

UV & EB Technology

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Outline of Talk

- Little Background
- Economic/Energy/Enviro Transformation
- The Little Red Hen
- Some Data
- Thank you!

What is RadTech?

- Technical Association for UV & EB
- Based in Bethesda, MD
- About 20 Years of Service
- Over 700 Members
- Supporting Over 20 Manufacturing Industries

RADTECH
THE ASSOCIATION FOR UV&EB TECHNOLOGY



UV = Ultraviolet Light



EB = Electron Beam





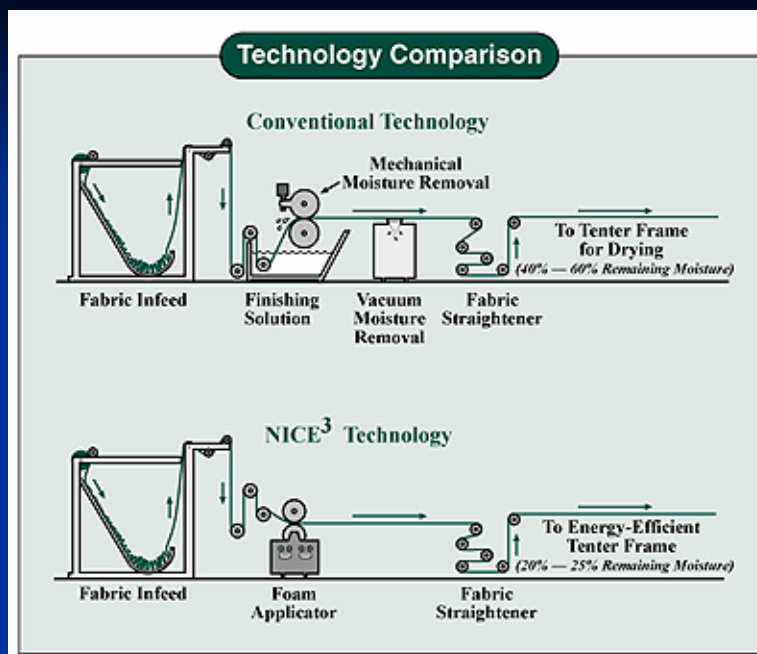
Big Share*

Fiber optics
 CDs/DVDs
 Over Print Varnish on paper
 Screen printing
 Coated labels
 Premium no wax flooring
 Ophthalmic plastic lenses (certain types)
 RTA furniture
 Automotive headlamps
 Photoresists used in circuit boards and chip manufacture
 Pre-finished hardwood flooring
 MDF fillers
 Particleboard fillers
 Window film coatings
 Photopolymer printing plates
 Decorative films (certain types)
 Mummification (3-5000 years ago, Egypt)

* End uses where UV/EB already holds a double digit share, ranging from 30% to close to 100%.

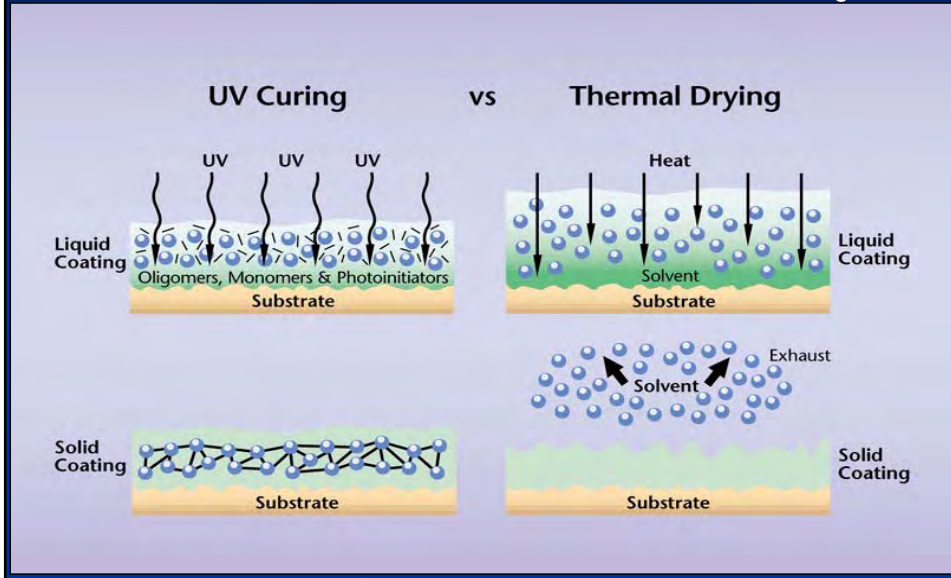
UV/EB Curing

- A True “Pollution Prevention” Technology
 - No/low VOCs, HAPs, CO₂
- Not an end-of-pipe control technology
- Offers substantial reductions in energy demand and emissions

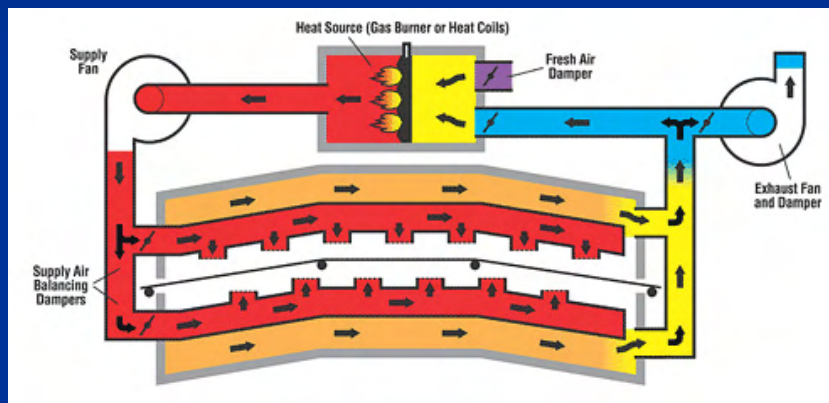


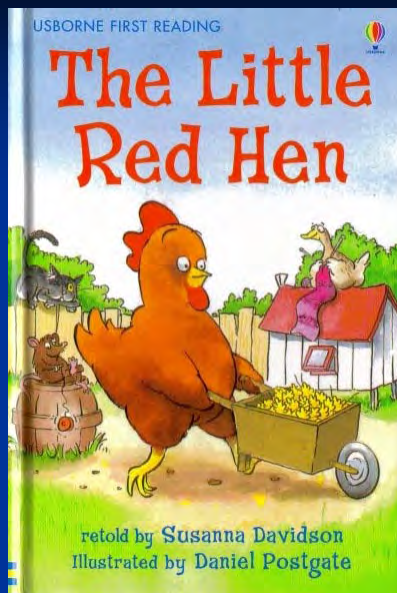
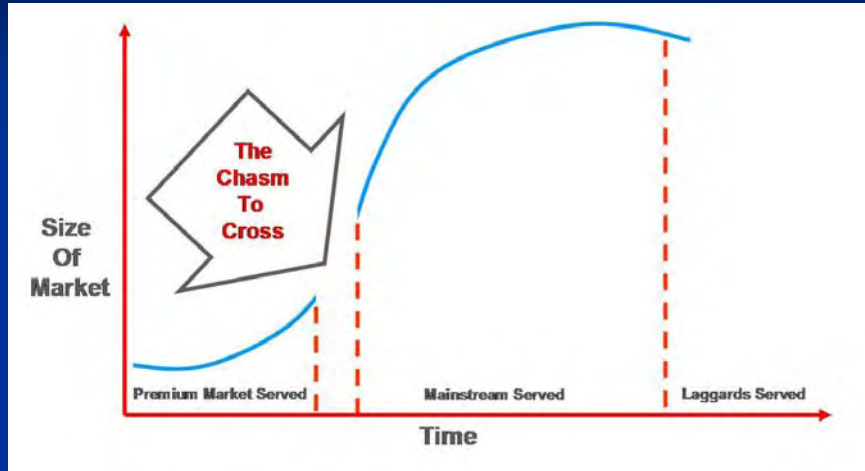
Chemistry & Formulation of UV

What are the differences between Conventional and UV curing?



Thermal Curing Process











Traditional Systems

- High energy demand:
 - Heat large volumes of air/substrate
 - Maintain the oven at temperature
 - Evaporate and remove water and/or solvent
- Require "end-of-pipe" VOC controls
- More energy input
- Greenhouse gases

UV/EB Safety Advantages

- UV/EB is inherently safer than solvents
- Low acute systemic toxicity
- Low chronic toxicity
- Not fetal or reproductive toxins
- Not carcinogenic or mutagenic in dermal and oral studies

Safety and Handling

MOST UV/EB COMPOUNDS / MATERIALS

- ↪ Generally not regulated by DOT as
 - ↪ Flammable
 - ↪ Corrosive
 - ↪ Toxic
- ↪ Generally not defined as "hazardous waste"
 - ↪ Should be disposed of properly in accordance with your state and local regulations
- ↪ Not included in any federal or state R-T-K list (Right To Know)

Safety and Handling

COMPARING SOLVENT & UV/EB SYSTEMS

	SOLVENTS	UV/EB
■ Explosive vapor	mostly yes	no
■ VOC	yes	no/low
■ HAPs	yes/no	no
■ Energy Use	high	low

Coors Brewing Company

Total Energy Usage

(Million BTU/Billion Cans)

	<u>W/B Thermal Uncontrolled</u>	<u>W/B Thermal + Incineration</u>	<u>UV Curing</u>
Electrical	16,300	19,500	15,900
Natural Gas	23,900	60,100	0
Total	40,200	79,600	15,900

Coors Brewing Company

Total Air Emissions (Metric Tons/Billion Cans)

	<u>W/B Thermal Uncontrolled</u>	<u>W/B Thermal + Incineration</u>	<u>UV Curing</u>
CO ₂	2,909	5,182	1,727
Nitrogen Oxides	8.1	11.6	6.5
Sulfur Oxides	18	23	18
Particulates	25	29	24
VOC	28	0.56	0.52
HAP	11.5	0.23	0.12
Non-Methane HC	0.05	0.10	0.02
CO	0.52	1.11	0.15
Ozone*	Not Measured	Not Measured	0.0019

*) Measured at the UV oven exhaust

BASF UV-Cured Web Coated Pressure Sensitive Adhesive

Energy Demand

	<u>acResin</u>	<u>Solvent</u>	<u>W/B Dispersion</u>
Electricity Consumption (MWh/yr)	3,917	2,758	5,376
Nat Gas-Curing (kft ³ /yr)	0	147,494	115,200
Nat Gas-VOC Incineration (kft ³ /yr)	0	64,128	0
Total Energy Demand (Million Btu/yr)	39,178	179,662	172,549
Normalized Energy Demand (million Btu/million m ² /yr)	510	2,802	4,493

100% Solids ⇒ Reduced Transport Carbon Emissions

- Truck Fuel Mileage: 5.7 mpg
- CO₂ Emissions /gallon: 22.4 Pounds
- Average length of haul: 500 miles
- Fuel gallons/haul: 89.9
- Emissions per haul: 2,014 lb CO₂

- Potential for > 1,000 lb CO₂ reduction per haul

References for estimates and conversion factors : US EIA

CONCLUSIONS UV/EB Curing

- Substantial reductions in energy use
- Substantial reductions in greenhouse gas emissions
- Substantial reductions in volatile organic emissions
- Safer workplace
- Positive performance advantages and economic returns

Thank you

- ASERTTI
- NYSERDA
- SCAQMD
- Southern Company
- ETAC
- And YOU!

www.radtech.org