Monsanto

FROM (NAME & LOCATION) C. D. Bias, St. Louis Research Dept.

DATE : July 21, 1967

SUBJECT : Replacement Product for Kodaflex 135

REFERENCE : Work Req. 67-73

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adhesives.

The attached tables summarize the data we have obtained to date in two different resin systems, Gelva TS-30 and National Starch Co.' s Resyn 25-1014.

As I see the problem, the major deficiency of K-135 is its very high volatility, which is greater than that of DBP or DIBP. Its other deficiencies, such as poor aging, retention of elongation, etc. follow from that. It also seems to be slow in wet tack in TS-30, but not in Resyn 25-1014. The major advantage of K-135 is its low price. So our best approach seemed to be to dilute S-160 with a cheaper product, such as Aroclor 1242 or IGM, at the same time maintaining compatibility, reasonable volatility, viscosity characteristics, etc.

I believe that a 90/10 blend of S-160 and Aroclor 1242 or an 85/15 blend of S-160 and IGM would give at least equivalent performance to K-135. Higher amounts of these diluents is not desirable because of decreased compatibility. The inclusion of 1% triethylene glycol (TEG) in several of the blends did not seem to confer any advantage. It may be that the glycol is too water-soluble and never really got into the resin. A less water-soluble glycol might be a better choice.

Incidental to the above study, we have confirmed that S-1548 is an excellent choice to compete with Benzoflex 9-88 (if the price were right). It may be that S-218A will do a good job also, but I am inclined to the view that it will not be quite as good as S-1548. A product which I feel will have a good chance to compete with 9-88 is a blend of S-160 and Cereclor S-52. We have not tested this blend, but I believe that we should do so in the near future. Other possibilities which would improve the performance of S-160 would be, I think, products such as S-8, tributyl phosphate, or S-192.

I have not tried as yet the low temperature film-forming test. If you still want it run on a couple of the plasticizers, I'll try to work it in for you next week. Please let me know.

C. D. Bias

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Vinac T.S-30 PVAc Emulsion

	S-160	LB 9-88	S-1548	S-150W, 88/12, 88%	S-160, 88%	S-160, 88%	S-160, 88%	K-135	DBP	DIOP	S-815	S-160 IGH, 85/15	S-160, IGH, TEG, 85/14/1	S-160, IGH 75/25	S-160, IGH, TEG, 25/24/1
Viscosity (cps) LVF, #4 spindle															
Initial															
30 rpm	3960	4180	3980	3960	3980	3860	4120		4140	4280	4000	3200	3280	3780	3640
60 rpm	2600	2700	2590	2600	2590	2520	2670		2700	2770	2650	2040	2150	2510	2380
1 wk RT															
30 rpm	4360	4360	4220	4440	4320	4360	4380		4620	4680	4760				
60 rpm	2830	2760	2700	2770	2750	2810	2750		2870	2940	3020				
1 wk 40°C															
30 rpm	4400	4000	4180	4140	4620	3580	3900		4760	3980	4380				
60 rpm	2790	2540	2700	2690	2910	2250	2500		2980	2570	2810				
3 wk RT															
30 rpm	5000	4440	4340	4920	3880	3780	4660		5100	5700	5260	3400	4180	4860	4520
60 rpm	3100	2840	2790	3070	2550	2490	2920		3100	3540	3220	2130	2630	2992	2850
3 wk 40°C															
30 rpm	6020	4320	4740	3600	5320	5460	2940		3760	4120	4280	6160	6760	9280	5720
60 rpm	3740	2750	2960	2680	3270	3320	2000		1940	2680	2750	3920	3780	5560	3640
Elongation (%)															
original	400	320	400	410	360	360	560		470	490	390	310	330	300	320
1 day, 75°C	360	280	380	310	230	300	200		320	150	310	320	310	300	290
2 day, 75°C	350	290	370				*		310			310	310	300	220
100% Modulus (PSI)															
original	200	300	190	160	230	260	100		130	140	200	420	330	620	610
1 day, 75°C	290	470	250	300	450	460	750		340	710	350	410	370	630	690
2 day, 75°C	240	390	220				*		380			430	480	570	510
Tensile Strength (PSI)															
original	630	820	610	550	650	810	360		390	570	670	1200	960	1370	1300
1 day, 75°C	810	1120	710	870	850	1240	1010		800	780	910	1110	1020	1360	1420
2 day, 75°C	660	880	600				*		880			1040	1180	1230	1350
Volatility (%)															
1 day, 75°C	4.0	5.7	2.6	4.9	3.1	10.0	36.2		18.4	20.9	6.0	7.1	7.2	8.7	9.6
2 day, "	4.7	6.0	4.9	5.1	6.2	17.1	46.8		31.2			8.2	8.9	14.0	13.7
3 "	4.7	6.8	5.0				63.9		42.8	34.7	8.3	11.2	11.1	17.9	17.3
* Too brittle to measure															
Wet Tack (min)	21	18	19	20	19	27	29		18	21	18	23	21	19	23

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Resyn 25-1014 PVAc Emulsion

	S-160	B 9-88	S-1548	S-1548 TEG, 99/1	S-160, A-1242 90/10	S-160 A-1242 80/20	K-135	DBP	DIBP	S-835	S-160, IGM 85/15	S-160, IGM TEG, 85/14/1	S-160, IGM 75/25	S-160, IGM, TEG, 75/24/
Viscosity (cps) - LVF, #3 spindle														
Initial														
30 rpm	1180	1260	1140	1070	1120	1140	1240	1200	1100	1180	1060	1200	1260	1140
60 rpm	750	790	720	680	710	710	780	760	710	720	670	760	800	740
1 week, RT														
30 rpm	1040	940	1010	980	1000	880	1230	1040	1200	1180	1040	930	1050	970
60 rpm	650	610	620	610	620	570	760	650	740	730	640	600	670	630
1 week 40°C.														
30 rpm	1140	1500	1420	1240	1220	1540	1370	1260	1680	1270	1560	1140	1220	1280
60 rpm	690	920	850	740	740	940	820	790	1000	750	950	710	770	790
3 weeks, RT														
30 rpm	910	890	1260	910	920	880	1190	1020	1180	1140	970	870	1100	980
60 rpm	590	580	770	580	580	550	750	690	730	690	610	570	670	630
3 weeks, 40°C.														
30 rpm	1060	770	760	970	1080	890	1260	1240	1340	1220	1370	1200	1260	780
60 rpm	670	520	510	610	670	560	760	790	800	760	840	740	780	530
Elongation (%)														
original	440	450	560	440	440	410	570	680	550	470	440	450	440	440
1 day, 75°C.	470	430	530	410	410	390	340	620	360	470	390	440	420	430
2 days, 75°C.	490	490	490	520	460	450	310	530	350	480	440	470	450	440
100% Moisture (PSI)														
original	160	200	110	170	240	250	90	60	100	140	230	200	290	280
1 day, 75°C.	150	190	110	170	260	320	840	70	200	150	260	200	300	300
2 days, 75°C.	140	190	130	100	140	180	960	100	340	130	160	150	180	180
Tensile Strength (PSI)														
original	890	980	690	900	1100	1020	510	400	740	890	1300	1090	1550	1520
1 day, 75°C.	890	1040	630	790	1230	1360	1920	520	800	1000	1190	1200	1510	1580
2 days, 75°C	790	890	540	760	890	1150	1980	680	1200	940	970	960	1190	1310
Volatility (%														
1 day, 75°C.	2.3	3.4	3.7	3.7	6.4	10.4	52.7	17.3	31.2	5.1	6.1	7.4	9.0	9.4
2 days, 75°C	3.3	4.2	4.5	4.0	8.7	15.6	67.0	31.4	45.8	7.3	9.4	10.1	12.7	14.2
3 days, 75°C.	4.6	4.5	4.7	4.7	10.4	18.5	74.8	44.4	56.8	10.5	13.0	11.9	15.7	17.0
Wet Tack (secs.)	14	16	17	15	15	16	23	26	25	23	18	24	27	30

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