

Market overview 2013

Overview of the European market for Radiation Curing

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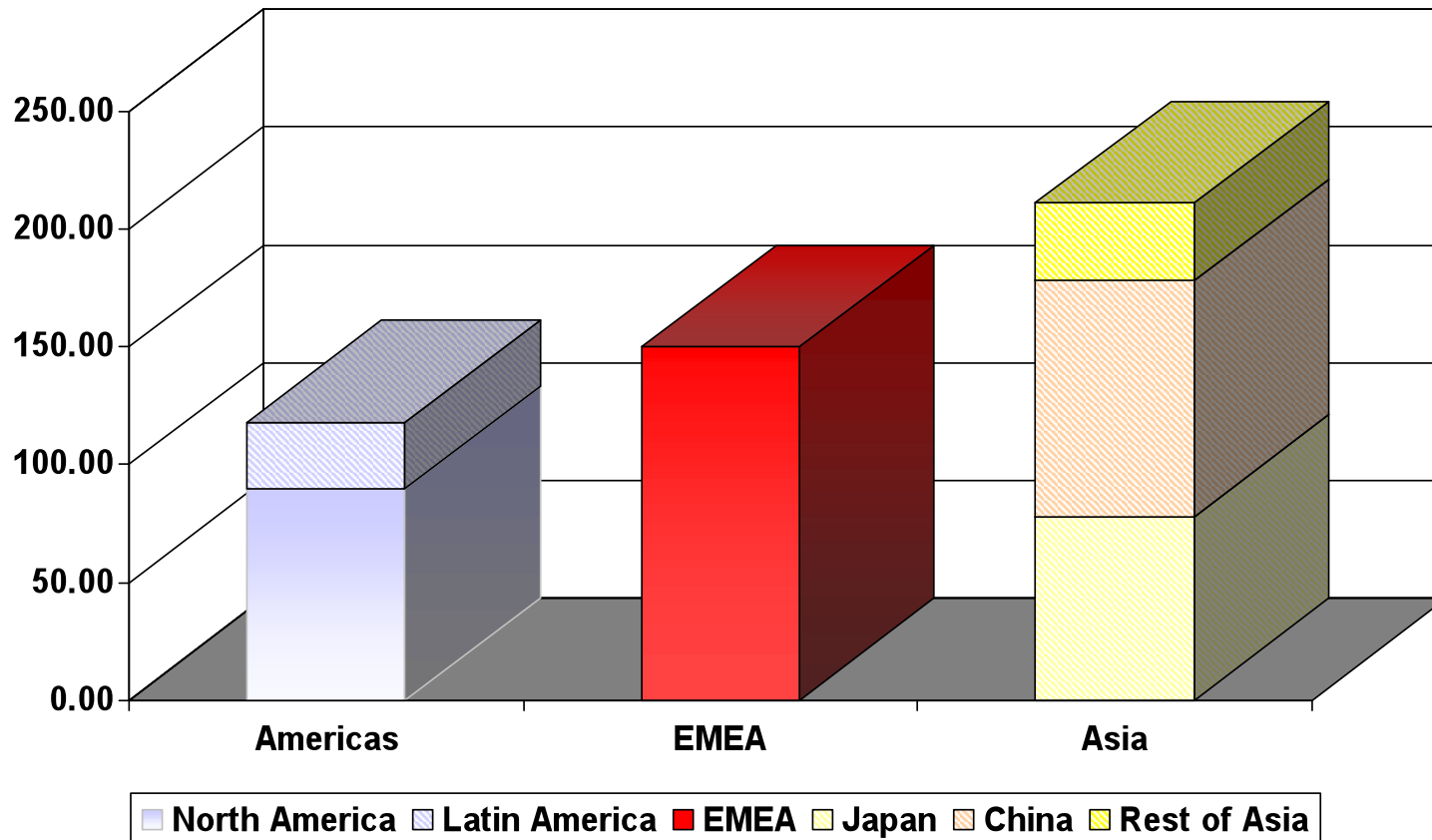


How the data was compiled

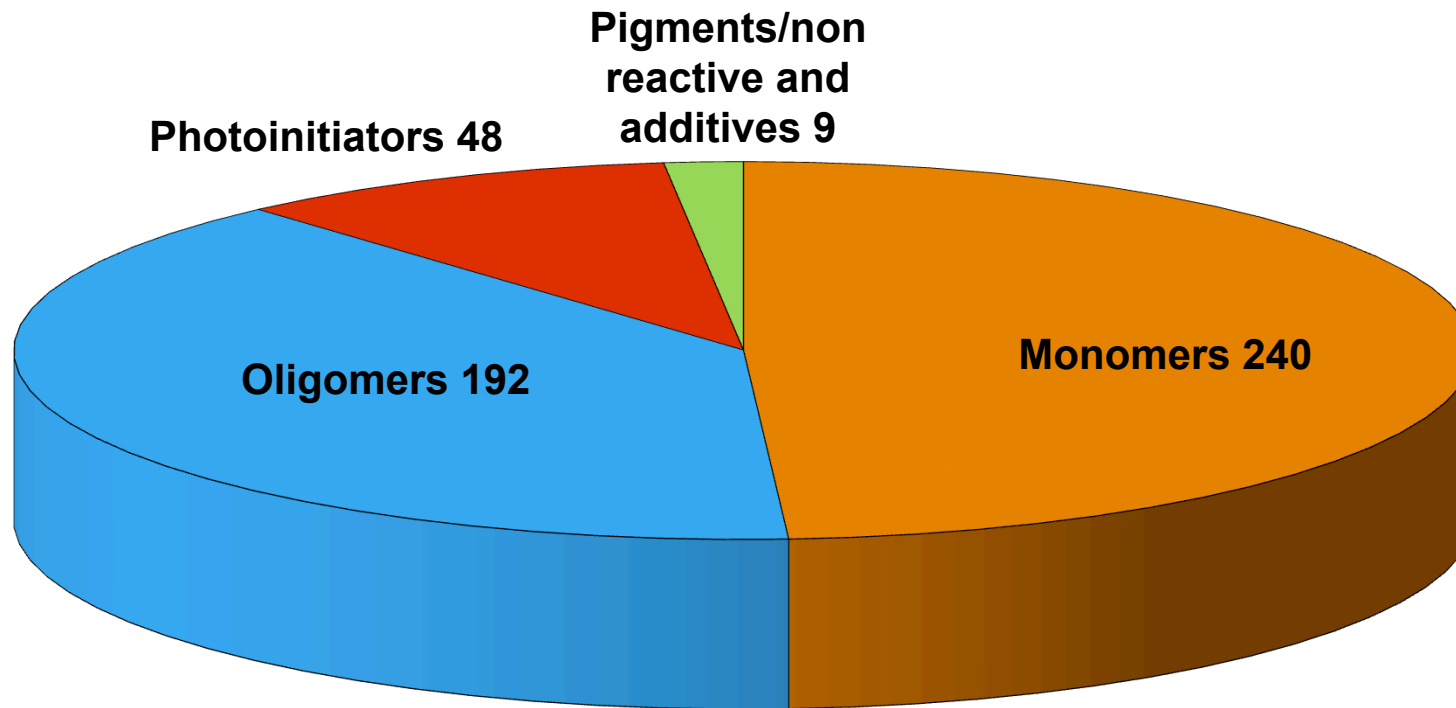
- Radiation curing is still a niche market and data is not collected in the major chemical studies.
- Data compiled from Raw Material manufacturers, various trade associations and private marketing reports.
- Main discrepancy is between Raw Material totals and Finished Formulation totals.
- Figures can be estimated by calculating the formulation percentages of Radiation Curing materials within Finished Formulations.

Global Energy Curing Market 2013

Approx. 489 K MT Only EMEA confirmed as 150 K mt



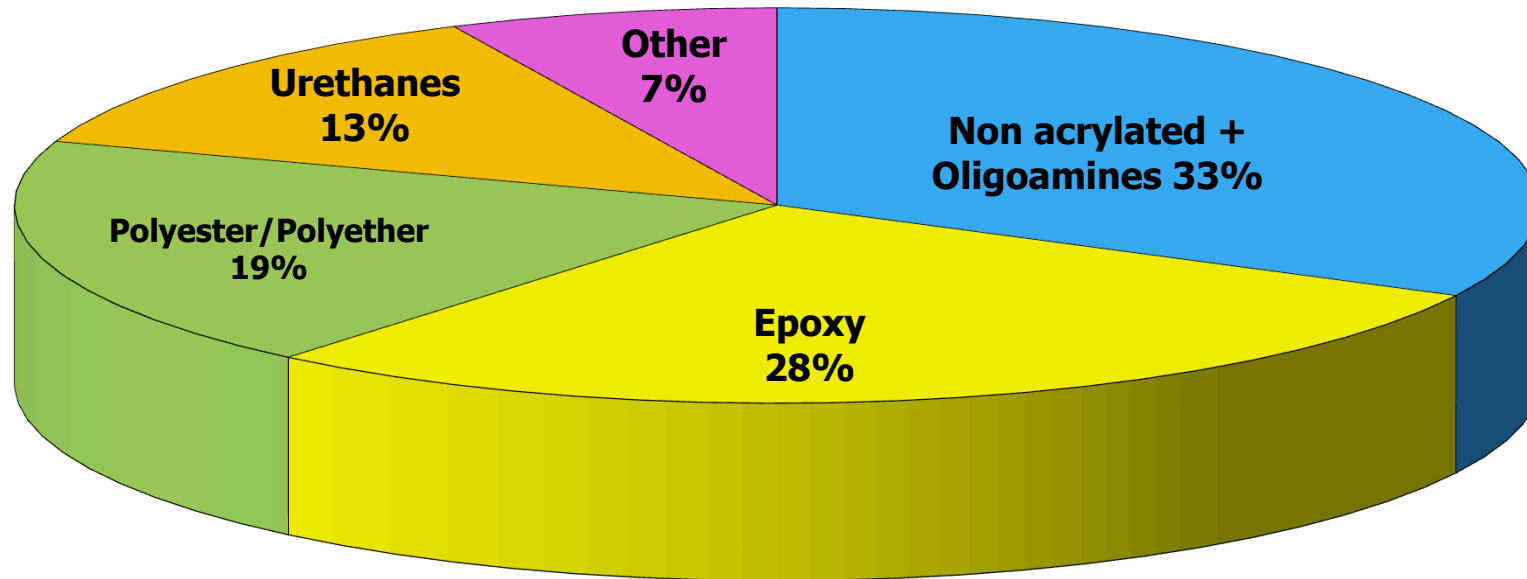
Energy Curing "Raw Materials"



(in 1,000 mt)

Worldwide formulated Usage 2013: 489000 mt

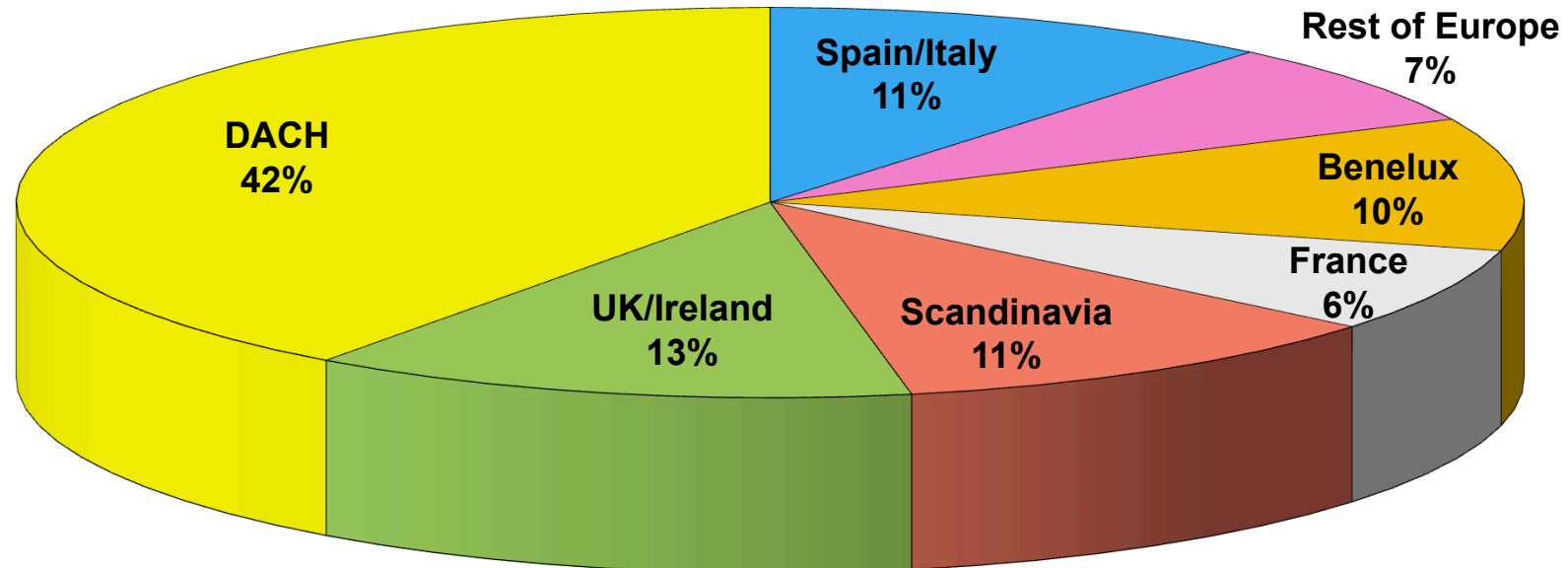
The Oligomer Market (in %)



Worldwide Usage 2013 192,000 mt

Trends; slight reduction in Epoxy and increases in PUDs and Polyester/Polyether.

European Energy Curing Market

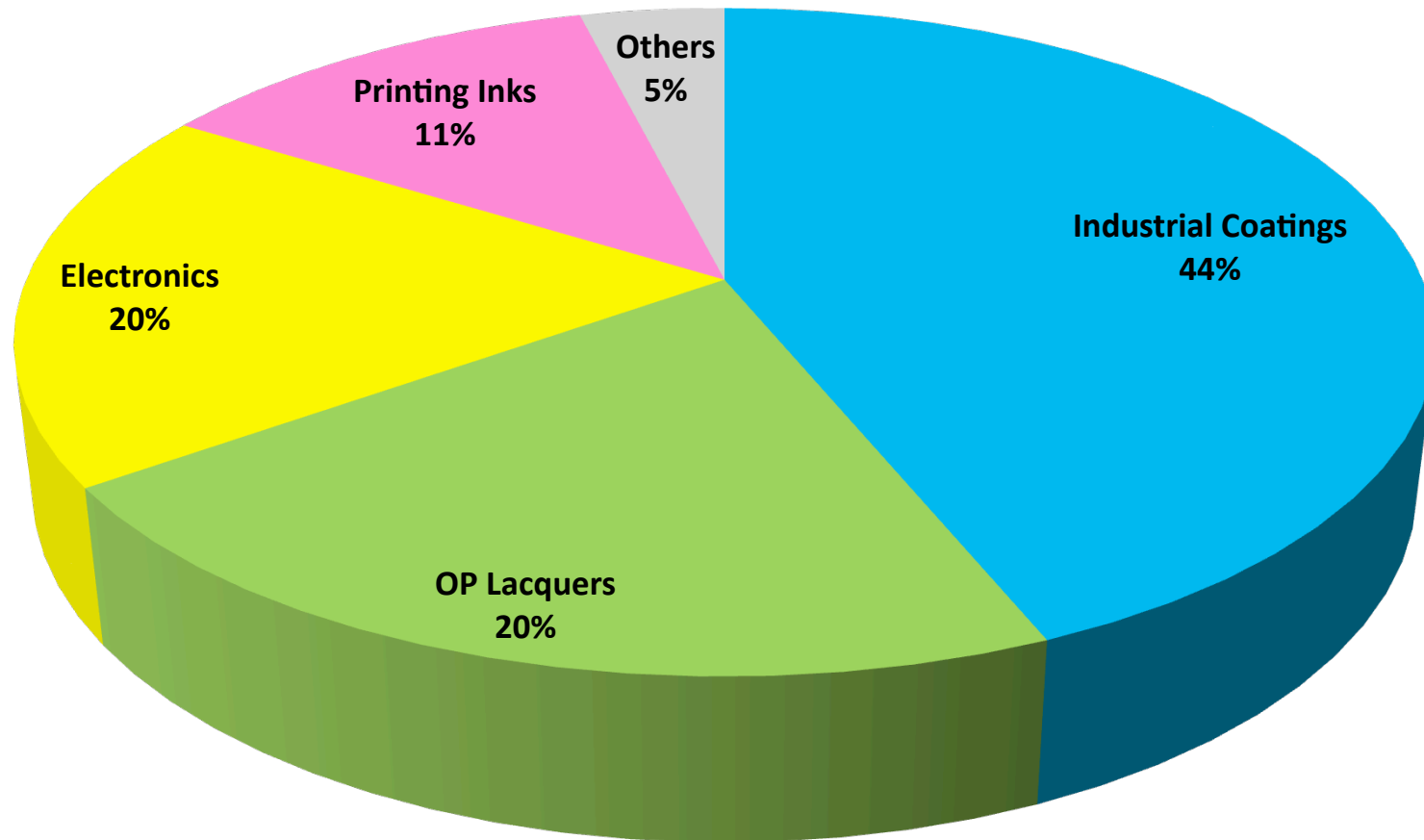


DACH = Germany, Austria + Switzerland

Formulation Volume 2012 =140,000 mt; **2013=150,000 mt**

Growth reached expected, circa 7% with slight increases of market share in DACH and decreases in France and the Benelux.

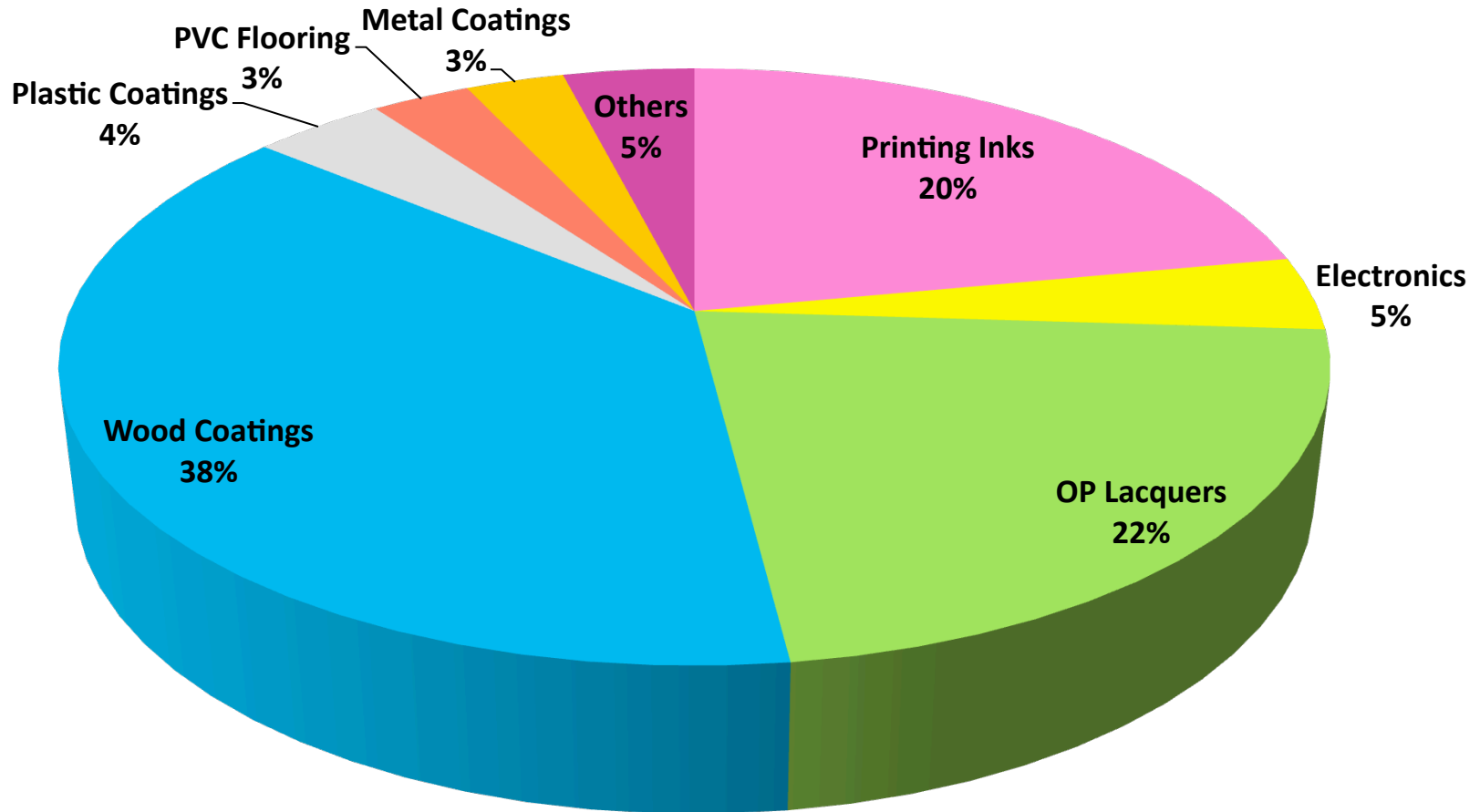
Energy Curing Applications



Worldwide Usage 2013: 489000 mt

Reduction in Printing Inks, increase in Electronics and Others.

Energy Curing Applications



Europe Usage 2013: 150,000 mt

Trends

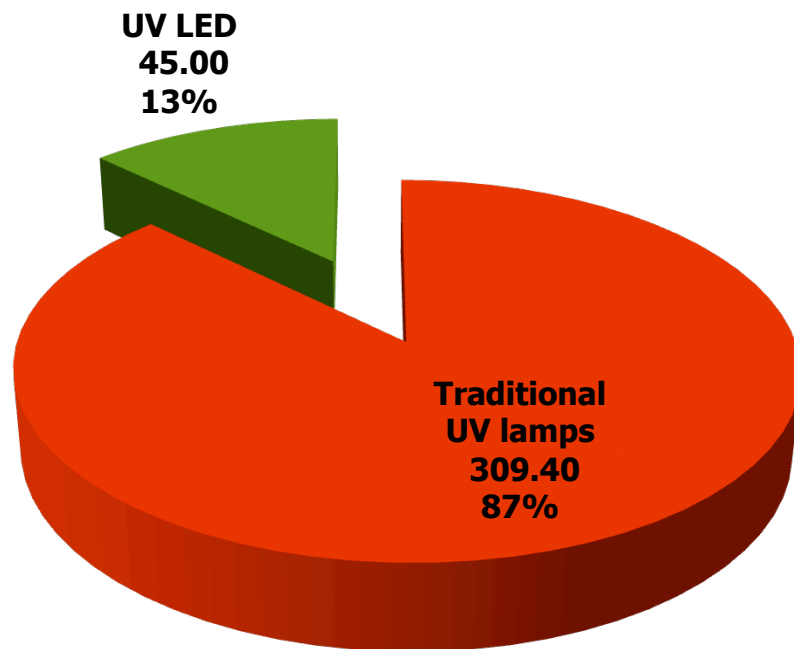


“new applications such as inkjet, field applied floor coatings, and water-based UV could stimulate growth beyond modest growth prospects.”

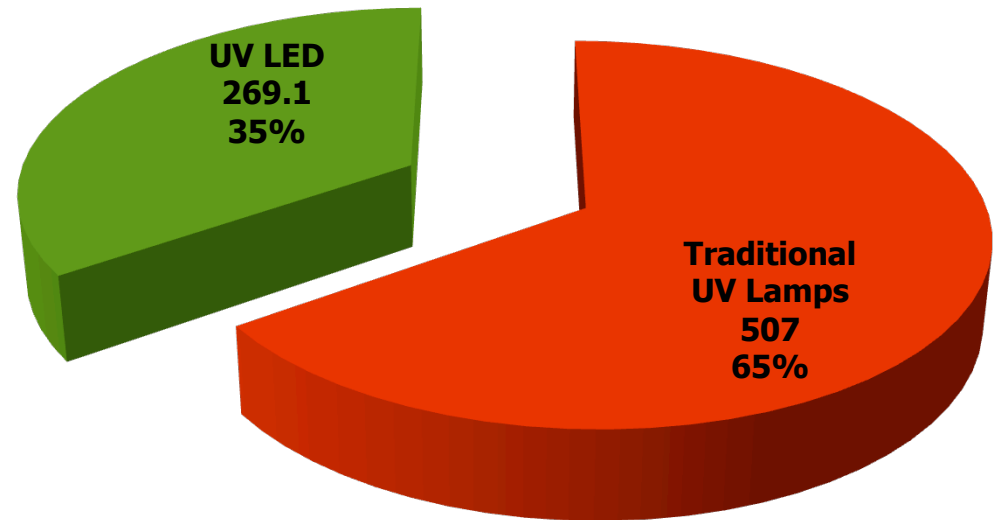
The Global Radiation Cured Products Industry market report, produced by Kusumgar, Nerlfi & Growney, Inc. in the spring of 2013

UV LED Lamp technology

Projected growth 2012 -2023



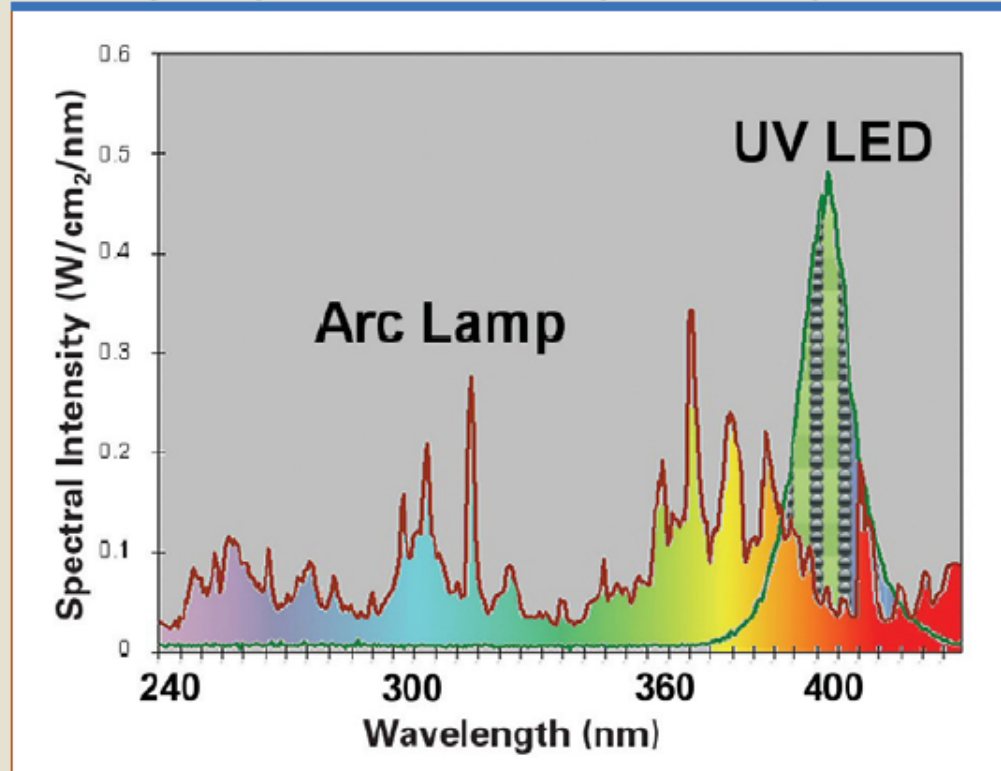
\$million (2012)



\$million (2023)

UV LED Lamp technology

Mercury lamp versus UV-LED spectral output



There has been early adoption in UV inkjet printing and more recently in the broader printing markets

UV LED systems are well suited to plastic applications and 3D modelling and are now being promoted for use in the wood (flat) coating and UV adhesive markets.

Growth of the UV curing market in the next 5-10 years will be closely linked to adoption of LED Lamp technology.

3D "Additive technologies

Once seen as prototyping, 3D modelling is now often seen as OEM manufacture

Various techniques

- Stereolithography.
(often cationic curing)
- Sintered powders and phase transition.
(Can be broken further, but mostly not UV curing)
- 3D print – Based on digital inkjet techniques.
(this technology is largely UV acrylate based)

Although there is fast growth and very big media hype, 3D printing is still relatively small.

Applications taken from the Innovation Sessions of Radtech

- Adhesives
- Offline/onsite, concrete, marble repair
- Real 3D writing
- Coating of plant seeds
- Paper modification (i.e. banana leaf)
- Car repair, glass, body, Windshields
- Transparent and conductive Coatings
- Ink jetted Solar panels
- Easy cleanable spray coatings
- Time/temp indicator films
- Textile, industrial and clothing
- UV cured optical materials
- Production of contact lenses
- Medical, enzyme encapsulation, biometric cellular coats, catheter tubes
- Dental
- Pipes, internal and external
- Circuit boards, solder resists, potting
- Thermal transfer ribbon
- Bank notes
- Glass fiber composites
- Sandpaper
- Rapid prototyping
- Coating on military vehicles
- Cosmetic fingernail decoration
- Membrane switches

And many more.....

Graphic Arts market

Graphic Arts

Global Print Market, \$ billion, constant (2010) prices & exchange rates

2006	2008	2009	2010	% change, 2009-10	2011	% change, 2010-11	2016	CAGR (%), 2011-16
804	822	777	785	1.0	791	0.8	845	1.3

Source: Pira International

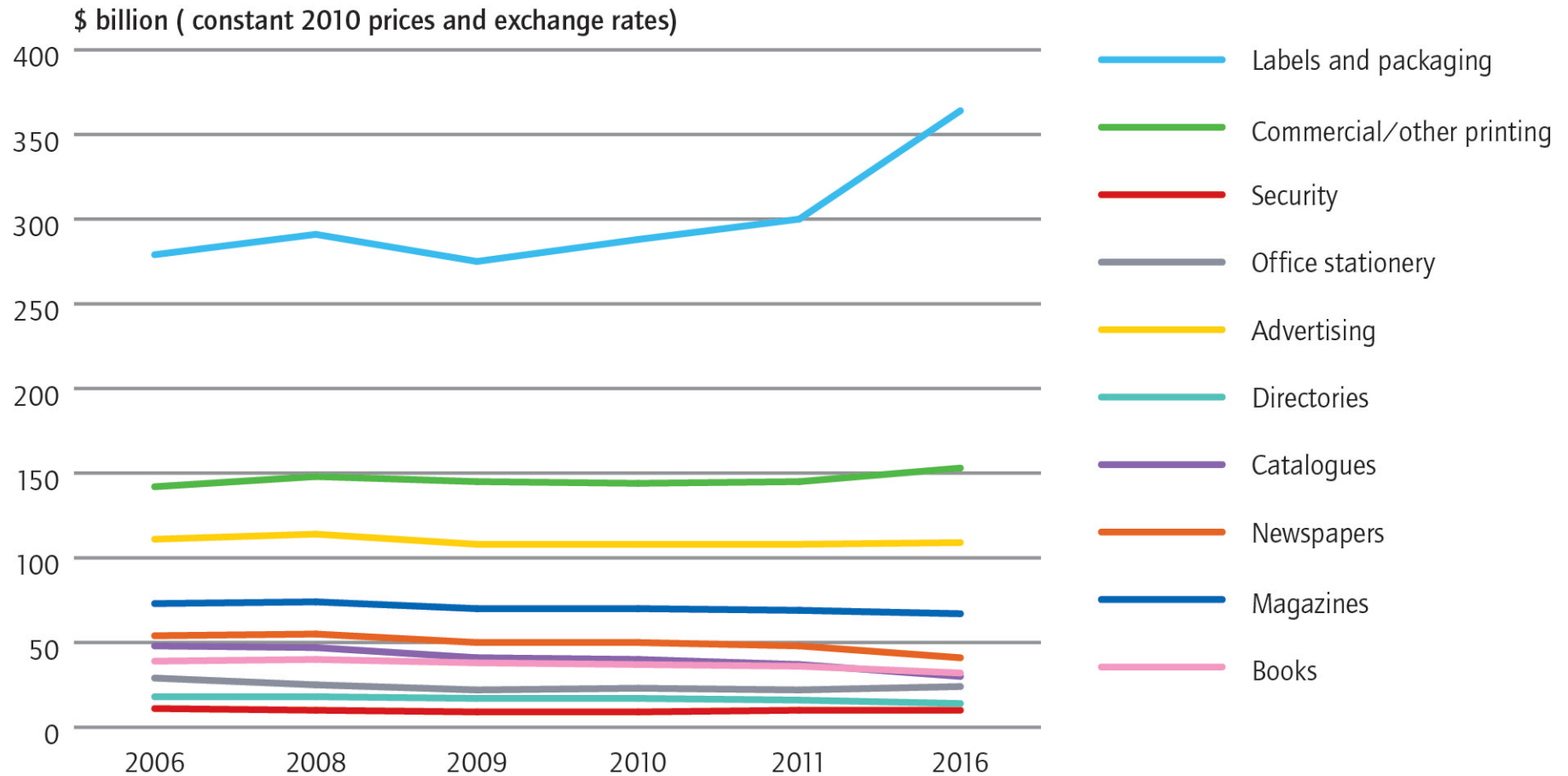
Certain sectors are growing at a much faster rate. (2011 – 2016)

- **growth of radcure in the packaging sector predicted to grow by 24%**
- **Growth of Radcure in UV Inkjet for labels and flexible packaging predicted 250% growth.**

(Pira International)

Graphic Arts

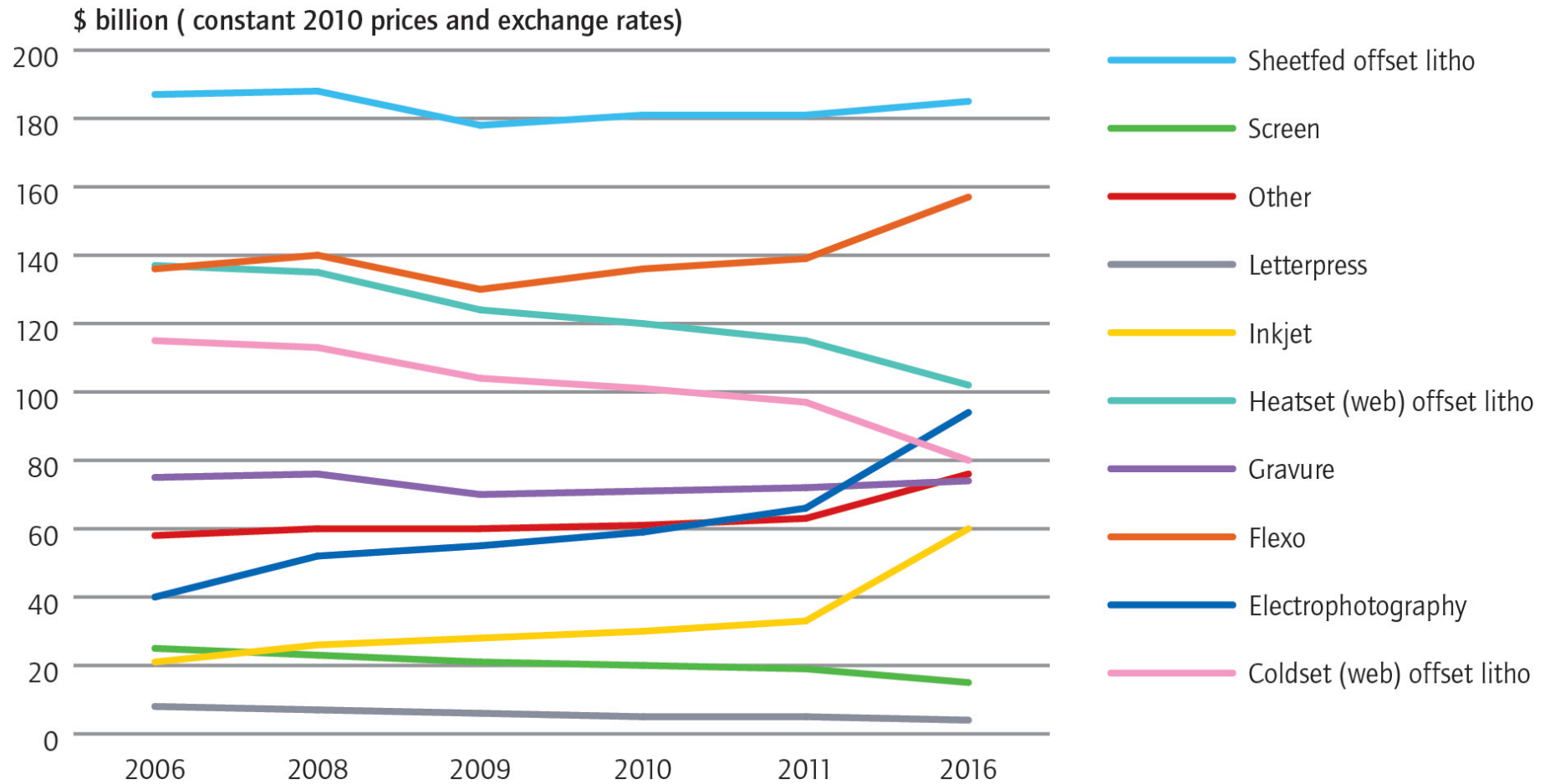
End-use Sectors (Global – all technologies)



Source: Pira International

Graphic Arts

Print Processes (Global – all technologies)



Source: Pira International

Inkjet

- “Inkjet is a small proportion of global print and printed packaging”
- “the sector is growing strongly while conventional print volumes fall”
- 2011 - 4.2% of print value. ~ 0.5% of the volume.
- 2017 - It will still account for less than 1% of print volume, but significantly it will be nearly 7% of the market value.



Industrial Coatings Trends

- **Technology Shifts**

- Even Industrial coatings are becoming more toxicity sensitive.
- Energy costs under greater scrutiny.
- Narrowing of raw material specifications, viscosity, colour etc.
- End specifications such as Weatherability, corrosion resistance are more stringent.
- Manufacture may migrate to AP but development of product and market still remains in Europe.
- More Water based UV and EB systems under consideration.

Regulatory and Compliance

REACH – Now the real work begins with the filling of the dossiers made more difficult with the lack of Analytical capacity available. Greater cost expected from reformulation.

Regulations – Swiss ordinance, German ordinance, RoHS (UV versus LED)

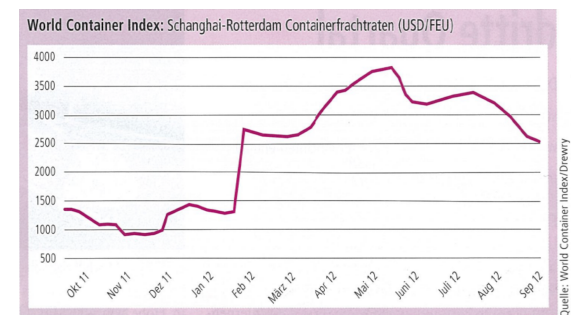
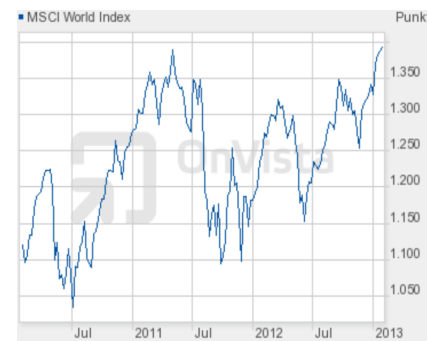
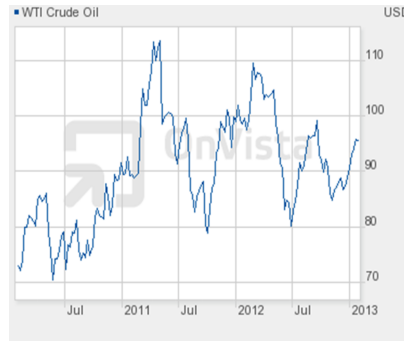
Compliance – Nestlé list , TetraPak, IKEA, BCF etc.

Restrictions –

Solvent, Stabilizer (e.g. MEHQ), Catalysts (e.g. Tin), various Photoinitiators including Benzophenone, various monomers from the compliance lists, BisPhenol A, and What comes next.

Unpredictable

- Volatility: Crude oil
- Volatility: Raw materials
- Volatility: Freight rates
- Volatility: Interest rates
- Volatility: Currency
- Volatility: Stock Markets



Thank You!!

Here's to a successful Radtech USA 2014