

Coatings Market Technical Tip TT-87A

Diisobutyl Ketone (DIBK) Solvent Substitution Options

DIBK is typically manufactured as a co-product of MIBK. Since it is not made deliberately, DIBK can sometimes be in short supply. The purpose of this technical tip is to illustrate how Eastman™ MAK (methyl n-amyl ketone) or Eastman™ MIAK (methyl isoamyl ketone) can be used as potential solvent or solvent blend substitutes for DIBK (diisobutyl ketone).

DIBK is an active solvent for a variety of synthetic resins. It is unique in that it provides an excellent balance of the following key properties:

- Solvency
- Evaporation rate
- Density
- Water miscibility
- Surface tension

While there are no other solvents that precisely match the properties of DIBK, *Eastman* MAK and MIAK are very

similar. In addition to being active solvents for a wide variety of resins, *Eastman* MAK and MIAK are relatively slow to evaporate, have low densities and surface tensions, and low water miscibility.

In applications where matching the evaporation rate and the solvency of DIBK are critical to the formulation, using blends of solvents with slower evaporation rates may be necessary. By blending *Eastman* MAK or MIAK with slower evaporating solvents, such as Eastman™ EEP (ethyl 3-ethoxypropionate) and Eastman™ 2-EHA (2-ethylhexyl acetate), formulators are able to adjust the solvent blend to suit their requirements.

Table 1 shows a comparison of suggested DIBK replacements based on performance. The blend ratios are adjusted to match the evaporation rate of DIBK. Table 2 lists the properties of each solvent or solvent blend.

Table 1: Performance of Suggested Replacements When Compared to DIBK

Key Properties	Performance Benefit	Eastman™ MAK or MIAK/EEP 50/50 Blend	Eastman™ MAK or MIAK/2-EHA 80/20 Blend	Eastman™ MAK	Eastman™ MIAK
High solvency	Lower viscosities at higher solids level	Equal	Better	Better	Better
Slow evaporation rate	Good flow and leveling Reduced surface defects Blush resistance	Equal	Equal	Slightly faster	Slightly faster
Low density	Reduced VOC	Slightly higher	Equal	Equal	Equal

Table 2: Solvent Properties

Solvent	DIBK Weight%	Eastman™ MAK or (MIAK) / EEP Blend Weight%	Eastman™ MAK or (MIAK) / 2-EHA Blend Weight%	Eastman™ MAK Weight%	Eastman™ MIAK Weight%
Eastman™ DIBK (Diisobutyl Ketone)	100	—	—	—	—
Eastman™ MAK (Methyl n-Amyl Ketone)	—	50	80	100	—
Eastman™ EEP Solvent (Ethyl 3-Ethoxypropionate)	—	50	—	—	—
Eastman™ MIAK (Methyl Isoamyl Ketone)	—	(50)	(80)	—	100
Eastman™ 2-Ethylhexyl Acetate	—	—	20	—	—
Total	100	100	100	100	100

Hansen Solubility Parameters

Hydrogen bonding	2	3.1	2.1	2	2
Dispersion	7.6	7.9	7.9	7.9	7.6
Polar	1.8	2.2	2.5	2.8	2.8
Total	8	8.8	8.5	8.6	8.3

Key Properties

Relative evaporation rate (n-butyl acetate = 1)	0.193	0.197	0.175	0.4	0.5
Density (lb/gal)	6.76	7.36	6.89	6.8	6.76
Solubility (wt% in water/water in @ 20°C)	0.05/0.7	2.9/2.2 ^a	0.03/0.55 ^a	0.5/1.3	0.5/1.2
Surface tension (dynes/cm @ 20°C)	24.6	26.5	26.0	26.1	25.8
Hazardous air pollutant	no	no	no	no	no

^aSolubility data is for the slower solvent of the blend

Summary

Eastman is a leading provider of solvents to a variety of industries and helping our customers meet their solvent needs is what we do. This technical tip is intended to help guide formulators that are looking for solvent substitution

options for DIBK. If additional assistance is needed, contact 800-EASTMAN and ask to speak with your technical service representative.





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) 423-229-1193
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.

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

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

ASIA PACIFIC

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.

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

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

Material Safety Data Sheets providing safety precautions, that should be observed when handling and storing Eastman products, are available online or by 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.

© Eastman Chemical Company, 2008.

Publication TT-87A
March 2008