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Monsanto

PLASTICIZERS

Technical Bulletin O/PL-345

SOLID PLASTICIZERS

. . . for adhesives, coatings and lacquers, foams, rigid compositions and films

Monsanto offers you 17 solid plasticizers from which to choose . . . the largest and most versatile selection available to the plastics industry.

Solid plasticizers perform unusual functions in adhesives, coatings and lacquers, foams, rigid compositions and films. Solid plasticizers are often overlooked in solving processing problems or in obtaining unique product properties. A solid plasticizer can transform a deficient product into a completely different, high performance product.

Versatility in Action

Hot Processing

Solid plasticizers offer processing advantages in hot processing applications. For example, in Banbury mixing a solid plasticizer will melt at or below the processing temperature and function as a solvating or fluxing liquid. The lowered viscosity of the Banbury charge improves the flow resulting in faster and easier processing. Upon cooling, the plasticizer returns to a solid form producing a rigid or semi-rigid film or molded product. The solid plasticizer thus reduces processing costs and imparts unique properties to the finished product.

Solvent Processing

Certain solid plasticizers enable successful formulation of higher solids content in lacquers. This means fewer coats are required to build a surface resulting in reduced application costs. As the lacquer dries, the solid plasticizer helps reduce blushing, sweating and separation.

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Versatility in Application

Adhesives . . . unusual properties

Delayed-tack and heat-seal adhesives owe their existence to solid plasticizers. 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 several U.S. patents.

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 add resilience to films and impart resistance to extraction by kerosene, oils and grease.

Rigid Products . . . easier processing

Processing rigid vinyl products can be simplified by using solid plasticizers without changing equipment or methods. When heated, 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.

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. Beneath that critical temperature, the coating does not block or have tackiness.

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.

Impregnants . . . better flow

To get even dispersement of impregnating powders, solid plasticizers can be used as a flow aid. The flow aid property is useful in certain types of adhesives, phenolic moldings, thermosetting ureas and melamine coatings.

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Solid Plasticizer Applications

Heat-sealing coatings
Dicyclohexyl phthalate (DCHP), diphenyl phthalate, Santolite® MHP, Santicizer® 1-H, Santicizer 9

Rigid extrusions
Diphenyl phthalate, Arochr® 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, Aroclor 1268

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

Urea molding compounds
Santicizer 9

Melamine 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, DCHP

Book-binding adhesives
Triphenyl phosphate, DCHP, diphenyl phthalate, Aroclor 5460 and 1268, Santolite MHP, Santicizer 1-H

Monsanto's Specifications

Dicyclohexyl Phthalate (DCHP)	Appearance	White lumps or granules
	Acidity (meq/100 gm.)	0.12 maximum
	Assay (ester content)	99.0% minimum
	Color (APHA)	100 maximum (molten)
	Odor	Moderate, aromatic; (slightly phthalic)
	Moisture (KF in methanol)	0.1% maximum
Diphenyl Phthalate	Appearance	White, fused solid with slight yellow or brown cast
	Color (diluted 20-50 ml with acetone), (APHA)	160 maximum
	Acidity (meq/100 gm.)	1.20 maximum
	Free phenol	0.20% maximum
Triphenyl Phosphate	Appearance	White flakes
	Odor	Very faint, aromatic
	Acidity (meq/100 gm.)	0.06 maximum
Aroclor 5442	Appearance	Yellow, clear, sticky resin
	Color (NPA)	2 maximum (molten)
Aroclor 4465	Appearance	Light-yellow, clear, brittle resin
	Color (NPA)	2 maximum (molten)
Aroclor 5460	Appearance	Clear, yellow to amber brittle resin or flakes
	Color (NPA)	2 maximum (molten)
	Acid number, mg KOH/g	0.05 maximum
Aroclor 1268	Appearance	White to off-white powder
	Hold Point, °C.	150-170
	Acid Number, mg KOH/g	0.05 maximum
Montar 1	Appearance	Black solid
Montar 2	Appearance	Black solid
Montar 3	Appearance	Black solid
Montar 4	Appearance	Black solid
Montar 5	Appearance	Dark brown or black solids
Montar 9	Appearance	Black solid

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Santicizer 3	Appearance	Practically white solid
	Acidity (meq/100 gm.)	1.60 maximum
	Color (APHA)	60 maximum (molten)
	Moisture (KF in methanol)	0.25% maximum
	Crystallizing Point (°C)	58.0 minimum
Santicizer 1-H	Appearance	Yellow-brown fused mass
	Crystallizing point, (°C)	82.5 minimum (in vacuum jacket)
	Color (APHA)	200 maximum (molten)
	Moisture (KF in methanol)	0.15% maximum
Santicizer 9	Appearance	Fine, white to light-cream granular particles
	Color (APHA) (33 1/3 wt. % in acetone)	85 maximum
	Moisture (KF in methanol)	1.0% maximum
Santolite MHP	Appearance	Hard, practically colorless resin
	Color of solution (25 g in 75 g butyl acetate) (APHA)	50 maximum

Melting Points/Softening Ranges

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

Technical Literature

For more information concerning Solid Plasticizers, write Monsanto for the following Technical Bulletins.

O/PL-306	Arochlor® 5442
	Arochlor 4465
	Arochlor 5460
	Arochlor 1268
PL-312	Dicyclohexyl Phthalate
O/PL-319	Diphenyl Phthalate
O/PL-328	Montar® 1
	Montar 2
	Montar 3
	Montar 4
	Montar 5
	Montar 9
O/PL 1-H	Santicizer® 1-H
PL-3	Santicizer 3
O/PL-9	Santicizer 9
O/PL-320	Santolite® MHP
PL-301	Triphenyl phosphate

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