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ABSTRACT

All seven oil immersion studies are complete at both temperatures. Nine out of ten refrigerant ambient immersion studies are complete including 60°C (140°F) for R-123. All twenty two plastic test materials have been molded into test bars. All test bars have been quality controlled for physical consistency and integrity. All twenty two creep test chambers are functional. Creep loads have been increased to 25% of ultimate tensile. Refrigerant gas solubilities of Emery 2927 with R-22 and 134a are complete.

SCOPE

The broad scope of this research is to provide compatibility information on engineering plastics with alternative refrigerants exposed to a wide variety of suitable lubricants and alternative refrigerants. In part, this report presents data obtained on the dimensional changes in the engineering plastic polymer and is measured in the as molded properties for immersion and tensile determinations. The physical changes will be measured after ambient aging, under stress and after thermal aging in individual refrigerant and lubricants and as selected mixtures at constant refrigerant pressures.

SIGNIFICANT RESULTS

ENGINEERING PLASTICS

All the engineering plastics have been molded into modified type 5 ASTM test bars. The exceptions are DuPont PTFE and DuPont Vespel DF and DF-ISO will be used as received. The PTFE plastic will not be tested in the creep rigs due to its high creep cold flow properties. All of the molded plastics have been molded as close to manufactures specifications as possible. The evidence of a quality test specimen was determined by tensile measurements of five individual test bars. All bars meet the reported tensile properties of the molded engineering plastic. This data is presented as an average of five test bars. The creep loads were calculated for 15, 20 and 25% of ultimate tensile loading for reference and comparison

LUBRICANT IMMERSION STUDIES

All of the plastic specimens have been evaluated at the required 60°C (140°F) and 100°C (212°F) temperatures. Molded test bars of all of the plastics were immersed in the test lubricant in screw cap sealed vials under nitrogen cover at temperature for 14 days duration. All of the plastics are affected by the lubricants in one way or the other. The lubricants with the most general affect were the mineral oil and alkylbenzene. Tables are provided detailing a summary of the average percent affect on measured parameters.

REFRIGERANT IMMERSION STUDIES

Refrigerants are being used as received. All of the immersion studies are being performed in separate stainless steel pressure tubes that are equipped with a gas space and a metering needle valve. All of the tubes are filled using a special low volume, low loss, stainless steel manifold. All of the refrigerants will be exhausted from the stainless steel tube as liquid and then concentrated to recover any and all extractables.

All refrigerants affect the plastic part in some way or other. The general trend is a weight gain and some softening. With the clear plastics the polymer takes on a silvery appearance. There seems to be a definite trend in the HFC refrigerants in that they appear to least affect the plastic.

The one plastic that should not be tested in the Emery 2927 40% refrigerant combinations appears to be the ABS plastic Cycolac GPM4700. The two other most likely to fail are polyphenylene ether and polycarbonate. The presence of oil however may allow these materials to survive the creep testing.

Plastics that have failed the ambient immersion testing will not be tested at the elevated temperature with that particular refrigerant.

The ambient and 60°C (140°F) aging of plastics in pure refrigerant for 14 days was at the saturation pressure of the refrigerant. In Phase II, the thermal aging of the plastics will be with selected refrigerant lubricant combinations at 150°C (300°F). The pressure of the refrigerant will be controlled at 250-300 psia (17-20bar)

STRESS CRACK-CREEP RUPTURE TEST CELLS

All of the test cells are complete and are of stainless steel construction. The biggest design change that has occurred since the last report is the change from a 15% ultimate tensile load to a 25% dead weight load. The reason for this change is that we were noticing unusual and unexplained noisy oscillations. After some extensive experimentation we were able to determine the nylon test bars were in tensile enough for the member to be in an elastic region and acted as a spring. We believe we were measuring earth vibrations, since a quiescent transducer was less noisy. Experiments with a 25% load gave the best curve function and provided sufficient load to stress the gauge area of the test bar. Nylon bars immersed in refrigerant and oil showed clear (visual) and measurable changes in the creep rate.

The lubricant originally chosen for the creep testing was EXP-0621. The MCLR committee decided to change the lube to Emery 2927 as the fluid of choice. The refrigerant concentration was chosen to be 40% refrigerant by weight. All of the test bars will be run in duplicate.

The measurement sensitivity of the creep rate is now finalized at 250 micro inches (2.5×10^{-4} inches). We feel this should be enough sensitivity to monitor macro movement and micro cracking of the specimen.

PLASTIC MOLD

The mold performed as expected. However, two additional ejector pins are needed to eject the test bar to produce better quality test bars. The quality of the finish in the gage area proved to be critical. We selected a 6F finish. The extension tabs have 8-12 pimples on each side to enhance gripping. The mold was designed to produce both thermoset and thermoplastic test bars.

PLASTIC MOLDING CONDITIONS AND SPECIFICATIONS

The plastic molding conditions for all of the plastics were maintained at the conditions specified by the manufacturer. In fact by enlarging the gate dimensions and mold temperatures we were able to produce plastic test parts that meet all of the physical qualities of the manufacturer. Therefore no bad parts are being tested.

REFRIGERANT OIL CONCENTRATIONS FOR CREEP RUPTURE TESTING

A decision was made to keep the refrigerant oil concentration constant through out the creep study. The concentration of refrigerant will be maintained at 40% and at ambient conditions. The fluid chosen is Emery 2927, a branched acid pentaerytheritol ester.

GENERAL SUMMARY

The chlorinated refrigerants seem to have the most affect on the plastic test bars. There also seems to be some selective activity of refrigerant structure on refrigerant retention and foaming of some of the plastics. The plastics that are most actively affected are ABS, polyphenlyene ether, polycarbonate at the ambient temperatures.

COMPLIANCE WITH AGREEMENT

There is one modification from the technical performance of the work as described in the contract agreement. The agreement states that we are to do creep studies at a 15% ultimate tensile load whereas we have found it necessary to go to a 25% dead weight load for reasons discussed above.

PRINCIPAL INVESTIGATOR EFFORT

The principal investigator has devoted 648 hours toward the completion of this contract.

APPENDIX

APPENDIX CONTENTS

ENGINEERING PLASTICS MOLDING SPECIFICATIONS AND MOLDING CONDITIONS

Plastic Type/Manufacturer	MANUFACTURE'S SPECIFICATIONS									ACTUAL MOLDING CONDITIONS													
	Drying time (hour)	Drying temp (deg. F)	Drying temp (deg.C)	Cylinder temp (deg. F)	Cylinder temp (deg.C)	Injection Pressure (psi)	Injection Pressure (KPa)	Mold temp (deg. F)	Mold temp (deg.C)	Drying time (hour)	Drying temp (deg. F)	Drying temp (deg.C)	Cylinder temp (deg. F)	Cylinder temp (deg.C)	Cylinder temp (deg. F)	Cylinder temp (deg.C)	Cylinder temp (deg. F)	Cylinder temp (deg.C)	Cycle time (sec)	Injection Pressure (psi)	Injection Pressure (KPa)	Mold temp (deg. F)	Mold temp (deg.C)
Amodel AD – 1000 HS Polyphthalamide/Amoco	*	175	79	585–625	307–329	*	*	*	*	14.5	300	149	615	324	600	316	595	313	18	750	5173	180	82
Cycolac GPM4700 ABS/GE	2–4	190–200	88–93	400–475	204–246	8000–20000	55178–137944	120–140	49–60	11	190	88	460	238	455	235	450	232	15	800	5516	120	49
Delrin II – 11500 Acetal/DuPont	*	*	*	400–440	204–227	10000–16000	68972–110355	180–220	82–104	666	190	88	430	221	425	218	420	216	15	700	4826	180	82
Durez 153 Phenolic/Hooker	*	*	*	*	*	*	*	340	171	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	170	77	170	77	170	77	60	545	3759	355	179
Kynar 720 Polyvinylidene Chloride ATOChem	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	375–450	191–232	MAX	MAX	120–200	49–93	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	445	229	435	224	435	224	15	700	4826	150	66
Lexan 161 Polycarbonate/GE	3–4	250	121	520–570	271–299	12000–20000	82767–137944	*	*	15	300	149	555	291	545	285	535	279	18	1200	8277	110	43
Noryl 731 Polyphenylene ether/GE	2–4	230–250	110–121	540–570	282–299	10000–18000	68972–124150	160–210	71–99	11	190	88	560	293	555	291	550	288	15	850	5863	150	66
Plenco 04485 Phenolic/Chem. Eng.	*	*	*	*	*	2000–6000	13794–41383	300–360	149–182	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	170	77	170	77	170	77	60	545	3759	355	179
Profax 6331 NW Polypropylene/Himont	*	*	*	*	*	*	*	*	*	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	415	213	400	204	395	202	15	700	4826	105	41
Radel A–200 Polyaryl Sulfide/Amoco	2 5	350	177	650–725	343–385	*	*	280–325	138–163	15	300	149	745	396	735	391	730	388	21	900	6207	305	152
Rynite 530 Polyethylene Terephthalate DuPont	2–3	250–275	121–135	555	291	*	*	190–250	88–121	14.5	300	149	550	288	545	285	5	282	20	750	5173	180	82
Supec G401 Polyphenylene Sulfide/GE	3–4	285	141	580–630	304–332	*	*	280–320	138–160	14.5	300	149	615	324	600	316	595	313	18	750	5173	180	82
Torlon 4203L Polyamide–imide/Amoco	8–24	250–350	121–177	580–650	304–343	MAX	MAX	390–420	199–216	48	350	177	675	357	660	349	650	343	20	1700	11725	425	218
Torlon 4301 Polyamide–imide/Amoco	8–24	250–350	121–177	580–650	304–343	MAX	MAX	390–420	199–216	48	350	177	675	357	660	349	650	343	20	1700	11725	450	232
Ultem 1000 Polyetherimide/GE	4	300	149	660–800	349–427	10000–20000	68972–137944	130–250	54–121	15	300	149	775	357	770	410	765	407	21	1000	6897	255	124
Ultem CRS 5001 Polyetherimide/GE	4	300	149	660–800	349–427	10000–20000	68972–137944	150–350	66–177	15	300	149	775	413	770	410	765	407	21	1000	6897	255	124
Ultrapek Polyetherketone/BASF	*	*	*	716–788	380–420	*	*	*	*	14	250	121	765	407	755	402	745	396	19	800	5516	375	191
Valox 325 PBT Polyethylene Terephthalate General Electric	3–4	250	121	455–480	235–249	8000–10000	55178–68972	60–150	16–66	11	190	88	480	249	475	246	470	243	15	900	6207	110	43
Victrex PEEK 450G Polyetheretherketone/ICI	3	300	149	698	370	10000 20300	68972–140013	356–374	180–190	15	300	149	725	385	715	379	710	377	25	1100	7587	362	183
Xydar MG 450 Liquid crystal polymer/Amoco	8	300	149	660–730	349–389	*	*	180–220	82–104	14.5	300	149	715	379	710	377	705	374	15	900	6207	190	88
Zytel 101 Nylon 6/6 DuPont	24	175	79	550–590	288 310	5000–20000	34486 137944	210–250	99–121	14.5	300	149	550	288	545	285	540	282	20	650	4483	180	82

* not specified by manufacturer

PHYSICAL PROPERTIES OF MOLDED ENGINEERING PLASTIC TEST BARS

ENGINEERING PLASTIC	TYPE	MANU-FACTURER	CROSS-SECTIONAL AREA		ULTIMATE TENSILE		% ELONGATION AT BREAK	CREEP LOAD (lbm)			CREEP LOAD (kg)		
			in^2	mm^2	lbm/in.^2	kg/mm^2		15%	20%	25%	15%	20%	25%
AMODEL AD 1000HS	POLYPHTHALAMIDE	AMOCO	0.017	10.65	11488.7	8.08	25.2	28.5	37.9	47.4	12.9	17.2	21.5
CYCOLAC GPM4700	ABS	G.E.	0.017	10.69	5528.9	3.89	26.4	13.7	18.3	22.9	6.2	8.3	10.4
DELRIN II 11500	ACETAL	DUPONT	0.016	10.57	9753.6	6.86	2.5	24.0	32.0	39.9	10.9	14.5	18.1
DUREZ	PHENOLIC	HOOKER	0.017	10.76	8611.7	6.05	1.2	21.5	28.7	35.9	9.8	13.0	16.3
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	0.016	10.30	7411.9	5.21	84.9	17.7	23.7	29.6	8.1	10.7	13.4
LEXAN 161	POLYCARBONATE	G.E.	0.017	11.00	10188.3	7.16	59.1	26.1	34.7	43.4	11.8	15.8	19.7
NORYL 731	POLYPHENYLENE ETHER	G.E.	0.017	10.74	7778.9	5.47	29.6	19.4	25.9	32.4	8.8	11.7	14.7
PROFAX 6331NW	POLYPROPYLENE	HIMONT	0.016	10.62	5397.0	3.79	308.1	13.3	17.8	22.2	6.0	8.1	10.1
RADEL A-200	POLYARYL SULFIDE	AMOCO	0.017	10.77	12728.2	8.95	61.2	31.9	42.5	53.1	14.5	19.3	24.1
RYNITE 530	POLYETHYLENE TEREPHTHLATE	DUPONT	0.017	10.85	20689.1	14.55	1.6	52.2	69.6	87.0	23.7	31.6	39.5
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	0.017	10.76	21261.7	14.95	1.1	53.2	70.9	88.7	24.1	32.2	40.2
TEFLON	POLYTETRAFLUOROETHYLENE	DUPONT	0.013	8.63	3878.5	2.73	127.5	7.8	10.4	13.0	3.5	4.7	5.9
TORLON 4203L	POLYIMIDE	AMOCO	0.016	10.57	27919.8	19.63	2.1	68.6	91.5	114.4	31.1	41.5	51.9
TORLON 4301	POLYIMIDE	AMOCO	0.017	10.67	22990.0	16.16	1.1	57.0	76.0	95.0	25.9	34.5	43.1
ULTEM 1000	POLYETHERIMIDE	G.E.	0.017	10.73	15750.0	11.07	43.6	39.3	52.4	65.5	17.8	23.8	29.7
ULTEM CRS 5001	POLYETHERIMIDE	G.E.	0.016	10.57	14491.0	10.19	28.2	35.6	47.5	59.4	16.2	21.5	26.9
ULTRAPEK	POLYETHERKETONE	BASF	0.016	10.63	14945.6	10.51	45.8	36.9	49.3	61.6	16.8	22.3	27.9
VALOX 325PBT	POLYBUTYLENE TEREPHTHLATE	G.E.	0.017	10.97	7269.5	5.11	143.7	18.5	24.7	30.9	8.4	11.2	14.0
VESPEL DF	POLYIMIDE	DUPONT	0.023	14.76	10864.6	7.64	0.8	37.3	49.7	62.1	16.9	22.5	28.2
VESPEL DF-ISO	POLYIMIDE	DUPONT	0.022	14.42	12208.9	8.58	0.9	40.9	54.6	68.2	18.6	24.8	30.9
VICTREX PEEK	POLYETHERKETONE	ICI	0.017	10.90	14359.8	10.10	51.7	36.4	48.5	60.7	16.5	22.0	27.5
XYDAR MG450	LIQUID CRYSTAL POYMER	AMOCO	0.017	10.69	13233.8	9.30	0.8	32.9	43.9	54.8	14.9	19.9	24.9
ZYTEL 101	NYLON 6/6	DUPONT	0.017	10.92	9828.0	6.91	54.9	25.0	33.3	41.6	11.3	15.1	18.9

ALL CALCULATIONS BASED ON AN AVERAGE OF FIVE TENSILE TESTS

ALL TENSILE PULLS WERE AT AMBIENT CONDITIONS

CHANGES IN PLASTICS IMMERSED IN BVA RO15 LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD 1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/FAINT GREEN	−0.03	−0.14	0.00	−0.11
AMODEL AD 1000 HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	NONE	−0.59	−0.54	0.00	−0.34
CYCOLAC GPM 4700	ABS	G.E.	60	0	0	0	0	NONE	−0.08	−0.32	0.00	−0.06
CYCOLAC GPM 4700	ABS	G.E.	100	0	0	0	0	CREME/WHITE COAT	−1.91	5.75	10.05	14.40
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	−0.13	0.14	0.00	−0.17
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	NONE	−0.28	−0.41	0.79	−0.21
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	−0.07	0.14	0.38	−0.44
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	−0.38	−0.81	−0.38	−2.51
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	−0.04	−0.27	0.40	−0.05
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	LUCITE/YELLOW TINT	−0.16	−0.14	0.00	0.00
LEXAN	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	−0.07	−0.11	0.31	0.03
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	NONE	−0.09	−0.68	−0.61	0.03
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	−0.17	−0.69	−0.62	0.15
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	GREY/WHITE COAT	−0.14	−0.05	1.24	2.38
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	0.40	−0.14	0.78	1.59
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	−0.09	2.44	2.34	10.44
RADEL A−200	POLYARYL SULFONE	AMOCO	60	0	0	0	0	NONE	0.01	−0.40	0.00	0.09
RADEL A−200	POLYARYL SULFONE	AMOCO	100	0	0	0	0	NONE	−0.01	0.00	−0.38	0.06
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	NONE	0.01	−0.40	−0.78	0.02
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	100	0	0	0	0	NONE	−0.01	0.13	−0.39	−0.09
SUPEC G401	POLYETHYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	−0.03	−0.27	−0.62	0.01
SUPEC G401	POLYETHYLENE SULFIDE	G.E.	100	0	0	0	0	CHOCOLATE/LIGHTER	−0.10	−0.53	−0.47	−0.01
TEFLON	POLYTETRAFLOUROETHANE	DUPONT	60	0	0	0	0	NONE	0.02	−0.40	0.39	0.12
TEFLON	POLYTETRAFLOUROETHANE	DUPONT	100	0	0	0	0	NONE	0.02	0.52	−1.49	0.03
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	−0.03	0.40	0.39	0.20
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.00	0.00	1.15	0.15
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	−0.04	−0.53	−1.51	0.16
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	−0.14	−0.13	0.00	0.19
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	−0.09	−0.32	0.00	0.01
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	−0.02	−0.16	0.00	0.02
ULTEM CRS 5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	0.01	−0.43	0.16	0.09
ULTEM CRS 5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	−0.06	−0.69	0.00	0.01
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	−0.01	0.00	0.78	0.04
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	0.00	0.00	−1.15	−0.11
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	60	0	0	0	0	NONE	−0.07	−0.38	0.01	0.06
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	100	0	0	0	0	NONE	−0.26	−0.22	0.00	0.05
VESPEL−DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.04	0.00	0.96	0.07
VESPEL−DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	0.00	−0.15	0.96	0.02
VESPEL−DF−ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	−0.03	−0.45	0.00	−0.08
VESPEL−DF−ISO	POLYIMIDE	DUPONT	100	1	0	0	0	NONE	−0.03	−0.45	0.00	−0.25
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	0.00	−0.40	0.00	0.03
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	−0.01	−0.40	−0.77	−0.03
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	60	0	0	0	0	NONE	0.01	−0.53	0.00	−0.03
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	100	0	0	0	0	NONE	0.00	−0.27	0.00	−0.03
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	0.03	0.14	−0.78	−0.04
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	NONE	−0.20	−0.41	−1.16	0.03

Note:

a. Temperatures conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN SHRIEVE ZEROL 150

PLASTIC	TYPE	MANUFAC-TURER	TEMPER-ATURE (deg. C) a.	PARTIC-ULATES b.	CRACK-ING b.	CRAZ-ING b.	SOFTEN-ING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/GREEN TINT	-0.09	-0.27	0.00	-0.08
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	NONE	-0.69	-0.27	-0.39	-0.51
CYCOLAC GPM4700	ABS	G.E.	60	0	0	0	0	NONE	-0.09	-0.13	0.78	-0.13
CYCOLAC GPM4700	ABS	G.E.	100	1	0	0	0	CREME/OFF WHITE ENDS	-2.69	3.07	3.40	5.57
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	-0.22	-0.68	0.00	-0.15
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	NONE	-0.57	-0.55	0.39	-0.58
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	2.90	1.22	0.40	2.96
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	LUCITE/YELLOW TINT	2.83	1.49	-1.50	2.82
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	-0.09	-0.05	-0.15	0.02
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	NONE	-0.12	0.11	0.16	0.02
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	-0.08	-0.16	0.00	0.07
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	GRAY/WHITE COAT	-0.01	1.23	5.46	5.49
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	0.40	0.14	-4.44	1.53
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	2.83	3.12	3.18	8.83
RADEL A-200	POLYARYL SULFONE	AMOCO	60	0	0	0	0	NONE	0.01	-0.53	0.78	0.40
RADEL A-200	POLYARYL SULFONE	AMOCO	100	0	0	0	0	NONE	0.03	-0.40	0.78	0.09
RYNITE 530	POLYETHYLENE SULFIDE	DUPONT	60	0	0	0	0	NONE	-0.01	-0.27	0.00	-0.07
RYNITE 530	POLYETHYLENE SULFIDE	DUPONT	100	0	0	0	0	NONE	-0.04	-0.40	-0.39	-0.14
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	-2.75	-0.80	-3.82	-2.88
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	CHOCOLATE/LIGHTER	-3.05	-1.60	-5.54	-2.83
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	0.02	-0.20	-0.04	-0.04
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	100	0	0	0	0	NONE	0.00	-0.51	-1.96	0.00
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.04	-0.48	0.31	0.12
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.07	-0.69	0.94	0.07
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.06	0.16	0.31	0.01
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.16	-0.43	-2.28	-0.24
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.01	-0.30	-0.48	-0.05
VESPEL-DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.04	-0.15	-0.94	0.01
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.01	0.00	1.44	-0.06
VESPEL-DF-ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.06	0.00	-0.96	-0.54
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	-0.04	-0.40	0.00	0.04
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	-0.06	-0.54	-0.39	-0.02
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	60	0	0	0	0	NONE	0.01	0.00	-1.89	0.00
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	100	0	0	0	0	NONE	-0.07	0.27	-2.28	-0.05
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	-0.14	-0.27	-0.39	-0.08
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	NONE	-0.22	-0.14	-0.39	-0.12

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN EMKARATE RL244 LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/GREEN TINT	-0.19	-0.27	-0.39	-0.32
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	CREME/GREEN TINT	-0.07	-0.27	-0.39	-0.79
CYCOLAC GPM4700	ABS	G.E.	60	0	0	0	0	CREME/WHITE FILM	-0.10	-0.16	0.62	-0.03
CYCOLAC GPM4700	ABS	G.E.	100	2	0	0	0	CREME/OFF WHITE	-2.11	2.51	10.56	13.17
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	-0.23	-0.41	0.00	-0.24
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	NONE	-0.23	-0.14	0.39	-0.26
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	-0.10	-0.13	-0.38	-0.76
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	-0.51	0.13	-0.77	-2.92
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	-0.10	-0.41	0.79	-0.01
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	NONE	-0.10	-0.54	0.79	0.07
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	-0.09	-0.21	-0.15	-0.02
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	CLEAR/FOGGY	-0.07	-0.42	1.53	0.80
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	-0.06	-0.32	1.25	0.13
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	NONE	-0.11	0.21	2.34	1.91
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	-0.06	-0.54	0.39	0.28
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	0.49	0.14	0.39	1.97
RADEL A-200	POLYARYL SULFONE	AMOCO	60	0	0	0	0	NONE	-0.04	-0.67	-0.38	-0.29
RADEL A-200	POLYARYL SULFONE	AMOCO	100	0	0	0	0	NONE	0.04	-0.40	0.00	-0.52
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	NONE	-0.01	-0.40	-0.39	-0.09
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	100	0	0	0	0	NONE	-0.01	-0.54	-0.39	-0.15
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	-0.01	-0.27	-0.16	0.00
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	CHOCOLATE/LIGHTER	-0.07	-0.37	0.16	-0.01
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	-0.04	0.00	-1.25	0.22
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	100	0	0	0	0	NONE	0.08	0.00	0.00	0.04
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.00	0.27	1.16	0.25
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.01	0.00	-0.38	0.11
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.00	0.00	0.38	0.17
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.00	0.00	-0.38	0.08
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.03	-0.48	0.63	-0.07
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.09	-0.43	0.00	-0.12
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.05	-0.32	-0.31	-0.12
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.08	-0.53	0.16	-0.17
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	-0.01	-0.14	0.78	-0.23
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	0.00	0.14	0.39	-0.19
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	60	0	0	0	0	NONE	-0.16	-0.32	0.16	-0.05
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	100	0	0	0	0	NONE	-0.30	-0.65	0.00	-0.10
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.04	-0.15	-1.43	-0.22
VESPEL-DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.03	0.00	-0.47	-0.32
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.06	-0.15	-0.48	-0.41
VESPEL-DF-ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.07	-0.15	-0.95	-0.56
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	0.01	-0.54	-0.39	-0.06
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	-0.01	-0.40	0.39	-0.09
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	60	0	0	0	0	NONE	0.03	0.00	-0.39	-0.01
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	100	0	0	0	0	NONE	0.00	-0.13	0.00	-0.06
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	-0.13	-0.41	-0.39	-0.25
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	NONE	-0.29	-0.27	-0.39	-0.63

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN EMERY 2927A LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD 1000HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/GREEN TINT	−0.03	0.135	0.000	0.006
AMODEL−AD 1000HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	CREME/DULL CREME	−0.49	−0.135	0.391	−0.263
CYCOLAC GPM4700	ABS	G.E.	60	0	0	0	0	NONE	−0.119	−0.053	−0.463	−0.099
CYCOLAC GPM4700	ABS	G.E.	100	0	0	0	0	CREME/FLESH CREME	−2.231	0.748	5.451	5.319
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	−0.044	0.137	0.787	−0.114
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	NONE	−0.160	0.000	0.394	−0.221
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	−0.100	−0.402	−0.382	−0.740
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	−0.527	−0.270	0.003	−3.182
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	0.058	0.272	0.000	0.000
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	NONE	−0.058	−0.135	0.000	0.143
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	−0.028	−0.801	0.000	0.009
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	NONE	−0.057	−1.181	0.000	0.777
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	0.000	0.536	0.394	−0.010
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	GREY/CLOUDY GREY	−0.100	0.134	1.169	0.568
PROFAX 6331NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	0.029	0.410	0.787	0.073
PROFAX 6331NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	0.705	0.407	0.000	2.625
RADEL A−200	POLYARYL SULFIDE	AMOCO	60	0	0	0	0	NONE	0.000	−0.401	−0.388	0.030
RADEL A−200	POLYARYL SULFIDE	AMOCO	100	0	0	0	0	NONE	−0.014	−0.133	−0.772	−0.122
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	NONE	−0.028	0.404	−0.388	−0.032
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	100	0	0	0	0	NONE	−0.028	0.000	−0.778	−0.083
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	0.000	0.268	0.944	−0.023
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	NONE	−0.102	0.214	0.001	−0.009
TEFLON	POLYTETRAFLUOROETHYLENE	DUPONT	60	0	0	0	0	NONE	0.140	1.140	0.000	0.004
TEFLON	POLYTETRAFLUOROETHYLENE	DUPONT	100	0	0	0	0	NONE	0.180	0.403	0.442	0.629
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	−0.029	0.135	0.000	0.251
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.000	0.135	1.183	0.048
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.029	0.135	−0.382	0.224
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	−0.043	0.134	0.382	0.052
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	−0.091	−0.641	0.314	−0.045
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	−0.034	−0.214	0.000	−0.131
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	−0.028	−0.428	0.156	0.006
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	−0.080	−0.106	0.469	−0.040
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	−0.014	−0.001	0.794	−0.135
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	−0.058	−0.001	0.000	−0.199
VALOX 325PBT	POLYBUTYLENE TEREPHTHLATE	G.E.	60	0	0	0	0	NONE	0.023	0.054	−0.429	−0.022
VALOX 325PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	100	0	0	0	0	NONE	−0.184	−0.054	0.308	−0.067
VESPEL−DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.015	0.000	0.000	0.064
VESPEL−DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	0.029	−0.149	0.962	−0.154
VESPEL−DF−ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	−0.015	0.000	−0.476	−0.298
VESPEL−DF−ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	−0.074	0.000	0.485	−0.613
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	0.000	−0.270	−0.385	0.030
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	−0.057	0.000	−0.772	0.007
XYDAR MG450	LIQUID CRYSTAL POLYMER	AMOCO	60	0	0	0	0	NONE	0.042	0.135	0.391	−0.008
XYDAR MG450	LIQUID CRYSTAL POLYMER	AMOCO	100	0	0	0	0	NONE	−0.014	0.403	0.000	−0.020
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	0.000	0.000	−1.136	0.027
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	YELLOW CREME/DARKER	−0.173	−0.135	0.000	−0.147

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F

b. % Change = change in before/after measurements of plastics

c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN EMKAROX VG32 LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL-AD 1000HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/GREEN TINT	-0.04	-0.13	0.00	-0.02
AMODEL-AD 1000HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	CREME/DULL CREME	-0.40	-0.27	0.00	-0.37
CYCOLAC GPM4700	ABS	G.E.	60	0	0	0	0	NONE	-0.13	-0.32	0.16	-0.14
CYCOLAC GPM4700	ABS	G.E.	100	0	0	0	0	CREME/FLESH	-4.14	0.21	0.46	0.11
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	-0.06	-0.06	0.00	-0.12
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	NONE	-0.19	-0.14	0.00	-0.25
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	-0.31	-0.14	-0.38	-2.01
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	-0.37	-0.54	-0.76	-2.00
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	0.06	-0.14	0.00	-0.01
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	LUCITE/DULLER	-0.07	-0.14	-0.39	0.02
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	-0.11	-0.27	-0.74	0.18
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	NONE	-0.13	-0.32	0.30	0.20
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	-0.13	0.11	0.63	0.00
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	GRAY/CLOUDY	-0.07	0.43	1.25	0.85
PROFAX 6331NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	0.98	0.00	0.00	0.02
PROFAX 6331NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	0.22	0.14	0.00	0.40
RADEL A-200	POLYARYL SULFIDE	AMOCO	60	0	0	0	0	NONE	0.01	-0.67	-0.38	-0.08
RADEL A-200	POLYARYL SULFIDE	AMOCO	100	0	0	0	0	NONE	0.04	-0.40	-0.39	-0.06
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	NONE	-0.01	0.00	0.00	-0.01
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	100	0	0	0	0	NONE	-0.06	0.00	0.00	-0.08
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	0.00	0.05	0.31	-0.03
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	CHOCOLATE/LIGHTER	-0.10	0.05	0.31	-0.01
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	0.08	0.51	0.38	0.04
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	100	0	0	0	0	NONE	0.30	0.00	1.64	1.19
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.00	0.14	0.77	0.05
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.03	0.13	0.00	0.07
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.01	0.13	0.00	0.13
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.01	0.40	-0.76	0.12
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.01	-0.27	-0.31	0.43
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.10	-0.32	-0.15	-0.01
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	0.01	-0.16	-0.31	-0.05
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.03	-0.32	0.16	-0.05
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	-0.01	0.00	0.39	-0.15
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	-0.01	0.00	-1.15	-0.16
VALOX 325PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	60	0	0	0	0	NONE	-0.06	0.11	0.00	-0.05
VALOX 325PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	100	0	0	0	0	NONE	-0.18	-0.05	0.30	-0.05
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.01	0.30	0.00	-0.04
VESPEL-DF	POLYIMIDE	DUFONT	100	0	0	0	0	NONE	0.00	-0.15	1.44	-0.11
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.04	-0.15	1.46	-0.56
VESPEL-DS-ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.03	0.00	-1.43	-0.34
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	-0.01	-0.13	-0.77	0.00
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	-0.03	0.00	0.00	0.00
XYDAR MG450	LIQUID CRYSTAL POLYMER	AMOCO	60	0	0	0	0	NONE	0.06	0.27	0.00	-0.01
XYDAR MG450	LIQUID CRYSTAL POLYMER	AMOCO	100	0	0	0	0	NONE	0.00	-0.13	0.39	-0.02
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	-0.03	-0.14	0.00	-0.03
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	NONE	-0.14	-0.14	-0.78	-0.18

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F

b. % Change = change in before/after measurements of plastics

c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN DOW P425 LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	CREME/GREEN TINT	-0.14	-0.41	-0.39	-0.43
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	NONE	-0.49	-0.27	-0.39	-0.66
CYCOLAC GPM4700	ABS	G.E.	60	0	0	0	0	NONE	-0.06	-0.11	0.16	-0.12
CYCOLAC GPM4700	ABS	G.E.	100	2	0	0	0	NONE	-1.73	0.05	3.42	3.91
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	-0.12	-0.27	0.00	-0.17
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	WHITE/OFF WHITE	0.28	-0.27	0.79	0.47
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	-0.14	-0.40	-0.77	-1.41
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	-0.47	-1.07	-1.15	-2.96
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	0.04	0.14	-0.39	-0.01
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	LUCITE/OFF WHITE	0.12	0.27	0.00	0.26
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	CLEAR/CLOUDY	-0.03	-0.32	-0.15	-0.07
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	CLEAR/CLOUDY	-0.08	0.16	1.37	1.24
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	-0.04	-0.43	0.63	0.00
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	NONE	-0.14	-0.21	0.94	0.04
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	-0.01	0.00	-0.39	2.75
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	NONE	-0.01	-0.27	-0.78	0.34
RADEL A-200	POLYARYL SULFONE	AMOCO	60	0	0	0	0	NONE	-0.09	0.13	0.00	-0.48
RADEL A-200	POLYARYL SULFONE	AMOCO	100	0	0	0	0	NONE	-0.10	-0.40	0.00	-0.46
RYNITE 530	POLYETHYLENE SULFIDE	DUPONT	60	0	0	0	0	NONE	-0.01	0.00	0.00	-0.11
RYNITE 530	POLYETHYLENE SULFIDE	DUPONT	100	0	0	0	0	NONE	-0.04	-0.27	-0.39	-0.06
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	0.00	-0.32	0.31	-0.04
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	NONE	-0.07	-0.16	0.16	-0.06
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	-0.02	-0.10	-1.19	0.02
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	100	0	0	0	0	NONE	0.30	0.10	-1.96	0.03
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	-0.01	-0.13	1.16	0.10
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	0.00	0.13	0.01	0.18
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.01	0.00	-0.01	0.09
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	-0.03	-0.27	-1.51	0.09
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.01	-0.16	0.63	-0.24
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.01	-0.21	0.31	-0.23
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.02	-0.37	0.63	-0.25
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.04	-0.21	0.16	-0.26
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	0.01	0.00	-0.39	-0.14
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	-0.06	-0.14	1.17	-0.16
VALOX 325 PBT	POLYETHERETHERKETONE	G.E.	60	0	0	0	0	NONE	-0.05	-0.22	-0.46	-0.17
VALOX 325 PBT	POLYETHERETHERKETONE	G.E.	100	0	0	0	0	NONE	-0.14	-0.59	-0.61	0.03
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.03	-0.30	-0.93	-0.33
VESPEL-DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	0.00	0.00	0.00	-0.29
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	-0.04	-0.15	-0.47	-0.49
VESPEL-DF-ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.06	-0.15	-1.41	-0.62
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	-0.10	-0.14	0.00	-0.08
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	-0.03	-0.27	-0.78	-0.08
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	60	0	0	0	0	NONE	0.03	-0.27	0.00	-0.01
XYDAR MG 450	LIQUID CRYSTALINE POLYMER	AMOCO	100	0	0	0	0	NONE	0.01	-0.13	0.00	-0.05
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	YELLOW CREME/YELLOW	-0.19	-0.54	0.00	-0.45
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	YELLOW-CREME/YELLO	-0.23	-0.41	-0.39	-0.50

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN BRL-150 LUBRICANT

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	NONE	-0.143	-0.541	0.000	-0.314
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	100	0	0	0	0	CREME/BURNT CREME	-0.544	-0.540	0.000	-0.779
CYCOLAC GPM 4700	ABS	G.E.	60	0	0	0	0	NONE	-0.097	0.000	0.468	-0.104
CYCOLAC GPM 4700	ABS	G.E.	100	0	0	0	0	NONE	-3.518	0.214	1.249	-0.109
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	-0.160	-0.274	0.000	-0.171
DELRIN II 11500	ACETAL	DUPONT	100	0	0	0	0	WHITE/OFF WHITE	-0.335	-0.274	0.000	-0.383
DUREZ	PHENOLIC	HOOKER	60	0	0	0	0	NONE	-0.413	-0.538	-0.763	-2.373
DUREZ	PHENOLIC	HOOKER	100	0	0	0	0	NONE	-0.370	-0.405	-1.148	-2.279
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	-0.102	-0.541	-0.394	-0.008
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	100	0	0	0	0	LUCITE/CREME	-0.204	-0.407	-0.787	-0.010
LEXAN 161	POLYCARBONATE	G.E.	60	0	0	0	0	NONE	-0.080	-0.267	0.000	-0.059
LEXAN 161	POLYCARBONATE	G.E.	100	0	0	0	0	NONE	-0.074	-0.534	-0.154	-0.076
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	0	0	0	0	NONE	-0.103	-0.268	0.001	0.115
NORYL 731	POLYPHENYLENE ETHER	G.E.	100	0	0	0	0	NONE	-0.143	-0.589	0.000	0.075
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	-0.158	-0.542	-0.781	-0.018
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	100	0	0	0	0	LUCITE/GREYER	-0.129	-0.406	-0.391	0.120
RADEL A-200	POLYARYL SULFONE	AMOCO	60	0	0	0	0	NONE	-0.085	-0.401	0.000	-0.375
RADEL A-200	POLYARYL SULFONE	AMOCO	100	0	0	0	0	NONE	-0.128	-0.267	0.388	-0.414
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	NONE	-0.071	0.134	0.781	-0.051
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	100	0	0	0	0	LT.TAN/PALE TAN	-0.057	-0.535	0.391	-0.125
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	-0.028	-0.374	-0.624	-0.011
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	100	0	0	0	0	NONE	-0.091	-0.321	0.624	-0.025
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	-0.040	0.416	-1.553	0.099
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	100	0	0	0	0	NONE	-0.080	-0.312	-1.517	0.311
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.029	0.000	0.769	0.329
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	-0.014	0.000	1.154	0.172
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.014	0.269	0.766	0.213
TORLON 4301	POLYAMIDEIMIDE	AMOCO	100	0	0	0	0	NONE	-0.085	0.268	-1.493	0.080
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.028	-0.428	-0.002	-0.165
ULTEM 1000	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.023	-1.305	1.090	-0.179
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	-0.017	-0.268	0.314	-0.144
ULTEM CRS5001	POLYETHERIMIDE	G.E.	100	0	0	0	0	NONE	-0.063	-0.268	0.629	-0.288
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	-0.014	0.136	1.157	-0.097
ULTRAPEK	POLYETHERKETONE	BASF	100	0	0	0	0	NONE	-0.029	0.136	0.388	-0.194
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	60	0	0	0	0	NONE	-0.115	-0.594	0.153	-0.080
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	100	0	0	0	0	NONE	-0.271	-0.377	0.157	-0.135
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.000	-0.149	-0.943	-0.265
VESPEL-DF	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.015	-0.149	-0.476	-0.325
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	1.443	0.152	-0.472	-0.439
VESPEL-DF-ISO	POLYIMIDE	DUPONT	100	0	0	0	0	NONE	-0.059	-0.151	-0.467	-0.593
VITREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	-0.014	-0.135	0.000	-0.078
VITREX PEEK 450G	POLYETHERETHERKETONE	ICI	100	0	0	0	0	NONE	-0.029	-0.134	0.000	-0.088
XYDAR MG 450	LIQUID CRYTALINE POLYMER	AMOCO	60	0	0	0	0	NONE	-0.014	-0.668	0.000	-0.001
XYDAR MG 450	LIQUID CRYTALINE POLYMER	AMOCO	100	0	0	0	0	NONE	0.014	-0.535	-0.388	-0.058
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	-0.187	-0.271	-0.391	-0.298
ZYTEL 101	NYLON 6/6	DUPONT	100	0	0	0	0	YELLOW CREME/BROWN	-0.245	-0.542	0.000	-0.526

Note:

a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN R-22

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.08	0.13	-0.39	0.84	0.72
CYCOLAC GPM4700	ABS	G.E.	RT	0	0	0	0	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	0.09	0.27	3.17	0.67	0.49
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.17	0.54	3.46	1.24	1.04
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.11	0.27	-0.35	0.61	0.52
LEXAN 161	POLYCARBONATE	G.E.	RT	?	0	0	0	CLEAR/CLOUDY	-0.75	2.27	25.19	28.10	18.22
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	2	0	0	0	NONE	-1.44	3.09	15.96	27.09	17.91
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.13	0.41	0.40	1.12	0.96
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.11	0.94	1.95	1.92	0.63
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	LT.TAN/WHITE EDGES	0.00	0.94	2.36	3.08	2.90
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.00	0.13	-0.39	0.14	0.10
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	1.67	-0.19	0.95	5.71	2.18
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.10	0.00	1.16	1.13	1.04
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.07	0.40	-0.39	0.89	0.81
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.09	1.48	3.89	6.67	5.20
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	-0.01	1.07	2.03	7.07	5.25
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.00	0.00	-2.27	0.16	0.13
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.85	1.22	-0.73	8.19	6.13
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.52	0.75	0.48	4.89	3.66
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.15	0.00	-1.43	1.00	0.84
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	0.04	0.41	6.30	0.25	0.14
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	-0.03	0.27	2.33	0.30	0.05
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.16	0.54	-0.39	1.60	1.34

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN R-32

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR. WT. CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.035	0.405	0.794	0.283	0.288
CYCOLAC GPM4700	ABS	G.E.	RT	0	0	0	2	NONE	11.655	50.535	181.722	18.400	8.141
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	1.544	1.646	1.587	3.864	2.154
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.028	-0.267	-0.775	0.265	0.223
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	2.542	2.578	1.200	5.945	3.433
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	0.468	2.006	4.251	10.135	7.643
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	1.071	2.145	3.510	7.591	5.078
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.669	0.271	0.794	1.994	1.386
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.329	0.399	2.353	3.856	2.945
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	NONE	0.043	0.402	1.978	1.810	1.450
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.014	0.535	0.018	0.319	0.241
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	0.622	0.413	3.051	1.451	0.771
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.014	-0.267	1.550	0.285	0.290
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	-0.029	0.000	0.787	0.289	0.265
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.100	0.667	-1.113	2.442	1.890
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.170	0.803	1.259	2.758	2.095
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.294	0.541	0.391	0.410	0.315
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	1	NONE	0.302	0.947	2.353	2.206	1.795
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.537	0.892	1.942	5.553	4.069
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.088	0.000	1.475	0.864	0.738
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	-0.071	0.404	0.018	0.473	0.382
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	-0.014	0.134	-0.379	0.062	0.050
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	1.484	0.136	0.794	0.193	0.204

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN R-123

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	-0.029	0.813	-1.556	-0.069	-0.061
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	60	0	0	0	0	NONE	-0.053	0.678	-1.917	2.187	2.045
CYCOLAC GPM4700	ABS	G.E.	RT	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
CYCOLAC GPM4700	ABS	G.E.	60	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	0.160	-0.137	-1.181	0.649	0.502
DELRIN II 11500	ACETAL	DUPONT	60	0	0	0	0	NONE	3.194	3.151	0.787	9.294	6.617
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.329	-0.668	0.000	6.241	6.266
DUREZ	PHENOLIC		60	0	0	0	0	NONE	0.028	-0.133	-0.009	0.818	0.716
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.116	0.409	0.797	0.118	-0.167
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	60	0	0	0	0	NONE	0.823	0.137	-2.362	1.582	1.421
LEXAN 161	POLYCARBONATE	G.E.	RT	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
LEXAN 161	POLYCARBONATE	G.E.	60	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
NORYL 731	POLYPHENYLENE ETHER	G.E.	60	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	1.166	0.816	1.569	6.854	5.272
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	60	0	0	0	0	NONE	1.770	2.988	-0.391	14.309	8.038
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.100	0.535	-0.775	-0.270	-0.247
RADEL A-200	POLYARYL SULFIDE	AMOCO	60	0	0	0	0	NONE	0.114	0.268	-1.163	0.778	0.572
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	LT. TAN/WHITE EDGES	0.014	0.134	1.563	0.154	-0.463
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	60	0	0	0	0	LT. TAN/WHITE EDGES	0.099	1.745	0.781	4.530	3.773
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	-0.014	0.134	0.784	-0.005	-0.009
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	60	0	0	0	0	NONE	-0.057	-0.401	-2.734	0.129	0.109
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	0.622	0.000	-1.135	2.473	2.078
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	60	0	0	0	0	NONE	1.803	1.421	-1.168	4.903	4.063
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	-0.014	-0.401	1.154	-0.019	0.052
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	-0.591	0.806	-1.938	0.509	0.633
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	-0.028	-0.268	2.713	-0.023	0.047
TORLON 4301	POLYAMIDEIMIDE	AMOCO	60	0	0	0	0	NONE	0.000	-0.402	-1.533	0.375	0.465
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	-0.071	0.001	-0.778	-0.178	-0.118
ULTEM 1000	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	0.071	0.003	-0.388	0.752	0.575
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	-0.028	0.161	-0.465	-0.150	-0.118
ULTEM CRS5001	POLYETHERIMIDE	G.E.	60	0	0	0	0	NONE	0.040	0.912	-0.780	0.686	0.549
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.043	-0.136	-0.781	-0.096	-0.049
ULTRAPEK	POLYETHERKETONE	BASF	60	0	0	0	0	NONE	1.204	0.813	0.775	0.099	0.060
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.014	0.136	1.163	1.510	1.237
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	60	0	0	0	0	NONE	0.863	1.081	1.145	7.023	6.281
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	-0.116	-0.298	-1.909	-0.100	-0.091
VESPEL-DF	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.102	-0.149	-0.952	0.663	0.608
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.015	0.000	-0.966	-0.163	-0.125
VESPEL-DF-ISO	POLYIMIDE	DUPONT	60	0	0	0	0	NONE	0.074	-0.302	-1.905	0.265	0.265
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	-0.057	0.000	-1.563	-0.075	-0.050
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	60	0	0	0	0	NONE	0.014	-0.134	-1.544	0.020	0.023
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	-0.028	-0.134	-0.388	0.005	0.003
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	60	0	0	0	0	NONE	-0.014	-0.669	-0.781	0.048	0.051
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	-0.058	0.542	-1.929	-0.251	-0.190
ZYTEL 101	NYLON 6/6	DUPONT	60	0	0	0	0	NONE	0.462	1.085	-1.903	2.305	2.216

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN REFRIGERANT 124

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.01	0.81	3.54	1.92	1.59
CYCOLAC GPM4700	ABS	G.E.	RT	3	3	3	3	CREME/WHITE	FAILED	FAILED	FAILED	FAILED	FAILED
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	0.54	0.96	0.05	1.36	0.96
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.17	0.94	3.59	1.43	1.30
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.06	-0.13	2.01	0.27	0.39
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	-0.01	-0.66	1.94	0.80	0.68
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0.01	0.67	4.38	0.69	0.51
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.55	1.36	2.78	1.49	1.30
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.14	0.80	2.37	1.00	0.72
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	LT. TAN/WHITE EDGES	-0.04	0.67	1.98	0.67	0.62
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	-0.06	0.27	0.79	0.12	0.23
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	1.52	2.49	2.27	4.43	3.18
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.18	0.94	2.73	1.17	1.11
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.03	0.54	0.39	0.84	0.85
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.24	0.67	-1.53	0.58	0.56
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.21	0.65	2.06	0.58	0.53
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	1.64	0.27	2.37	0.31	0.33
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.04	0.54	1.18	2.16	2.20
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.16	0.00	7.92	1.54	1.24
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.04	0.15	4.04	0.70	0.74
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	-0.09	0.81	1.97	0.24	0.28
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	-0.01	0.40	1.99	0.05	0.16
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.48	1.36	3.17	3.46	2.68

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN REFRIGERANT 134

PLASTIC	TYPE	MANUFAC-TURER	TEMPER-ATURE (deg. C) a.	PARTIC-ULATES b.	CRACK-ING b.	CRAZ-ING b.	SOFTEN-ING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.043	0.677	-0.769	1.926	1.490
CYCOLAC GPM4700	ABS	G.E.	RT	3	3	3	3	NONE	FAILED	FAILED	FAILED	FAILED	FAILED
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	1.764	1.646	0.394	3.370	2.355
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.242	0.808	-1.530	1.776	1.371
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.100	0.545	-1.184	0.599	0.568
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	0.014	0.401	1.938	1.287	0.895
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0.172	0.268	0.781	0.581	0.368
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.091	-0.269	-1.548	0.473	0.335
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.199	0.402	-2.256	1.117	0.729
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	LT TAN/WHITE EDGES	0.099	0.673	-3.369	1.301	1.071
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.000	0.401	1.932	0.069	0.073
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	0.783	1.263	-2.980	1.607	1.259
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.152	0.804	-2.276	1.136	0.934
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.085	0.402	-1.136	0.879	0.710
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.100	0.804	-1.929	0.694	0.489
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.114	0.646	-0.779	0.253	0.049
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.030	0.813	0.000	0.315	0.236
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.259	0.542	-0.769	0.945	0.686
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.334	0.902	-0.948	1.623	1.170
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.132	0.152	-1.896	0.694	0.525
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	-0.057	0.270	-2.256	0.242	0.162
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	0.057	0.269	1.953	0.020	0.011
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.461	1.493	1.172	3.408	2.601

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN R-134A

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR. WT. CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.13	2.90	2.95	1.38	1.19
CYCOLAC GPM4700	ABS	G.E.	RT	0	0	0	0	NONE	0.16	1.74	1.57	1.77	1.19
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	0.38	2.09	5.83	1.38	0.78
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.44	0.67	5.04	1.89	1.42
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.26	0.96	0.81	0.73	0.54
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	1.23	3.02	3.59	0.55	0.30
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0.06	0.40	1.18	0.32	0.18
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.17	0.82	-0.78	0.53	0.37
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.49	2.74	6.15	0.75	0.48
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	NONE	0.20	2.34	2.87	0.40	0.24
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.01	0.41	0.00	0.10	0.04
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	1.33	-0.10	9.62	2.30	1.87
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.14	0.94	0.75	1.15	0.95
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.07	0.67	1.16	0.87	0.68
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.58	0.67	0.39	0.78	0.41
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.10	0.70	0.96	0.66	0.45
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.14	2.07	5.42	0.40	0.24
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.27	0.41	0.39	0.31	0.18
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.52	2.44	6.70	1.51	1.07
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.34	2.48	6.19	0.74	0.55
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	0.24	1.93	7.06	0.36	0.19
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	0.04	0.67	1.59	0.04	0.03
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.59	3.19	3.69	2.59	2.21

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

CHANGES IN PLASTICS IMMERSED IN REFRIGERANT 142B

PLASTIC	TYPE	MANUFAC-TURER	TEMPER-ATURE (deg. C) a.	PARTIC-ULATES b.	CRACK-ING b.	CRAZ-ING b.	SOFTEN-ING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.000	0.271	1.563	0.225	0.192
CYCOLAC GPM4700	ABS	G.E.	RT	2	0	0	2	CREME/OFF WHITE	0.000	2.410	4.267	13.249	10.998
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	0.000	0.412	-0.722	0.474	0.383
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.114	0.137	-1.550	0.268	0.247
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.000	-0.270	-0.766	0.407	0.367
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	0.000	-0.652	-1.103	0.984	0.718
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0.000	0.940	2.719	2.944	1.914
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.924	1.496	-0.388	3.947	3.050
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.000	-0.263	-0.769	0.063	0.149
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	NONE	0.000	0.403	-1.48[illegible]	0.295	0.269
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.000	0.134	0.775	0.135	0.141
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	0.945	0.003	0.360	2.138	1.787
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	-0.021	0.805	0.376	0.149	0.204
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.000	0.268	-0.373	0.150	0.202
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.000	-0.264	2.347	0.119	0.147
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.000	0.268	0.004	0.129	0.124
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.029	0.008	-3.393	0.151	0.129
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.014	0.136	-0.388	0.252	0.231
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.000	0.000	0.014	0.229	0.217
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	-0.015	0.152	-5.951	0.160	0.160
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	-0.029	-0.135	-0.778	0.138	0.129
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	0.000	0.403	-1.544	0.142	0.146
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.072	0.407	-0.775	0.132	0.163

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

PLASTICS IMMERSED IN REFRIGERANT 143-A

PLASTIC	TYPE	MANUFACTURER	TEMPERATURE (deg. C) a.	PARTICULATES b.	CRACKING b.	CRAZING b.	SOFTENING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD-1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	-0.09	0.13	3.17	1.76	1.39
CYCOLAC GPM4700	ABS	G.E.	RT	0	0	0	0	NONE	0.09	0.40	0.78	0.75	0.46
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	-0.22	0.14	2.00	0.69	0.43
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.14	0.27	1.13	1.26	1.07
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.20	0.14	0.00	0.38	0.32
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	0.01	0.27	1.93	0.40	0.30
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0.01	0.54	-0.77	0.37	0.27
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.36	0.14	2.34	0.80	0.68
RADEL A-200	POLYARYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.13	-0.27	-3.66	0.86	0.71
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	NONE	-0.03	-0.53	2.34	0.33	0.24
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	0.03	0.27	0.01	0.08	0.08
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	1.43	-1.32	4.26	2.55	1.91
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.15	0.80	0.40	1.08	0.98
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.01	0.00	0.77	0.76	0.67
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.07	0.00	2.32	0.29	0.22
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.55	-0.05	0.01	0.61	0.45
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	0.11	-1.06	1.19	0.29	0.22
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.22	0.41	-0.78	0.29	0.23
VESPEL-DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.29	0.45	0.49	1.37	1.02
VESPEL-DF-ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.15	0.45	0.00	0.72	0.57
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	0.17	-0.60	1.60	0.14	0.09
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	-0.07	0.40	0.78	0.03	0.03
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.19	-0.27	-1.10	2.62	2.11

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

PLASTICS IMMERSED IN REFRIGERANT 152–A

PLASTIC	TYPE	MANUFAC–TURER	TEMPER–ATURE (deg. C) a.	PARTIC–ULATES b.	CRACK–ING b.	CRAZ–ING b.	SOFTEN–ING b.	COLOR CHANGE	AVERAGE% LENGTH CHANGE c.	AVERAGE% WIDTH CHANGE c.	AVERAGE% THICKNESS CHANGE c.	AVERAGE% WEIGHT CHANGE c.	AVERAGE% 24 HR WT CHANGE c.
AMODEL AD–1000 HS	POLYPHTHALAMIDE	AMOCO	RT	0	0	0	0	NONE	0.21	–0.78	1.97	1.64	1.29
CYCOLAC GPM4700	ABS	G.E.	RT	0	0	0	2	NONE	–5.14	0.00	147.70	19.11	14.81
DELRIN II 11500	ACETAL	DUPONT	RT	0	0	0	0	NONE	1.33	1.24	2.39	3.57	2.90
DUREZ	PHENOLIC		RT	0	0	0	0	NONE	0.30	0.27	–0.76	1.91	1.51
KYNAR 720	POLYVINYLIDENE CHLORIDE	ATOCHEM	RT	0	0	0	0	NONE	0.83	0.95	1.99	2.02	1.61
LEXAN 161	POLYCARBONATE	G.E.	RT	0	0	0	0	NONE	0.06	0.40	2.71	2.47	1.80
NORYL 731	POLYPHENYLENE ETHER	G.E.	RT	0	0	0	0	NONE	0 26	0.54	2.75	2.24	1.44
PROFAX 6331 NW	POLYPROPYLENE	HIMONT	RT	0	0	0	0	NONE	0.52	0.27	–1.93	1.51	1.16
RADEL A–200	POLY*RYL SULFIDE	AMOCO	RT	0	0	0	0	NONE	0.59	0.81	2.36	3.26	2.56
RYNITE 530	POLYETHYLENE TEREPHTHALATE	DUPONT	RT	0	0	0	0	NONE	–0.01	0.54	–0.37	0.84	0.58
SUPEC G401	POLYPHENYLENE SULFIDE	G.E.	RT	0	0	0	0	NONE	1.47	0.00	1.18	0.14	0.09
TEFLON	POLYTETRAFLUOROETHANE	DUPONT	RT	0	0	0	0	NONE	0.70	0.30	3.71	1.13	0.89
TORLON 4203L	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.09	0.00	0.00	0.31	0.33
TORLON 4301	POLYAMIDEIMIDE	AMOCO	RT	0	0	0	0	NONE	0.61	0.27	–0.38	0.25	0.25
ULTEM 1000	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.17	1.37	–0.38	0.85	0.60
ULTEM CRS5001	POLYETHERIMIDE	G.E.	RT	0	0	0	0	NONE	0.11	0.21	0.20	0.83	0.65
ULTRAPEK	POLYETHERKETONE	BASF	RT	0	0	0	0	NONE	–0.01	0.00	0.80	–0.54	–0.58
VALOX 325 PBT	POLYBUTYLENE TEREPHTHALATE	G.E.	RT	0	0	0	0	NONE	0.22	0.14	0.00	0.70	0.51
VESPEL–DF	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.42	0.45	2.96	2.02	1.57
VESPEL–DF–ISO	POLYIMIDE	DUPONT	RT	0	0	0	0	NONE	0.15	0.30	1.98	0.77	0.62
VICTREX PEEK 450G	POLYETHERETHERKETONE	ICI	RT	0	0	0	0	NONE	0.04	0.14	1.19	0.05	0.01
XYDAR MG 450	LIQUID CRYSTAL POLYMER	AMOCO	RT	0	0	0	0	NONE	0.06	0.27	–3.38	–0.02	–0.05
ZYTEL 101	NYLON 6/6	DUPONT	RT	0	0	0	0	NONE	0.10	0.27	2.36	1.22	0.82

Note:

a. Temperature conversions: RT=ambient, 60 deg.C = 140 deg.F
b. % Change = change in before/after measurements of plastics
c. Qualitative scale: 0=no change, 1=slight, 2=large, 3=complete change

END

DATE
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