

# Future Composite Materials Need for Global Wind Energy Market 2014–2019

https://marketpublishers.com/r/F52AD22702FEN.html

Date: October 2013 Pages: 240 Price: US\$ 4,900.00 (Single User License) ID: F52AD22702FEN

# **Abstracts**

According to Lucintel, total worldwide composite materials consumption in wind energy market is expected to witness significant decline in 2013 driven by reduced market for wind turbines in the US, India and other countries. The market is expected to recover during next five years (2014-2019), but with a slower pace. Wind energy market is getting affected by various factors such as reduced government support and incentives, decline in the prices of solar photovoltaic, grid connectivity issues and others.

The composite materials market for wind application includes various raw materials, such as polyester resin, epoxy resin, glass fiber, carbon fiber, adhesive, coating, and core materials.

Lucintel, a leading global management consulting and market research firm, has conducted a detail analysis on the future needs of composite materials for wind energy market and presents its findings in "Future Composite Materials Needs for Global Wind Energy Market 2014-2019". As per the study, the composite materials market in wind applications is expected to be an attractive market in the future as wind energy capacity installation would grow globally. European and US based material suppliers are likely to face threat from new suppliers of China and other nations. Material suppliers would have good opportunity in this growth market – working with new and existing blade manufacturers.

Although composites are gaining popularity in wind energy market but technological changes are creating new set of challenges. Some of the key challenges are achieving adequate stiffness to prevent excessive blade deflection, preventing buckling failure, and ensuring adequate fatigue life under variable wind loading conditions. To solve these challenges, blade manufacturers have started using high performance materials



such as carbon fiber but carbon fiber is eight to 10 times expensive than glass fiber which hinders its extensive use in turbine blades. During the forecast period, average cost of composite materials would increase as more carbon fiber and improved resin formulations will be adopted by blade manufacturers.

Wind energy industry is passing through uncertainties which create a challenge for the composite material suppliers. As of current data, the US market seems to be busted in the year 2013 due to inconsistency in government support and incentives among other factors. Huge layoff of approximately 3,200 employees in 2012 by leading players in the US wind energy market reflects declining confidence of industry players. India wind energy market is also suffering with policies inconsistency affecting the new capacity installations. China wind energy installation is losing its attractiveness considering a flat market in 2013 but significant investments towards grid connectivity promises gradual improvement in the market in the coming years.

This detailed research report contains the wind energy market analysis, market analysis for composites in wind industry, trends in wind blade technology, current and future resin and reinforcement materials needs, core materials in wind applications and many other elements, all of which can help you make confident business decisions in this globally competitive marketplace.

This unique report from Lucintel will provide you with valuable information, insights, and tools needed to identify new growth opportunities and operate your business successfully in this market. This report will save hundreds of hours of your own personal research time and will significantly benefit you in expanding your business in this market. In today's stringent economy, you need every advantage that you can find.

#### Features of This Report:

To make business, investment, and strategic decisions, you need timely, useful information. This market report fulfills this core need and is an indispensable reference guide for multinational materials suppliers, product manufacturers, investors, executives, distributors, and many more that operate in this market.

Some of the features of "Future Composite Materials Need for Global Wind Energy Market: 2014–2019" include:

Analysis of competitive intensity of the industry based on Porter's Five Forces model which helps to understand the competitive position of industry players



Global composite materials market intelligence with special emphasis on wind energy market

Market size in terms of value and volume by material type, market size trend (2008-2013) and forecast (2014-2019) for key market segments that are useful to make major investment decisions

Regional analysis provides composite materials in global wind energy market breakdown of key regions of North America, Europe, Asia Pacific, and Rest of the World in terms of value and volume

Competitive landscape, emerging trends, unmet needs, market drivers and growth opportunity analysis provided helps to ascertain a sound investment decision



# Contents

#### **1. EXECUTIVE SUMMARY**

## 2. INDUSTRY BACKGROUND AND CLASSIFICATIONS

- 2.1: Introduction to wind energy market 2.1.1: Major components of a wind turbine
- 2.1.2: Benefits of wind energy
- 2.1.3: Drawbacks of wind energy
- 2.1.4: Cost of wind energy
- 2.2: Introduction to composite materials in wind energy market
- 2.3: Wind blade manufacturing process
- 2.3.1: Hand Lay-up/Wet Lay-up process
- 2.3.2: VARTM Process
- 2.3.3: SCRIMP Process
- 2.3.4: Prepreg Lay-up Process
- 2.3.5: SPRINT Technology
- 2.3.6: Siemens Integral Blade Technology
- 2.4: Technology trends in wind blade manufacturing
- 2.5: Future blade manufacturing process needs
- 2.6: Supply chain for the composite materials in wind energy industry
- 2.7: Porter's Five Forces Analysis for composite materials in wind energy market
- 3. Composite Materials in Wind Blades
- 3.1: Overview of the blade manufacturing industry
  - 3.1.1: Increased blade length dynamics
- 3.1.2: Challenges in scaling up blade length
- 3.1.3: Advantage of composites use in blade manufacturing
- 3.2: Composite raw materials in wind blades
  - 3.2.1: Resin types
  - 3.2.2: Future needs from resins used in wind blade manufacturing
  - 3.2.3: Prepreg materials
  - 3.2.4: Reinforcement materials
  - 3.2.5: Carbon-Fiber use in wind blade manufacturing
  - 3.2.6: Future needs from reinforcement fibers in wind blades
  - 3.2.7: Adhesives for wind blade
  - 3.2.8: Performance improvement desired by blade manufacturers

# 4. RESIN, REINFORCEMENT, AND INTERMEDIATE MATERIALS



- 4.1: Epoxy-based resins for prepreg processing
- 4.2: Epoxy-based resins for infusion processing
- 4.3: Epoxy-based resins for hand lay-up process
- 4.4: Price and performance analysis for epoxy resins
- 4.5: Polyester resin for wind blade manufacturing
- 4.6: Vinyl ester resin for the vacuum infusion process
- 4.7: New developments in reinforcement materials
- 4.8: Fabric
- 4.9: Prepreg

# 5. CORE MATERIALS AND OTHER MATERIALS IN WIND APPLICATIONS

- 5.1: Overview of core materials in wind blades
- 5.2: Balsa end grain wood
- 5.3: PVC Foam (Polyvinylchloride Foam)
- 5.4: SAN Foam (Styrene-Acrylonitrile Foam)
- 5.5: PET Foam (Poly-Ethylene-Terephthalate)
- 5.6: Other development in core material
- 5.7: New players entering in PET foam (Poly-Ethylene-Terephthalate) material market
- 5.8: Pricing of Core Materials
- 5.9: New development in adhesives for wind energy
- 5.10: New development in gelcoat for wind energy

# 6. MARKET ANALYSIS

- 6.1: Market analysis 2013
- 6.1.1: Global wind energy market by value and by volume
- 6.1.2: Global composite materials in wind energy market by value and by volume
- 6.1.2.1: Composite materials in wind energy market by type of material
- 6.1.2.2: Composite materials in wind blade market by manufacturing process
- 6.1.2.3: Composites consumption by turbine component
- 6.2: Market Trend 2008-2013
  - 6.2.1: Macroeconomic Trends
  - 6.2.2: Global wind energy market trend by value and by volume
  - 6.2.3: Global composite materials trend in wind energy market by value and by volume

6.2.3.1; North America composite materials consumption trend in wind energy market by value and by volume

6.2.3.2; Europe composite materials consumption trend in wind energy market by value and by volume



6.2.3.3 Asia Pacific composite materials consumption trend in wind energy market by value and by volume

6.2.3.4 ROW composite materials trend in wind energy market by value and by volume

6.2.4: Composites consumption trend by type of raw material

6.2.5: Global wind turbine blade market trend by volume

6.2.6: Global wind blade market trend by manufacturing process

6.2.7: Composites consumption by blade manufacturer

6.3: Market drivers and challenges

6.4: Market Forecast 2014-2019

6.4.1: Macroeconomic forecasts

6.4.2: Global wind energy market forecast by value and by volume

6.4.3: Global composite materials in wind energy market forecast by value and by volume

6.4.3.1: North America composite materials in wind energy market forecast by value and by volume

6.4.3.2: European composite materials consumption forecast in wind energy market by value and by volume

6.4.3.3: Asia Pacific composite materials forecast in wind energy market by value and by volume

6.4.3.4: ROW Composite materials forecast in wind energy market by value and by volume

6.4.4: Composites consumption forecast by type of raw material

# 7. FINANCIAL (COST STRUCTURE AND PROFITABILITY) ANALYSIS

7.1: Global composite materials in wind energy market profitability analysis

7.2: Cost structure trend of global composite materials in wind energy market 2008-2013

7.3: Regional cost structure trend 2008-2013

# 8. COMPETITIVE LANDSCAPE AND GROWTH OPPORTUNITIES ANALYSIS

8.1: Market share analysis

8.1.1: Market share analysis of wind blade manufacturers

8.2: Growth opportunities analysis

8.2.1: Growth opportunities for global composite materials consumption in wind energy market by material type

8.2.2: Growth opportunities for composite materials consumption in wind energy



market by region

- 8.2.3: Opportunities for new material suppliers
- 8.2.4: Roadmap for new material suppliers

## 9. MARKET STRATEGIC ASSESSMENT

- 9.1: Emerging trends in global composite materials in wind energy market
- 9.2: Unmet needs in composite materials in wind energy market
- 9.3: Innovations and new product launches
- 9.4: Mergers and acquisitions in composite materials in wind energy market
- 10. Expert Opinions

## **11. COMPANY PROFILES FOR LEADING PLAYERS**

- 11.1: Owens Corning
- 11.2: PPG Industries
- 11.3: Jushi Group Co. Ltd.
- 11.4: Chongqing Polycomp International Corp. (CPIC)
- 11.5: Hexcel Corporation
- 11.6; DIAB International
- 11.7: Huntsman
- 11.8: Momentive
- 11.9: LM Wind Power
- 11.10; Vestas
- 11.11: Gamesa



# **List Of Figures**

#### LIST OF FIGURES

#### CHAPTER 2. INDUSTRY BACKGROUND AND CLASSIFICATIONS

Figure 2.1: Cost of wind generated electricity 1995-2018

Figure 2.2: Comparing turbine component weights for baseline and experimental 1.5 MW and 3 MW Turbines

Figure 2.3: Key players of composite materials in wind energy market

Figure 2.4: Process flow in making rotor blades

Figure 2.5: Material flow chart for Wet Hand Lay-Up Process

Figure 2.6: Material flow chart for VARTM Process

Figure 2.7: Material flow chart for Prepreg Lay-Up Process

Figure 2.8: Supply chain-composite materials in global wind energy market

Figure 2.9: Porter's Five Forces analysis for composite materials in global wind energy market

## CHAPTER 3. Composite Materials in Wind Blades

Figure 3.1: Comparison of different materials for density and stiffness

- Figure 3.2: Future materials road map for wind blades
- Figure 3.3: Improvement in tensile strength property of E-Glass Fiber for Wind Energy
- Figure 3.4: Improvement in tensile modulus of E-Glass Fiber for Wind Energy
- Figure 3.5: Improvement in shear strength of Epoxy Adhesives

Figure 3.6: Improvement in tensile strength of Epoxy Adhesives

Figure 3.7: Ranking of performance characteristics that requires most improvement

# CHAPTER 5. CORE MATERIALS AND OTHER MATERIALS IN WIND APPLICATIONS

Figure 5.1: Use of core materials in wind blades

Figure 5.2: Compression property comparison for various types of core materials (6 pound/ft3 density)

Figure 5.3: Shear strength comparison of various types of core materials (6 pound/ft3)

#### CHAPTER 6. MARKET ANALYSIS

Figure 6.1: Global wind energy equipment market (\$M) by region in 2013



Figure 6.2: Global wind energy market annual installation (GW) by region in 2013

Figure 6.3: Annual wind power installation by top countries in 2013

Figure 6.4: Composite materials in wind energy market (\$M) distribution (%) by region in 2013

Figure 6.5: Composite materials in wind energy market (\$M) by region in 2013

Figure 6.6: Composite materials in wind energy market (M lbs) by region in 2013

Figure 6.7: Composite materials consumption in global wind energy market distribution (%) by material type (\$M) in 2013

Figure 6.8: Composite materials consumption in global wind energy market by material type (\$M) in 2013

Figure 6.9: Composite material consumption in global wind energy by weight by material type (M lbs) in 2013

Figure 6.10: Composite material consumption in global wind energy market by material type (M lbs) in 2013

Figure 6.11: Market value (\$M) and gross margin (%) of various composite materials for wind Energy Market in 2013

Figure 6.12: Wind blade market (M lbs) distribution (%) by manufacturing process in 2013

Figure 6.13: Composite consumption (M lbs) by wind blade market manufacturing process in 2013

Figure 6.14: Percentage of composite consumption by wind turbine components

Figure 6.15: Global GDP growth rate trend

Figure 6.16: Global population growth rate trend

Figure 6.17: Global inflation rate trend

Figure 6.18: Global unemployment rate trend

Figure 6.19: Regional GDP growth rate trend at constant price

Figure 6.20: Regional population growth rate trend

Figure 6.21: Population age structure 2013

Figure 6.22: Regional inflation rate trend

Figure 6.23: Regional unemployment rate trend

Figure 6.24: Global and regional per capita income trend

Figure 6.25: Global wind energy equipment market trend 2008-2013

Figure 6.26: Global wind energy market annual installation (GW) trend 2008-2013

Figure 6.27: Percentage of installed turbines by average rated capacity (2008–2013)

Figure 6.28: Global composite materials consumption in wind energy market trend 2008-2013

Figure 6.29: North America composite materials consumption in wind energy market trend 2008-2013

Figure 6.30: European composite materials consumption in wind energy market trend



2008-2013

Figure 6.31: Asia Pacific composite materials consumption in wind energy market trend 2008-2013

Figure 6.32: ROW composite materials consumption in wind energy market trend 2008-2013

Figure 6.33: Composite raw materials consumption (M lbs) trend (2008–2013) for wind energy market

Figure 6.34: Composite raw materials consumption (\$M) Trend (2008–2013) for wind energy market

Figure 6.35: Global wind blade market installation trend 2008-2013

Figure 6.36: Global wind blade manufacturing process breakdown (%) trend (M lbs) 2008-2013

Figure 6.37: Composites consumption (M lbs) by wind blade manufacturers in 2013

Figure 6.38: Drivers and challenges of global composite materials in wind energy market

Figure 6.39: Trend in average turbine capacity (2014–2019)

Figure 6.40: Expected progression of average and maximum blade lengths (m)

Figure 6.41: Global GDP growth rate forecast

Figure 6.42: Global population growth rate forecast

Figure 6.43: Global inflation rate forecast

Figure 6.44: Global unemployment rate forecast

Figure 6.45: Regional GDP growth rate forecast at constant price

Figure 6.46: Regional population growth rate forecast

Figure 6.47: Population Age Structure, 2019

Figure 6.48: Regional inflation rate forecast

Figure 6.49: Regional unemployment rate forecast

Figure 6.50: Global and regional per capita income forecast

Figure 6.51: Global wind energy equipment market (\$B) forecast 2014-2019

Figure 6.52: Global wind energy market annual installation (GW) forecast 2014-2019

Figure 6.53: Global composite materials consumption in wind energy market forecast 2014-2019

Figure 6.54: North America composite materials consumption in wind energy market forecast 2014-2019

Figure 6.55: European composite materials consumption in wind energy market forecast 2014-2019

Figure 6.56: Asia Pacific composite materials consumption in wind energy market forecast 2014-2019

Figure 6.57: ROW composite materials consumption in wind energy market forecast 2014-2019



Figure 6.58: Composites raw material consumption (M Pounds) forecast (2014–2019) for wind energy market

Figure 6.59: Composites raw material consumption (\$M) forecast (2014–2019) for wind energy market

Figure 6.60: Forecast for composites consumption by type of materials in 2019

Figure 6.61: Composite material consumption in global wind energy by weight by material type (M lbs) in 2019

Figure 6.62: Composite material consumption in global wind energy market by material type (\$M) in 2019

Figure 6.63: Composite material consumption in global wind energy by weight by material type (\$M) in 2019

# CHAPTER 7. FINANCIAL (COST STRUCTURE AND PROFITABILITY) ANALYSIS

Figure 7.1: Global composite materials in wind energy market profitability analysis (%) 2008-2013

Figure 7.2: Cost structure trend of global composite materials in wind energy market 2008-2013

Figure 7.3: Cost structure trend of North American composite materials in wind energy market 2008-2013

Figure 7.4: Cost structure trend in European composite materials in wind energy market 2008-2013

Figure 7.5: Cost structure trend in Asia Pacific composite materials in wind energy market 2008-2013

# CHAPTER 8. COMPETITIVE LANDSCAPE AND GROWTH OPPORTUNITIES ANALYSIS

Figure 8.1: Market share analysis of wind blade manufacturers in 2012

Figure 8.2: Growth opportunities for global composite materials consumption in wind energy market by material type

Figure 8.3: Growth opportunity in global composite materials consumption in wind energy market by region

Figure 8.4: New opportunities for material suppliers in wind blade markets Figure 8.5: Market entry barriers and their impact on material suppliers

# CHAPTER 9. MARKET STRATEGIC ASSESSMENT

Figure 9.1: Emerging trends in global composite materials in wind energy market



Figure 9.2: Unmet needs in global composite materials in wind energy market LIST OF TABLES

#### **CHAPTER 1. EXECUTIVE SUMMARY**

Table 1.1: Market parameters for raw materials of composite materials in global wind energy market and attributes of usage

Table 1.2: Market parameters for wind turbine market and attributes of usage

# **CHAPTER 2. INDUSTRY BACKGROUND AND CLASSIFICATIONS**

Table 2.1: Study estimates of percentage cost savings for turbine components due to blade weight reduction

Table 2.2: Study findings for percentage turbine component weight savings due to blade weight reduction

Table 2.3: Cost of energy savings analysis for 0.75 MW, 1.5 MW, 3 MW and 5 MW experimental wind turbines with baseline model

Table 2.4: Estimation of turbine cost savings per pound of turbine weight savings

Table 2.5: Comparison of advantages and disadvantages in Hand Lay-Up, VARTM, and Prepreg Lay-Up Processes

# **CHAPTER 3. COMPOSITE MATERIALS IN WIND BLADES**

Table 3.1: Comparison of mechanical properties for polyester, epoxy, and vinyl ester based resins

Table 3.2: Future needs from resin systems for wind blades

Table 3.3: Comparison of mechanical properties for various fiber reinforcements

Table 3.4: Comparison of properties of adhesives

# CHAPTER 4. RESIN, REINFORCEMENT, AND INTERMEDIATE MATERIALS

Table 4.1: Material properties of HexPly M19 Epoxy System

Table 4.2: Material properties of Velinox

Table 4.3: Material properties of Renuvo Wet Laminating (WL)

Table 4.4: Material properties of RENUVO MPS

Table 4.5: Material properties of Araldite LY 1564 Series of Epoxy Resins in

Combination with Different Hardeners

Table 4.6: Material properties for the Prime 20 LV Resin System

Table 4.7: Material properties for the Airstone 780E Epoxy Resin System



Table 4.8: Material properties for the Epolam 2040 Epoxy Resin System Table 4.9: Material properties of the Araldite LY3505, Araldite LY1556 SP, and XB 3585 systems

Table 4.10: Material properties for the Airstone 730E Laminating System

Table 4.11: Material properties for Polylite 32850-00 Resin

Table 4.12: Material properties of Hybon 2026

Table 4.13: Material properties for E7 ViPro

Table 4.14: Material properties of Hextow Carbon Fiber

Table 4.15: Material properties of Panex 35 Carbon Fiber

Table 4.16: Material properties of Panex 35 for Prepreg and Fabric

Table 4.17: Material properties of TEX 400 Low-Twist Long Flax Fiber Roving

Table 4.18: Material properties of Advantex Glass

Table 4.19: Material properties of WE91-1, WE91-2, WT93, and Sparpreg Systems

Table 4.20: Material properties of RENUVO PP

# CHAPTER 5. CORE MATERIALS AND OTHER MATERIALS IN WIND APPLICATIONS

Table 5.1: Comparison of core material properties and prices

Table 5.2: Material properties for the Baltek SB End-Grain Balsa

Table 5.3: Material properties for the Baltek SBC End-Grain Balsa

Table 5.4: Material properties of ProBalsa End-Grain Balsa

Table 5.5: Material properties of Balsaflex UVOTEC

Table 5.6: Material properties for the Airex C70 and Airex C71 PVC Foam

Table 5.7: Material properties of Divinycell HP PVC Foam

Table 5.8: Material properties of PV Cell G-Foam (G45-G200)

Table 5.9: Material properties of Divinycell Matrix MX 10-8

Table 5.10: Material properties of Corecell T-Foam Series

Table 5.11: Material properties for the Airex T90 and Airex T92 PET Foam

Table 5.12: Material properties for the G-PET Foam

Table 5.13: Material properties for Arma FORM PET AC

Table 5.14: Material properties for Arma FORM PET GR

Table 5.15: Material properties for TYCOR W5

Table 5.16: Mechanical strength of DOW COMPAXX 900 Foam

Table 5.17: Material properties of Spabond 340LV-HT

Table 5.18: Material properties of W1101

Table 5.19: Material properties of Macroplast

Table 5.20: Material properties of Crystic Ecogel S1PA

Table 5.21: Material properties of HPC Gelcoat



#### **CHAPTER 6. MARKET ANALYSIS**

Table 6.1: Top five wind energy markets—annual growth rate comparisons and new MW wind energy installation

Table 6.2: Manufacturing techniques used by wind blade manufacturers

Table 6.3: Market trends (2008-2013) in global wind energy market by volume and by value

Table 6.4: Average growth rates for one, three, and five years in global wind energy equipment market in terms of annual installation

Table 6.5: Ranking of countries in terms of cumulative wind capacity

Table 6.6: Market trends (2008-2013) in global composite materials consumption in wind energy

Table 6.7: Average growth rates for one, three, and five years in global composite materials in wind energy market in terms of \$ consumption

Table 6.8: Market trends (2008-2013) North American composite materials consumption in wind energy

Table 6.9: North American composite materials consumption average growth rates for one, three, and five years in terms of \$

Table 6.10: Market trends (2008-2013) in European composite materials consumption in wind energy market

Table 6.11: European composite materials consumption average growth rates for one, three, and five years in terms of \$

Table 6.12: Market trends (2008-2013) in Asia Pacific composite materials consumption in wind energy

Table 6.13: Asia Pacific composite materials consumption average growth rates for one, three, and five years in terms of \$

Table 6.14: Market trends (2008-2013) in ROW composite materials consumption in wind energy

Table 6.15: ROW composite materials consumption average growth rates for one, three, and five years in terms of \$

Table 6.16: Market trends (2008-2013) in global wind blade market

Table 6.17: Average growth rates for one, three, and five years in global wind blade market in terms of number of blade installation

Table 6.18: Raw materials used by wind blade manufacturers

Table 6.19: Economic outlook of leading economies of four regions for the year 2014

Table 6.20: Market forecast (2014-2019) in global wind energy market

Table 6.21: Average growth rates for one, three, and five years in global wind energy market in terms of annual installation



Table 6.22: Market forecast (2014-2019) in global composite materials consumption in wind energy

Table 6.23: Average growth rates for one, three, and five years in global composite materials consumption in wind energy market in terms of \$

Table 6.24: Market forecast (2014-2019) for North America composite materials consumption in wind energy

Table 6.25: Average growth rates for one, three, and five years in North America composite materials in wind energy market in terms of \$ consumption

Table 6.26: Market forecast (2014-2019) for composite materials consumption in Europe

Table 6.27: Average growth rates for one, three, and five years in the European composite materials consumption in wind energy market in terms of \$

Table 6.28: Market forecast (2014-2019) in Asia Pacific composite materials consumption in wind energy

Table 6.29: Average growth rates for one, three, and five years in Asia pacific composite materials consumption in wind energy market in terms of \$

Table 6.30: Market forecast (2014-2019) in ROW composite materials consumption in wind energy

Table 6.31: Average growth rates for one, three, and five years in ROW composite materials consumption in wind energy market in terms of \$

# CHAPTER 8. COMPETITIVE LANDSCAPE AND GROWTH OPPORTUNITIES ANALYSIS

Table 8.1: Market share of wind blade manufacturers in 2012



# I would like to order

Product name: Future Composite Materials Need for Global Wind Energy Market 2014–2019 Product link: <u>https://marketpublishers.com/r/F52AD22702FEN.html</u>

Price: US\$ 4,900.00 (Single User License / Electronic Delivery) If you want to order Corporate License or Hard Copy, please, contact our Customer Service: <u>info@marketpublishers.com</u>

# Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <u>https://marketpublishers.com/r/F52AD22702FEN.html</u>