A Comparison of *Eastman* 168 Plasticizer With *Palatinol* 79P[1] and *Eastman* DOP Plasticizers

Introduction

Eastman 168, *Palatinol* 79P, and *Eastman* DOP plasticizers were compared in flexible vinyl formulations at equal efficiency (hardness) levels and different phr levels. Dry blends and plastisols were evaluated.

Results

1. More *Eastman* 168 was needed to match the hardness of *Palatinol* 79P, but less *Eastman* DOP was required.
2. The mechanical properties of the three plasticizers were generally equal.
3. *Eastman* 168 and DOP had the best resistance to soapy water extraction.
4. Since C_{11} ester was not present, 79P was higher in volatility than 168.
5. *Eastman* 168 and 79P had approximately equal low-temperature flexibility properties, and both had better low-temperature flexibility than DOP.
6. The lowest-viscosity plastisols were obtained with 79P, followed by 168.

Laboratory Work

Film samples of flexible vinyl compounds were prepared in thicknesses of 70 and 10 mils (see Table 1). The 70-mil samples were used to determine mechanical and low-temperature flexibility properties, while the 10-mil samples were used for extraction testing (see Table 2).

[1]Palatinol *79P, a semilinear plasticizer marketed by BASF Corporation, is based on a blend of* C_7 *and* C_9 *alcohols derived from linear alpha olefins. The alcohols and the plasticizer are produced by Sterling Chemical Company.*

EASTMAN

Table 1

Flexible Vinyl Compound Formulations

Plasticizer	168[a]	79P[a]	DOP[a]
PVC Suspension Resin	100	100	100
Eastman 168 Plasticizer	70.7	—	—
Palatinol 79P Plasticizer	—	65.0	—
Eastman DOP Plasticizer	—	—	63.9
$CaCO_3$ Filler	40	40	40
Epoxidized Soybean Oil	4	4	4
Ba-Cd-Zn Heat Stabilizer	2	2	2

[a]*Units are phr.*

Table 2

Properties of Flexible Vinyl Compounds

Plasticizer	168	79P	DOP
phr	70.7	65.0	63.9
Mechanical Properties			
Specific Gravity	1.323	1.366	1.363
Shore A Hardness	75	75	75
Tensile Strength, psi	2,098	2,309	2,166
Elongation, %	398	413	387
Modulus, 100%, psi	957	835	971
Tear Strength, lb/in.	293	295	296
Permanence Properties			
Soapy Water Extraction @ 50°C, % wt loss	1.71	2.51	1.15
Oil Extraction, % wt loss	21.9	17.5	15.5
Hexane Extraction, % wt loss	31	29	28
Activated Carbon @ 90°C, % wt loss	2.6	3.5	6.1
Low-Temperature Properties			
Torsion Modulus, °C (°F)			
35,000 psi	−38 (−37)	−37 (−35)	−33 (−27)
135,000 psi	−54 (−65)	−53 (−63)	−52 (−62)
Low-Temperature Impact, °C (°F)	−41 (−42)	−43 (−45)	−36 (−33)

Flexible vinyl plastisols were prepared according to the formulations in Table 3. The viscosity of each plastisol was determined after aging for 24 hours, 1 week, 2 weeks, and 3 weeks (Figure 1). Volatility of the plasticizers was determined after fusing for 10 minutes at 177°C (350°F) and 10 minutes at 204°C (400°F). The results are shown in Figure 2.

Table 3

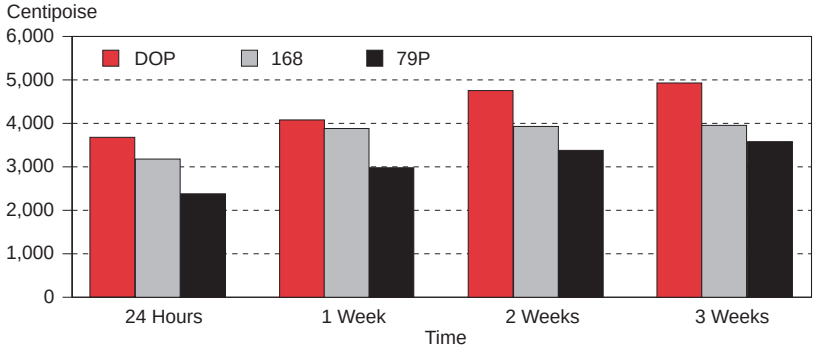
Flexible Vinyl Plastisol Formulations

Plasticizer	168[a]	79P[a]	DOP[a]
PVC Dispersion Resin	100	100	100
Eastman 168 Plasticizer	84	—	—
Palatinol 79P Plasticizer	—	80	—
Eastman DOP Plasticizer	—	—	80
$CaCO_3$ Filler	30	30	30
Epoxy Tallate	4	4	4
Ba-Cd-Zn Heat Stabilizer	2	2	2

[a]*Units are phr.*

Figure 1

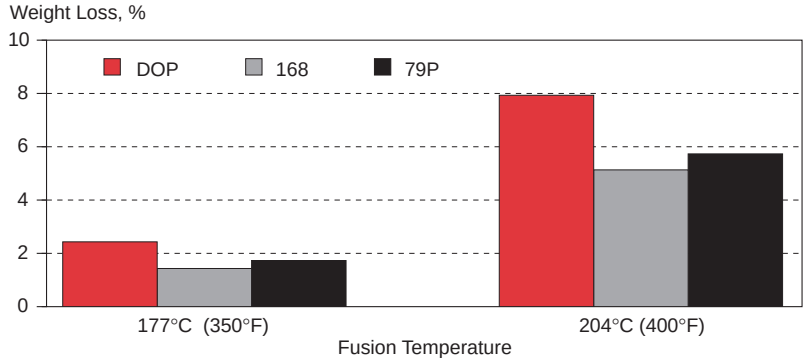
Plastisol Brookfield Viscosity[a]
Eastman 168 vs. *Palatinol* 79P and *Eastman* DOP



[a]*Spindle #5, 10 rpm*

Figure 2

Plastisol Volatility After Fusion[a]
Eastman 168 vs. *Palatinol* 79P and *Eastman* DOP



[a]*Time—10 minutes*

EASTMAN

NORTH AMERICA

Eastman Chemical Company
Corporate Headquarters
P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

Telephone:
U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, (1) 423-229-2000
Fax: (1) 423-229-1673

http://www.eastman.com

LATIN AMERICA

Eastman Chemical Latin America
9155 South Dadeland Blvd.
Suite 1116
Miami, Fl 33156 U.S.A.

Telephone: (1) 305-671-2800
Fax: (1) 305-671-2805

EUROPE / MIDDLE EAST / AFRICA

Eastman Chemical B.V.
Customer Service Center
Weena 159-161
3013 CK Rotterdam
NETHERLANDS

Telephone: (31) 10 2402 111
Fax: (31) 10 2402 100

ASIA PACIFIC

Eastman Chemical Japan Ltd.
AIG Aoyama Building 5F
2-11-16 Minami Aoyama
Minato-ku, Tokyo 107-0062 JAPAN

Telephone: (81) 3-3475-9510
Fax: (81) 3-3475-9515

Eastman Chemical Asia Pacific Pte. Ltd.
#05-04 Winsland House
3 Killiney Road
Singapore 239519 SINGAPORE

Telephone: (65) 6831-3100
Fax: (65) 6732-4930

Material Safety Data Sheets providing safety precautions that should be observed in handling and storing Eastman products are available online or on request. You should obtain and review the available material safety information before handling any of these products. If any materials mentioned are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

Neither Eastman Chemical Company nor its marketing affiliates shall be responsible for the use of this information, or of any product, method, or apparatus mentioned, and you must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and for the health and safety of your employees and purchasers of your products. No warranty is made of the merchantability or fitness of any product, and nothing herein waives any of the Seller's conditions of sale.

Eastman is a trademark of Eastman Chemical Company.

Publication L-216D
June 2003

Printed in U.S.A.