

# Durability meets fast fusing

# Benzoflex™ RF-532 plasticizer

Benzoflex™ RF-532 plasticizer is a fast-fusing non-phthalate plasticizer for use in PVC flooring applications. PVC plastisols with a fast fuser allow for faster line speeds and wider processing windows than plastisols with only a general-purpose plasticizer. When used in resilient sheet flooring, luxury vinyl tile, vinyl composite tile, and PVC-backed carpet, Benzoflex RF-532 demonstrates good stain resistance and resistance to degradation by ultraviolet light. Compared to butylbenzyl phthalate (BBP), Benzoflex™ RF-532 also offers improved in-process heat stability, excellent efficiency, and good low-temperature flexibility, making it an effective replacement for traditional fast-fusing plasticizers.

# Blend to optimize

In many flooring applications, Benzoflex RF-532 can be used in combination with a general-purpose plasticizer. Blending plasticizers allows manufacturers to have more processing options during production. The efficiency of a general-purpose plasticizer, such as Eastman  $168^{\text{M}}$  non-phthalate plasticizer, can be improved by blendiing it with Benzoflex RF-532.

PVC produced with a Benzoflex RF-532 and Eastman 168 blend retains the same tensile and tear properties, as shown in Table 1. Blends with Benzoflex RF-532 result in similar fusion temperatures compared to BBP, allowing manufacturers to increase line speeds as effectively as with traditional phthalate options.

# Performance benefits

- · Non-phthalate
- Fast fusing
- Excellent weatherability
- · Superior heat stability

Table 1

Physical properties: Eastman 168 blends

Property	Eastman 168/ Benzoflex RF-532 70/30 at 60 phr	Eastman 168/ BBP 70/30 at 60 phr	Eastman 168 at 60 phr
Fusion temperature, °C	134	131	148
Tensile strength, MPa	17.5	17.2	17.9
Elongation at break, %	298	304	321
Modulus at 100% elongation, MPa	8.6	8.5	9.1
Shore A hardness	67	67	71
Tear resistance, kN/m	65	65	64
Tear energy, N*mm	1123	1250	1136

# Mechanical properties

In a simple formulation with low plasticizer content, PVC containing either Benzoflex RF-532 or BBP has similar Shore A hardness, tensile strength, and brittleness temperature properties, as shown in Table 2. The Brabender torque rheometer curves in Figure 1, clearly show that the plastisols made with Benzoflex RF-532 and BBP gel and fuse virtually identically.

Table 2 Mechanical properties: Fast-fuser comparison

Property	Benzoflex RF-532 40 phr	BBP 40 phr
	7.5 phr TXIBa	7.5 phr TXIB
Fusion temperature, °C	103	103
Tensile strength, MPa	16.8	16.5
Elongation at break, %	260	244
Modulus at 100% elongation, MPa	9.1	9.4
Shore A hardness	73	72
Tear resistance, kN/m	63	67
Tear energy, N*mm	2674	2529
Brittleness temperature, °C	-6	-6

 $<sup>^{</sup>a}$ Eastman TXIB $^{™}$  formulation additive

Figure 1



# Heat and UV stability

A PVC formulation with Benzoflex RF-532 develops less color when heated to 350°C than does a PVC formulation containing BBP. Weather properties are also improved when using Benzoflex RF-532. Weathering of 70-mil-thick PVC in a weatherometer with 0.89 W/m²/nm of fluorescent UV, and a peak irradiance at 340 nm results in less yellowing of the PVC samples containing Benzoflex RF-532 as compared to the significant yellowing of the BBP sample. In the industry standard CIE Lab colorspace weatherability test, the yellowness-blueness index b\* increased from an initial point of approximately 0 to 11 for Benzoflex RF-532 and 0 to 39 for BBP at 1500 h exposure. The samples were cycled between 8 h of light at 50°C and 4 h of dark at 45°C with condensation.

## Your next step: contact us

If your formulation requires a non-phthalate plastisol, resistance to degradation from ultraviolet light, or blending with a general-purpose plasticizer, Benzoflex™ RF-532 plasticizer is your solution. And when you switch, an Eastman technical specialist will be by your side to help make your transition seamless.

To find out more about Benzoflex RF-532 as a fast-fusing non-phthalate plasticizer for flooring, call your Eastman representative today or visit www.EastmanPlasticizers.com.

## **EASTMAN**

The results of insight

#### 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) 423-229-1193

#### 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

#### Eastman Chemical B.V.

Fascinatio Boulevard 602-614 2909 VA Capelle aan den IJssel The Netherlands

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

#### Eastman (Shanghai) Chemical Commercial Company, Ltd. Jingan Branch

1206, CITIC Square No. 1168 Nanjing Road (W) Shanghai 200041, P.R. China

Telephone: (86) 21 6120-8700 Fax: (86) 21 5213-5255

#### Eastman Chemical Japan Ltd.

MetLife 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

Telephone: (65) 6831-3100 Fax: (65) 6732-4930 Although the information and recommendations set forth herein are presented in good faith, Eastman Chemical Company makes no representations or warranties as to the completeness or accuracy thereof. You must make your own determination of their 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. Nothing contained herein is to be construed as a recommendation to use any product, process, equipment, or formulation in conflict with any patent, and we make no representations or warranties, express or implied, that the use thereof will not infringe any patent. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND NOTHING HEREIN WAIVES ANY OF THE SELLER'S CONDITIONS OF SALE.

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

© 2014 Eastman Chemical Company. Eastman, Benzoflex, Eastman 168, Effusion, The results of insight, and TXIB are trademarks of Eastman Chemical Company.

www.eastman.com