OPPORTUNITIES FOR THERMOSET RESINS IN THE COMPOSITES INDUSTRY

Presented by: Sanjay Mazumdar, CEO
Lucintel, Dallas, USA
Contents

- About Lucintel
- Types of thermoset resins
- Applications of thermoset resins
- Price and Performance Analysis
- Thermoset resin Market ($ Billion) by Type of Material
- Resin market by Region
- Thermoset resin market by Industry Segments
- Market Trends
- Future Growth Opportunities
About Lucintel

- Global market research and management consulting firm
- Lucintel creates your equation for growth — whether you need to understand market dynamics, identify new opportunities or increase your profitability
- About 50 market intelligence reports off the shelf on various materials and industry segments.
Lucintel Customer

- Lucintel has over 700 customers from 70 countries.
Types of Thermoset Resins

Widely used thermoset resins for the composites industry are:

- Polyester resin
- Epoxy resin
- Vinyl ester resin
- Phenolic
- Polyurethane
- High temperature resins such as Cyanate Ester and BMI
Descriptions

- **Polyester resins**: Corrosion resistance, low weight, major applications: construction, pipe & tank, transportation
  - Orthophthalic & Isophthalic
  - FRP & Non-FRP

- **Epoxy resins**: coatings, adhesives, E&E, wind energy, pipes, tanks, aircraft parts, sporting goods etc.
Phenolics meet FAA and JAR requirements for low smoke and toxicity. Their applications are aircraft interiors, stow bins & galley walls etc.

Polyurethane can be thermosetting/ thermoplastic (based upon the functionality of the selected polyols) used in automobile and adhesive industry

Vinylester exhibit better resistance to water & are used in fiberglass tank, FRP pipes and marine products
Various applications of thermoset resins

Yachts, Trains, Wind blades, Water tank, Chemical storage tanks, (over 30,000 composites applications)
The mechanical properties of epoxies are higher than vinyl ester and polyester resins.

Epoxy resin provides highest toughness and strain to failure.

Typical Resin strain comparison (Post cure for 5 hrs @ 800 C)
The price of a resin depends upon several factors such as volume, quality, customer service, and more.

The overall analysis of the thermoset resins shows that epoxies have largest price variations based on performance.

Comparison of thermoset resins on price and performance matrix 07
Because of the relationship between competing materials and composites, where one material can be used as a replacement for another, prices become important.

Price comparison for various competing materials based on weight, strength and modulus.
Price & Performance Analysis

- Based on raw materials price, cold rolled steel is least expensive followed by glass/ polyester material.

- On strength basis, glass / polyester as well as carbon / epoxy composites are highly competitive as compared to aluminum & steel.
Price & Performance Analysis

- Aluminum costs $23 more per unit strength as compared to glass/polyester composites.

- Based on cost per unit modulus, stainless steel, aluminum and carbon/epoxy prices are comparable.

- Glass/polyester composites provide 40% - 50% raw material cost savings as compared to aluminum and steel – based on equal strength.
Market Opportunities

- In the global composites industry, thermoset resins dominate the market with 76.5% share.

![Bar chart showing global composites shipment (mil lbs) by resin type in 2007]
Total Market = $7.9 billion

Market share of different thermoset resins in the global composite industry ($ shipment)

- Polyester resin (66%)
- Epoxy resin (23%)
- Others (11%)

Source: Lucintel Market Report
Regional Analysis

- Asia and rest of the world (40%)
- North America (36%)
- Europe (24%)

Thermoset resin shipment ($ mil) by region in 2007 for the composites industry:

- Asia and Rest of World: 2921.48, 40%
- North America: 2657.30, 36%
- Europe: 1791.73, 24%
Thermoset resin market distribution ($ mil) by segments for composites

- **Construction** (26%)
- **Pipe & Tank** (20%)
- **Electrical/ Electronic** (16%)
Brief descriptions of markets

- **Construction:**
  - Residential (Bathtubs, decks, swimming pools etc.)
  - Commercial (Utility poles, bridges, railings etc.)

- **Pipe and Tank:**
  - Tanks (underground, above ground, and wrapping), fittings, ducts and hoods etc.

- **Electrical and Electronic (E & E) Segment:**
  - PCB, rods, tubes, molded parts, electrical housings etc.

- **Transportation:**
  - Automotives, trucks and truck trailers, mass transits etc.
Brief descriptions of markets

- **Marine**: hulls, decks, bulkheads, railings, hatch covers, tools etc.
- **Consumer Products**: Golf clubs, bicycles, fishing rods, skis, tennis rackets, snowmobiles, mobile campers, etc.
- **Aerospace / Defense**: commercial and military aircrafts
- **Wind Energy**: Blades, hubs, nacelles etc.
- **Others**: housings and bases, tooling, safety hats, and other products
Market Trends

- In the last 15 years, Glass fiber reinforced plastics (GFRP) grew by 50%, however, the market for Carbon fiber reinforced plastics (CFRP) grew at 5 times the rate of GFRP.

- Epoxy resin market is growing rapidly due to growth in wind energy, aerospace, and pipe and tank market.
Some of the future growth opportunities for thermoset resins in the composites industry are (Lucintel 2008):

- Wind energy
- Aerospace applications
- FRP (fiber reinforced plastic) window in North America
- FRP door in North America
- FRP pipes in China, India, and other developing nations
- FRP tanks in China, India, and other developing nations
Key Technology developments - Turbine capacity

Technology Road map

Average Turbine Capacity (MW)

- 2000: 2 MW
- 2008: 7.5 MW
- 2015: 12 MW

Key: The figures inside the box represent highest capacity in MW
Key Technology developments - Blade Length

Technology Road map

Key: The figures inside the box represent maximum blade length in m

Average Blade Length (m)

- 2000: 23 meters
- 2008: 63 meters
- 2015: 94 meters

The chart shows an upward trend in average blade length from 2000 to 2015.
Key Technology developments – Material Requirement in Blades

Technology Road map

- All Fiberglass Construction
- Glass and Carbon fiber construction
- Fiberglass + Carbon fiber + Nano Technology
Source and Contact Information

This analysis is based on following market reports from Lucintel:

“Trends and Forecasts in Global Thermoset Resin Market 2008-2013”
&
“Global Composites Market 2008-2013”
&

Report features: market size estimates ($ and lbs) for various market segments and applications, market share, market trends and forecasts (2008-2013) in various segments, and more)

For table of contents and other information on above, please contact me or Lucintel at:
helpdesk@lucintel.com
Tel.: 972-620-8888