The North American Market for UV/EB Technology
Bio Inspired Glue
Shark Skin Aircraft Coatings
Ultra Thin PV Applications
Thinking Differently About Wine?
Most Competitive Exporters
Source: Boston Consulting Group 2014

Under Pressure
China, Brazil, Czech Republic, Poland, Russia

Losing Ground
Belgium, Sweden, France, Switzerland, Italy

Rising Stars
Mexico, USA
## MAPI Manufacturing Forecasts

### Spring 2014 Forecast, Annual Percent Changes

<table>
<thead>
<tr>
<th>Sector</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing Starts</td>
<td>19</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>Motor Vehicle &amp; Parts</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Household Appliances</td>
<td>7</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Aluminum Production</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Fabricated Metal Products</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Paper</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Industrial Machinery</td>
<td>3</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Communications Equipment</td>
<td>0</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Electric Lighting Equipment</td>
<td>-3</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Medical Equip. &amp; Supplies</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Aerospace Products &amp; Parts</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Public Works Construction</td>
<td>-5</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Ink World Magazine Survey

(412 respondents)

Are you currently working with UV/EB-curable products?
- Yes: 57.5%
- No: 42.5%

If no, have you ever evaluated UV/EB-curable products?
- Yes: 41.7%
- No: 58.3%
Ink world Magazine Survey
(412 respondents)

What are the most important factors relating to the adoption of UV/EB curable products?

- Speed: 53.1%
- Better physical properties: 48.6%
- Reduced VOCs: 45.8%
- High benefit/cost: 42.5%
Ink world Magazine Survey
(412 respondents)

What materials do you primarily work with?

- Water-based liquid: 64.8%
- Solvent-based liquid: 46.4%
Coatings World Magazine Survey
(906 respondents)

Are you currently working with UV/EB-curable products?
- Yes: 30.4%
- No: 69.6%

If no, have you ever evaluated UV/EB-curable products?
- Yes: 27.7%
- No: 72.3%
What is the most important factors relating to the adoption of UV/EB curable products?

- Speed: 50.8%
- Reduced VOCs: 45.3%
- Better physical properties: 44%
- High benefit/cost: 39.3%
Which of the following other materials do you currently work with?

- Powder coating: 21.3%
- Water-based liquid: 69%
- High Solids: 45.3%
- Solvent-based liquid: 60.6%
MOTIVATIONS for Using UV-LED Technology. By ranking:

1. Suitable for heat-sensitive substrates
2. Energy efficiency
3. System lifetime/downtime benefits
4. Instant on/off capability
5. Operating cost savings
6. More consistent UV output
7. Health and safety benefits
8. Environmental
9. Capital cost savings
Factors that may be limiting the use of UV-LEDs:

1. Lack of suitable curable materials
2. UV-LED investment costs too high
3. Technical limitations of existing equipment (output, cooling, size, wavelength)
4. Users lack of UV-LED familiarity/knowledge
5. New technology
6. Critical lamp to substrate distances
7. Limited base of installed UV-LED installations for the market application
8. UV-LED formulated ink, coating, or adhesive costs too high
The time frame in which you believe LED curing will become commonplace for:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>0-2/ys</th>
<th>2-5/ys</th>
<th>Col 1+ Col 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Inkjet (single pass)</td>
<td>58</td>
<td>25</td>
<td>83</td>
</tr>
<tr>
<td>Digital Inkjet (wide format)</td>
<td>45</td>
<td>34</td>
<td>79</td>
</tr>
<tr>
<td>Adhesives (industrial)</td>
<td>29</td>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td>Screen Inks</td>
<td>22</td>
<td>34</td>
<td>56</td>
</tr>
<tr>
<td>Flexo Inks</td>
<td>22</td>
<td>42</td>
<td>64</td>
</tr>
<tr>
<td>Adhesives (field applied)</td>
<td>21</td>
<td>37</td>
<td>58</td>
</tr>
<tr>
<td>Offset Inks (high speed graphics)</td>
<td>16</td>
<td>34</td>
<td>50</td>
</tr>
<tr>
<td>Offset Inks (sheet metal deco)</td>
<td>15</td>
<td>37</td>
<td>52</td>
</tr>
<tr>
<td>Coatings (graphics)</td>
<td>15</td>
<td>36</td>
<td>51</td>
</tr>
<tr>
<td>Coatings (field applied)</td>
<td>12</td>
<td>32</td>
<td>44</td>
</tr>
<tr>
<td>3D Industrial</td>
<td>12</td>
<td>34</td>
<td>46</td>
</tr>
<tr>
<td>Coatings (industrial)</td>
<td>7</td>
<td>36</td>
<td>43</td>
</tr>
</tbody>
</table>
2013 UV/EB Formulated Product Usage by Volume (percent of total)

- Graphic Arts—OPV: 28%
- Graphic Arts—Inks: 21%
- Wood: 19%
- Plastic Coatings: 6%
- Printing Plates: 5%
- Adhesives: 7%
- Optical Fiber: 3%
- Metal Decorating: 3%
- All Other: 8%
2013 UV/EB Formulated Average Annual Growth Rate Last Two Years (by Volume)
Top 10 Projected UV/EB Applications
(Each expected to grow by over 7% per year over next two years):

1. 3-D Printing/Additive
2. Inkjet Graphic Arts
3. Inkjet Industrial
4. Fingernail Applications
5. Laminating Adhesives
6. Water-Based UV
7. Field-Applied UV
8. Metal Decorating
9. Electronics
10. Food Packaging Applications
RadTech Biennial Survey

Top Emerging Markets for UV/EB

1. China
2. India
3. Brazil
4. USA
RadTech Biennial Survey

UV/EB Formulated Product Sales Growth in North America, by Volume

Projected Annual Growth Over the Next Three Years—6.7%

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>4.6%</td>
</tr>
<tr>
<td>2013</td>
<td>5.4%</td>
</tr>
<tr>
<td>2014</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

(Percent change from previous year)
Most Important Advances in Last Two Years:

1. Improved outdoor weathering
2. Better adhesion
3. Fast cure speeds
4. UV-LEDs
Thank you!

www.radtech.org