

Monsanto

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DATE	February 2, 1970	CC: M. W. Farrar	Res. 1
		J. R. Darby	Res. 1
SUBJECT	PLASTICIZERS FOR POLYSULFIDES	W. F. Waychoff	WWAYC
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TO	N. W. Touchette	J. A. Cannon	Res. 3
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Evaluations of several plasticizers and blends for use in polysulfides has been completed. These studies have yielded two potential classes of compounds or blends which should be more extensively investigated. The most outstanding material evaluated was β -phenoxyethyl benzyl phthalate. This material easily out-performed all other materials screened including Aroclor 1254 and Aroclor 1260, the products currently used. It is to be emphasized that plasticizer efficiency in a polysulfide is not desired. Consequently the lower efficiency of β -phenoxyethyl benzyl phthalate is a desirable property. Improved volatility and decreased oil extraction are added advantages. It is also important to emphasize the excellent flow and processing characteristics seen with this plasticizer.

The class of blends which appeared promising in this work was Aroclor 5460 with phthalates such as Santicizer 160, Santicizer 261, Santicizer 278, or blends of Aroclor 5460 with β -phenoxyethyl benzyl phthalate. In general, with the exception of somewhat greater efficiency, these blends closely approximate the properties of Aroclor 1254 or Aroclor 1260. Flow and processing characteristics are probably satisfactory but some problems may be found because of viscosity variations.

An initial viscosity study was completed to determine what blends would approximate the per se viscosity of Aroclor 1254. The results are given in Table One.

TABLE ONE

Viscosity in CPS; #6 HAT Brookfield, 23° C

	% Aroclor 5460		
	33-1/3%	50%	67-2/3
DUP	270	2,090	92,500
β -Phenoxyethyl benzyl Phthalate	46,250	---	---
Santicizer 261	676	9,760	458,400
Santicizer 160	444	4,030	376,000

(Aroclor 1254 = 12,000 cps)

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It is readily seen that some blend between 50 and 67 per cent Aroclor 5460 should approximate Aroclor 1254 viscosity. It was also shown that crystallization did not occur after freezing for any of the blends.

Santicizer 711 was found to be effective in blends but was eliminated because of compatibility problems. Santicizer 278 was eliminated pending clarification of availability. DUP has been added because of its excellent viscosity behavior with Aroclor 5460.

Future work will consequently be done with blends of Aroclor 5460 and DUP, Santicizer 160, and Santicizer 261. Efforts will be made to match the viscosity of the blends to that of current products to allow normal processing. Additional studies including cure rates, shelf stability, and lacquer mar will be made. From these results it is hoped that a commercially available blend suitable for immediate field testing will be obtained.

Because of its outstanding technical performance evaluation of β -phenoxyethyl benzyl phthalate will be extended. Additional application data in other sealant areas will be obtained. If larger quantities can be obtained, studies will be broadened to cover most ASA specifications.

Charts describing recent results are attached. Formulations were:

Thiokol LP-32	100	} 100
*Statex F 12	30	
Plasticizer	25	
Lead Dioxide	50	} 15
Santicizer 160	45	
Stearic Acid	5	

*Furnex beads used in Aroclor 5460 blends.

If we may answer any questions or if you have any suggestions, please call.

A W Morgan

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Attachment

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PROPERTIES OF PLASTICIZED POLYSULFIDE

PLASTICIZER - 25 LP-32 - 100 STATEXF-12 - 30	INSTRON			FLEX. TEMP. °C	DAY	SHORE HARDNESS		WATER SENSITIVITY		2 DAY % LOSS
	100% MODULUS	TENSILE	90 ELONGATION			INITIAL	AFTER VOL.	% SOL. MATTER LOST	% AB- SORPTION	
11 S-160	67.6	239.5	76.3			23		0.5	1.8	5.5
12 S-711	72.5	271.9	71.3			26		0.8	1.71	4.8
13 A-1254	79.6	322.4	74.6			28		0.52	1.45	8.4
14 A-1260	72.5	322.1	72.3			30		0.5	1.47	6.21
15 2:1 A-1260/S-160	87.7	322.8	69.8			26		0.52	1.7	8.3
16 Cereclor 52	96.7	294.3	77.6			24		0.52	1.63	5.9
17 Chloronak 500	76.8	299.9	72.6			25		0.56	1.97	7.02
18 S-278	81.2	299.9	75.3			24		0.52	1.82	5.5
19 S-263	73.5	266.9	71.9			25		1.00	2.39	1.8
20 B-Phenoxymethyl Benzyl Phthalate (OR-14570)	72	293.3	63.9			34		0.58	1.88	1.8
21 B-Phenoxymethyl NYA 711 Phthalate (SAC #66930)	103.7	352.2	71.3			27		0.61	1.93	5.8
22 4-Chlorobutyl Benzyl Tetrachlorophthalate	79.6	322.4	76.3			25		0.83	1.87	3.2
23 Bis-4-Chlorobutyl Adipate	72.5	271.9	76.3			24		0.8	2.48	5.0

COMMENTS

EXDED IN
1 WEEKEXDED
IN 1 WEEK

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PROPERTIES OF PLASTICIZED POLYSULFIDE

PLASTICIZER	INSTRON 10090 MODULUS	INSTRON TENSILE ELONG. %				FLEX. TEMP. °C	VOLATILITY % PLAS. LOST	SHORE HARDNESS		WATER SENSITIVITY		2 DAY % LOST
								INITIAL	AFTER VOL.	% SOL. MATTER LOST	% AB- SORPTION	
Blu-4-Chlorobutyl Phthalate	114	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 OR-145570/5-160	115	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
Bengoflex 9-88	116	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 OR-145570/5-711	117	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
OR-118287C	118	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 4-Chlorobutyl Bengoflex 9-88 /5-160	119	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
1:1 5-261/A-5460	120	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 A-5460/5-160	121	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
1:1 OR-145570/A-5460	122	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 A-5460/5-278	123	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 A-5460/5-261	124	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
2:1 A-5460/5-711	125	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	
Nonylphenyl Bengoflex 9-88	126	246	68.6	83.9	68.3	81.3	3.9	30	0.70	1.87	4.36	

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