

Plasticizer formulation selector guide

Coating, caulk, and sealant manufacturers are often looking for alternative plasticizers to achieve better performance or non-phthalate plasticizer alternatives to meet regulations. This technical tip is a general guide to aid formulators in selecting Eastman plasticizers or coalescents for their systems. In general, additives act differently depending on the formulation, so these ratings and suggestions may not hold true for every application. Based on internal evaluations of these materials, we have found general trends with the products listed in the following tables.

Efficiency

Table 1 compares several plasticizers and coalescents and denotes their compatibility with solventborne and/or waterborne coatings. It indicates there is little difference in plasticizer efficiency in solvent-based coatings. The efficiencies of these plasticizers were evaluated by adding the plasticizer at five different levels and then measuring the glass transition of the material by differential scanning calorimetry (DSC).

The effect of each plasticizer on hardness was measured with a pendulum hardness tester (ASTM D4366). The efficiencies of the plasticizers in architectural, industrial, and maintenance (AIM) water-based systems were measured by determining the amount of plasticizer required to form a film of several latexes at certain temperatures using a minimum film formation temperature (MFFT) gradient bar.

Three of the plasticizers in Table 1 were more efficient at softening lacquers than the others. Eastman DOA, Eastman Triacetin, and Eastman Optifilm™ enhancer 400 are the most efficient in these systems. Eastman DOA was the best overall in the wood lacquer tested, since no haze formed after mechanical polishing. Addition level also had no effect on haze formation, making Eastman DOA the most formulator friendly. Initially, the others made clear films as well, but mechanical polishing caused haze in the films that had high addition levels. In a water-based system, both Optifilm 400 and Eastman Velate™ coalescent 368 were highly efficient, but Optifilm 400 has the lower VOC content of the two.

Table 1

Table 1				
	Compatibility guide for solvent-based and water-based systems		Coatings efficiency guide	
Phthalate plasticizers	Suitable for solvent-based coatings	Suitable for AIM water-based coatings	Efficiency in lacquer systems	Efficiency in AIM latex emulsions
Dibutyl phthalate (DBP)	C	C	2	M
Diisooheptyl phthalate (DIHP) (discontinued)	C	I	2	NA
Diisononyl phthalate (DINP)	C	P	2	NA
Butyl benzyl phthalate (BBP)	C	C	2	M
Eastman DOP	C	I	2	L
Non-phthalate plasticizers and coalescents	Suitable for solvent-based coatings	Suitable for AIM water-based coatings	Efficiency in lacquer systems	Efficiency in AIM latex emulsions
Benzoflex™ 50 plasticizer	C	C	2	M
Benzoflex 9-88	C	C	2	M
Benzoflex 9-88SG (lower –OH content)	C	C	2	M
Benzoflex 1046	C	C	2	M
Eastman 168™ non-phthalate plasticizer	C	I	2	L
Eastman 168 SG	C	I	2	L
Eastman 168 Renew 20	C	I	2	L
Eastman Effusion™ plasticizer	C	C	2	M
Eastman DOA	C	I	3	L
Eastman DOA Renew 20 plasticizer	C	I	3	L
Eastman DOM	C	C	2	M
Eastman Optifilm™ enhancer 400	C	C	3	H
Eastman SAIB	C	I	1	NA
Eastman TOTM	C	I	2	L
Eastman Triacetin	C	C	3	M
Eastman Triacetin Renew 59	C	C	3	M
Eastman TXIB™ formulation additive	C	C	2	M
Velate 262	C	C	2	L
Velate 368	C	C	2	H
Velate 375	C	C	2	M
	Key: C = Compatible P = Partially compatible I = Incompatible		Key: 1 = Good 2 = Better 3 = Best H = High M = Medium L = Low NA = Not applicable	

Table 2 lists the recommendations for Eastman plasticizers in various types of caulks and sealants. Some plasticizers are the primary recommendation for specific systems. Others are only effective in certain formulas, and some have more than one plasticizer that is suitable for a certain application.

Table 2
Plasticizer recommendations for adhesives and sealant applications

End use		Benzoflex 50	Benzoflex LC-531	Benzoflex 2088	Benzoflex LA-705	Benzoflex 9-88	Benzoflex 9-88SG	Benzoflex 352	Benzoflex PS-507	Eastman 168	Eastman 168 Renew 20	Eastman TXIB	Eastman Triacetin	Eastman Triacetin Renew 59
Adhesives	Cyanoacrylate adhesives					●								
	Polyurethane adhesives					●	●					○		
	Hot-melt adhesives							●						
	Latex construction adhesives	●		○								○		
	Latex packaging adhesives—polyvinyl acetate			○	●							○	●	●
	Latex packaging adhesives—vinyl acetate/ethylene copolymer			○	●							○	●	●
	Latex packaging adhesives—vinyl acetate/acrylic copolymer			●								○	○	○
	Latex pressure-sensitive adhesives (PSA)			●						●	●		○	○
Sealants	Polyurethane sealants					○	●							
	Latex sealants	○	●	●	○					○	○	○		
	PVC plastisols	○		○						●	●	○		
	Polysulfide sealants					●			●					
	Two-part polysulfide sealants (B-side)					○								
Key: ● = Primary recommendation ○ = Suitable in some formulations														

These tables are to serve only as a general guideline in selecting a plasticizer for a given application. Your system may require another recommendation, or you may have an application not listed in the document. In that case, contact us at EastmanPlasticizers.com or call 1-800-EASTMAN.



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