.4%	29.2%	3.6%	480.2%	-10.6%	-4.6%
HFC-134a/PAG, Modified	-25.7%	-39.8%	5.8%	51.7%	-23.0%	-14.0%
HFC-125/PAG, Modified	-2.0%	56.9%	9.9%	141.2%	-3.5%	-1.5%
HFC-134a/PAG Diol	-35.4%	14.4%	11.4%	316.6%	-30.0%	-22.9%

Varnish Bond Strength

Varnish Coated on Magnet Wire A(ester base with amide imide overcoat)

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	73.7 lbs.	43.8 lbs.	51.8 lbs.	9.9 lbs	41.3 lbs	45.0 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-8.3%	-30.0%	-11.1%	31.0%	-35.0%	-28.4%
HCFC-22/Mineral	-21.2%	7.5%	-0.7%	199.2%	4.5%	3.1%
HCFC-124/Alkylbenzene	-23.7%	-41.3%	-30.2%	123.7%	-16.3%	-18.5%
HCFC-142b/Alkylbenzene	-84.5%	-67.7%	-74.1%	-25.2%	-45.0%	-65.5%
HFC-152a/Alkylbenzene	-42.8%	-48.4%	-70.1%	79.3%	-61.7%	-1.4%
HFC-134a/Ester, Mixed Acid	-24.4%	-9.0%	-5.1%	125.7%	-4.7%	-1.6%
HFC-134a/Ester, Branched Acid	-26.2%	-15.3%	-10.0%	177.5%	-10.1%	-31.3%
HFC-32/Ester, Branched Acid	-32.0%	-20.9%	-23.4%	172.1%	-8.8%	6.5%
HFC-125/Ester, Branched Acid	-2.5%	12.4%	31.7%	301.9%	-12.4%	-1.9%
HFC-143a/Ester, Branched Acid	-37.3%	-37.3%	-38.3%	150.3%	10.6%	6.5%
HFC-134/Ester, Branched Acid	-2.7%	1.3%	13.4%	535.5%	-0.3%	-2.0%
HFC-245ca/Ester, Branched Acid	3.6%	9.7%	2.8%	82.1%	-16.4%	5.3%
HFC-134a/PAG, Butyl Monoether	0.0%	-2.5%	16.0%	200.2%	6.1%	14.8%
HFC-32/PAG, Butyl Monoether	-19.5%	9.1%	28.7%	323.0%	-4.0%	1.6%
HFC-125/PAG, Butyl Monoether	10.8%	21.8%	29.8%	351.1%	6.8%	6.6%
HFC-134a/PAG, Modified	5.7%	-7.4%	19.2%	127.3%	-11.7%	-2.7%
HFC-125/PAG, Modified	-7.2%	37.7%	27.0%	234.9%	-18.4%	-22.1%
HFC-134a/PAG Diol	-62.9%	-24.6%	23.1%	204.7%	-26.3%	-18.9%

Varnish Bond Strength

Varnish Coated on Magnet Wire B(Dacron/Glass served wire)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	40.1 lbs	36.1 lbs	36.0 lbs	33.1 lbs	40.5 lbs	20.2 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-30.3%	-11.1%	-36.8%	-43.5%	-26.6%	-12.5%
HCFC-22/Mineral	-19.6%	-3.8%	-27.6%	-45.7%	-8.5%	10.3%
HCFC-124/Alkylbenzene	-16.8%	-1.0%	-27.6%	-45.1%	-11.5%	-3.6%
HCFC-142b/Alkylbenzene	-2.8%	12.2%	-14.6%	-18.0%	-14.1%	22.3%
HFC-152a/Alkylbenzene	-8.5%	5.7%	-1.0%	-31.6%	-5.6%	-9.5%
HFC-134a/Ester, Mixed Acid	-22.6%	5.2%	-19.3%	-26.0%	2.4%	27.1%
HFC-134a/Ester, Branched Acid	-6.2%	-9.0%	-5.1%	-28.8%	-12.2%	16.0%
HFC-32/Ester, Branched Acid	-25.6%	-8.6%	-28.9%	-47.6%	-20.8%	-3.1%
HFC-125/Ester, Branched Acid	-25.1%	14.4%	-20.9%	20.1%	-8.8%	-26.7%
HFC-143a/Ester, Branched Acid	-25.8%	-0.3%	-10.9%	-41.7%	-13.8%	-3.8%
HFC-134/Ester, Branched Acid	-1.0%	26.2%	-8.3%	53.8%	11.3%	-0.5%
HFC-245ca/Ester, Branched Acid	-21.7%	14.2%	-19.0%	-11.9%	-3.3%	6.6%
HFC-134a/PAG, Butyl Monoether	-7.6%	37.1%	-18.5%	6.4%	-0.5%	-7.4%
HFC-32/PAG, Butyl Monoether	22.6%	48.6%	-4.2%	-10.5%	8.9%	10.1%
HFC-125/PAG, Butyl Monoether	-18.2%	16.5%	-2.9%	13.4%	-5.3%	5.9%
HFC-134a/PAG, Modified	-12.0%	40.6%	-13.1%	4.2%	-5.5%	3.3%
HFC-125/PAG, Modified	22.9%	51.6%	13.5%	30.6%	23.6%	36.0%
HFC-134a/PAG Diol	2.6%	21.0%	8.0%	10.3%	0.1%	16.3%

Varnish Bond Strength

Varnish Coated on Magnet Wire B(Dacron/Glass served wire)

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	40.1 lbs	36.1 lbs	36.0 lbs	33.1 lbs	40.5 lbs	20.2 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-35.5%	-11.0%	-24.0%	-44.5%	-16.6%	-25.7%
HCFC-22/Mineral	-17.0%	-6.5%	-21.4%	-51.2%	-21.0%	-6.6%
HCFC-124/Alkylbenzene	-19.8%	-11.2%	-21.0%	-38.0%	-29.6%	-6.4%
HCFC-142b/Alkylbenzene	-30.5%	-28.0%	-24.1%	-46.4%	-32.1%	-14.8%
HFC-152a/Alkylbenzene	-25.4%	-12.8%	-13.1%	-39.2%	-20.8%	-25.5%
HFC-134a/Ester, Mixed Acid	-14.4%	6.7%	-13.1%	-24.8%	-4.5%	5.4%
HFC-134a/Ester, Branched Acid	-15.9%	-8.3%	-5.3%	-54.7%	-14.8%	1.6%
HFC-32/Ester, Branched Acid	-22.6%	-16.7%	-31.1%	-70.4%	-32.9%	-23.4%
HFC-125/Ester, Branched Acid	-16.4%	15.4%	-15.2%	7.9%	-19.5%	-3.2%
HFC-143a/Ester, Branched Acid	-23.5%	-21.8%	-29.3%	-35.8%	-30.0%	-26.1%
HFC-134/Ester, Branched Acid	-3.0%	19.7%	-17.5%	-6.7%	-8.5%	-2.1%
HFC-245ca/Ester, Branched Acid	-18.7%	6.9%	-17.1%	-8.8%	-9.6%	-7.4%
HFC-134a/PAG, Butyl Monoether	-23.1%	33.1%	-14.8%	-0.4%	-15.4%	-17.4%
HFC-32/PAG, Butyl Monoether	-12.5%	13.6%	-16.4%	16.1%	3.3%	2.6%
HFC-125/PAG, Butyl Monoether	16.4%	24.3%	1.5%	37.3%	19.4%	42.6%
HFC-134a/PAG, Modified	-18.4%	23.2%	-11.6%	-12.0%	-8.5%	7.5%
HFC-125/PAG, Modified	-3.6%	38.7%	-8.3%	0.5%	1.0%	4.9%
HFC-134a/PAG Diol	-12.3%	-52.9%	-15.3%	-56.3%	-11.2%	0.0%

Varnish Bond Strength

Varnish Coated on Magnet Wire C(ester imide overcoated with amide imide)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	51.2 lbs.	50.7 lbs.	58.3 lbs.	5.8 lbs	49.3 lbs	36.1 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-56.6%	-51.0%	-24.3%	109.8%	-49.9%	-37.8%
HCFC-22/Mineral	-0.6%	-46.3%	-38.8%	201.4%	-49.7%	-22.5%
HCFC-124/Alkylbenzene	-27.1%	-46.6%	-56.8%	99.4%	-46.9%	4.8%
HCFC-142b/Alkylbenzene	-7.4%	-50.4%	-47.1%	62.7%	-55.9%	-25.5%
HFC-152a/Alkylbenzene	-46.5%	-53.5%	-52.3%	89.2%	-49.4%	23.6%
HFC-134a/Ester, Mixed Acid	8.7%	-46.6%	-28.8%	56.7%	-55.2%	-51.8%
HFC-134a/Ester, Branched Acid	26.4%	-45.3%	-41.1%	97.9%	-52.8%	-11.4%
HFC-32/Ester, Branched Acid	3.4%	-50.4%	-46.3%	67.1%	-46.8%	-13.4%
HFC-125/Ester, Branched Acid	18.2%	-42.8%	-20.5%	-70.3%	-50.0%	-37.5%
HFC-143a/Ester, Branched Acid	-25.8%	-0.3%	-10.9%	-41.7%	-13.8%	-3.8%
HFC-134/Ester, Branched Acid	23.3%	-30.2%	1.1%	459.2%	-40.3%	47.2%
HFC-245ca/Ester, Branched Acid	3.0%	-34.6%	-11.1%	274.0%	-49.8%	-38.4%
HFC-134a/PAG, Butyl Monoether	-35.9%	-51.5%	-39.2%	74.7%	-54.3%	-37.3%
HFC-32/PAG, Butyl Monoether	28.1%	-38.4%	8.9%	170.8%	-50.2%	-30.9%
HFC-125/PAG, Butyl Monoether	8.0%	-18.5%	13.8%	588.6%	-40.5%	9.6%
HFC-134a/PAG, Modified	26.5%	-49.4%	-14.0%	-8.4%	-46.7%	-48.4%
HFC-125/PAG, Modified	31.8%	-6.3%	21.3%	432.2%	-43.2%	54.5%
HFC-134a/PAG Diol	-18.1%	-33.5%	-26.5%	89.5%	-40.7%	-52.8%

Varnish Bond Strength

Varnish Coated on Magnet Wire C(ester imide overcoated with amide imide)

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Varnish Type					
	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	51.2 lbs.	50.7 lbs.	58.3 lbs.	5.8 lbs	49.3 lbs	36.1 lbs

	% Change from Unexposed					
Exposure with:	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	15.7%	-45.6%	3.7%	125.6%	-37.7%	11.9%
HCFC-22/Mineral	-1.5%	-15.4%	-23.6%	192.0%	-18.0%	-0.9%
HCFC-124/Alkylbenzene	37.8%	-44.9%	-38.7%	123.0%	-50.0%	21.3%
HCFC-142b/Alkylbenzene	-81.2%	-71.3%	-73.1%	151.4%	-49.9%	-17.1%
HFC-152a/Alkylbenzene	-46.2%	-51.1%	-24.1%	144.8%	-51.9%	46.1%
HFC-134a/Ester, Mixed Acid	4.7%	-39.4%	-4.1%	35.9%	-34.2%	-34.2%
HFC-134a/Ester, Branched Acid	5.0%	-34.9%	-14.9%	219.9%	-40.4%	-29.7%
HFC-32/Ester, Branched Acid	19.0%	-31.3%	-31.2%	116.8%	-42.0%	21.6%
HFC-125/Ester, Branched Acid	34.6%	-22.7%	-17.0%	168.7%	-33.8%	-28.9%
HFC-143a/Ester, Branched Acid	-5.8%	46.0%	-22.0%	152.1%	-44.3%	-12.6%
HFC-134 Ester, Branched Acid	16.6%	-29.0%	-16.4%	401.8%	-19.3%	20.6%
HFC-245ca/Ester, Branched Acid	14.7%	-4.9%	1.7%	442.0%	-25.4%	-26.1%
HFC-134a/PAG, Butyl Monoether	34.2%	-21.4%	-10.7%	-15.0%	-31.7%	-3.0%
HFC-32/PAG, Butyl Monoether	30.3%	-18.9%	15.3%	325.2%	-26.6%	-24.2%
HFC-125/PAG, Butyl Monoether	43.0%	-2.5%	33.4%	681.7%	-19.3%	42.7%
HFC-134a/PAG, Modified	36.0%	114.4%	-29.9%	220.4%	-28.0%	-28.0%
HFC-125/PAG, Modified	20.4%	-2.0%	17.0%	366.3%	-39.8%	10.7%
HFC-134a/PAG Diol	2.8%	-22.7%	-21.6%	-84.0%	-53.4%	-34.0%

Burnout Strength

Magnet Wire A(ester base with amide imide overcoat)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	576 sec	430 sec	510 sec	442 sec	578 sec	606 sec	580 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-5.3%	3.8%	11.8%	-4.1%	-4.5%	-7.6%	-11.7%
HCFC-22/Mineral	-31.1%	-20.8%	-22.5%	-37.8%	-33.2%	-35.6%	-33.7%
HCFC-124/Alkylbenzene	-30.6%	15.8%	-12.6%	-18.8%	-12.6%	-2.4%	-17.6%
HCFC-142b/Alkylbenzene	-37.3%	-18.9%	-18.4%	-41.6%	-38.0%	-28.5%	-35.9%
HFC-152a/Alkylbenzene	-13.1%	-1.0%	4.6%	-20.1%	-10.8%	-5.1%	-3.1%
HFC-134a/Ester, Mixed Acid	-9.9%	2.9%	-30.3%	-19.1%	-8.0%	-13.3%	0.4%
HFC-134a/Ester, Branched Acid	-16.7%	8.9%	4.8%	-8.3%	-9.3%	-4.1%	-13.3%
HFC-32/Ester, Branched Acid	-12.4%	-17.4%	0.5%	-29.0%	-6.1%	-20.0%	-27.8%
HFC-125/Ester, Branched Acid	-17.6%	-23.6%	-21.4%	-14.1%	-20.9%	-17.9%	-4.4%
HFC-143a/Ester, Branched Acid	-22.6%	12.4%	13.7%	-16.5%	-7.0%	-20.2%	-9.9%
HFC-134/Ester, Branched Acid	-9.1%	-25.4%	-5.4%	-22.6%	-17.5%	-5.9%	-8.9%
HFC-245ca/Ester, Branched Acid	-9.5%	-29.5%	-14.4%	-8.8%	-18.6%	-26.7%	0.9%
HFC-134a/PAG, Butyl Monoether	-4.1%	34.3%	5.6%	-20.0%	-16.9%	-4.7%	-12.9%
HFC-32/PAG, Butyl Monoether	-30.2%	0.2%	-2.9%	2.4%	0.6%	-23.8%	-8.7%
HFC-125/PAG, Butyl Monoether	-3.0%	0.3%	-1.3%	-16.4%	-33.6%	-12.5%	-5.3%
HFC-134a/PAG, Modified	-9.9%	-25.4%	-5.4%	-22.6%	-17.5%	-5.9%	-8.9%
HFC-125/PAG, Modified	-11.6%	21.9%	-15.6%	-25.3%	-15.9%	-14.4%	-4.2%
HFC-134a/PAG Diol	-12.2%	-25.2%	2.7%	-26.2%	-14.5%	-6.9%	-7.1%

Burnout Strength

Magnet Wire A(ester base with amide imide overcoat)

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150C(302°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	576 sec	430 sec	510 sec	442 sec	578 sec	606 sec	580 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-3.2%	15.4%	17.8%	-5.5%	-1.3%	-2.5%	-3.7%
HCFC-22/Mineral	-14.4%	-41.2%	-15.7%	-27.2%	-32.9%	-25.8%	-51.8%
HCFC-124/Alkylbenzene	-14.7%	-30.1%	8.6%	-32.7%	-19.8%	-3.7%	-22.9%
HCFC-142b/Alkylbenzene	-34.5%	-32.5%	-6.8%	-22.3%	-34.5%	-24.4%	-30.7%
HFC-152a/Alkylbenzene	-3.8%	5.4%	7.7%	-34.4%	-24.3%	-8.6%	-8.1%
HFC-134a/Ester, Mixed Acid	-7.6%	-16.3%	-24.9%	-24.1%	-11.6%	-9.3%	-6.1%
HFC-134a/Ester, Branched Acid	-11.9%	-4.8%	11.6%	-35.1%	-25.6%	-13.7%	-14.0%
HFC-32/Ester, Branched Acid	-6.4%	-13.0%	-17.4%	-17.8%	-5.1%	-27.8%	-33.7%
HFC-125/Ester, Branched Acid	-24.7%	-12.8%	-23.7%	-12.1%	-19.1%	-11.3%	-7.0%
HFC-143a/Ester, Branched Acid	-22.7%	-16.2%	-6.0%	-24.4%	-18.2%	-26.3%	-6.3%
HFC-134/Ester, Branched Acid	-4.6%	-12.3%	-4.4%	-15.2%	-10.8%	-22.5%	1.5%
HFC-245ca/Ester, Branched Acid	-13.0%	36.0%	-11.2%	-14.8%	-1.9%	-25.3%	0.6%
HFC-134a/PAG, Butyl Monoether	-21.4%	-14.9%	-5.0%	-19.8%	-17.1%	-19.6%	-29.8%
HFC-32/PAG, Butyl Monoether	-8.3%	-16.9%	-9.6%	4.1%	32.1%	-8.6%	-9.7%
HFC-125/PAG, Butyl Monoether	-12.0%	20.3%	10.0%	-9.7%	-11.5%	-24.0%	1.0%
HFC-134a/PAG, Modified	-7.8%	-12.3%	1.4%	-15.2%	-10.8%	-22.5%	1.5%
HFC-125/PAG, Modified	-16.7%	13.5%	10.0%	-28.8%	-13.6%	-24.8%	-19.5%
HFC-134a/PAG Diol	-15.3%	1.3%	-2.6%	-24.4%	-12.3%	-3.7%	0.7%

Burnout Strength

Magnet Wire B(Dacron/Glass served wire)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	736 sec	746 sec	755 sec	734 sec	734 sec	742 sec	743 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-3.3%	-1.8%	-3.1%	-1.0%	-0.4%	-1.4%	-2.2%
HCFC-22/Mineral	-0.9%	-2.2%	-2.3%	-0.4%	-0.5%	-1.2%	-0.7%
HCFC-124/Alkylbenzene	-2.1%	-2.0%	-1.9%	-0.7%	-5.5%	-0.7%	-0.7%
HCFC-142b/Alkylbenzene	-6.7%	-2.7%	-3.2%	-5.5%	-0.3%	-0.3%	-2.1%
HFC-152a/Alkylbenzene	-0.3%	-2.1%	-4.7%	-3.8%	-0.3%	-0.4%	-1.5%
HFC-134a/Ester, Mixed Acid	-0.2%	-2.4%	-2.5%	-0.4%	-1.5%	-0.1%	-0.9%
HFC-134a/Ester, Branched Acid	-6.8%	-2.1%	-2.2%	-0.2%	-5.3%	1.6%	-1.2%
HFC-32/Ester, Branched Acid	-4.1%	-0.3%	-1.8%	-0.2%	-0.8%	1.9%	-1.2%
HFC-125/Ester, Branched Acid	-7.0%	-1.7%	-2.2%	-0.3%	-0.5%	0.5%	-1.3%
HFC-143a/Ester, Branched Acid	-10.8%	-1.1%	-2.0%	0.2%	-0.1%	0.9%	-0.6%
HFC-134/Ester, Branched Acid	-0.3%	-1.5%	-0.9%	-0.5%	0.1%	0.7%	-0.9%
HFC-245ca/Ester, Branched Acid	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HFC-134a/PAG, Butyl Monoether	-6.0%	-1.3%	-2.1%	-0.4%	-0.3%	1.0%	-0.4%
HFC-32/PAG, Butyl Monoether	-5.4%	-0.9%	-2.0%	-0.2%	-0.5%	0.2%	-1.4%
HFC-125/PAG, Butyl Monoether	-2.7%	-1.7%	-0.8%	-2.3%	-0.2%	1.1%	-1.4%
HFC-134a/PAG, Modified	-0.6%	-0.3%	-1.7%	-0.1%	-0.2%	1.3%	-1.0%
HFC-125/PAG, Modified	-4.4%	-1.0%	-1.4%	-0.3%	-0.1%	0.5%	-0.6%
HFC-134a/PAG Diol	-6.7%	-1.1%	-2.9%	-0.5%	-0.6%	-0.6%	-1.6%

Burnout Strength

Magnet Wire B(Dacron/Glass served wire)

Results after 500-hour exposure plus a 24-hour air bake @ 150C(302°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	736 sec	746 sec	755 sec	734 sec	734 sec	742 sec	743 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-1.9%	-3.1%	-4.3%	-1.1%	-1.5%	-2.6%	-3.2%
HCFC-22/Mineral	-1.0%	-0.5%	-3.6%	-1.5%	-24.0%	-1.8%	-1.1%
HCFC-124/Alkylbenzene	-2.1%	-2.6%	-2.1%	-0.5%	-3.5%	-1.4%	-1.7%
HCFC-142b/Alkylbenzene	-0.4%	-4.2%	-2.3%	-0.3%	-2.7%	-2.6%	-1.0%
HFC-152a/Alkylbenzene	-0.5%	-1.8%	-2.1%	-0.4%	-0.6%	-1.1%	-0.2%
HFC-134a/Ester, Mixed Acid	-0.7%	-2.4%	-1.7%	-0.4%	-0.5%	1.6%	-0.6%
HFC-134a/Ester, Branched Acid	-0.5%	-2.1%	-0.9%	-0.2%	-2.0%	1.9%	-1.0%
HFC-32/Ester, Branched Acid	-3.5%	-0.3%	-1.4%	-0.5%	-2.5%	1.1%	-1.8%
HFC-125/Ester, Branched Acid	-7.6%	-1.8%	-2.5%	-0.9%	-0.2%	-1.5%	-0.9%
HFC-143a/Ester, Branched Acid	-3.5%	-0.2%	-1.3%	-0.5%	-0.4%	1.1%	-0.7%
HFC-134/Ester, Branched Acid	-0.9%	-1.9%	-1.9%	-0.8%	-0.7%	0.0%	-0.9%
HFC-245ca/Ester, Branched Acid	-4.9%	-1.4%	-13.0%	-3.1%	-2.5%	-1.6%	0.3%
HFC-134a/PAG, Butyl Monoether	-3.4%	-1.3%	-2.3%	-0.4%	-0.6%	-1.5%	0.3%
HFC-32/PAG, Butyl Monoether	-7.4%	-1.5%	-2.1%	-1.3%	0.3%	2.0%	-1.9%
HFC-125/PAG, Butyl Monoether	-1.1%	-1.9%	-1.9%	-0.9%	-0.3%	1.5%	-0.9%
HFC-134a/PAG, Modified	-0.9%	0.8%	-2.5%	-0.5%	-0.4%	1.5%	-0.9%
HFC-125/PAG, Modified	-1.1%	-1.3%	-2.9%	-0.7%	-0.6%	0.8%	-2.1%
HFC-134a/PAG Diol	-1.1%	-1.0%	-1.4%	-0.6%	-0.6%	1.4%	-1.1%

Burnout Strength

Magnet Wire C(ester imide overcoated with amide imide)

Results after 500-hour exposure @ 127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	579 sec	469 sec	473 sec	494 sec	557 sec	505 sec	632 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	4.8%	6.1%	14.5%	-11.9%	-7.1%	7.8%	-7.0%
HCFC-22/Mineral	-37.2%	-40.8%	-17.1%	-37.7%	-44.0%	-26.2%	-49.7%
HCFC-124/Alkylbenzene	-61.8%	2.1%	-9.9%	-0.9%	-39.7%	-9.5%	-27.7%
HCFC-142b/Alkylbenzene	-53.1%	-39.9%	-21.4%	-52.2%	-58.1%	-37.4%	-42.0%
HFC-152a/Alkylbenzene	-1.0%	-3.0%	13.0%	-23.1%	-10.9%	7.2%	-9.5%
HFC-134a/Ester, Mixed Acid	-14.6%	-35.3%	-10.6%	-16.5%	-12.6%	3.7%	-5.9%
HFC-134a/Ester, Branched Acid	-22.9%	11.0%	20.5%	15.8%	-34.7%	22.8%	-8.3%
HFC-32/Ester, Branched Acid	-27.9%	-11.5%	-5.3%	-34.8%	-25.9%	4.4%	-27.1%
HFC-125/Ester, Branched Acid	-12.4%	-35.0%	3.1%	-48.1%	-23.6%	14.7%	-9.4%
HFC-143a/Ester, Branched Acid	-3.6%	-9.0%	5.1%	-28.2%	-1.0%	0.0%	-11.9%
HFC-134/Ester, Branched Acid	-10.4%	-11.4%	24.9%	-22.1%	-4.6%	13.0%	-8.3%
HFC-245ca/Ester, Branched Acid	-7.6%	24.3%	23.0%	-28.5%	-13.2%	11.6%	-4.7%
HFC-134a/PAG, Butyl Monoether	-7.6%	-0.6%	18.0%	-26.7%	-12.0%	13.7%	-25.0%
HFC-32/PAG, Butyl Monoether	-20.8%	-1.6%	19.2%	-22.1%	-16.1%	-6.0%	-9.5%
HFC-125/PAG, Butyl Monoether	0.6%	-26.4%	14.5%	-29.9%	-1.9%	2.7%	-2.2%
HFC-134a/PAG, Modified	-9.6%	-2.1%	13.5%	-37.0%	-1.1%	14.8%	-5.3%
HFC-125/PAG, Modified	-10.8%	4.8%	7.4%	-35.5%	2.6%	12.0%	-16.8%
HFC-134a/PAG Diol	-22.6%	-2.5%	24.7%	-40.9%	-5.2%	20.9%	-11.5%

Burnout Strength

Magnet Wire C(ester imide overcoated with amide imide)

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150C(302°F)

	Varnish Type					
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	579 sec	469 sec	473 sec	494 sec	557 sec	505 sec	632 sec

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	3.9%	-19.3%	-3.3%	-10.5%	-3.7%	-3.5%	-9.5%
HCFC-22/Mineral	-36.3%	-33.6%	-17.7%	-29.3%	-55.3%	-26.1%	-60.3%
HCFC-124/Alkylbenzene	-22.6%	0.3%	-3.5%	-3.2%	-34.5%	-9.5%	-14.5%
HCFC-142b/Alkylbenzene	-45.8%	-49.8%	-21.6%	-57.6%	-56.4%	-14.3%	-44.3%
HFC-152a/Alkylbenzene	-8.9%	-3.6%	6.6%	-26.8%	-13.4%	-17.2%	2.3%
HFC-134a/Ester, Mixed Acid	-3.9%	-33.4%	9.2%	-21.7%	-8.6%	7.6%	-8.5%
HFC-134a/Ester, Branched Acid	-16.5%	-7.8%	9.2%	-19.5%	-4.4%	11.0%	-10.7%
HFC-32/Ester, Branched Acid	-14.7%	-37.2%	0.6%	-32.5%	-2.8%	8.5%	-26.6%
HFC-125/Ester, Branched Acid	-20.8%	-11.2%	1.6%	-26.3%	-6.5%	13.4%	-21.0%
HFC-143a/Ester, Branched Acid	-16.9%	-21.0%	-1.5%	-23.6%	6.0%	12.9%	-13.2%
HFC-134/Ester, Branched Acid	-7.4%	-16.6%	21.6%	-20.5%	4.4%	17.2%	-0.6%
HFC-245ca/Ester, Branched Acid	-4.7%	28.4%	8.7%	-23.1%	-4.1%	17.4%	-11.1%
HFC-134a/PAG, Butyl Monoether	-12.0%	-0.6%	18.0%	-26.7%	-12.0%	13.7%	-25.0%
HFC-32/PAG, Butyl Monoether	-5.6%	-13.1%	4.5%	-15.5%	-15.5%	-14.5%	-9.7%
HFC-125/PAG, Butyl Monoether	-8.9%	15.6%	0.7%	-22.5%	-5.3%	-0.3%	-1.6%
HFC-134a/PAG, Modified	-5.6%	-0.8%	9.4%	-33.4%	0.4%	14.7%	-8.1%
HFC-125/PAG, Modified	-17.0%	-26.7%	19.7%	-30.4%	-21.7%	13.0%	-18.6%
HFC-134a/PAG Diol	-17.7%	17.6%	25.1%	-21.5%	-10.0%	13.5%	-8.7%

Dielectric Strength

Magnet Wire A(ester base with amide imide overcoat)

Results after a 500-hour exposure @127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	15.8 kV	16.2 kV	18.8 kV	15.6 kV	12.0 kV	16.8 kV	19.1 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-2.5%	-53.5%	-32.1%	-19.1%	1.0%	-43.6%	-34.1%
HCFC-22/Mineral	-5.4%	-11.5%	-13.3%	-2.7%	0.2%	-25.7%	-13.6%
HCFC-124/Alkylbenzene	-5.0%	-8.9%	-17.5%	-3.2%	1.7%	-0.4%	-21.4%
HCFC-142b/Alkylbenzene	-19.2%	-8.1%	-11.0%	5.8%	-8.8%	-11.4%	-7.2%
HFC-152a/Alkylbenzene	-4.9%	16.1%	-27.9%	-6.3%	-1.5%	-17.8%	-20.7%
HFC-134a/Ester, Mixed Acid	-16.6%	16.1%	-21.8%	-13.4%	17.7%	12.7%	-4.2%
HFC-134a/Ester, Branched Acid	3.0%	-29.6%	1.9%	-11.7%	21.5%	14.2%	-3.4%
HFC-32/Ester, Branched Acid	3.3%	-16.8%	-10.1%	-5.2%	23.0%	10.6%	-13.6%
HFC-125/Ester, Branched Acid	-5.0%	-14.8%	-5.8%	-22.4%	10.3%	-11.2%	-5.2%
HFC-143a/Ester, Branched Acid	-18.5%	7.8%	-14.0%	-6.6%	35.1%	13.1%	-21.5%
HFC-134/Ester, Branched Acid	-2.6%	-25.4%	-5.4%	-22.6%	-17.5%	-5.9%	-8.9%
HFC-245ca/Ester, Branched Acid	-11.8%	9.7%	-4.3%	-14.6%	2.6%	9.4%	-9.6%
HFC-134a/PAG, Butyl Monoether	3.2%	-1.3%	-23.7%	-4.3%	-0.6%	-10.3%	-13.9%
HFC-32/PAG, Butyl Monoether	-9.3%	4.2%	-1.9%	-2.1%	25.7%	5.3%	-2.3%
HFC-125/PAG, Butyl Monoether	-4.6%	7.6%	1.9%	-1.7%	8.0%	-3.7%	-1.6%
HFC-134a/PAG, Modified	-14.4%	-19.4%	-18.9%	-10.2%	-3.9%	14.0%	-6.4%
HFC-125/PAG, Modified	-8.6%	12.7%	-2.6%	-34.1%	4.9%	19.0%	-18.7%
HFC-134a/PAG Diol	-0.2%	-24.3%	0.8%	0.4%	7.0%	3.7%	0.2%

Dielectric Strength

Magnet Wire A(ester base with amide imide overcoat)

Results after a 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150C(302°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	15.8 kV	16.2 kV	18.8 kV	15.6 kV	12.0 kV	16.8 kV	19.1 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-5.2%	-37.9%	-22.6%	-9.9%	1.9%	-20.5%	-48.4%
HCFC-22/Mineral	-11.0%	-4.9%	-8.2%	-11.6%	-0.9%	-29.0%	-22.1%
HCFC-124/Alkylbenzene	-1.4%	4.7%	-36.4%	-6.4%	-10.9%	0.5%	-8.1%
HCFC-142b/Alkylbenzene	-3.1%	-11.2%	-16.2%	-12.6%	-0.5%	-14.2%	-24.4%
HFC-152a/Alkylbenzene	-9.2%	-24.2%	-29.8%	-4.8%	-7.1%	-10.0%	-40.9%
HFC-134a/Ester, Mixed Acid	-11.0%	3.9%	-23.8%	-8.3%	14.6%	10.4%	-6.1%
HFC-134a/Ester, Branched Acid	-6.9%	-12.9%	-18.6%	-16.5%	-3.7%	-10.2%	-8.5%
HFC-32/Ester, Branched Acid	-18.8%	-32.2%	-33.7%	-20.9%	-4.1%	-26.3%	-15.6%
HFC-125/Ester, Branched Acid	-10.2%	-34.5%	-1.2%	-19.7%	-7.8%	8.9%	-29.3%
HFC-143a/Ester, Branched Acid	-13.1%	-0.1%	-12.8%	-14.0%	-8.8%	-25.5%	-26.9%
HFC-134/Ester, Branched Acid	-13.0%	-16.8%	-22.7%	-16.3%	3.7%	-13.4%	-16.5%
HFC-245ca/Ester, Branched Acid	-15.8%	36.0%	-11.2%	-14.8%	-1.9%	-25.3%	0.1%
HFC-134a/PAG, Butyl Monoether	-16.6%	-9.2%	-25.8%	-13.5%	-11.7%	-32.3%	-33.5%
HFC-32/PAG, Butyl Monoether	-14.6%	-10.7%	-6.0%	-26.3%	-6.0%	5.7%	-11.5%
HFC-125/PAG, Butyl Monoether	-14.6%	-16.7%	-10.9%	-14.9%	-11.5%	6.1%	-28.1%
HFC-134a/PAG, Modified	-8.1%	-23.4%	-34.6%	-16.2%	-13.3%	-22.6%	1.8%
HFC-125/PAG, Modified	-11.2%	18.0%	3.3%	-31.1%	-13.7%	9.7%	-16.8%
HFC-134a/PAG Diol	-30.0%	-16.5%	-50.7%	-19.4%	-6.6%	-8.4%	-20.6%

Dielectric Strength

Magnet Wire B(Dacron/Glass served wire)

Results after 500-hour exposure @127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	11.6 kV	13.3 kV	12.3 kV	12.7 kV	12.5 kV	14.4 kV	13.3 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-6.9%	-8.9%	-2.9%	-4.9%	-6.0%	-14.7%	-2.0%
HCFC-22/Mineral	13.3%	11.0%	1.3%	5.2%	0.6%	-25.7%	16.0%
HCFC-124/Alkylbenzene	6.5%	2.5%	-0.1%	1.4%	-2.0%	16.1%	8.7%
HCFC-142b/Alkylbenzene	8.3%	13.1%	32.0%	0.1%	2.6%	37.6%	13.9%
HFC-152a/Alkylbenzene	-4.3%	-5.7%	-6.4%	-23.6%	-35.8%	-3.5%	9.0%
HFC-134a/Ester, Mixed Acid	28.0%	6.5%	5.5%	10.4%	6.4%	2.4%	11.5%
HFC-134a/Ester, Branched Acid	12.1%	8.3%	5.4%	1.1%	-4.0%	8.3%	15.8%
HFC-32/Ester, Branched Acid	0.4%	-17.2%	-3.3%	-8.5%	-6.8%	-4.1%	5.4%
HFC-125/Ester, Branched Acid	2.5%	40.6%	1.2%	6.2%	-0.2%	8.7%	7.2%
HFC-143a/Ester, Branched Acid	11.8%	28.9%	-5.9%	0.7%	0.9%	-15.2%	4.9%
HFC-134/Ester, Branched Acid	9.0%	19.4%	10.0%	9.6%	5.3%	10.2%	7.2%
HFC-245ca/Ester, Branched Acid	3.8%	5.5%	-13.5%	3.6%	-0.9%	-9.0%	-3.8%
HFC-134a/PAG, Butyl Monoether	5.6%	5.3%	-24.3%	11.4%	4.3%	19.3%	9.7%
HFC-32/PAG, Butyl Monoether	27.1%	10.8%	-6.9%	11.5%	5.4%	-25.5%	10.3%
HFC-125/PAG, Butyl Monoether	22.7%	-17.8%	-3.3%	-6.2%	2.7%	12.7%	7.4%
HFC-134a/PAG, Modified	23.6%	-4.2%	10.2%	1.2%	7.4%	26.8%	11.4%
HFC-125/PAG, Modified	-7.0%	-1.5%	2.9%	5.4%	-0.8%	-3.8%	10.1%
HFC-134a/PAG Diol	29.7%	49.2%	60.6%	24.5%	14.2%	8.7%	38.4%

Dielectric Strength

Magnet Wire B(Dacron/Glass served wire)

Results after a 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150C(302°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	11.6 kV	13.3 kV	12.3 kV	12.7 kV	12.5 kV	14.4 kV	13.3 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-8.1%	-10.9%	-15.4%	-9.9%	-13.2%	-18.2%	-17.9%
HCFC-22/Mineral	0.2%	-17.6%	-5.4%	-11.2%	-14.0%	-12.4%	-4.0%
HCFC-124/Alkylbenzene	-3.6%	-1.2%	9.9%	-6.5%	-6.5%	-6.7%	-0.3%
HCFC-142b/Alkylbenzene	-6.1%	-13.4%	-2.3%	-0.6%	-9.5%	-12.6%	-10.5%
HFC-152a/Alkylbenzene	-2.7%	-15.4%	-3.9%	-6.7%	-8.1%	1.0%	-4.0%
HFC-134a/Ester, Mixed Acid	13.4%	1.2%	8.6%	7.4%	-0.4%	-4.0%	5.8%
HFC-134a/Ester, Branched Acid	-1.1%	-11.9%	-2.4%	-9.3%	-3.8%	-8.2%	-1.6%
HFC-32/Ester, Branched Acid	1.1%	-0.7%	-3.6%	-10.8%	-7.4%	-17.7%	2.1%
HFC-125/Ester, Branched Acid	-3.7%	-13.6%	1.2%	-5.1%	-3.1%	-0.5%	-3.4%
HFC-143a/Ester, Branched Acid	-2.1%	-7.5%	2.4%	-5.7%	4.5%	-15.4%	-3.3%
HFC-134/Ester, Branched Acid	-2.0%	5.7%	8.6%	-5.2%	0.4%	-23.0%	4.4%
HFC-245ca/Ester, Branched Acid	0.9%	-10.5%	-1.9%	0.3%	-5.1%	1.5%	-1.6%
HFC-134a/PAG, Butyl Monoether	1.3%	-10.5%	10.1%	-4.1%	-8.0%	-16.8%	-4.3%
HFC-32/PAG, Butyl Monoether	3.1%	0.5%	-8.2%	-1.6%	-0.5%	-14.8%	-1.8%
HFC-125/PAG, Butyl Monoether	2.2%	-9.7%	14.9%	1.9%	-0.6%	1.5%	-2.3%
HFC-134a/PAG, Modified	1.1%	-7.7%	3.1%	-11.0%	-7.5%	-25.7%	1.2%
HFC-125/PAG, Modified	0.0%	-17.7%	15.6%	-1.3%	-5.6%	-7.5%	-10.4%
HFC-134a/PAG Diol	-6.8%	-9.5%	-3.3%	-5.7%	-3.7%	-14.2%	-16.3%

Dielectric Strength

Magnet Wire C(ester imide overcoated with amide imide)

Results after a 500-hour exposure @ 127°C(260°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	16.6 kV	15.1 kV	18.2 kV	14.5 kV	11.4 kV	15.9 kV	14.8 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-21.4%	-16.4%	-35.0%	-16.3%	16.9%	-42.8%	4.1%
HCFC-22/Mineral	6.4%	-27.2%	9.7%	25.5%	25.6%	6.5%	-7.4%
HCFC-124/Alkylbenzene	-18.6%	-25.0%	2.2%	20.6%	15.8%	-12.2%	9.0%
HCFC-142b/Alkylbenzene	-16.8%	11.8%	-6.5%	17.4%	0.4%	14.9%	17.9%
HFC-152a/Alkylbenzene	7.1%	-25.2%	-21.5%	0.0%	20.7%	11.6%	24.1%
HFC-134a/Ester, Mixed Acid	-0.6%	8.8%	-10.5%	6.5%	62.8%	-24.0%	15.9%
HFC-134a/Ester, Branched Acid	-11.2%	-2.9%	0.9%	3.5%	10.8%	6.7%	11.6%
HFC-32/Ester, Branched Acid	-10.0%	-15.3%	2.4%	-5.1%	12.1%	-1.2%	18.2%
HFC-125/Ester, Branched Acid	-4.0%	9.1%	1.9%	-1.3%	2.8%	25.8%	0.6%
HFC-143a/Ester, Branched Acid	-9.5%	15.7%	4.8%	-11.8%	16.4%	-5.1%	0.9%
HFC-134/Ester, Branched Acid	-18.9%	4.5%	-1.4%	-1.2%	-9.2%	15.1%	-6.9%
HFC-245ca/Ester, Branched Acid	-24.1%	.27.26	9.3%	5.2%	37.1%	7.3%	16.5%
HFC-134a/PAG, Butyl Monoether	-8.4%	7.3%	5.4%	9.7%	32.8%	10.6%	33.0%
HFC-32/PAG, Butyl Monoether	-16.6%	19.3%	8.8%	1.3%	23.8%	17.0%	-6.4%
HFC-125/PAG, Butyl Monoether	-30.9%	11.2%	-7.6%	4.2%	31.2%	17.8%	27.8%
HFC-134a/PAG, Modified	-12.6%	14.6%	1.5%	-5.4%	-23.7%	-25.1%	27.7%
HFC-125/PAG, Modified	-17.8%	5.5%	5.4%	0.6%	28.2%	10.1%	9.1%
HFC-134a/PAG Diol	-12.2%	21.1%	8.4%	0.8%	12.3%	24.7%	29.9%

Dielectric Strength

Magnet Wire C(ester imide overcoated with amide imide)

Results after a 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Varnish Type						
	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Unexposed	16.6 kV	15.1 kV	18.2 kV	14.5 kV	11.4 kV	15.9 kV	14.8 kV

	% Change from Unexposed						
Exposure with:	Uncoated	U-475EH	Y-390PG	ER-610	Y-833	No.923	Iso-800
Nitrogen	-15.7%	-5.5%	2.1%	-45.6%	9.7%	-32.0%	-1.3%
HCFC-22/Mineral	-9.1%	-21.5%	-12.6%	0.8%	5.1%	5.3%	12.7%
HCFC-124/Alkylbenzene	-1.0%	-23.8%	8.8%	-22.9%	51.6%	6.0%	24.1%
HCFC-142b/Alkylbenzene	-10.9%	-1.0%	-11.5%	4.5%	-1.7%	-2.2%	20.3%
HFC-152a/Alkylbenzene	-17.9%	-1.8%	-18.4%	12.0%	31.5%	-17.2%	5.9%
HFC-134a/Ester, Mixed Acid	-3.6%	24.5%	-1.0%	0.2%	36.1%	-4.9%	32.4%
HFC-134a/Ester, Branched Acid	-4.5%	-21.4%	2.2%	-4.3%	-8.6%	-29.7%	19.3%
HFC-32/Ester, Branched Acid	-26.4%	8.3%	-37.0%	-7.8%	-6.3%	10.4%	-9.4%
HFC-125/Ester, Branched Acid	-22.0%	-3.2%	-0.9%	1.1%	-2.5%	9.0%	17.2%
HFC-143a/Ester, Branched Acid	-14.7%	-1.8%	-36.8%	7.5%	-1.3%	-0.4%	12.6%
HFC-134/Ester, Branched Acid	-16.6%	-3.7%	-1.2%	-8.5%	-25.8%	-0.6%	0.3%
HFC-245ca/Ester, Branched Acid	-15.8%	13.9%	-2.5%	-20.8%	-2.0%	3.1%	12.6%
HFC-134a/PAG, Butyl Monoether	-29.6%	5.3%	-28.0%	-11.7%	0.3%	17.7%	-14.0%
HFC-32/PAG, Butyl Monoether	-13.8%	17.3%	-34.2%	-5.9%	16.8%	11.6%	14.5%
HFC-125/PAG, Butyl Monoether	-12.4%	29.8%	6.5%	-3.8%	13.1%	14.6%	25.8%
HFC-134a/PAG, Modified	-14.9%	-11.6%	-4.8%	2.0%	-9.5%	-30.6%	26.0%
HFC-125/PAG, Modified	-11.2%	-9.0%	-3.5%	-27.6%	20.8%	20.9%	15.1%
HFC-134a/PAG Diol	-27.9%	6.7%	0.8%	1.1%	4.6%	6.3%	-8.0%

Sheet Insulation

% Change in Weight

Results after 500-hour exposure @127°C(260°F)

Exposure with:	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
	% Change in Weight					
Nitrogen	0.1%	0.1%	0.1%	0.2%	0.3%	0.1%
HCFC-22/Mineral	9.3%	3.3%	5.2%	14.4%	20.0%	6.1%
HCFC-124/Alkylbenzene	6.6%	1.1%	2.5%	11.6%	26.7%	1.2%
HCFC-142b/Alkylbenzene	6.2%	1.0%	2.1%	10.7%	19.1%	2.9%
HFC-152a/Alkylbenzene	6.0%	-0.2%	0.5%	10.0%	14.8%	2.2%
HFC-134a/Ester, Mixed Acid	7.1%	3.8%	1.5%	12.3%	21.3%	1.8%
HFC-134a/Ester, Branched Acid	7.4%	4.9%	1.2%	13.0%	18.6%	1.5%
HFC-32/Ester, Branched Acid	7.4%	-1.0%	1.1%	12.7%	19.8%	1.7%
HFC-125/Ester, Branched Acid	6.1%	0.5%	0.7%	11.7%	16.4%	0.9%
HFC-143a/Ester, Branched Acid	5.4%	1.4%	0.7%	11.5%	16.2%	1.0%
HFC-134/Ester, Branched Acid	8.6%	1.2%	1.5%	14.9%	32.1%	1.7%
HFC-245ca/Ester, Branched Acid	7.5%	4.3%	1.0%	13.7%	35.6%	1.2%
HFC-134a/PAG, Butyl Monoether	6.7%	-0.4%	1.3%	12.4%	17.8%	2.1%
HFC-32/PAG, Butyl Monoether	7.6%	1.4%	1.1%	14.0%	22.7%	1.6%
HFC-125/PAG, Butyl Monoether	6.8%	0.2%	0.4%	13.6%	25.2%	0.8%
HFC-134a/PAG, Modified	7.4%	0.1%	1.0%	14.0%	19.6%	1.4%
HFC-125/PAG, Modified	7.7%	2.0%	2.8%	14.1%	24.4%	3.1%
HFC-134a/PAG Diol	8.4%	-3.4%	2.3%	13.8%	22.9%	2.5%

Sheet Insulation

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

Exposure with:	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
	% Change in Weight					
Nitrogen	0.5%	0.0%	0.2%	1.5%	0.8%	0.1%
HCFC-22/Mineral	3.7%	1.4%	0.0%	4.3%	9.0%	0.0%
HCFC-124/Alkylbenzene	1.5%	-0.4%	0.2%	4.7%	7.2%	0.3%
HCFC-142b/Alkylbenzene	1.1%	-2.3%	-0.6%	3.9%	5.7%	-0.2%
HFC-152a/Alkylbenzene	2.4%	-2.4%	-1.0%	3.8%	5.8%	0.0%
HFC-134a/Ester, Mixed Acid	4.3%	4.9%	0.7%	8.6%	24.1%	0.6%
HFC-134a/Ester, Branched Acid	4.1%	2.5%	-0.1%	7.1%	19.0%	0.2%
HFC-32/Ester, Branched Acid	3.9%	-1.0%	-0.3%	8.4%	17.7%	0.4%
HFC-125/Ester, Branched Acid	3.9%	-0.6%	0.6%	7.5%	16.6%	0.3%
HFC-143a/Ester, Branched Acid	2.7%	-1.1%	-0.1%	5.7%	11.8%	0.1%
HFC-134/Ester, Branched Acid	3.4%	-0.5%	5.2%	8.5%	23.7%	0.3%
HFC-245ca/Ester, Branched Acid	5.1%	1.9%	0.1%	8.9%	27.9%	0.4%
HFC-134a/PAG, Butyl Monoether	1.1%	-1.7%	-0.3%	2.6%	0.6%	0.0%
HFC-32/PAG, Butyl Monoether	2.3%	-0.3%	-0.3%	3.7%	1.0%	0.2%
HFC-125/PAG, Butyl Monoether	2.0%	-0.7%	-0.1%	3.6%	0.8%	0.1%
HFC-134a/PAG, Modified	1.0%	-1.2%	0.0%	2.3%	0.8%	0.1%
HFC-125/PAG, Modified	2.0%	-0.9%	-0.2%	3.9%	1.5%	0.3%
HFC-134a/PAG Diol	1.7%	0.0%	0.2%	2.7%	0.8%	6.6%

Sheet Insulation

% Change in Tensile Strength

Results after 500-hour exposure @ 127°C(260°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
Unexposed	17.4 ksi	13.7 ksi	21.7 ksi	18.7 ksi	7.5 ksi	21.7 ksi
Exposure with:	% Change from Unexposed					
Nitrogen	-49.6%	-8.6%	-24.0%	-9.0%	-5.9%	-21.5%
HCFC-22/Mineral	-17.2%	-10.7%	-35.2%	-11.6%	-25.6%	-29.5%
HCFC-124/Alkylbenzene	-50.5%	-84.8%	-100.0%	-1.9%	5.1%	-100.0%
HCFC-142b/Alkylbenzene	-12.2%	-17.7%	-27.7%	-5.6%	-18.6%	-29.8%
HFC-152a/Alkylbenzene	-37.6%	-21.6%	-33.3%	-4.3%	-23.1%	-27.7%
HFC-134a/Ester, Mixed Acid	-21.6%	-11.0%	-32.1%	4.0%	-21.2%	-34.8%
HFC-134a/Ester, Branched Acid	-10.3%	-5.4%	-23.7%	-1.5%	-15.0%	-25.4%
HFC-32/Ester, Branched Acid	-11.3%	-8.5%	-24.8%	-3.2%	-18.5%	-27.7%
HFC-125/Ester, Branched Acid	-4.9%	-5.0%	-17.8%	-1.4%	-14.7%	-21.8%
HFC-143a/Ester, Branched Acid	-7.1%	-2.6%	-22.3%	0.4%	-23.0%	-24.2%
HFC-134/Ester, Branched Acid	-3.7%	4.3%	-11.7%	-0.4%	-1.9%	-13.7%
HFC-245ca/Ester, Branched Acid	-6.9%	-5.2%	-15.9%	-5.4%	-13.3%	-35.1%
HFC-134a/PAG, Butyl Monoether	-8.3%	-7.5%	-17.5%	-8.0%	-23.1%	-18.9%
HFC-32/PAG, Butyl Monoether	-8.8%	-6.8%	-18.8%	-5.6%	-16.1%	-17.5%
HFC-125/PAG, Butyl Monoether	-0.9%	0.2%	-13.9%	0.3%	-14.8%	-22.0%
HFC-134a/PAG, Modified	-10.6%	-2.1%	-27.3%	-23.5%	-17.0%	-23.9%
HFC-125/PAG, Modified	-14.1%	-6.9%	-22.2%	-11.6%	-15.8%	-27.8%
HFC-134a/PAG Diol	-13.2%	-16.9%	-23.2%	-2.5%	-17.9%	-28.7%

ksi=1,000 pounds per square inch.

Sheet Insulation

% Change in Tensile Strength

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
Unexposed	17.4 ksi	13.7 ksi	21.7 ksi	18.7 ksi	7.5 ksi	21.7 ksi
Exposure with:	% Change from Unexposed					
Nitrogen	-76.7%	-83.6%	-97.8%	-2.7%	-26.3%	-65.9%
HCFC-22/Mineral	-16.4%	-11.5%	-93.9%	-3.0%	-18.8%	-16.3%
HCFC-124/Alkylbenzene	-55.0%	-93.2%	-100.0%	4.1%	-24.0%	-100.0%
HCFC-142b/Alkylbenzene	-41.9%	-39.8%	-24.4%	2.7%	-24.7%	-21.0%
HFC-152a/Alkylbenzene	-36.3%	-63.8%	-25.0%	-0.1%	-24.5%	-21.1%
HFC-134a/Ester, Mixed Acid	-36.6%	-39.8%	-25.5%	8.4%	-23.7%	-20.1%
HFC-134a/Ester, Branched Acid	-4.2%	-5.1%	-27.1%	0.9%	-17.9%	-22.5%
HFC-32/Ester, Branched Acid	-9.1%	-6.2%	-24.8%	3.3%	-16.9%	-22.2%
HFC-125/Ester, Branched Acid	-5.3%	-1.1%	-22.1%	-5.8%	-16.0%	-22.4%
HFC-143a/Ester, Branched Acid	-2.1%	-4.9%	-23.0%	2.8%	-17.5%	-21.6%
HFC-134/Ester, Branched Acid	-4.0%	-1.2%	-16.6%	2.0%	-12.7%	-24.2%
HFC-245ca/Ester, Branched Acid	-3.0%	-4.8%	-26.2%	-11.0%	-5.4%	-12.7%
HFC-134a/PAG, Butyl Monoether	-0.6%	-6.7%	-20.8%	6.4%	-19.0%	-23.1%
HFC-32/PAG, Butyl Monoether	-3.5%	-4.5%	-26.2%	1.8%	-17.5%	-21.8%
HFC-125/PAG, Butyl Monoether	-4.4%	-0.9%	-17.7%	7.5%	-21.9%	-23.9%
HFC-134a/PAG, Modified	-6.5%	-0.9%	-22.4%	7.2%	-22.4%	-22.7%
HFC-125/PAG, Modified	-52.4%	-6.9%	-11.6%	3.4%	-25.0%	-22.9%
HFC-134a/PAG Diol	-12.4%	-16.5%	-48.6%	3.2%	-29.1%	-27.0%

ksi=1,000 pounds per square inch.

Sheet Insulation

% Change in Elongation

Results after 500-hour exposure @ 127°C(260°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MQ	Nomex	Nomex Mica	Melinex
Unexposed	20.0%	46.0%	131.0%	17.0%	4.0%	160.0%
Exposure with:	% Change from Unexposed					
Nitrogen	-87.5%	-50.0%	-95.0%	-43.6%	-70.8%	-96.4%
HCFC-22/Mineral	-41.9%	-71.0%	-87.8%	-55.4%	-79.2%	-74.5%
HCFC-124/Alkylbenzene	-54.4%	98.2%	-100.0%	-45.1%	-72.9%	-100.0%
HCFC-142b/Alkylbenzene	-49.4%	-64.5%	-72.0%	-56.4%	-79.2%	-89.0%
HFC-152a/Alkylbenzene	-85.0%	-78.6%	-85.6%	-40.2%	-66.7%	-87.5%
HFC-134a/Ester, Mixed Acid	-13.8%	-47.8%	-10.7%	-48.0%	47.9%	-89.6%
HFC-134a/Ester, Branched Acid	-35.0%	-47.5%	-20.1%	-28.4%	-72.9%	-95.9%
HFC-32/Ester, Branched Acid	-29.4%	-50.0%	-11.5%	-5.4%	-66.7%	-5.9%
HFC-125/Ester, Branched Acid	-25.6%	-47.5%	5.3%	-27.9%	-72.9%	-17.6%
HFC-143a/Ester, Branched Acid	-31.9%	-44.2%	-17.7%	-18.6%	-62.5%	-95.6%
HFC-134/Ester, Branched Acid	-26.3%	-39.1%	-3.1%	-34.3%	-72.9%	-4.2%
HFC-245ca/Ester, Branched Acid	-50.0%	-54.3%	-42.0%	-44.6%	-79.2%	-63.9%
HFC-134a/PAG, Butyl Monoether	-28.8%	-47.8%	1.8%	-30.4%	-66.7%	1.5%
HFC-32/PAG, Butyl Monoether	-16.9%	-47.8%	5.2%	-22.5%	-70.8%	-1.8%
HFC-125/PAG, Butyl Monoether	-28.8%	-43.1%	6.5%	-28.4%	-75.0%	2.3%
HFC-134a/PAG, Modified	-40.0%	-48.9%	-69.0%	-37.7%	-72.9%	-13.3%
HFC-125/PAG, Modified	-51.3%	-55.8%	-8.9%	-32.4%	-68.8%	-23.0%
HFC-134a/PAG Diol	-50.6%	-57.6%	-16.3%	-33.3%	-68.8%	-32.2%

Sheet Insulation

% Change in Elongation

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
Unexposed	20.0%	46.0%	131.0%	17.0%	4.0%	160.0%
Exposure with:	% Change from Unexposed					
Nitrogen	-66.7%	-54.3%	-95.4%	-54.4%	-68.8%	-96.8%
HCFC-22/Mineral	-75.4%	-75.4%	-99.1%	-61.3%	-77.1%	-95.8%
HCFC-124/Alkylbenzene	-57.5%	-96.7%	-100.0%	-40.7%	-66.7%	-100.0%
HCFC-142b/Alkylbenzene	-87.5%	-84.4%	-94.4%	-48.5%	-64.6%	-95.6%
HFC-152a/Alkylbenzene	-85.4%	-96.0%	-95.7%	-44.1%	-62.5%	-96.0%
HFC-134a/Ester, Mixed Acid	-34.2%	-47.8%	-19.3%	-36.3%	-68.8%	-96.0%
HFC-134a/Ester, Branched Acid	-23.3%	-48.6%	-94.7%	-43.6%	-70.8%	-95.7%
HFC-32/Ester, Branched Acid	-24.4%	-43.1%	-15.0%	-31.4%	-72.9%	-30.5%
HFC-125/Ester, Branched Acid	-24.4%	-46.4%	-9.7%	-52.9%	-68.8%	-5.9%
HFC-143a/Ester, Branched Acid	-29.2%	-52.9%	-14.9%	-45.6%	-68.8%	-95.6%
HFC-134/Ester, Branched Acid	-35.4%	-43.8%	4.3%	-46.1%	-75.0%	2.2%
HFC-245ca/Ester, Branched Acid	-39.4%	-49.3%	-47.5%	-62.7%	-72.9%	-49.2%
HFC-134a/PAG, Butyl Monoether	-40.4%	-53.3%	-6.7%	-48.5%	-77.1%	-10.2%
HFC-32/PAG, Butyl Monoether	-41.3%	-53.3%	-0.6%	-50.0%	-75.0%	-8.6%
HFC-125/PAG, Butyl Monoether	-37.1%	-42.4%	2.8%	-52.0%	-77.1%	-27.1%
HFC-134a/PAG, Modified	-39.6%	-54.3%	-63.1%	-39.7%	-77.1%	-4.1%
HFC-125/PAG, Modified	-69.2%	-40.6%	3.1%	-36.8%	-77.1%	-65.9%
HFC-134a/PAG Diol	-61.3%	-67.4%	-72.3%	-44.6%	-79.2%	-96.5%

Sheet Insulation

% Change in Dielectric Strength

Results after 500-hour exposure @ 127°C(260°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
Unexposed	flash	flash	flash	10.7 kV	10.2 kV	flash
Exposure with:	% Change from Unexposed					
Nitrogen	flash	flash	flash	2.7%	-9.7%	flash
HCFC-22/Mineral	flash	flash	flash	flash	3.7%	flash
HCFC-124/Alkylbenzene	flash	flash	flash	flash	14.0%	flash
HCFC-142b/Alkylbenzene	flash	flash	flash	0.4%	10.4%	flash
HFC-152a/Alkylbenzene	flash	flash	flash	21.1%	-3.9%	flash
HFC-134a/Ester, Mixed Acid	flash	flash	flash	13.0%	15.1%	flash
HFC-134a/Ester, Branched Acid	flash	flash	flash	flash	5.4%	flash
HFC-32/Ester, Branched Acid	flash	flash	flash	10.3%	7.5%	flash
HFC-125/Ester, Branched Acid	flash	flash	flash	flash	-14.2%	flash
HFC-143a/Ester, Branched Acid	flash	flash	flash	flash	2.8%	flash
HFC-134/Ester, Branched Acid	flash	flash	flash	flash	flash	flash
HFC-245ca/Ester, Branched Acid	flash	flash	flash	flash	flash	flash
HFC-134a/PAG, Butyl Monoether	flash	flash	flash	flash	-13.0%	flash
HFC-32/PAG, Butyl Monoether	flash	flash	flash	19.3%	-5.9%	flash
HFC-125/PAG, Butyl Monoether	flash	flash	flash	flash	15.1%	flash
HFC-134a/PAG, Modified	flash	flash	flash	flash	-1.9%	flash
HFC-125/PAG, Modified	flash	flash	flash	28.7%	1.7%	flash
HFC-134a/PAG Diol	flash	flash	flash	16.8%	9.0%	flash

*Flash indicates dielectric went around sheet insulation not through.

Sheet Insulation

% Change in Dielectric Strength

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Sheet Insulation Type					
	Nomex/Mylar Nomex	Dacron/Mylar Dacron	Mylar MO	Nomex	Nomex Mica	Melinex
Unexposed	flash	flash	flash	10.7 kV	10.2 kV	flash
Exposure with:	% Change from Unexposed					
Nitrogen	flash	flash	flash	-1.8%	-4.6%	flash
HCFC-22/Mineral	flash	flash	flash	0.6%	-6.9%	flash
HCFC-124/Alkylbenzene	flash	flash	flash	-3.2%	-9.5%	flash
HCFC-142b/Alkylbenzene	flash	flash	flash	3.4%	1.1%	flash
HFC-152a/Alkylbenzene	flash	flash	flash	-8.8%	-3.9%	flash
HFC-134a/Ester, Mixed Acid	flash	flash	flash	6.3%	14.7%	flash
HFC-134a/Ester, Branched Acid	flash	flash	flash	6.3%	10.6%	flash
HFC-32/Ester, Branched Acid	flash	flash	flash	5.6%	11.0%	flash
HFC-125/Ester, Branched Acid	flash	flash	flash	8.9%	1.2%	flash
HFC-143a/Ester, Branched Acid	flash	flash	flash	10.8%	-1.0%	flash
HFC-134/Ester, Branched Acid	flash	flash	flash	7.7%	17.2%	flash
HFC-245ca/Ester, Branched Acid	flash	flash	flash	7.0%	flash	flash
HFC-134a/PAG, Butyl Monoether	flash	flash	flash	-3.4%	-4.2%	flash
HFC-32/PAG, Butyl Monoether	flash	flash	flash	1.4%	0.7%	flash
HFC-125/PAG, Butyl Monoether	flash	flash	flash	-12.3%	-2.5%	flash
HFC-134a/PAG, Modified	flash	flash	flash	-4.6%	-3.7%	flash
HFC-125/PAG, Modified	flash	flash	flash	-22.6%	1.2%	flash
HFC-134a/PAG Diol	flash	flash	flash	-21.7%	-6.5%	flash

*Flash indicates dielectric went around sheet insulation not through.

Spiral Wrapped Sleeving Insulation

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F)

Exposure with:	Sleeving Insulation Type		
	Nomex	Mylar	Nomex/Mylar
	% Change in Weight		
Nitrogen	0.3%	-0.6%	0.1%
HCFC-22/Mineral	13.3%	3.3%	6.6%
HCFC-124/Alkylbenzene	12.1%	0.2%	4.5%
HCFC-142b/Alkylbenzene	11.9%	2.8%	5.5%
HFC-152a/Alkylbenzene	11.1%	2.5%	7.1%
HFC-134a/Ester, Mixed Acid	16.0%	4.4%	6.3%
HFC-134a/Ester, Branched Acid	12.1%	2.0%	4.6%
HFC-32/Ester, Branched Acid	13.1%	1.9%	4.8%
HFC-125/Ester, Branched Acid	13.2%	1.6%	4.7%
HFC-143a/Ester, Branched Acid	11.4%	1.4%	4.0%
HFC-134/Ester, Branched Acid	17.2%	3.0%	6.2%
HFC-245ca/Ester, Branched Acid	14.7%	2.4%	5.5%
HFC-134a/PAG, Butyl Monoether	14.2%	2.1%	5.0%
HFC-32/PAG, Butyl Monoether	14.6%	1.9%	5.9%
HFC-125/PAG, Butyl Monoether	13.3%	1.4%	4.8%
HFC-134a/PAG, Modified	14.4%	1.9%	5.5%
HFC-125/PAG, Modified	15.3%	3.9%	7.8%
HFC-134a/PAG Diol	15.5%	3.0%	5.2%

Spiral Wrapped Sleeving Insulation

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

Exposure with:	Sleeving Insulation Type		
	Nomex	Mylar	Nomex/Mylar
	% Change in Weight		
Nitrogen	-0.8%	-0.9%	-1.0%
HCFC-22/Mineral	5.3%	0.2%	1.4%
HCFC-124/Alkylbenzene	2.7%	-0.6%	0.3%
HCFC-142b/Alkylbenzene	1.3%	-1.9%	-1.3%
HFC-152a/Alkylbenzene	3.9%	-0.2%	0.5%
HFC-134a/Ester, Mixed Acid	11.8%	2.7%	3.1%
HFC-134a/Ester, Branched Acid	8.3%	0.2%	2.5%
HFC-32/Ester, Branched Acid	7.2%	-0.2%	2.3%
HFC-125/Ester, Branched Acid	7.6%	0.9%	1.8%
HFC-143a/Ester, Branched Acid	6.2%	-0.2%	0.9%
HFC-134/Ester, Branched Acid	7.1%	0.3%	0.9%
HFC-245ca/Ester, Branched Acid	9.4%	-1.5%	-9.7%
HFC-134a/PAG, Butyl Monoether	4.5%	-0.5%	0.2%
HFC-32/PAG, Butyl Monoether	6.6%	0.5%	0.9%
HFC-125/PAG, Butyl Monoether	5.8%	0.4%	0.6%
HFC-134a/PAG, Modified	3.3%	0.1%	0.3%
HFC-125/PAG, Modified	5.5%	0.2%	1.0%
HFC-134a/PAG Diol	2.8%	-0.9%	-2.5%

Lead Wire

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F)

Exposure with:	Lead Wire Type: % Change in Weight	
	Dacron/Mylar/Dacron	Dacron/Mylar/Teflon/Dacron
Nitrogen	0.0%	0.0%
HCFC-22/Mineral	4.8%	4.1%
HCFC-124/Alkylbenzene	4.2%	3.7%
HCFC-142b/Alkylbenzene	2.7%	3.1%
HFC-152a/Alkylbenzene	3.0%	3.5%
HFC-134a/Ester, Mixed Acid	4.8%	4.0%
HFC-134a/Ester, Branched Acid	4.0%	3.2%
HFC-32/Ester, Branched Acid	3.3%	2.7%
HFC-125/Ester, Branched Acid	4.2%	3.3%
HFC-143a/Ester, Branched Acid	3.4%	2.9%
HFC-134/Ester, Branched Acid	4.6%	4.4%
HFC-245ca/Ester, Branched Acid	7.3%	6.3%
HFC-134a/PAG, Butyl Monoether	3.5%	3.0%
HFC-32/PAG, Butyl Monoether	3.9%	3.1%
HFC-125/PAG, Butyl Monoether	3.6%	3.0%
HFC-134a/PAG, Modified	4.3%	3.5%
HFC-125/PAG, Modified	5.5%	4.4%
HFC-134a/PAG Diol	4.2%	3.2%

Lead Wire

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus 24-hour air bake @ 150°C(302°F)

Exposure with:	Lead Wire Type: Dacron/Mylar/Dacron — % Change in Weight	Lead Wire Type: Dacron/Mylar/Teflon/Dacron — % Change in Weight
Nitrogen	0.0%	0.0%
HCFC-22/Mineral	0.3%	-3.1%
HCFC-124/Alkylbenzene	1.0%	0.9%
HCFC-142b/Alkylbenzene	2.7%	3.1%
HFC-152a/Alkylbenzene	0.7%	1.1%
HFC-134a/Ester, Mixed Acid	4.3%	3.6%
HFC-134a/Ester, Branched Acid	2.9%	2.3%
HFC-32/Ester, Branched Acid	1.9%	2.5%
HFC-125/Ester, Branched Acid	3.6%	3.0%
HFC-143a/Ester, Branched Acid	1.9%	1.1%
HFC-134/Ester, Branched Acid	3.8%	2.1%
HFC-245ca/Ester, Branched Acid	4.4%	3.2%
HFC-134a/PAG, Butyl Monoether	1.1%	0.7%
HFC-32/PAG, Butyl Monoether	1.3%	0.9%
HFC-125/PAG, Butyl Monoether	1.9%	0.6%
HFC-134a/PAG, Modified	1.2%	0.4%
HFC-125/PAG, Modified	2.4%	0.6%
HFC-134a/PAG Diol	1.9%	1.1%

Lead Wire

% Change in Dielectric Strength

Results after 500-hour exposure @ 127 °C(260°F)

	Lead Wire Type	
	Dacron/Mylar/Dacron	Dacron/Mylar/Teflon/Dacron
Unexposed	9.6 kV	9.95 kV
Exposure with:	% Change from Unexposed	
Nitrogen	3.0%	-12.2%
HCFC-22/Mineral	-8.8%	11.1%
HCFC-124/Alkylbenzene	-17.9%	30.4%
HCFC-142b/Alkylbenzene	27.2%	-13.6%
HFC-152a/Alkylbenzene	35.3%	-18.5%
HFC-134a/Ester, Mixed Acid	-9.6%	44.0%
HFC-134a/Ester, Branched Acid	-13.4%	22.4%
HFC-32/Ester, Branched Acid	-6.9%	21.2%
HFC-125/Ester, Branched Acid	-16.6%	31.1%
HFC-143a/Ester, Branched Acid	-18.7%	29.8%
HFC-134/Ester, Branched Acid	-20.2%	27.0%
HFC-245ca/Ester, Branched Acid	-12.9%	42.4%
HFC-134a/PAG, Butyl Monoether	-14.0%	23.9%
HFC-32/PAG, Butyl Monoether	-14.4%	30.6%
HFC-125/PAG, Butyl Monoether	-11.2%	26.2%
HFC-134a/PAG, Modified	-30.4%	29.5%
HFC-125/PAG, Modified	10.7%	41.9%
HFC-134a/PAG Diol	-4.3%	18.0%

Lead Wire

% Change in Dielectric Strength

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Lead Wire Type	
	Dacron/Mylar/Dacron	Dacron/Mylar/Teflon/Dacron
Unexposed	9.61 kV	9.95 kV

Exposure with:	% Change from Unexposed	
Nitrogen	-9.1%	-7.9%
HCFC-22/Mineral	-1.0%	22.8%
HCFC-124/Alkylbenzene	1.7%	20.7%
HCFC-142b/Alkylbenzene	29.7%	-7.2%
HFC-152a/Alkylbenzene	31.4%	0.6%
HFC-134a/Ester, Mixed Acid	-2.8%	39.6%
HFC-134a/Ester, Branched Acid	-6.9%	12.2%
HFC-32/Ester, Branched Acid	-17.6%	40.6%
HFC-125/Ester, Branched Acid	1.4%	26.4%
HFC-143a/Ester, Branched Acid	0.4%	8.1%
HFC-134/Ester, Branched Acid	-15.0%	22.5%
HFC-245ca/Ester, Branched Acid	-6.6%	25.7%
HFC-134a/PAG, Butyl Monoether	1.5%	5.5%
HFC-32/PAG, Butyl Monoether	-11.2%	18.4%
HFC-125/PAG, Butyl Monoether	-5.5%	-9.8%
HFC-134a/PAG, Modified	-5.6%	3.0%
HFC-125/PAG, Modified	12.6%	-1.5%
HFC-134a/PAG Diol	-5.7%	2.3%

Tapes

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F)

Exposure with:	Tape Type: Woven Glass	Polyester	Permacel
	% Change in Weight		
Nitrogen	-0.4%	0.1%	-0.5%
HCFC-22/Mineral	0.8%	4.2%	7.1%
HCFC-124/Alkylbenzene	0.2%	2.1%	18.3%
HCFC-142b/Alkylbenzene	-0.1%	1.4%	7.6%
HFC-152a/Alkylbenzene	0.6%	1.7%	6.9%
HFC-134a/Ester, Mixed Acid	9.3%	16.2%	9.9%
HFC-134a/Ester, Branched Acid	0.1%	0.8%	7.6%
HFC-32/Ester, Branched Acid	0.5%	0.3%	47.9%
HFC-125/Ester, Branched Acid	7.2%	1.1%	44.8%
HFC-143a/Ester, Branched Acid	0.0%	0.8%	-0.5%
HFC-134/Ester, Branched Acid	0.2%	1.7%	12.0%
HFC-245ca/Ester, Branched Acid	0.6%	4.6%	36.0%
HFC-134a/PAG, Butyl Monoether	0.1%	1.5%	14.5%
HFC-32/PAG, Butyl Monoether	0.7%	1.8%	4.5%
HFC-125/PAG, Butyl Monoether	-0.2%	0.9%	14.9%
HFC-134a/PAG, Modified	0.1%	0.6%	26.3%
HFC-125/PAG, Modified	0.4%	1.7%	34.3%
HFC-134a/PAG Diol	0.4%	7.0%	33.2%

Tapes

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

Exposure with:	Tape Type: Woven Glass	Polyester	Permacel
	% Change in Weight		
Nitrogen	-0.2%	0.0%	-4.2%
HCFC-22/Mineral	-0.3%	0.5%	-3.0%
HCFC-124/Alkylbenzene	-0.1%	0.5%	-4.1%
HCFC-142b/Alkylbenzene	-0.1%	-1.2%	-6.8%
HFC-152a/Alkylbenzene	0.1%	-0.8%	-0.8%
HFC-134a/Ester, Mixed Acid	11.4%	8.2%	0.4%
HFC-134a/Ester, Branched Acid	3.6%	-0.8%	2.2%
HFC-32/Ester, Branched Acid	2.7%	3.3%	43.6%
HFC-125/Ester, Branched Acid	-6.5%	0.3%	28.9%
HFC-143a/Ester, Branched Acid	-0.1%	-0.6%	-13.3%
HFC-134/Ester, Branched Acid	0.1%	-0.8%	-12.9%
HFC-245ca/Ester, Branched Acid	0.0%	0.0%	0.0%
HFC-134a/PAG, Butyl Monoether	-0.1%	-0.1%	-13.0%
HFC-32/PAG, Butyl Monoether	3.2%	-1.6%	22.1%
HFC-125/PAG, Butyl Monoether	-0.2%	-0.2%	-14.6%
HFC-134a/PAG, Modified	0.0%	0.1%	-3.6%
HFC-125/PAG, Modified	-0.2%	-0.6%	7.9%
HFC-134a/PAG Diol	0.2%	-1.2%	-10.4%

Tapes

% Change in Break Load

Results after 500-hour exposure @ 127°C(260°F)

	Tape Type		
	Woven Glass	Polyester	Permacel
Unexposed	39.0 lbs	56.1 lbs	88.5 lbs

Exposure with:	% Change from Unexposed		
Nitrogen	5.4%	-27.3%	6.5%
HCFC-22/Mineral	-56.4%	-60.3%	-69.3%
HCFC-124/Alkylbenzene	36.0%	-53.9%	-36.4%
HCFC-142b/Alkylbenzene	49.5%	-7.5%	-1.1%
HFC-152a/Alkylbenzene	53.3%	-4.7%	4.1%
HFC-134a/Ester, Mixed Acid	24.0%	5.6%	-14.0%
HFC-134a/Ester, Branched Acid	28.1%	5.3%	-5.0%
HFC-32/Ester, Branched Acid	24.6%	5.1%	-46.9%
HFC-125/Ester, Branched Acid	10.1%	-1.5%	-57.4%
HFC-143a/Ester, Branched Acid	41.6%	-4.8%	-18.2%
HFC-134/Ester, Branched Acid	41.7%	7.1%	-26.7%
HFC-245ca/Ester, Branched Acid	73.8%	1.8%	0.0%
HFC-134a/PAG, Butyl Monoether	37.2%	5.9%	15.0%
HFC-32/PAG, Butyl Monoether	79.2%	6.0%	-55.1%
HFC-125/PAG, Butyl Monoether	30.6%	3.1%	-46.9%
HFC-134a/PAG, Modified	38.3%	3.7%	-21.7%
HFC-125/PAG, Modified	6.4%	2.8%	-11.1%
HFC-134a/PAG Diol	52.2%	8.2%	-47.1%

Tapes

% Change in Break Load

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Tape Type		
	Woven Glass	Polyester	Permacel
Unexposed	39.1 lbs.	56.1 lbs	88.5 lbs

Exposure with:	% Change from Unexposed		
Nitrogen	14.8%	-29.1%	-11.4%
HCFC-22/Mineral	-39.4%	-60.6%	-78.6%
HCFC-124/Alkylbenzene	55.9%	-69.6%	-19.9%
HCFC-142b/Alkylbenzene	47.2%	-9.7%	-16.2%
HFC-152a/Alkylbenzene	43.9%	-22.4%	-15.3%
HFC-134a/Ester, Mixed Acid	29.0%	1.4%	-21.9%
HFC-134a/Ester, Branched Acid	18.7%	-2.3%	8.8%
HFC-32/Ester, Branched Acid	22.3%	-6.2%	-56.2%
HFC-125/Ester, Branched Acid	51.7%	3.7%	-16.1%
HFC-143a/Ester, Branched Acid	41.9%	-6.9%	2.2%
HFC-134/Ester, Branched Acid	42.8%	-5.0%	10.2%
HFC-245ca/Ester, Branched Acid	26.6%	-3.4%	-2.7%
HFC-134a/PAG, Butyl Monoether	59.2%	-2.5%	12.1%
HFC-32/PAG, Butyl Monoether	29.3%	-1.5%	-5.1%
HFC-125/PAG, Butyl Monoether	26.4%	-0.5%	-2.5%
HFC-134a/PAG, Modified	65.5%	1.4%	-2.4%
HFC-125/PAG, Modified	15.3%	-18.5%	6.4%
HFC-134a/PAG Diol	42.1%	-12.5%	-0.9%

Tie Cord

% Change in Weight

Results after 500-hour exposure @127°C(260°F)

Exposure with:	Tie Cord Type: Polyester % change in weight
Nitrogen	0.0%
HCFC-22/Mineral	2.2%
HCFC-124/Alkylbenzene	0.8%
HCFC-142b/Alkylbenzene	0.2%
HFC-152a/Alkylbenzene	1.5%
HFC-134a/Ester, Mixed Acid	17.8%
HFC-134a/Ester, Branched Acid	0.8%
HFC-32/Ester, Branched Acid	-0.1%
HFC-125/Ester, Branched Acid	0.7%
HFC-143a/Ester, Branched Acid	0.0%
HFC-134/Ester, Branched Acid	0.8%
HFC-245ca/Ester, Branched Acid	0.9%
HFC-134a/PAG, Butyl Monoether	0.8%
HFC-32/PAG, Butyl Monoether	1.1%
HFC-125/PAG, Butyl Monoether	0.3%
HFC-134a/PAG, Modified	0.4%
HFC-125/PAG, Modified	5.4%
HFC-134a/PAG Diol	1.8%

Tie Cord

% Change in Weight

Results after 500-hour exposure @ 127°C(260°F) plus 24-hour air bake @ 150°C(302°F)

	Tie Cord Type
	Polyester
Exposure with:	**% change in weight**
Nitrogen	0.0%
HCFC-22/Mineral	0.0%
HCFC-124/Alkylbenzene	-0.3%
HCFC-142b/Alkylbenzene	1.6%
HFC-152a/Alkylbenzene	-0.3%
HFC-134a/Ester, Mixed Acid	8.1%
HFC-134a/Ester, Branched Acid	1.4%
HFC-32/Ester, Branched Acid	-0.1%
HFC-125/Ester, Branched Acid	-0.2%
HFC-143a/Ester, Branched Acid	-0.9%
HFC-134/Ester, Branched Acid	-0.1%
HFC-245ca/Ester, Branched Acid	0.2%
HFC-134a/PAG, Butyl Monoether	-1.1%
HFC-32/PAG, Butyl Monoether	-0.6%
HFC-125/PAG, Butyl Monoether	-0.9%
HFC-134a/PAG, Modified	-0.5%
HFC-125/PAG, Modified	-0.7%
HFC-134a/PAG Diol	-0.6%

Tie Cord

% Change in Break Load

Results after a 500-hour exposure @ 127°C(260°F)

	Tie Cord Type
	Polyester
Unexposed	28.4 lbs.

Exposure with:	% change from Unexposed
Nitrogen	-11.1%
HCFC-22/Mineral	-22.0%
HCFC-124/Alkylbenzene	32.2%
HCFC-142b/Alkylbenzene	15.3%
HFC-152a/Alkylbenzene	29.8%
HFC-134a/Ester, Mixed Acid	20.1%
HFC-134a/Ester, Branched Acid	14.1%
HFC-32/Ester, Branched Acid	15.2%
HFC-125/Ester, Branched Acid	21.8%
HFC-143a/Ester, Branched Acid	18.1%
HFC-134/Ester, Branched Acid	26.5%
HFC-245ca/Ester, Branched Acid	7.7%
HFC-134a/PAG, Butyl Monoether	15.7%
HFC-32/PAG, Butyl Monoether	16.1%
HFC-125/PAG, Butyl Monoether	10.9%
HFC-134a/PAG, Modified	29.6%
HFC-125/PAG, Modified	13.7%
HFC-134a/PAG Diol	16.2%

Tie Cord

% Change in Break Load

Results after 500-hour exposure @ 127°C(260°F) plus a 24-hour air bake @ 150°C(302°F)

	Tie Cord Type
	Polyester
Unexposed	28.4 lbs.

Exposure with:	% change from Unexposed
Nitrogen	0.5%
HCFC-22/Mineral	-21.8%
HCFC-124/Alkylbenzene	15.9%
HCFC-142b/Alkylbenzene	9.2%
HFC-152a/Alkylbenzene	1.5%
HFC-134a/Ester, Mixed Acid	17.4%
HFC-134a/Ester, Branched Acid	9.4%
HFC-32/Ester, Branched Acid	15.2%
HFC-125/Ester, Branched Acid	18.7%
HFC-143a/Ester, Branched Acid	12.3%
HFC-134/Ester, Branched Acid	15.0%
HFC-245ca/Ester, Branched Acid	15.8%
HFC-134a/PAG, Butyl Monoether	12.6%
HFC-32/PAG, Butyl Monoether	25.8%
HFC-125/PAG, Butyl Monoether	10.7%
HFC-134a/PAG, Modified	37.8%
HFC-125/PAG, Modified	20.2%
HFC-134a/PAG Diol	23.5%

Appendix B.

IDENTIFICATION OF LUBRICANTS

Lubricants Identification:

Mineral-Witco Suniso 3GS
Alkylbenzene-Schrieve Zerol150
Ester, Mixed Acid-ICI Emkarate RL244
Ester, Branched Acid-Emery 2927 ISO32
PAG, Butyl Monoether-ICI Emkarox VG32
PAG, Modified-Allied Signal BRL150
PAG, Diol-Dow P425

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7/9/93