North American UV+EB Market Overview

Eileen Weber
allnex
President, RadTech North America
UV+EB Emerging Applications

Could this extra squishy new material mean safer bike helmets?

JOHNS HOPKINS ARL'S BREAKTHROUGH FLEXIBLE, CUTTABLE LITHIUM-ION BATTERY NOW WON'T CATCH FIRE

MAJOR IKEA SUPPLIER IN EUROPE USES UV LED CURING IN FURNITURE FINISHING

GETTING FLOORED FOR ALL THE RIGHT REASONS

EVERYTHING THAT GOES INTO MAKING A NEW BALANCE SNEAKER

WASTE COOKING OIL TURNED INTO 3D PRINTING RESIN

NAIL ENAMEL GETS greener

WORKHOLDING ADHESIVES FOR OPTICAL AND CERAMIC COMPONENTS

SELF-STICK ADHESIVE MADE WITH BLACK PEPPER DERIVATIVE ADJUSTS TO MANY TASTES

www.radtech.org
A Unique Idea Accelerator for UV+EB Start-ups, Students & Innovators
UV+EB Formulated Product Sales Growth in North America, by Volume (percent change from previous year)

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 (e)</td>
<td>3.7%</td>
</tr>
<tr>
<td>2020 (f)</td>
<td>4.6%</td>
</tr>
<tr>
<td>Next 3 year Annual Avg (f)</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
Global Market for UV+EB
RadTech NA Survey 2020

North America 26%
EU Europe 27%
Asia 38%
Rest of World 9%
UV+EB Formulated Product Usage 2019, By Volume

North America (Metric Tons '000)

- 2001: 77.3
- 2003: 84.1
- 2005: 97.5
- 2007: 110.8
- 2009: 112.1
- 2011: 122.0
- 2013: 132.6
- 2015: 142.7
- 2017: 151.2
- 2019: 165.1

RadTech Survey Biennial Market Survey 2020
2019 UV+EB Formulated Product Usage by Volume (percent of total)

- Graphic Arts—OPV: 25%
- Graphic Arts—Inks: 22%
- Wood: 18%
- Plastic Coatings: 12%
- Printing Plates: 7%
- Adhesives: 5%
- Optical Fiber: 5%
- Metal Decorating: 3%
- All Other: 3%
- Other: 12%
3D Printing?

Gartner Hype Curve

- Technology Trigger
- Trough of Disillusionment
- Slope of Enlightenment
- Plateau of Productivity
- Peak of Inflated Expectations
Next 2 Year Forecast
RadTech Biennial Survey 2020

UV+EB Products:
Average Annual Growth Rate
Over Next Two Years (by Volume)
UV+EB Formulated Product Usage by Volume

Other Categories We Track

- Graphic Arts Clear OPV
- Off-Set (Litho) Inks
- Screen Printing Inks
- Flexo Inks
- Letter Press Inks
- Inkjet Inks
- Wood Fillers
- Wood Stains and Sealers
- Wood Pigmented Coatings
- Wood Clear Finishes
- Wood Flooring (Prefinished)
- Metal Tubing & Pipe
- Metal Name Plate
- Metal Wire Coating
- Electronic Adhesives
- Electronic Photoresists
- Conformal Coatings
- Silicone Release Coatings
- Optical Fiber-Coating, inks, matrix
- Printing Plates (Flexo & Off Set)
- Stereolithography/Additive manuf.
- Dental Applications
- Medical Apparatus
- Plastic Film & Sheet (exclude Vinyl Flooring (Tile & Sheet)), incl. display film, auto film, optical film, window film etc.
- Vinyl Flooring (Tile & Sheet)
- Plastic Auto Lens & Reflectors
- Plastic Interior Trim
- Plastic Flooring (Prefinished)
- Adhesives--Optical
- Adhesives--Pressure Sensitive
- Adhesives--Laminating
- Can Coating Inks
- Can Coating OPV
- Can End Varnishes
# UV+EB Formulated Product Curing Distribution by Equipment Type

## North America

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional UV</td>
<td>74%</td>
</tr>
<tr>
<td>UV LED</td>
<td>15%</td>
</tr>
<tr>
<td>Electron Beam</td>
<td>6%</td>
</tr>
<tr>
<td>Dual Cure/Hybrid Cure</td>
<td>5%</td>
</tr>
</tbody>
</table>

RadTech Biennial UV+EB Market Survey 2020
Motivations for using UV+EB

- Improve Physical Performance
- Increase Productivity
- Enabling/New
- Green Technology/Environmental Compliance

RadTech Biennial UV+EB Market Survey 2020
Advances
Most Important
In Last 2 Years

- UV LEDs
- Better UV Technology Overall
- Better Adhesion
- Sustainable Materials

RadTech Survey Biennial Market Survey 2018
Needs To Address

- PI for UV LEDs
- Regulations
- Improved weatherability
- Sustainability
- Concerns About migration
- Adhesion

RadTech Biennial UV+EB Market Survey 2020