

Eastman Plasticizer Technical Tip

Eastman 168 Plasticizer With Secondary Plasticizers (TT-35B)

INTRODUCTION

Secondary plasticizers are typically aliphatic, aromatic, and naphthenic hydrocarbons used in plastisol applications. They are generally lower in cost compared to general purpose plasticizers, which helps to optimize plastisol formulation cost. Secondary plasticizers are also used to adjust plastisol viscosity for proper processing of the material. However, many of these secondary plasticizers are not completely compatible in finished vinyl and cannot be used by themselves as the sole plasticizer. Incompatibility can be seen in the form of exudation, discoloration, and crease whitening.

FORMULATIONS AND EXPERIMENTAL DATA

The compatibility of secondary plasticizers in plastisols using *Eastman 168* plasticizer was investigated. Basic plastisol formulations containing *Eastman 168* plasticizer, varying levels of secondary plasticizer, PVC resin, and a heat stabilizer were analyzed for compatibility. See Tables 1 and 2 below.

Table 1: Formulations

Formulation	PHR (Parts per hundred resin)
<i>Eastman 168</i> plasticizer ^a	60
Secondary plasticizer	5, 10, 15
<i>Oxy 654</i> PVC resin ^b	100
<i>Akrostab</i> LT 4798 heat stabilizer ^c	3

^a*Eastman Chemical Company*, ^b*Occidental Chemical Corporation*, ^c*Akzo Nobel*

Table 2: Secondary Plasticizers Used in Experiment

Secondary Plasticizer	Manufacturer
<i>Jayflex 210</i>	ExxonMobil
<i>Jayflex 215</i>	ExxonMobil
Mineral spirits	
Mineral seal oil	
Epoxidized soybean oil	Crompton
<i>Eastman TXIB</i> formulation additive	Eastman
Chlorinated paraffin S45	ICI Cereclor
Chlorinated paraffin S52	ICI Cereclor
<i>Viscobyk 4040</i>	Byk Chemie
<i>Viscobyk 5050</i>	Byk Chemie
<i>Exxsol D80</i>	ExxonMobil
<i>Exxsol D95</i>	ExxonMobil

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Plastisols were prepared in Hobart mixers using low shear paddles. Mixing time was 25 minutes, followed by de-aeration of the plastisols. Seventy mil thickness vinyl sheets were fused in a convection oven for 20 minutes @ 375°F.

Loop compatibility tests were performed from samples of each formulation. A small piece of vinyl from each 70 mil sheet was bent over and held in position. The outside diameter of looped sample was 5/16". Looped samples were checked after one hour, one day, and one week for any sign of exudation by wiping the inside of the loop with cigarette paper. Test was performed in ambient temperature laboratory.

The following ratings were given for the level of exudation observed:

0=no exudation, **1=slight exudation**, **2=moderate exudation**, and **3=heavy exudation**.

Table 3: One Hour Compatibility

Secondary Plasticizer	5 phr	10 phr	15 phr
<i>Jayflex</i> 210	0	0	0
<i>Jayflex</i> 215	1	2	3
Mineral spirits	0	0	0
Mineral seal oil	0	0	2
Epoxidized soybean oil	0	0	0
<i>Eastman TXIB</i> formulation additive	0	0	0
Chlorinated paraffin S45	0	0	0
Chlorinated paraffin S52	0	0	0
<i>Viscobyk</i> 4040	0	0	0
<i>Viscobyk</i> 5050	1	1	2
<i>Exxsol</i> D80	1	1	1
<i>Exxsol</i> D95	1	1	1

Table 4: One Day Compatibility

Secondary Plasticizer	5 phr	10 phr	15 phr
<i>Jayflex</i> 210	0	0	1
<i>Jayflex</i> 215	2	3	3
Mineral spirits	0	0	0
Mineral seal oil	0	1	3
Epoxidized soybean oil	0	0	0
<i>Eastman TXIB</i> formulation additive	0	0	0
Chlorinated paraffin S45	0	0	1
Chlorinated paraffin S52	0	0	1
<i>Viscobyk</i> 4040	0	1	1
<i>Viscobyk</i> 5050	1	1	2
<i>Exxsol</i> D80	1	1	1
<i>Exxsol</i> D95	2	2	2

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Table 5: One Week Compatibility

Secondary Plasticizer	5 phr	10 phr	15 phr
<i>Jayflex</i> 210	0	0	1
<i>Jayflex</i> 215	2	3	3
Mineral spirits	0	0	0
Mineral seal oil	0	1	3
Epoxidized soybean oil	0	0	0
<i>Eastman TXIB</i> formulation additive	0	0	0
Chlorinated paraffin S45	0	0	2
Chlorinated paraffin S52	0	0	2
<i>Viscobyk</i> 4040	1	1	2
<i>Viscobyk</i> 5050	1	2	2
<i>Exxsol</i> D80	1	1	0*
<i>Exxsol</i> D95	2	1	0*

* Exudate may have evaporated over the course of test period due to volatility of secondary.

CONCLUSION

The secondary plasticizers used in this experiment have varying levels of compatibility in a plastisol containing *Eastman* 168 as the plasticizer. This is dependent on the structure of the secondary and the level used. Proper laboratory experimentation should be performed to determine the compatibility of secondary plasticizers with *Eastman* 168 in other formulations and with other secondary plasticizers not listed above.

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