Dimethyl Carbonate (DMC) replaces MEK

April 2011
Overview

- Review of DMC physical properties
- VOC exemption status by state
- Physical properties comparison: DMC VS MEK
- Regulatory comparison: DMC VS MEK
- Use recommendations of DMC
DMC: Physical Properties

- Colorless
- Moderate to fast evaporation rate
  - $n$-butyl acetate = 1; DMC = 3.4; acetone = 7.2;
- Good solvency and compatibility
  - Polar solvency
  - Moderate H-bonding strength
- Low toxicity
  - Mild odor, sweet and crisp
  - Low skin irritation
  - TWA 200 ppm, recommended exposure limit
- Freeze point: 2 – 4 °C (36 – 38 °F)
- Flammable Liquid, Flash point: 17 °C (63 °F)
- Density: 1.071
DMC & PC VOC EXEMPT STATES
Last updated: April 1, 2011

Red: state level exemption in process; for PC check with local air board. DMC approved
Orange: check with local ARP to confirm exemption, most have approved
Yellow: state level exemption approved, nearly complete, confirm with local air board
Green: VOC exemption complete
## Physical Property Comparison: DMC VS MEK

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>DMC</th>
<th>MEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density @ 25C (#/gal)</td>
<td>8.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Boiling Point (C)</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>3.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Flash Point (F)</td>
<td>17.2</td>
<td>-3.9</td>
</tr>
<tr>
<td>Hansen solubility Parameter (Cal/cm³)</td>
<td>9.9</td>
<td>9.3</td>
</tr>
<tr>
<td>Polar/Hydrogen bonding</td>
<td>4.7/1.9</td>
<td>4.4/2.5</td>
</tr>
<tr>
<td>Surface Tension (dynes/cm)</td>
<td>28.5</td>
<td>24.2</td>
</tr>
<tr>
<td>Vapor Pressure 20 C (mm Hg)</td>
<td>42</td>
<td>85</td>
</tr>
<tr>
<td>Freeze Point (C)</td>
<td>4</td>
<td>-86.3</td>
</tr>
</tbody>
</table>

DMC compares favorably to MEK

- **Pros**: improved flash point for fire safety
- **Cons**: freeze point
# Regulatory Comparison: DMC VS MEK

<table>
<thead>
<tr>
<th>Regulation</th>
<th>DMC</th>
<th>MEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARA 313 Reportable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Hazardous Air Pollutant</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
DMC: Paint & Coating Use

- Co-Solvent: DMC is best used as a co-solvent for: acrylics, urethane and alkyd systems
  - Partial to full replacement with DMC did not show negative coating performance for polyurethane varnish and matt finish paints
- Compatibility: DMC is miscible with almost all organic solvents
- Regulatory Compliance: DMC easily replaces:
  - oxygenated solvents like esters and glycol ethers for improved regulatory compliance
  - partial amounts of alcohols and ketones