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How you can
benefit from...

MONSANTO

SECRET

67

REVISED
~~Summer~~ 1960
~~Summer~~
OCTOBER
Monsanto Chemical Company
Plasticizer Sales Department
Organic Chemicals Division
St. Louis 24, Missouri
E. N. Lindbergh Blvd.

Monsanto

REVISED
OCTOBER 1960

0221460

TAKEN AS A CLASS

... solid plasticizers show more versatility than just about any other group. You find them in adhesives, lacquers, foams, rigid compositions and films... and in each type they perform unusual functions. Many times it is the solid plasticizer that allows a different product to be made, one that commands attention by its uniqueness.

This folder will acquaint you with the solid plasticizers available from Monsanto, and Monsanto can offer you the industry's largest selection. You'll find detailed information on each plasticizer in a Monsanto technical bulletin... see page 7 for the list. If you'd prefer, a Monsanto salesman will call and discuss your particular application. Investigate the new products or product improvements you can make by using solid plasticizers. Monsanto technical service will be glad to show you how solid plasticizers can work for you.

SOLID PLASTICIZERS GIVE YOU...

Hot processing

Hot processing is one area where solid plasticizers perform to good advantage. For instance, if you're mixing plasticizer and resin in a Banbury mixer, a solid plasticizer will melt at the processing temperature and function as a solvating liquid plasticizer for the resin. The lowered viscosity improves the formulation flow and results in much easier processing. Upon cooling, the plasticizer returns to its solid state which produces a stiff film or article.

Solvent use

In lacquers, certain solid plasticizers permit higher solid percentages. High-solid lacquers need fewer coats to build up a surface and therefore reduce application costs. As the lacquer dries, the presence of the solid plasticizer helps reduce blushing, sweating and separation.

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SOLID PLASTICIZERS GIVE YOU...

For adhesives...*unusual properties*

Delayed-tack and heat-seal adhesives owe their existence to solid plasticizers, because it is the solid plasticizer that makes delayed-tack and heat sealing possible. Delayed-tack adhesives are activated by heat, and once activated, remain tacky long enough to permit handling before the adhesive cools and sets. The sharp melting point of solid plasticizers provides a sharp activation point for the adhesive. This activation temperature varies with different solid plasticizers, and special adhesives can be easily formulated to fit handling methods by selecting the proper solid plasticizer. Delayed-tack adhesives are covered by U. S. Pat. Nos. 2,462,029; 2,608,542; 2,608,543; 2,613,156 and 2,613,191.

For films...*no blocking*

Solid plasticizers can be used with other primary plasticizers to produce tough, clear films that feel dry and separate easily. Liquid plasticizers used alone often cause blocking due to a slight surface tackiness. Solid plasticizers also add resilience to films and impart exceptional resistance to extraction by kerosene, oils and greases.

For rigid products...*easier processing*

Processing of rigid vinyl products can be made easier by using solid plasticizers... without changing present equipment or methods. With heating, the solid melts and acts as a solvating liquid plasticizer for the resin. Upon cooling, the article becomes rigid because the plasticizing effect of the solid plasticizer is slight at room temperature. Used strictly as a processing aid, the solid plasticizer pays its own way by lowering processing costs.

For heat-seal coatings...*sharp activation temperature*

Like adhesives, heat-seal coatings require the sharp melting points of solid plasticizers to give them the heat-seal property. By themselves, liquid plasticizers cannot endow coatings with a sharp activation temperature. Instead, the coatings tend to block and be tacky at temperatures beneath the activation temperature. In this type of coating, solid plasticizers can be chosen to provide an exact temperature at which the heat-seal property is activated. And beneath that critical temperature, the coating does not block or have tackiness.

For rigid foams...*toughness*

In the chemically-blown foams, solid plasticizers can be used to add toughness to the finished foam.

In the plastisol foam process, solid plasticizers thicken the starting formulation to make possible more uniform cell formation as the gas is released. A uniform cellular structure makes the foam tough and provides uniform dimensional stability.

In chemically-blown vinyl foams made by milling or Banburying, the solid plasticizer acts as a liquid solvating plasticizer at the process temperature to make possible easy processing. At room temperature, the solid plasticizer's inefficiency results in a higher compression-resistant foam.

For impregnants...*better flow*

To get even dispersment of impregnating powders, solid plasticizers can be used as a flow aid for producing brake band linings. The flow aid property is also useful in certain types of adhesives, phenolic moldings and thermosetting ureas.

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**CHECK
THIS
LIST**

*of applications
for Monsanto's
solid plasticizers*

Heat-sealing coatings

Dicyclohexyl phthalate (DCHP), Diphenyl phthalate, Santolite* MPH, Santicizer* 1-H, Santicizer 9

Rigid extrusions

Diphenyl phthalate, Aroclor* 5460, Triphenyl phosphate, Santicizer 1-H, DCHP

Moldings and rigid foams

Triphenyl phosphate, Diphenyl phthalate, Aroclor 5460 and 1268, DCHP

Break-away "glass"

Santolite MHP

Phenolic brake linings

Santicizer 9

Surface coatings and composition wallboard

Cellulose acetate	Triphenyl phosphate
Nitrocellulose	DCHP, Diphenyl phthalate, Santolite MHP, Aroclor 5460
Melamine	Santicizer 9

Thermosetting resins	Santicizer 9, Santicizer 1-H, Triphenyl phosphate, Aroclor 5460 and 1268
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Urea molding compounds

Santicizer 9

Fire-resistant cellulose acetate

Triphenyl phosphate

Crystallizing lacquers

Santicizer 1-H

Polyamides

Santicizer 9, Santicizer 1-H

Vinyl and other hot melts

Triphenyl phosphate, DCHP, Diphenyl phthalate, Aroclor 5460 and 1268, Montar* 4, 5, and 9

Delayed-tack adhesives

Diphenyl phthalate, Santicizer 1-H

Book-binding adhesives

Triphenyl phosphate, DCHP, Diphenyl phthalate, Aroclor 5460 and 1268, Santolite MHP, Santicizer 1-H

You can add to this list by developing your own special applications with solid plasticizers.

For special problems, take advantage of Monsanto's "Plasticizer Council" service. Research and technical service specialists are available to discuss and recommend ways to solve plasticizing problems.

Writer: "Plasticizer Council"
Monsanto Chemical Company
Organic Chemicals Division
St. Louis 24, Missouri

800 N. Lindbergh Blvd.

* Santolite, Santicizer, Aroclor, Montar, Monsanto Trademarks, Reg. U. S. Pat. Off.

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check

of Monsanto solid plasticizers

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DICYCLOHEXYL PHTHALATE (DCHP)

Appearance	White Solid
Acidity (phthalic acid)	0.01 per cent maximum
Melting point	63.0 °C. minimum <i>to start</i>
Assay (ester content)	99. per cent minimum
Color of melt (APHA)	100 maximum
Odor	Moderately aromatic, slightly phthalic characteristic
Moisture (KF in methanol)	0.1 per cent maximum

DIPHENYL PHTHALATE

Appearance	Essentially white, fused solid with slight yellow or brown cast
Color (APHA diluted 20:50 ml. with acetone)	160 maximum
Acidity (as phthalic acid)	0.10 per cent maximum
Free phenol	0.20 per cent maximum
Ash	0.05 per cent maximum
Moisture	0.25 per cent maximum
Turbidity (diluted 20:50 ml. with acetone)	Essentially clear

TRIPHENYL PHOSPHATE

Appearance	White flakes
Odor	Very faintly aromatic, maximum
Melting point	48.5° C. minimum to start
Acidity (as phthalic phosphoric acid)	0.003 per cent, maximum
Stability to acid potassium permanganate	65 per cent transmission, minimum

AROCLOR 5460

Appearance	Clear, yellow to amber brittle resin
Color, NPA, Molten	2 maximum
Softening Point, °C (ASTM E28-51T)	98 — 105.5
Solubility (25 g. in 25 g. Acetone at 25° C.)	1 hour minimum
Acid number, mg KOH/g.	0.05 maximum
Phosphorus chlorine, per cent	58.5 — 60.6

AROCLOR 1268

Hold Point, °C.	135 - 160
Acid Number	150 - 170
mg KOH/g.	0.05

more

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SPECIFICATIONS (Continued)

MONTAR 3
3 and 4
MONTAR 4

Appearance ✓
Softening Point, °C.
(ASTM E28-51T)
Acidity
Chlorine ~~Content~~ per cent
~~Calcium~~ Calcium oxide, per cent
~~Iron~~ Iron, per cent

Black Solid
MONTAR 3
120 - 170
Slightly basic
50 - 52
5 - 10%
0.3 - 0.6%

Black Solid
MONTAR 4
140 - 200
Slightly basic
54 - 56%
5 - 10%
0.5 - 1.0%

MONTAR 5
MONTAR 6
MONTAR 9

Appearance θ or black or blackish
Softening Point, °C. ✓
(ASTM E28-51T)
Acidity (Mg KOH/g)
~~Chlorine~~ Chlorine, per cent
~~Calcium~~ Calcium oxide, per cent
~~Iron~~ Iron, per cent
Flash Point (°F.)
Fire Point (°F.)

MONTAR 5	MONTAR 6	MONTAR 9
180 - 250	150 - 210	130 - 160
Slightly basic	Slightly basic	0.1 - 0.3 Slightly basic
53 - 55	59 - 61	—
1 - 3	2 - 5	—
0.1 - 0.2	0.2 - 0.4	0.2 - 0.4
—	—	450 - 550
—	—	530 - 630

SANTOWAX R

Color, (Liquid), NPA
Upper Hold Point, °C.
Lower Hold Point, °C.
Distillation Range, °C.
(Uncorrected)

3.5 - 4.5
137 - 145
48 - 63
80% from 350 - 400

SANTICIZER 1-H

Appearance
Crystallizing point, °C.
(in vacuum jacket)
Melt test:
Color (APHA)
Clarity
Moisture %
(by KF in methanol)

Yellowish brown fused mass
82.5 minimum
300 maximum
5% turbid maximum
Slightly
0.25 maximum

SANTICIZER 9

Appearance
Color & Turbidity
(3 1/2% wt. in acetone)
Turbidity
Color
Moisture
(by methanol)
Screen test
Retained on 20 mesh
Retained on 40 mesh

imp 105
Fine, white to light-cream, granular particles
APHA 40 maximum
APHA 85 maximum
3%
1.0% maximum
Trace, maximum
3.0% per cent, maximum

SANTOLITE MHP
"A" Grade

Appearance
Color of solution
(25 grams in 75 grams butyl acetate)
Refractive index — 25° C.
(25:75 butyl acetate)
Solubility
(25:75 butyl acetate)

imp. 67
Hard, practically colorless resin
APHA 80 maximum
1.4275 to 1.4325
Complete

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Gentlemen:

Please send me the checked technical literature about your solid plasticizers.

- PL-301 Triphenyl Phosphate
- PL-1H Santoclar 1-H
- PL-9 Santoclar 9
- PL-306 Crocolastic
- PL-312 Dicyclohexyl phthalate
- PL-319 Dikemyl phthalate
- PL-320 Santalite M49, MS-80%
- ~~PL-0-139~~ Mander Compounds

~~I am interested in the following applications:~~

NAME _____

TITLE _____

Company _____

Address _____

City _____

Zone _____ State _____

(address or
P.O. Box)
ADD-51)

0221466

CHECK THIS RANGE
MELTING POINTS
IN SOMEWAYS

questionnaire
attached

Mol. Wt.	Temp. (°C)		
48.5	98-105.5	Triphenyl Phosphate	Aroclor 548
62	120-170	Santolite MHP	Montar 3
63	130-160	Dicyclohexyl phthalate	Montar 9
69	135-160 ±	Diphenyl phthalate	Aroclor 124
92.5	140-200	Santizinc 1-H	Montar 4
105	150-210	Santizinc 9	Montar 6
	180-250		Montar 3

a) crystallization point b) hold point

TECHNICAL LITERATURE

...is available on all of Monsanto's solid plasticizers. Write for your copies today.
Send

BULLETINS:

- ② No. PL-301 Triphenyl phosphate
- ① No. PL-1H Santizinc 1-H
- ② No. PL-9 Santizinc 9
- ⑤ No. PL-312 Dicyclohexyl phthalate
- ④ No. ~~PL-319~~ Diphenyl phthalate
- ⑦ No. ~~PL-320~~ Santolite MHP, MS-80%
- No. O-125 Santowax R
- No. O-129 Montar Compounds
- No. ~~O-130~~ *Plasticizers*
Aroclor Compounds

close together

PL-? ⑤

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Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing patents covering any material or its use.

*see long a part at bottom of p. 1
if this page is too crowded*

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