# **Growth Opportunities in the Global Carbon Fiber Market**

Published: May 2016

Trends, opportunities and forecast in this market to 2021 by market segment (aerospace, industrial, sporting goods), applications type (commercial, regional jets, general aviation, wind energy, civil/construction, others), precursor's type (PAN-based, Pitch-based), and region (North America, Europe, Asia Pacific and Rest of the World)

**Table of Content** 

### **Table of Contents**

- 1. Executive Summary
- 2. Evolution of Carbon Fiber Market
  - 2.1: Overview of Past and Present
  - 2.2: Future of the Carbon Fiber Market
- 3. Properties and Price Comparison
  - 3.1: Type of Material
    - 3.1.1: Continuous Fiber
    - 3.1.2: Chopped Fiber
    - 3.1.3: Milled Fiber
    - 3.1.4: Metal-Coated Fiber
  - 3.2: Properties of Continuous Carbon Fiber
  - 3.3: Properties of Chopped Carbon Fiber
  - 3.4: Properties of Milled Carbon Fiber
  - 3.5: Properties of Metal-coated Fiber
  - 3.6: Price versus Property of Different Kinds of Carbon Fiber
  - 3.7: Price and Property Comparison of Different Kinds of Fiber

### 4. Carbon Fiber Suppliers

- 4.1: Key Material Suppliers and Their Market Shares
- 4.2: Company Overview
  - 4.2.1: Toray Industries Inc.
  - 4.2.2: Hexcel Composites
  - 4.2.3: Teijin Ltd.
  - 4.2.4: Formosa Plastics Corporation
  - 4.2.5: Zoltek Corp.
  - 4.2.6: Mitsubishi Rayon Co. Ltd.
  - 4.2.7: SGL Group The Carbon Company
  - 4.2.8: Mitsubishi Plastics Composites America, Inc.
  - 4.2.9: Nippon Graphite Fiber Corporation
  - 4.2.10: Cytec Industries Inc.
  - 4.2.11: Kureha Corporation
  - 4.2.12: Donac Co., Ltd.
  - 4.2.13: Dalian Xingke Carbon Fiber Co.
  - 4.2.14: Jiyan High-Tech Fibers
  - 4.2.15: Anshan Sinocarb Carbon Fibers Co., Ltd.
  - 4.2.16: Sinosteel Jilin Carbon Co., Ltd.
  - 4.2.17: Weihai Tuozhan Fiber
  - 4.2.18: Zhongheng New Materials
  - 4.2.19: Zhongfu Shenying Carbon Fiber Co., Ltd.
  - 4.2.20: Jiangsu Hengshen Fiber Materials Co., Ltd.

### 5. Carbon Fiber Market Analysis

- 5.1: Supply and Demand Analysis
- 5.2: Carbon Fiber by Market Segments
  - 5.2.1: Carbon Fiber in Industrial Market
  - 5.2.2: Carbon Fiber in Aerospace Market
  - 5.2.3: Carbon Fiber in Sporting Goods Market
- 5.3: Carbon Fiber Market by Precursor
  - 5.3.1: PAN-based Carbon Fiber Market Analysis
  - 5.3.2: Pitch-based Carbon Fiber Market Analysis
- 5.4: Carbon Fiber Market by Region
  - 5.4.1: Carbon Fiber Demand by Region
  - 5.4.2: Carbon Fiber Capacity by Country
- 5.5: Mergers and Acquisitions
- 5.6: Innovation Trends in Carbon Fiber
  - 5.6.1: Innovation Trends Focused on High Tensile Strength
  - 5.6.2: Innovation Trends Focused on High Tensile Modulus
  - 5.6.3: Innovation Trends Focused on Compatibility with Different Resin
- 5.7: New Developments

# 6. Market Trends

- 6.1: Growth Trends in Global Carbon Fiber Shipment
- 6.2: Growth Trends in PAN-based Carbon Fiber
- 6.3: Growth Trends in Pitch-Based Carbon Fiber
- 6.4: Trends in Supply and Demand
- 6.5: Trends by Applications
  - 6.5.1: Industrial Market
  - 6.5.2: Aerospace Market
  - 6.5.3: Sporting Goods Market
- 6.6: Trends by Region
- 6.7: Trends in Carbon Fiber Price

# 7. Market Forecast

- 7.1: Forecast by Capacity
- 7.2: Forecast by Applications
  - 7.2.1: Industrial Market
  - 7.2.2: Aerospace Market
  - 7.2.3: Sporting Goods Market
- 7.3: Forecast by Region
- 7.4: Value Chain Analysis

# 8. Manufacturing of Carbon Fiber

- 8.1: Carbon Fibers from Precursor
  - 8.1.1: Carbon Fibers from Polyacrylonitrile (PAN)
  - 8.1.2: Carbon Fibers from Rayon
  - 8.1.3: Carbon Fibers from Pitch
- 8.2: Carbon Fibers in Melt-Blown Nonwovens
  - 8.2.1: Carbon Fibers from Isotropic Pitch
  - 8.2.2: Carbon Fibers from Anisotropic Mesophase Pitch

# **List of Figures**

# 1. Executive Summary

Figure 1.1: Porter's Five Forces Analysis of Global Carbon Fiber Industry

#### 2. Overview of Carbon Fiber Market

Figure 2.1: Evolution in Carbon Fiber Applications

# 3. Properties and Price Comparison

- Figure 3.1: Suppliers of Carbon Fiber Materials
- Figure 3.2: Fabrication and Applications of Different Carbon Fiber Materials
- Figure 3.3: Typical Continuous Carbon Fiber
- Figure 3.4: Typical Chopped Carbon Fiber
- Figure 3.5: Typical Metal-Coated Carbon Fiber
- Figure 3.6: Tensile Modulus Comparison of Different Types of Carbon Fiber
- Figure 3.7: Comparison of Tensile Strength for Various Carbon Fiber Materials
- Figure 3.8: Comparison of Elongation at Break for Various Carbon Fiber Materials
- Figure 3.9: Comparison of Density for Various Carbon Fiber Materials
- Figure 3.10: Comparison of Tensile Modulus for Various Chopped Carbon Fibers
- Figure 3.11: Comparison of Tensile Strength for Various Chopped Carbon Fibers
- Figure 3.12: Comparison of Density for Various Chopped Carbon Fibers
- Figure 3.13: Comparison of Elongation for Various Chopped Carbon Fibers
- Figure 3.14: Comparison of Tensile Strength for Various Milled Carbon Fibers
- Figure 3.15: Comparison of Filament Diameter for Various Milled Carbon Fibers
- Figure 3.16: Comparison of Density for Various Milled Carbon Fibers
- Figure 3.17: Comparison of Tensile Modulus for Various Metal-Coated Carbon Fibers
- Figure 3.18: Comparison of Tensile Strength for Various Metal-Coated Carbon Fibers
- Figure 3.19: Comparison of Elongation at Break for Various Metal-Coated Carbon Fibers
- Figure 3.20: Comparison Chart of Tensile Modulus Per Unit Price for Various Carbon Fibers
- Figure 3.21: Comparison Chart of Tensile Strength Per Unit Price for Various Carbon Fibers
- Figure 3.22: Comparison of Tensile Modulus Per Unit Price for Various Carbon Fibers
- Figure 3.23: Comparison of Tensile Strength Per Unit Price for Various Carbon Fibers

#### 4. Material Suppliers

- Figure 4.1: Suppliers of Carbon Fiber Materials
- Figure 4.2: Industry Leaders' Market Share (Million Pounds) Total Carbon Fiber Market in 2015
- Figure 4.3: Carbon Fiber Shipments (Million Pounds) by Industry Leaders in 2015
- Figure 4.4: Market Share of Industry Leaders in PAN and Pitch-Based Carbon Million Dollars in 2015
- Figure 4.5: Carbon Fiber Shipments (\$ Million) by Industry Leaders in 2015
- Figure 4.6: A Geographic Snapshot of Carbon Fiber Manufacturers

# 5. Global Carbon Fiber Market Analysis

- Figure 5.1: Global PAN Carbon Fiber Demand and Capacity in 2015
- Figure 5.2: Percentage Distribution of PAN-Based Carbon Fiber Shipments (M Pounds) by Market Segments in 2015
- Figure 5.3: Percentage Distribution of Carbon Fiber Shipments (M Pounds) in Industrial Applications in 2015
- Figure 5.4: Percentage Distribution of Carbon Fiber Shipments (\$ Million) in Industrial Applications in 2015
- Figure 5.5: Percentage Carbon Fiber Distribution (M Pounds) in Global Aerospace Market
- Figure 5.6: Percentage Comparison of Carbon Fiber Shipments (\$ Million) in Global Aerospace Market by Segments in 2015
- Figure 5.7: Percentage Carbon Fiber Distribution (M Pounds) in Sporting Goods Market by Applications in 2015
- Figure 5.8: Carbon Fiber Shipments (\$ Million) in Sporting Goods Market by Applications in 2015
- Figure 5.9: Percentage Distribution of Carbon Fiber (Million Pounds) by Precursor in 2015
- Figure 5.10: Percentage Distribution of Carbon Fiber (\$ Million) by Precursor in 2015

- Figure 5.11: Percentage Distribution of PAN-Based Carbon Fiber (M Pounds) by Market Segments in 2015
- Figure 5.12: Percentage Distribution of PAN-Based Carbon Fiber (\$ Million) by Market Segments in 2015
- Figure 5.13: Percentage Distribution of Pitch-Based Carbon Fiber (M Pounds) by Market Segments in 2015
- Figure 5.14: Pitch-Based Carbon Fiber Shipment (\$ Million) by Market in 2015
- Figure 5.15: Percentage Carbon Fiber Distribution (M Pounds) by Region in 2015
- Figure 5.9: Percentage Distribution of Carbon Fiber (Million Pounds) by Precursor in 2015
- Figure 5.8: Carbon Fiber Shipments (\$ Million) in Sporting Goods Market by Applications in 2015
- Figure 5.10: Percentage Distribution of Carbon Fiber (\$ Million) by Precursor in 2015
- Figure 5.11: Percentage Distribution of PAN-Based Carbon Fiber (M Pounds) by Market Segments in 2015
- Figure 5.12: Percentage Distribution of PAN-Based Carbon Fiber (\$ Million) by Market Segments in 2015
- Figure 5.13: Percentage Distribution of Pitch-Based Carbon Fiber (M Pounds) by Market Segments in 2015
- Figure 5.14: Pitch-Based Carbon Fiber Shipment (\$ Million) by Market in 2015
- Figure 5.15: Percentage Carbon Fiber Distribution (M Pounds) by Region in 2015
- Figure 5.16: Percentage Carbon Fiber Distribution (\$ Million) by Region in 2015
- Figure 5.17: Percentage Carbon Fiber Distribution (M Pounds) by Country in 2015
- Figure 5.18: Distribution of carbon fiber production (\$ million) by country in 2015
- Figure 5.19: Percentage Carbon Fiber Capacity Distribution by Region in 2015
- Figure 5.20: Recent Carbon Fiber Innovations Focused on High Tensile Strength
- Figure 5.21: Carbon Fiber Innovation Trends Focused on High Tensile Modulus

#### 6. Market Trends

- Figure 6.1: Growth Trend in the Carbon Fiber Market in Terms of Pounds Shipments (2010–2015)
- Figure 6.2: Growth Trend in the Carbon Fiber Market in Terms of Dollar Shipments (2010–2015)
- Figure 6.3: Growth Trend in PAN-Based Carbon Fiber Market (2010–2015) in Terms of Pounds Shipments
- Figure 6.4: Growth Trend in PAN-Based Carbon Fiber Market (2010–2015) in Terms of Dollar Shipments
- Figure 6.5: Growth Trend in Pitch-Based Carbon Fiber Market (2010–2015) in Terms of Million Pounds Shipment
- Figure 6.6: Growth Trend in Pitch-Based Carbon Fiber Market (2010–2015) in Terms of \$ Million Shipments
- Figure 6.7: Trend in Worldwide PAN Carbon Fiber Demand and Capacity (M Pounds)
- Figure 6.8: Trend in New Capacity (Nameplate) Installation for PAN Carbon Fiber by Major Players
- Figure 6.9: Average Growth Rates in Important Markets in Last Five Years
- Figure 6.10: Total Carbon Fiber Demand by Market (2010–2015) in Terms of Million Pounds of Shipments
- Figure 6.11: Total Carbon Fiber Demand by Market in 2010 in Million Pounds Shipments
- Figure 6.12: Total Carbon Fiber Demand by Market in 2015 in Million Pounds Shipments
- Figure 6.13: Total (PAN and Pitch) Carbon Fiber Distribution (M Pounds) by Industrial Market in 2010
- Figure 6.14: Total (PAN and Pitch) Carbon Fiber Distribution (\$ Million) by Industrial Market in 2010
- Figure 6.15: Total (PAN and Pitch) Carbon Fiber distribution (Million Pounds) by Industrial market in 2015
- Figure 6.16: Total (PAN and Pitch) Carbon Fiber Distribution (\$ Million) by Industrial Market in 2015
- Figure 6.17: CAGR (2010–2015) for Total (PAN and Pitch) Carbon Fiber Demand (Million Pounds) for Various Applications in Industrial Market
- Figure 6.18: CAGR (2010–2015) for Total (PAN and Pitch) Carbon Fiber Demand (\$ Million) for Various Applications in the Industrial Market
- Figure 6.19: Total (PAN and Pitch) Carbon Fiber Distribution (Million Pounds) in Various Aerospace Markets (New and Aftermarket) in 2010
- Figure 6.20: Total (PAN and Pitch) Carbon Fiber Distribution (Million Pounds) in Various Aerospace Markets (New and Aftermarket) in 2015
- Figure 6.21: Total (PAN and Pitch) Carbon Fiber Distribution (\$ Million) in Various Aerospace Markets (New and Aftermarket) in 2010
- Figure 6.22: Total (PAN and Pitch) Carbon Fiber Distribution (\$ Million) in Various Aerospace Market (New and Aftermarket) in 2015
- Figure 6.23: CAGR (2010–2015) for Total Carbon Fiber in Various Aerospace Markets (New and Aftermarket), Million Pounds

Figure 6.24: CAGR (2010–2015) for Total Carbon Fiber in Various Aerospace Markets (New and Aftermarket), \$ Million

Figure 6.25: Global Sporting Goods Market Distribution by Applications in Million Pounds Shipment in 2010

Figure 6.26: Global Sporting Goods Market Distribution by Applications in \$ Million Shipments in 2010

Figure 6.27: Global Sporting Goods Market Distribution by Applications in Million Pounds Shipment in 2015

Figure 6.28: Global Sporting Goods Market Distribution by Applications in

\$ Million Shipments in 2015

Figure 6.29: CAGR (2010–2015) for Sporting Goods Market in Million Pounds Shipment

Figure 6.30: CAGR (2010–2015) for Sporting Goods Market in \$ Million Shipment

Figure 6.31: Carbon Fiber Demand by Region in 20072010 and 2015 in Terms of Million Pounds Shipments

Figure 6.32: Carbon Fiber Demand by Region in 2010 and 2015 in Terms of \$ Million Shipments

Figure 6.33: Carbon Fiber Demand by Region in 2010 in Terms of Million Pounds Shipments

Figure 6.34: Carbon Fiber Demand by Region in 2015 in Terms of Million Pounds Shipments

Figure 6.35: Price Trend in Industrial, Aerospace, and Sporting Goods Carbon Fiber

#### 7. Market Forecast

Figure 7.1: Forecast of Carbon Fiber in Terms of Million Pounds Shipments (2016–2021)

Figure 7.2: Forecast of Carbon Fiber in Terms of \$ Million Shipments (2016–2021)

Figure 7.3: Forecast in Worldwide PAN Carbon Fiber Nameplate Demand and Actual Capacity (M pounds)

Figure 7.4: New Worldwide Capacity (Million Pounds) Installed by Various Industry Players

Figure 7.5: Sectorial Snapshot of Major Market Segments of Carbon Fiber

Figure 7.6: Percentage Distribution of Carbon Fiber By Market in 2021 in Terms of Million Pounds Shipment

Figure 7.7: Forecast of Carbon Fiber in Different Market in Terms of Million Pounds Shipment

Figure 7.8: Forecast of Carbon Fiber in Different Market in Terms of Million Dollars Shipments

Figure 7.9: Average Percentage Growth Rate for Important Segments for the Next Five Years

Figure 7.10: Penetration of 2.5 MW turbines in 2010 and 2016

Figure 7.11: Technology Roadmap (Average Turbine Capacity) for Carbon Fiber Applications in Wind Turbines

Figure 7.12: Technology Roadmap (Average Blade Length) for Carbon Fiber Applications in Wind Turbines

Figure 7.13: Material Roadmap (Blade Modulus) for Carbon Fiber Applications in Wind Turbine

Figure 7.14: Carbon Fiber Applications in Large Size Wind Turbines

Source: Lucintel Analysis

Figure 7.15: Carbon Fiber Growth Drivers and Challenges in Roller Market

Figure 7.16: Carbon fiber Potential at Different Penetration Levels.

Source: Lucintel Analysis

Figure 7.17: CFRP Penetration in Automotive Industry

Source: Lucintel Analysis

Figure 7.18: Material Development in Automotive Industry

Source: Lucintel Analysis

Figure 7.19: Key Challenges in Usage of Composites in CNG Tanks

Figure 7.20: Stationary Fuel Cell Shipment Projections.

Source: Fuel Cell Today

Figure 7.21: A photograph of fuel cell car.

Figure 7.22: Fuel Cell Shipment Projections in Transportation

Source: Fuel Cell Today

Figure 7.23: Carbon Fiber Potential Scenarios in Bridge Rehabilitation (Source: Lucintel Analysis)

Figure 7.24: Carbon Fiber Growth Drivers and Challenges for Civil and Construction Market

Figure 7.25: Increase in Average Well Depth in Feet (Source: Lucintel Estimate)

Figure 7.26: Carbon Fiber Growth Drivers and Challenges in Oil and Offshore Market

Figure 7.27: Carbon Fiber Growth Drivers and Challenges in Marine Industry

Figure 7.28: Forecast (2016–2021) in Industrial Market by Segment, Million Pounds

Figure 7.29: Forecast (2016–2021) in Industrial Market by Segment, \$ Million

Figure 7.30: Percentage Distribution of Carbon Fiber Shipments (Million Pounds) in Industrial Applications in 2016

Figure 7.31: Carbon Fiber Distribution (%) by Industrial Applications in 2016

Figure 7.32: Total (PAN and Pitch) Carbon Fiber Demand Distribution (Million Pounds) by Industrial Market in 2021

Figure 7.33: Total (PAN and Pitch) Carbon Fiber Demand Distribution (\$ Million) by Industrial Market in 2021

- Figure 7.34: CAGR (2016–2021) for Total (PAN and Pitch) Carbon Fiber Demand (M Pounds) for Various Applications in Industrial Market
- Figure 7.35: CAGR (2016–2021) for Total (PAN And Pitch) Carbon Fiber Demand (\$ Million) for Various Applications in Industrial Market
- Figure 7.36: Trend and Forecast for Average Composites Content in Commercial Aerospace Market
- Figure 7.37: Trend and Forecast for Carbon Fiber in Commercial Aerospace Market
- Figure 7.38: Carbon Fiber Shipment (Million Pounds) in Aerospace Market by Segments (2016–2021)
- Figure 7.39: Carbon Fiber Shipment (\$ Million) in Aerospace Market by Segments (2016–2021)
- Figure 7.40: Percentage Carbon Fiber Distribution (M Pounds) in Global Aerospace Market by Segments in 2016
- Figure 7.41: Percentage Comparison of Carbon Fiber Shipments (\$ Million) in Global Aerospace Market by Segments in 2016
- Figure 7.42: Aerospace Market (M Pounds) Distribution for Total (PAN and Pitch) Carbon Fiber by Applications Segments in 2021
- Figure 7.43: Aerospace Market (\$ Million) Distribution for Total (PAN and Pitch) Carbon Fiber by Applications Segments in 2021
- Figure 7.44: CAGR (2016–2021) for Total Carbon Fiber in Various Aerospace Market (New and Aftermarket), Million Pounds
- Figure 7.45: CAGR (2016–2021) for Total Carbon Fiber in Various Aerospace Market (New and Aftermarket), \$ Million
- Figure 7.46: Forecast in Sporting Goods Market in Million Pounds Shipment, 2016–2021
- Figure 7.47: Forecast in Sporting Goods Market in \$ Million Shipment, 2016–2021
- Figure 7.48: CAGR (2016–2021) for Sporting Goods Market in Million Pounds Shipment
- Figure 7.49: CAGR (2016–2021) for Sporting Goods Market in \$ Million Shipment
- Figure 7.50: Percentage Carbon Fiber Distribution (Million Pounds) in Sporting Goods Market by Applications in 2016
- Figure 7.51: Carbon Fiber Shipments (\$ Million) in Sporting Goods Market by Applications in 2016
- Figure 7.52: Percentage Carbon Fiber Distribution (Million Pounds) in Sporting Goods Market by Applications in 2021
- Figure 7.53: Percentage Distribution of Carbon Fiber by Region in 2016 in Terms of Million Pounds Shipment
- Figure 7.54: Percentage Distribution of Carbon Fiber by Region in 2021 in Terms of Million Pounds Shipment
- Figure 7.55: Percentage Distribution of Carbon Fiber by Region in 2016 in Terms of \$ Million Shipment
- Figure 7.56: Percentage Distribution of Carbon Fiber by Region in 2021 in Terms of \$ Million Shipment
- Figure 7.57: Distribution of Carbon Fiber by Region in 2016 and 2021 in Terms of Million Pounds Shipment
- Figure 7.58: Demand of Carbon Fiber by Region in 2016 and 2021 in Million Dollars Shipment
- Figure 7.59: Dollar Shipment and Gross Margin Flow Chart of 2015 Carbon Fiber Market
- Figure 7.60: Gross Profit Distribution in Various Nodes of Value Chain in 2015
- Figure 7.61: Gross Profit in Various Nodes of Value Chain in 2015
- Figure 7.62: Dollar (\$) and Gross Margin Flow Chart in Carbon Fiber Market in 2021

### 8. Manufacturing of Carbon Fiber

- Figure 8.1: Schematic Representation of Carbon Fiber Preparation from PAN Fibers
- Figure 8.2: Manufacturing Process Schematic for Pitch-Based Carbon Fibers

# **List of Tables**

# 1. Executive Summary

- Table 1.1: Carbon Fiber Market Parameters and Attributes Materials Perspective
- Table 1.2: Carbon Fiber Market Parameters and Attributes End Product Market Perspective

## 3. Properties and Price Comparison

- Table 3.1: Typical Properties for Thornel Carbon Fibers
- Table 3.2: Typical Properties of Grafil Carbon Fiber
- Table 3.3: Typical Properties of Pyrofil Carbon Fiber
- Table 3.4: Properties of Hexcel Continuous Fiber
- Table 3.5: Properties of Dialead® Standard Grades Carbon Fiber
- Table 3.6: Properties of PANOX Carbon Fiber
- Table 3.7: Properties of SIGRAFIL T Carbon Fiber
- Table 3.8: Properties of SIGRAFIL C Carbon Fiber

- Table 3.9: Properties of Tenax Carbon Fiber
- Table 3.10: Properties of Pyromex Carbon Fiber
- Table 3.11: Properties of Tenax Carbon Fiber
- Table 3.12: Properties of PYRON Carbon Fiber
- Table 3.13: Properties of PYRON Single and Multi-Ply Yarns
- Table 3.14: Properties of Panex Single and Multi-Ply Yarns
- Table 3.15: Properties of Nippon Granoc Continuous Fiber
- Table 3.16: Properties of Thermalgraph Fiber
- Table 3.17: Uses of Hexcel PAN-Based Chopped Carbon Fiber
- Table 3.18: Properties of Grafil Chopped Fiber
- Table 3.19: Properties of Pyrofil Chopped Fiber
- Table 3.20: Properties of Dialead Chopped Carbon Fiber
- Table 3.21: Properties of Tenax Chopped Carbon Fiber
- Table 3.22: Properties of Tenax Chopped Carbon Fiber
- Table 3.23: Properties of Panex 35 Chopped Carbon Fiber
- Table 3.24: Properties of Nippon Granoc Chopped Fiber
- Table 3.25: Properties of PANOX Milled Fiber
- Table 3.26: Properties of SIGRAFIL C Milled Fiber
- Table 3.27: Properties of Dialead® Milled Fiber
- Table 3.28: Properties of HTA Nickel-Coated Filament Yarn
- Table 3.29: Properties of Tenax Nickel-Coated Filament Yarn
- Table 3.30: Typical Properties of Common Structural Materials
- Table 3.31: Price and Property Comparison of Carbon Fiber Supplied by Different Companies in 2010
- Table 3.32: Price and Property Comparison for Different Kinds of Fiber

### 4. Material Suppliers

- Table 4.1: Comparison of Applications of Carbon Fiber Material by Suppliers
- Table 4.2: Major Segments Served by Main Carbon Fiber Manufacturers

### 5. Global Carbon Fiber Market Analysis

- Table 5.1: Evolution of Carbon Fiber Applications in Different Segments by Year
- Table 5.2: A List of Carbon Fiber Applications in Various Markets in Combination With Other Materials
- Table 5.3: Ranking of PAN-Based Carbon Fiber Suppliers According To Their Nameplate
- Table 5.4: Ranking (Based on Revenue from Carbon Fiber Business) of Pitch-Based Carbon Fiber Manufacturers in 2015
- Table 5.5: Material Suppliers by Region
- Table 5.6: Average Tensile Strength and Innovation Trend of Carbon Fiber
- Table 5.7: Recent Carbon Fiber Innovations Focused on High Tensile Strength by Different Company
- Table 5.8: Average Tensile Modulus and Innovation Trend of Carbon Fiber
- Table 5.9: Recent Carbon Fiber Innovations Focused on High Tensile Modulus by Different Company
- Table 5.10: New product launches by competitors

#### 6. Market Trends

- Table 6.1: CAGR in Last One, Five, and 15 Years in Terms of \$ Million Shipment
- Table 6.2: Price (\$ Per Pound) and Market Trend in Carbon Fiber Industry
- Table 6.3: Structural Fabric Repair System
- Table 6.4: Racing Boat Model and Boat Manufacturers

# 7. Market Forecast

- Table 7.1: Nominal Capacity Trends and Forecast in PAN-Based Carbon Fiber
- Table 7.2: Price (\$ Per Pound) and Market Forecast for Carbon Fiber Industry by Segments
- Table 7.3: Wind Energy Market's Impact Analysis
- Table 7.4: Challenges in Carbon Fiber Adoption in Wind Energy Market
- Table 7.5: Features, Advantages, and Benefits of Carbon Composites Rollers
- Table 7.6: Mass Saving Properties of CFRP
- Table 7.7: Carbon Fiber Usage Criteria for Automotive Applications versus Wind Energy Applications
- Table 7.8: Weight Comparison Steel verses Carbon Composites Structures Used in Offshore and Oil Industry
- Table 7.9: Major Drivers Behind the Growth of Carbon Fiber in Aerospace Market
- Table 7.10: Major Challenges of Carbon Fiber in the Aerospace Market
- Table 7.11: Major Drivers for Carbon Fiber Usage in Sporting Goods Market
- Table 7.12: Major Challenges for Carbon Fiber Usage in Sporting Goods Market