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Your guide to...

PENGAD 800-631-6989
DEPOSITION EXHIBIT 4
6/26/14 LG

Monsanto®

TOP-QUALITY PLASTICIZERS

Here are plasticizers and resin modifiers for any and every resin system!

No matter what the application or performance specification, one or a combination of the plasticizers offered here will do the job. As shown here, you can select from the widest choice of plasticizers available from any single source. They are recommended for use in compounding:

- Flexible Film and Sheeting
- Adhesives
- Lacquers
- Sealing Compounds
- Paints
- Casting Compounds
- Extrusions
- Plastisols
- Fabric & Paper Coatings

YOU CAN DEPEND UPON THESE PRODUCTS' QUALITY AND PERFORMANCE

open once for "Compatibility" guide • open fully for a listing of products and properties

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WATER_PCB-SD0000007332

PHTHALATES

		Dibutyl	Dicyclohexyl	Diethyl	Diisodecyl	Diisooctyl	Dimethyl	Di(n-octyl,n-decyl)	Dioctyl	Diphenyl	Ditridecyl	Santicizer® 160	Santicizer 165	Santicizer 213	Santicizer 214	Santicizer 215	Santicizer 262	Santicizer 602	Santicizer 603	Santicizer 630	Santicizer 631	Santicizer 632	Santicizer 636	Santicizer 681	Santicizer 683
VINYL TYPE	Polyvinyl Chloride	100	30	I	100	100	I	100	100	80	100	100	100	100	100	100	100	100	100	100	100	100	100	90	100
	Polyvinyl Acetate	100	50	100	I	I	100	I	I	70	I	100	I	10	I	I	40	I	I	I	I	I	I	I	I
	Polyvinyl Butyral	100	50	50	25	15	50	15	15	50	25	100	10	50	20	30	20	25	25	25	25	20	25	5	20
	Polyvinylidene Chloride	75	20	75	10	25	50	25	25	20	10	75	50	25	10	15	25	15	20	25	25	10	25	20	10
	Polystyrene	100	20	100	100	100	100	100	50	70	100	100	100	75	75	100	50	100	100	100	100	75	100	60	75
CELLULOSIC	Nitrocellulose	100	50	100	100	100	60	100	100	80	100	100	100	40	40	40	100	100	100	50	60	40	100	70	40
	Ethyl Cellulose	100	50	100	100	100	100	100	100	30	100	100	100	75	75	100	100	100	100	100	100	75	100	80	75
	Cellulose Acetate	25	I	85	I	I	80	I	I	I	I	10	I	I	I	I	I	I	I	I	I	I	I	I	I
	Cellulose Acetate Butyrate	100	20	100	50	50	100	50	50	20	50	100	50	40	20	40	50	50	40	25	30	20	50	35	20
	Cellulose Acetate Propionate	30	10	100	15	20	100	20	20	10	15	80	50	20	5	I	25	20	40	5	10	5	20	5	5
MISCELLANEOUS THERMOPLASTIC	Chlorinated Rubber	100	20	25	100	100	25	50	33	20	100	80	100	25	25	100	30	100	50	100	100	25	100	100	25
	High Styrene-Butadiene	50	20	25	50	50	20	50	50	20	50	50	50	40	40	40	50	50	50	40	40	40	50	35	40
	Protein Compounds	20	I	20	I	I	20	I	I	I	I	10	I	I	I	I	I	I	I	I	I	I	I	I	I
	Shellac	I	I	5	I	I	5	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Acrylic Type Resins	70	25	100	25	25	100	25	25	25	25	70	25	15	I	20	70	25	25	10	10	I	25	I	I
	Polyamides	25	10	I	20	25	I	25	25	10	20	25	25	I	I	5	20	20	20	I	I	I	20	25	I
THERMOSETTING	Polyester	20	20	10	15	20	5	20	20	20	15	20	20	5	5	5	15	10	15	5	5	5	10	5	5
	Epoxy	25	10	10	I	I	I	I	I	10	I	25	10	I	I	I	15	I	10	I	I	I	I	I	I
	Phenolic	50	25	25	25	25	25	25	25	30	25	50	50	25	25	25	25	25	25	25	25	25	25	25	25
	Alkyd	70	25	25	25	25	25	25	25	25	25	50	50	25	25	20	25	25	25	25	25	25	25	25	25
	Melamine	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Polyurethane	25	10	15	25	25	15	25	25	10	25	25	25	20	20	20	25	25	25	20	20	20	25	20	20
	Nitrile & Neoprene Rubbers	100	50	100	33	100	100	100	50	50	33	100	50	50	50	40	70	50	50	50	50	50	50	65	50

I = Incompatible Figures = Compatibility, PHR

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Compatibility Guide

ADIPATES			PHOSPHATES					SULFONAMIDES					PHTHALYL GLYCOLLATES				PERMANENT						MISCELLANEOUS				
Diisodecyl	Dioctyl	Di(n-octyl, n-decyl)	Santicizer 140	Santicizer 141	Tributoxyethyl	Tricresyl	Triphenyl	Santicizer 1-H	Santicizer 3	Santicizer 8	Santicizer 9	Santolite® MHP	Santolite MS-80%	Santicizer E-15	Santicizer B-16	Santicizer M-17	Santicizer 405	Santicizer 409	Santicizer 411	Santicizer 480	Santicizer 481	Santicizer 482	Santicizer 483	Aroclor®	HB-40®	Mod-Epox®	Montar®	Triphenyl Phosphite
50	75	75	100	100	60	100	20	1	1	1	1	15	15	25	100	20	100	100	100	100	100	100	100	35	40	10	10	10
1	1	1	40	50	40	40	80	50	50	100	50	50	50	100	100	100	75	100	75	20	50	100	1	50	1	1	10	1
1	25	1	100	100	50	100	50	50	50	100	50	50	50	100	100	100	40	75	40	30	30	50	15	50	50	1	10	1
10	15	15	75	75	50	75	20	20	25	50	20	25	25	75	75	75	10	25	10	10	10	15	25	50	20	1	10	1
25	100	20	15	50	100	15	20	10	10	20	10	10	10	30	30	30	1	50	1	40	20	1	50	100	100	1	10	1
35	35	35	100	100	100	100	75	75	80	80	50	100	100	100	100	100	100	100	100	100	100	100	100	100	10	1	10	1
100	100	50	70	100	50	70	30	80	60	60	75	75	75	75	75	75	10	33	10	50	75	25	100	75	100	5	15	5
1	1	1	35	20	10	15	35	20	45	90	30	25	25	100	50	100	1	1	1	1	1	1	1	1	1	1	1	1
50	25	25	30	80	25	30	50	40	40	50	25	50	50	100	50	100	100	100	100	70	80	80	50	50	30	5	10	5
1	1	1	40	100	40	40	50	50	50	100	50	50	50	100	50	100	50	10	50	40	40	50	20	10	1	1	1	1
100	100	100	100	100	100	100	50	25	25	50	25	50	50	80	80	100	50	50	50	70	50	50	50	100	100	5	10	5
20	20	20	50	50	50	50	20	25	25	25	25	25	25	50	50	50	15	25	10	30	20	20	40	50	25	1	20	1
1	1	1	20	25	10	30	10	30	30	50	40	25	25	25	40	20	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	25	25	40	60	25	25	10	30	10	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	25	100	25	25	25	25	25	25	25	25	25	50	70	60	1	1	1	10	10	10	50	10	20	1	1	1
25	25	25	25	25	15	25	10	50	50	50	25	50	50	1	20	1	1	1	1	20	15	1	25	25	1	1	10	1
1	1	1	20	20	20	20	10	5	5	10	5	20	20	5	20	5	5	10	5	15	20	10	20	25	1	5	10	1
1	1	1	25	25	25	25	10	20	20	50	50	25	25	25	25	25	1	1	1	1	1	1	1	50	1	100	25	100
25	25	25	50	50	50	50	50	50	50	50	50	50	50	50	50	50	15	25	15	25	15	15	25	25	25	25	25	25
25	50	25	70	70	50	70	50	40	30	25	25	25	25	70	70	70	20	25	20	20	25	20	25	25	15	5	25	0.5
1	1	1	1	1	1	1	1	25	25	50	80	25	25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	15	15	25	25	25	25	10	10	10	20	10	25	25	25	25	25	10	15	10	25	15	10	25	25	15	1	10	1
33	20	33	33	40	50	55	50	50	50	50	50	50	50	50	50	50	25	50	25	25	25	30	50	50	50	25	50	25

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Specifications and Typical Properties

Pour Point (°C)	Boiling Point (at 760 mm. Hg) (°C)	Vapor Pressure (mm Hg) at 150°C	Vapor Pressure (mm Hg) at 200°C	Vapor Pressure (mm Hg) at 300°C	Viscosity (centistokes) at 0°C	Viscosity (centistokes) at 25°C	Viscosity (centistokes) at 98.9°C	Surface Tension at 20°C (dynes/cm.)	Thermal-Expansion Coefficient (at 10° to 40°C) (cc/cc/°C)	* Specification Flash-Point (C.O.C.) (°F)	* Specification Fire Point (C.O.C.) (°F)	* Specification Assay (Ester Content) (%)	* Specification Sulfur (Copper-strip test)	* Specification Solubility in water (at 25°C) (%)
	340 0	1	9	300	55.0	15.6	2.4	35	0.00078	340	395	99 min.	—	0.001 (30°C)
	220 to 228 (4 mm. Hg)	0.09	1.1	—	—	—	—	36.4 (75°C±1°)	—	405	465	* 99.0 min.	—	<0.01
supercools readily	298	8	50	—	31.0	9.8	1.8	35.3 (20.5°C)	—	305	335	99 min.	Negative	0.1 (32°C)
	250 to 257 (4 mm. Hg)	0.015	0.35	—	642.0	91.0	5.6	29	0.00074	450	520	—	—	<0.005
	228 to 237 (4 mm. Hg)	< 0.05	1.0	—	322.0	55.0	4.3	—	0.00073	430	480	99 min. to 101	Negative	<0.01
supercools)	282	13	76	—	54	11.4	1.6	32	0.00092 (0° to 30°C)	300	315	99.0 min.	Negative	0.4 (32°C)
	232 to 267 (4mm. Hg)	0.01	0.25	--	—	138	34	31	0.00071	435	—	—	—	
	386	0.05	1.2	—	348.0	58.0	4.3	33 (25°C)	0.00074	425	480	99 to 101	Negative	<0.005
	405	0.15	1.7	55	—	—	—	—	—	435	—	—	—	<0.01
	285 (35mm. Hg)	—	—	—	1500	160	8	—	—	450	—	—	—	—
	370	0.16	2	90	—	41.5	—	39.9 (25°C)	0.00080	390	—	—	—	0.0003 (30°C)
	-	0.14	1.8	—	250.0	45.0	3.9	—	—	390	—	—	Negative	<0.005
	—	19.6	70.4	—	—	17.0	—	33.6 (24°C)	—	315	335	—	—	Practically insoluble
	-	15.0	53.1	—	—	29.6 (37.8°C)	4.5	31.0 (24°C)	0.00051	325	355	—	—	Practically insoluble
	- -	—	—	—	—	75	4.5	—	—	495	—	—	—	Practically insoluble
		—	0.33	34	900	92	5.2	34.3 (25°C)	0.00051	420	515	—	—	
		—	—	—	—	34.5 (37.8°C)	5.0	—	—	412	—	—	—	
	- -	—	—	—	400.0	60.0	4.6	—	0.00076	395	—	—	—	--
	—	—	—	—	450.0	61.0	4.3	—	0.00074	370	—	—	—	—
	—	—	—	—	250.0	50.0	4.8	—	0.00074	385	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	240 (4 mm. Hg)	0.02	0.58	—	—	14.5 (37.8°C)	3.6	30	0.00077	—	—	—	—	<0.01
	---	0.04	0.80	—	—	9.5 (37.8°C)	2.8	29	0.00076	401	480	—	Negative	<0.01
	214 (5 mm. Hg)	< 0.15	2.5	—	—	8.2 (37.8°C)	2.4	29	0.00078	377	450	—	—	<0.01
	420	—	0.5	29	1256.0	89.0	4.0	44.5	0.00057	470	695	—	—	<0.002 gm:100 ml
	370	0.15	1.9	—	—	7.8 (55°C)	2.9	—	—	437	—	—	—	0.001 (34°C)
	390	0.08	1	760 (390°C)	208.0	33.0	2.8	42	0.00067	450	none at 625	—	—	<0.005
	375	0.095	1.3	—	61.0	16.4	2.5	36.7 (23°C)	—	435	460	—	—	0.003
	215-228	< 0.10	1.6	—	—	12.0 (20°C)	—	30	0.00081	435	485	—	—	0.11
	137-145	7.3	>500	—	—	3.8 (20°C)	—	29	0.00086	380	400	—	—	0.1
	320	0.47	7	480	616.0	58.0	2.9	—	—	386	--	--	Negative	0.0175 (30°C)
	345	0.1	1.8	190	279.0	46.0	3.6	—	—	390	—	—	Negative	0.0012 (30°C)
	310	0.5	8	600	1476.0	82.0	2.8	43.6 (25°C)	—	380	—	—	Negative	0.09 (30°C)
	350	—	—	—	—	—	—	—	—	—	—	—	—	0.00045 (30°C)
		0.8 (temp?)	—	—	—	—	—	—	—	371	—	—	—	Slight

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360 (approx.)	0.25	3.2	—	—	—	—	—	—	420	—	—	—	1 (34°C)
—	—	—	—	—	—	—	—	—	—	—	—	—	Practically insolut
—	—	—	—	—	—	—	—	—	—	—	—	—	Rel
—	—	—	—	—	10,500 to 13,500	—	—	—	555	—	—	—	Practically insolut
—	—	—	—	—	2,900 to 3,500	—	—	0.00071	530	570	—	—	Practically insolut
—	—	—	—	—	9,000 to 9,800	—	—	—	540	—	—	—	Practically insolub
—	—	—	—	—	556	—	—	—	475	535	—	—	Practically insolut
—	—	—	—	—	3,878	—	—	—	485	535	—	—	Practically insolub
—	—	—	—	—	6,422	—	—	—	525	580	—	—	Practically insolub
—	—	—	—	—	156	—	—	—	485	525	—	—	Practically insolub
345 to 396	2	15	230	70.0	29.0 (37.8°C)	3.8	40.1 (25°C)	—	345	385	—	—	—
360	—	11 (220°C)	—	—	—	—	—	—	375	525	—	—	Hygroscopic
360	—	11 (220°C)	—	—	17.5	—	—	—	375	525	—	—	Hygroscopic

FLAME-RETARDANT PLASTICIZERS

If you want products that resist burning, build your formulations with one or a combination of flame-retardant plasticizers. Monsanto's liquid and solid flame-retardant plasticizers offer a wide range of compatibilities. Other beneficial properties include permanence, chemical resistance, extraction resistance, flexibility and weatherability.

Santicizer® 140
Santicizer 141
Tricresyl Phosphate
Triphenyl Phosphate
11 Aroclor® Plasticizers
6 Montar® Compounds

FDA REGULATED PLASTICIZERS

Monsanto offers more FDA regulated plasticizers than any supplier for use in compositions related to food packaging and handling, and for articles that come into close contact with the human body. The following list of plasticizers offer you high specification standards of purity, low odor, minimum taste, flexibility, clearness and water resistance for applications such as: food-wrapping paper coatings, packaging films, label adhesives and inks, beverage and blood tubing:

Dioctyl Phthalate
(high-water-content foods only)
Diisooctyl Phthalate
(high-water-content foods only)
Diethyl Phthalate
Dioctyl (2-ethylhexyl) Adipate
Santicizer® 141
Santicizer E-15
Santicizer B-16
Santicizer 160

SOLID PLASTICIZERS

Choose from a variety of plasticizers for use in adhesives, coatings and lacquers, foams, rigid compositions and films. Solid plasticizers decrease your hot processing time at reduced cost. During solvent processing, they require fewer surface-building coats and at less cost. For use such as delayed-tack and heat-seal adhesives and coatings for non-blocking films, easier processing of rigid plastics products, toughness of rigid foams, for even flow and uniform filling of resinous impregnants, choose from the following:

	Melting Point (°C)	Softening Range (°C)
Aroclor® 5442	—	46-52
Triphenyl Phosphate	48.5	—
Montar® 1	—	54-160
Santicizer® 3	58	—
Aroclor 4465	—	60-66
Santolite® MHP	62	—
Dicyclohexyl Phthalate	63	—
Diphenyl Phthalate	69	—
Montar 2	—	70-170
Santicizer 1-H	82.5	—
Montar 3	—	86-168
Montar 4	—	92-206
Aroclor 5460	—	98-105
Santicizer 9	105	—
Montar 9	—	130-175
Aroclor 1268	—	150-170
Montar 5	—	155-195

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MONSANTO PLASTICIZERS: Summary

Plasticizer	Molecular Weight	Acidity (meq./100 gm max)	Appearance	Color (APHA) (maximum)	Moisture (KF in methanol) (% maximum)	Odor	Refractive Index (at 25°C)	Specific Gravity (25°/25°C)	Density (at 25°C) (lb./gal.)	Crystalizing Point (°C)
PHTHALATES										
Dibutyl	278.34	• 0.12	• Clear, oily liquid	• 20	• 0.15	• Slight, characteristic	1.4895 to 1.4915	• 1.044 to 1.048	8.72	<—35
Dicyclohexyl	330.41	• 0.12	• White lumps or granules	• 100 (molten)	• 0.1	• Moderate, aromatic; slight phthalic, characteristic	—	1.29	—	—
Diethyl	222.11	• 0.12	• Clear, oily liquid	• 10	• 0.15	• Slight, aromatic, max.	1.4990 to 1.5010	• 1.115 to 1.119	9.35	<—0.3
Diisodecyl	446.65	• 0.12	• Clear, oily liquid	• 50	• 0.10	• Slight, characteristic	1.4794 to 1.4864	• 0.963 to 0.969	8.05	—53 (stiff, clear gel)
Diisooctyl	390.53	• 0.12	• Clear, oily liquid	• 35	• 0.10	• Slight, characteristic, max.	1.4810 to 1.4880	• 0.980 to 0.985	8.21	—45
Dimethyl	194.18	• 0.12	• Clear, oily liquid	• 10	• 0.25	• Slight, aromatic, max.	1.5123 to 1.5143	• 1.188 to 1.192	9.92	0.9 (in –2°C bath)
Di(n-octyl,n-decyl)	418 (average)	• 0.01	• Clear, oily liquid	• 50	• 0.10	• Slight, characteristic	• 1.4810 to 1.4860	• 0.9680 to 0.9770	8.1 •	—30
Dioctyl	390.53	• 0.12	• Clear, oily liquid	• 25	• 0.10	• Slight, characteristic, max.	1.4845 to 1.4858	• 0.980 to 0.985	8.21	—55 (very stiff gel)
Diphenyl	318.31	• 1.20	• Essentially white, fused solid with a slightly yellow or brown cast	• 160 (20wt: 50ml acetone)	0.25	—	1.572 (@ 74°C)	1.28	—	—
Ditridecyl	530	• 0.12	• Clear liquid	• 100	• 0.1	• Clear, characteristic	• 1.4813 to 1.4850	• 0.948 to 0.955	7.93	—
Santicizer® 160	312.35	• 0.37	• Clear, oily liquid	• 40	• 0.15	• Slight, characteristic, max.	• 1.535 to 1.540	• 1.115 to 1.123	9.3	<—35
Santicizer 165	—	• 0.12	• Clear, oily liquid	• 40	• 0.12	• Slight (similar to DOP)	• 1.484 to 1.487	• 0.990 to 0.996	8.28	—
Santicizer 213	—	• 0.25	• Clear, oily liquid	• 75	• 0.15	Characteristic, very low	• 1.521 to 1.524	• 1.040 to 1.045	8.68	—
Santicizer 214	—	• 0.15	• Clear, oily liquid	• 100	• 0.15	Characteristic, very low	• 1.481 to 1.486	• 0.948 to 0.956	7.9	—
Santicizer 215	—	• 0.12	• Clear, oily liquid	• 100	• 0.10	Characteristic	• 1.508 to 1.516	• 0.974 to 0.980	8.14	—
Santicizer 262	396.5	• 0.37	• Clear, oily liquid	• 100	• 0.15	—	• 1.519 to 1.523	• 1.048 to 1.057	8.7	—27.8
Santicizer 602	—	• 0.18	• Clear, oily liquid	• 50	• 0.10	• Characteristic ,mild	• 1.482 to 1.486	0.971 to 0.977	8.1	—
Santicizer 603	—	• 0.12	• Clear, oily liquid	• 100	• 0.10	Characteristic	• 1.4825 to 1.4895	• 0.977 to 0.987	8.18	—
Santicizer 630	—	• 0.12	• Clear, oily liquid	• 70	• 0.10	—	• 1.5095 to 1.5160	• 0.987 to 0.994	8.25	—
Santicizer 631	—	• 0.12	• Clear, oily liquid	• 40	• 0.10	—	• 1.4990 to 1.5045	• 0.984 to 0.990	8.22	—
Santicizer 632	—	• 0.12	• Clear, oily liquid	• 100	• 0.15	—	• 1.484 to 1.487	• 0.976 to 0.982	8.15	—
Santicizer 636	—	• 0.12	• Clear, oily liquid	• 75	• 0.10	—	• 1.478 to 1.488	• 0.969 to 0.977	8.11	—
Santicizer 681	—	• 0.20	• Clear, oily liquid	• 40	• 0.10	—	• 1.472 to 1.479	• 0.963 to 0.970	8.05	—
Santicizer 683	—	• 0.12	• Clear, oily liquid	• 40	• 0.10	—	• 1.488 to 1.489	• 0.975 to 0.981	8.09	—
ADIPATES										
Diisodecyl	446.0	• 0.50	• Clear, oily liquid	• 50	• 0.10	• Mild	1.4485 to 1.4525	• 0.962 to 0.973	7.65	<—50
Di(n-octyl,n-decyl)	398 (average)	• 0.35	• Clear, oily liquid	• 50	• 0.10	Characteristic	• 1.448 to 1.458	• 0.914 to 0.922	7.63	—5
Dioctyl	370.56	• 0.25	• Clear, oily liquid	• 25	• 0.10	• Mild	1.444 to 1.448	• 0.921 to 0.927	7.72	<—70
PHOSPHATES										
Tricresyl	368.18	• 0.20	• Clear, oily liquid	• 75	• 0.15	• No foreign odor	1.556	• 1.157 to 1.173	9.7	<—35
Triphenyl	326.31	• 0.06	• White flakes	20 (molten)	—	• Very faint, aromatic, max	1.550 (@ 60°C)	1.268 (60°/20°C)	10.5	49
Santicizer 140	340.2	• 0.20	• Clear, oily liquid	• 80	• 0.15	• Essentially odorless	1.550 to 1.570	• 1.203 to 1.213	10	<—35
Santicizer 141	362.40	• 0.20	• Clear, oily liquid	• 60	• 0.10	• Slight, sweet	1.507 to 1.510	• 1.089 to 1.093	9.1	—
Tributoxyethyl	—	• 1.0	• Clear, oily liquid	• 75	• 0.20	• Characteristic, mild	• 1.434 to 1.438	• 1.017 to 1.023	8.50	<—70
Tributyl	266.32	• 0.61	• Clear, oily liquid	• 25	• 0.20	• Characteristic	• 1.422 to 1.424	• 0.973 to 0.978	8.14	< 80
GLYCOLATES										
Santicizer E-15	280.27	• 0.17	• Clear, oily liquid	• 20	• 0.15	• Slight, max.	1.496 to 1.500	• 1.180 to 1.185	9.85	(supercools 20 readily)
Santicizer B-16	336.37	• 0.33	• Clear, oily liquid	• 45	• 0.15	• Slight, characteristic	1.488 to 1.492	• 1.095 to 1.105	9.15	<—35
Santicizer M-17	266.24	• 0.33	• Clear, oily liquid	• 20	• 0.15	• Slight, characteristic, max.	1.504	• 1.217 to 1.227	10.20	<—35
SULFONAMIDES										
Santicizer 1-H	253.36	—	• Yellow-brown fused mass	• 300 (molten)	• 0.15	—	—	1.125	—	(in vacuum jacket) • 82.5 min.
Santicizer 3	199.23	• 1.60	• Practically white solid	• 60 (molten)	• 0.25	—	1.512 to 1.532 (65°C)	1.166 to 1.176 (65°/65°C)	—	• 58.0 min.
Santicizer 8	[illegible]	• 0.80	• Light yellow viscous liquid free of turbidity or [illegible]							

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[illegible]	[illegible]	[illegible]	* Fine, white to light-cream, granular particles	* 85 (33⅓ wt. % in acetone)	* 1.0	Essentially none	—	[illegible]			
[illegible]	—	(mg. KOH/g)	* Hard, practically colorless resin	* 50 (25g: 75g butyl acetate)	—	Faint formaldehyde	1.4275 to 1.4325 (25g:75g butyl acetate)	1.35		62	
[illegible]			* Light-colored, viscous liquid. Free flowing above 20°C	* 80 (25g: 35g butyl acetate)	—	—	—	1.256	10.5	—	
PERMANENT											
Santicizer 405	—	* 1.0	* Clear, viscous liquid	* 250 (50ml: 50ml 95% ethanol)	* 0.15	* Characteristic	1.476	* 1.128 to 1.132	9.41	—	
Santicizer 409	—	* 1.5	* Clear, liquid	* 150 (50ml: 50ml 95% ethanol)	* 0.15	Very faint ester	1.4654	* 1.080 to 1.084	9.01		
Santicizer 411	—	* 1.0	* Slightly yellow, viscous liquid; some solids on standing	* 175 (50ml: 50ml 95% ethanol)	* 0.15	* Slight, characteristic	1.4772	* 1.104 to 1.110	9.20		
Santicizer 480	—	* 0.60	* Clear, oily liquid	* 200	* 0.15	Slight, characteristic	1.4943	* 1.039 to 1.046	8.72	—	
Santicizer 481	—	* 0.85	* Clear, oily liquid	* 300	* 0.15	Slight, characteristic	1.4795	* 1.072 to 1.078	8.96	—	
Santicizer 482	—	* 1.1	* Clear, liquid	* 325	* 0.15	Slight, characteristic	1.4751	* 1.097 to 1.103	9.16	—	
Santicizer 483	—	* 0.24	* Clear, oily liquid	* 125	* 0.15	Slight, characteristic	* 1.5015 to 1.5056	* 1.045 to 1.052	8.74	—	
OTHER											
HB-40®	—	—	Practically colorless, oily liquid	* 150	* 125 ppm	Faint, characteristic	1.5600 to 1.5750	* 1.001 to 1.007 (25°/15.5° C)	8.37	—	
Mod-Epox®	—	* 0.08 (mg KOH/g)	* Oily liquid or light-yellow solid	* 50	—	—	* 1.587 to 1.590	* 1.176 to 1.182 (30°/15.5°C)	9.83	25	
Triphenyl Phosphite	310.28	* 0.15 (mg KOH/g)	* Oily liquid or light-yellow solid	* 50	—	—	* 1.587 to 1.590	* 1.176 to 1.182 (30°/15.5°C)	9.83	25	

GENERAL PROPERTIES OF REPRESENTATIVE AROCLOR® PLASTICIZERS AND RESINS (*MONSANTO SPECIFICATIONS)

0509818

PROPERTY	AROCLOR 1221	AROCLOR 1232	AROCLOR 1242	AROCLOR 1248	AROCLOR 1254	AROCLOR 1260	AROCLOR 1262	AROCLOR 5442	AROCLOR 4465	AROCLOR 5460	AROCLOR 1268
Appearance	Clear, mobil oil	Clear, mobil oil	*Clear, mobil oil	*Clear, mobil oil	Light-yellow viscous oil	*Light-yellow, soft, sticky resin	*Light-yellow sticky viscous resin	*Yellow, clear, sticky resin	*Light-yellow, clear, brittle resin	*Clear, yellow-to-amber, brittle resin or flakes	*White to off-white powder
Color, maximum	*50 APHA	*100 APHA	*100 APHA	*100 APHA	*100 APHA	*150 APHA	*150 APHA	*2 NPA (molten)	*2 NPA (molten)	*2 NPA (molten)	1.5 NPA (molten)
Chlorine, per cent	20.5-21.5	31.5-32.5	42	48	54	60	61.5-62.5	42	65	58.5-60.6	68
Acidity, mg KOH/g, maximum	*0.014	*0.014	*0.015	*0.010	*0.10	*0.014	*0.014	0.05	0.5	0.5	0.05
Moisture, ppm, maximum	—	—	*50	*50	*50	*50	—	—	—	—	—
Avg. Coefficient of Expansion, cc/cc/°C	0.00071 (15°-40°C)	0.00073 (25°-100°C)	0.00068 (25°-65°C)	0.00070 (25°-65°C)	0.00066 (25°-65°C)	0.00067 (20°-100°C)	0.00064 (25°-65°C)	0.00123 (25°-99°C)	0.00061 (25°-65°C)	0.00179 (25°-124°C)	0.00067 (20°-100°C)
Specific Gravity	*1.182-1.192 (25°/25°C)	*1.270-1.280 (25°/15.5°C)	*1.381-1.392 (25°/15.5°C)	*1.405-1.415 (65°/15.5°C)	*1.495-1.505 (65°/15.5°C)	*1.555-1.566 (90°/15.5°C)	*1.572-1.583 (90°/15.5°C)	1.470 (25°/25°C)	1.670 (25°/25°C)	1.670 (25°/25°C)	1.804-1.807 (25°/25°C)
Density, pounds per gallon, 25°C	9.85	10.55	11.50	12.04	12.82	13.90	13.72	12.24	13.91	13.91	15.09
Distillation Range, °C, corrected (ASTM D-20, modified)	275-320	290-325	325-366	340-375	365-390	385-420	390-425	215-300 (4 mm. Hg)	230-320 (4 mm. Hg)	280-335 (5 mm. Hg)	435-450
Evaporation Loss, %, 100°C, 6 hours (ASTM D-6, mod.) 163°C, 5 hours	1.0-1.5 —	1.0-1.5 —	0-0.4 3.0-3.6	0-0.3 3.0-4.0	0-0.2 1.1-1.3	0-0.1 0.5-0.8	0-0.1 0.5-0.6	0.01 0.2	0-0.02 0.2-0.3	0.03	0-0.06 0.1-0.2
Flash Point (Cleveland Open Cup), °C / °F	141-150 286-302	152-154 305-310	176-180 348-356	193-196 379-384	NONE	NONE	NONE	247 477	NONE	NONE	NONE
Fire Point (Cleveland Open Cup), °C / °F	176 349	238 460	NONE**	NONE	NONE	NONE	NONE	350 662	NONE	NONE	NONE
Pour Point (ASTM D-97), °C / °F	1 (crystals) 34 (crystals)	—35.5 —32	—19 2	—7 19.4	10 50	31 88	35-38 99	46 115	— —	— —	— —
Softening Point (ASTM E-28), °C / °F	— —	— —	— —	— —	— —	— —	— —	*46-52 115-126	*60-66 140-151	*98-105.5 208-222	*150-170 (hot 302-338 point)
Refractive Index, n_D^{20} in 20°C	1.617-1.618	1.620-1.622	1.627-1.629	1.630-1.631	1.639-1.641	1.647-1.649	1.6501-1.6517	—	1.664-1.667	1.660-1.665	—
Viscosity, Seconds Saybolt Universal (ASTM D-88) 100°F (37.8°C)	*38-41	*44-51	*82-92	185-240	1800-2500	—	600-850 (160°F; 71°C)	—	—	—	—
130°F (54.4°C)	35-37	39-41	49-56	*73-80	260-340	3200-4500	*86-100	—	90-150	—	—
210°F (98.9°C)	30-31	31-32	34-35	36-37	*44-48	*72-78		300-400	(266°F; 130°C)	—	—

*Monsanto Company specifications.
**NONE indicates no flash or fire up to boiling point.

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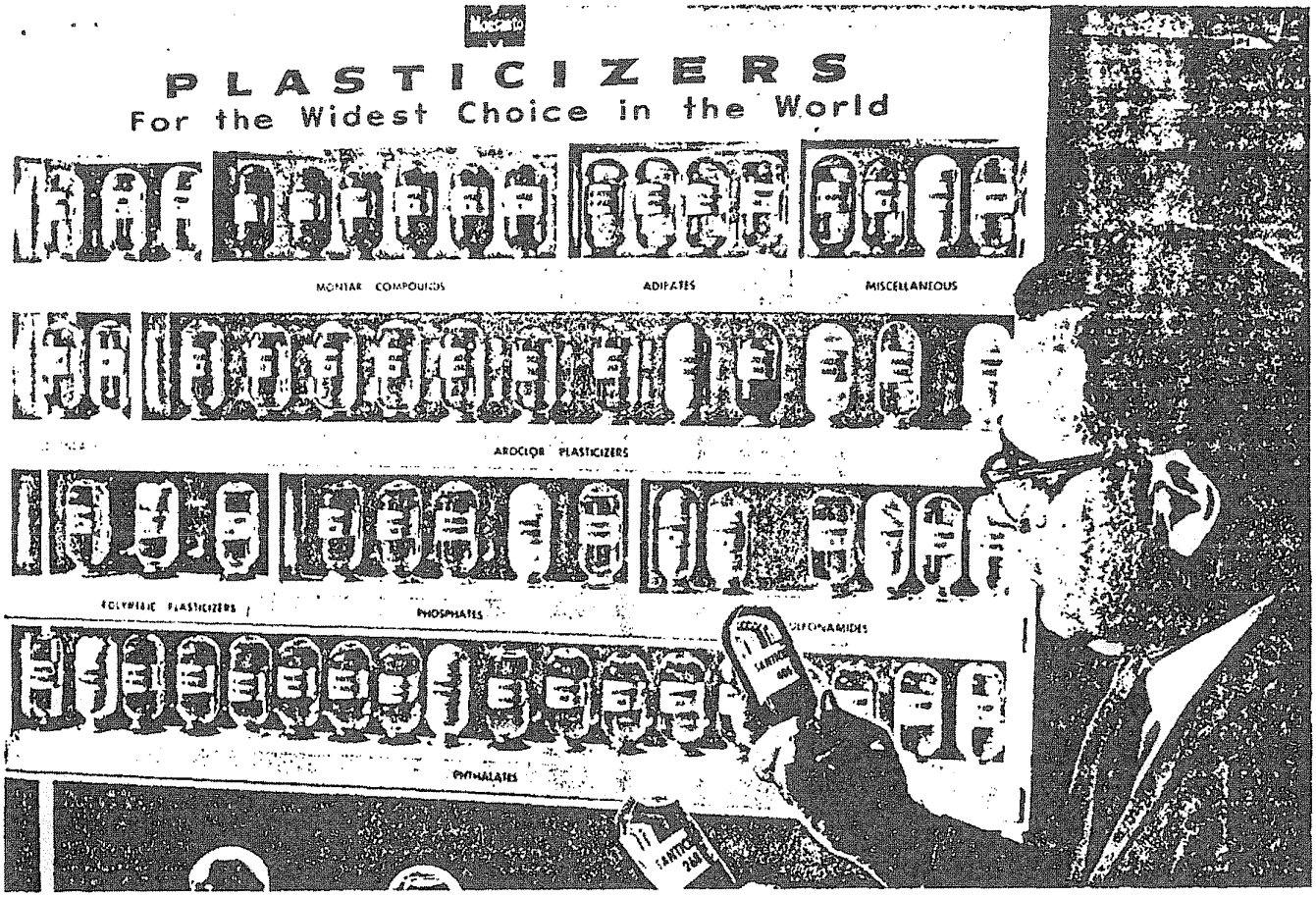
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