Eastman solvents—performance sheet

Suggested replacements for toluene

Introduction

Toluene's largest single use is in industrial coating applications, mainly in wood furniture and fixtures, containers and closure, automotive finishes and machinery (see Table 1). With increasing legislative pressure geared towards reducing toluene usage, many formulators have been seeking alternative solvents.

Table 1 **Toluene applications**

Application	End use %
Coatings, paint, and lacquers	54
Adhesives	17
Other (including cleaners)	22
Inks (primarily gravure inks)	5
Pharma	1

Tables 2 and 3 show Eastman's suggested replacement blends for toluene and their typical properties.

Table 2 **Reformulation blends**[a]

Solvent	Control volume %	Blend #1 volume %	Blend #2 volume %	Blend #3 volume %	Blend #4 volume %
Toluene	100	—	—	—	—
Eastman MPK[b] (methyl *n*-propyl ketone)	—	—	80	—	—
Isopar™ C[c]	—	—	—	—	30
Eastman IBIB (isobutyl isobutyrate)	—	—	—	9	—
Eastman isobutanol (isobutyl alcohol)	—	20	—	—	—
Eastman isobutyl acetate	—	50	20	91	70
Aliphatic hydrocarbon	—	30	—	—	—
Total	100	100	100	100	100

[a] *These solvent blends are only suggested starting points for developing alternative systems. They should be thoroughly evaluated to determine their suitability for specific application.*

[b] *MPK (methyl n-propyl ketone) is not on EPA's HAP or SARA list, but it does contain <=10 wt% MIBK, which is on both lists.*

[c] *Exxon Manufacturing*

Table 3 **Reformulation blends—typical properties**

Typical properties	Control volume %	Blend #1 volume %	Blend #2 volume %	Blend #3 volume %	Blend #4 volume %
R.E.R. (relative evaporation rate)	1.902	1.764	2.083	1.242	1.866
Hansen solubility parameters					
Dispersion	8.8	7.4	7.72	7.4	7 .37
Polar	0.7	1.46	3.32	1.764	1.26
Hydrogen bonding	1.0	3.11	2.46	3.082	2.17
Total	8.884	8.159	8.756	8.208	7.785

Table 4 **Key points—Eastman's replacement blends vs. toluene**

Blend	Environmental	Uses	Comments
Blend #1	– Non-HAP – Non-SARA reportable – Lower toxicity concerns	– Cleaners – Inks – Nitrocellulose lacquers	Addition of aliphatic hydrocarbon helps lower cost.
Blend #2	– Non-HAP – Non-SARA reportable	– Automotive – Coil – Architectural interior	MPK provides the versatile solvency and helps contribute to a lower VOC versus other types of solvents with similar evaporation rate.
Blend #3	– Non-HAP – Non-SARA reportable	– Wood furniture – Auto refinish	IBIB brings excellent blush resistance which is important especially for wood coatings and stains.
Blend #4	– Non-HAP – Non-SARA reportable	– Thinners – Sealants – Lacquers – Varnishes	Isopar™ C lowers the solvency to help minimize elastomer swelling in adhesives and rubber goods.

Conclusion

Today's formulators and applicators are looking for toluene alternatives as more regulatory rules are promulgated and enforced. Examples can be seen in a variety of industries including adhesives, inks, paint, and coatings. A specific example is the EPA's (Environmental Protection Agency) focus on the wood furniture industry because it is one of the largest OEM consumer markets for solvent use. Formulators and applicators are not only seeing pressures at the federal and state level but abroad as well. The suggested replacements should assist formulators and applicators in their requirements to meet regulatory challenges.

EASTMAN

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

www.eastman.com

TT-41C 6/13