



Status of the North American Composites Industry Market Potentials and Innovation Mega Trends

Lucintel Brief

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Market Intelligence + Growth Consulting + Opportunity Screening + M&A Due Diligence + Benchmarking = **Your Company's Growth.**

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- **Limitations of Composites**
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Executive Summary

- **The composites materials market in North America was estimated at \$8 billion in 2020, and is forecast to grow at around 4% CAGR to reach \$10.3 billion in 2026**
- **Aerospace, automotive, and wind energy have demand pull, whereas civil engineering, oil and gas, medical and others require push strategy for market penetration**
- **The aerospace, transportation, marine, and pipe and tank markets are the key drivers of growth for the composites market:**
 - Reducing weight and increasing efficiency are the key requirements in the automotive industry, driving the use of carbon fiber in automobile manufacturing
 - Increased composites penetration in aircraft such as Boeing 787, Airbus A350, and increasing demand for weight reduction in the aerospace industry
- **Some of the limitations for composites are high material cost, lack of high volume processes for structural parts, lack of better repair, recycling, and joining technologies**
- **Development of low-cost carbon fiber, shorter cure time of epoxy resin, and evolution of 3D printer in various composite applications for mass production are the major disruptions to drive the demand of composites in future**
- **Major growth strategies for composites are identification of right applications based on synergy, cost reduction, technology development, and strategic alliances**
- **There are significant opportunities existing for composites players within the US as well as in emerging economies through JV and acquisitions**

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Transportation is the Largest Segment and is Expected to Remain the Largest in Next Six Years (1/2)

NA Composites Market	Market Size (\$B)- 2020	CAGR % (2020-2026)	Future Outlook	Major Composite Part Manufacturers	Major OEMs
Transportation	\$2.2	5.9%	<ul style="list-style-type: none"> The transportation segment is expected to remain the largest market for composites as demand for lightweight materials would be high to meet CAFÉ regulations 	<ul style="list-style-type: none"> Magna Core Molding Johnson Control Faurecia 	<ul style="list-style-type: none"> GM Ford Toyota
Construction	\$1.9	3.9%	<ul style="list-style-type: none"> The construction segment provides significant opportunities for composites as it is expected to gain momentum post-COVID with rising housing numbers 	<ul style="list-style-type: none"> Jeld-Wen Crane Composites Masonite Anderson Strongwell 	<ul style="list-style-type: none"> NA
Wind Energy	\$0.6	-6.8%	<ul style="list-style-type: none"> PTC ended in 2020 and its impact will be observed by 2022, which will impact composites demand for wind blade manufacturing 	<ul style="list-style-type: none"> TPI Excel Composites 	<ul style="list-style-type: none"> GE Renewable Energy Vestas Siemens Gamesa

Transportation is the Largest Segment and is Expected to Remain the Largest in Next Six Years (2/2)

NA Composites Market	Market Size (\$B)- 2020	CAGR % (2020-2026)	Future Outlook	Major Composite Part Manufacturers	Major OEMs
Pipe & Tank	\$0.8	6.2%	<ul style="list-style-type: none"> Growing investment for the replacement of old and dilapidated pipeline, rehabilitation is expected to drive composites usage in this market 	<ul style="list-style-type: none"> NOV Fiber Glass System Future pipe Industries Shawcor Amiblu (Hobas) RPS Composites 	<ul style="list-style-type: none"> NA
Marine	\$0.4	6.1%	<ul style="list-style-type: none"> The marine segment provides significant opportunities for composites as it is expected to gain momentum post-COVID 	<ul style="list-style-type: none"> Brunswick Sunseeker 	<ul style="list-style-type: none"> Brunswick Marine Product Corporation Sunseeker
Aerospace	\$0.3	6.3%	<ul style="list-style-type: none"> Composites used in the aerospace industry is expected to grow with increase in deliveries 	<ul style="list-style-type: none"> GKN Aerospace Triumph Aero structures Spirit Aerosystem M C Gill Corporation 	<ul style="list-style-type: none"> Boeing Airbus

Composites are Used in Various Applications due to Benefits such as Light Weight and High Strength. Metals and Plastics are Major Competing Materials

Aerospace



- Fuselage
- Wings
- Control surfaces
- Fan blades
- Tail cones
- Interiors

- Aluminum
- Steel
- Plastics

Transportation



- Chassis
- Body closures
- Under body parts
- Interiors
- Front cabin (train)

- Aluminum
- Steel
- Iron
- Plastics

Wind Energy



- Wind blades
- Nacelles
- Spinners

- Steel
- Iron

Construction



- Bathtubs
- Doors & Windows
- Putruded profiles
- Swimming pools
- Poles

- Concrete
- Steel
- Plastics

Marine

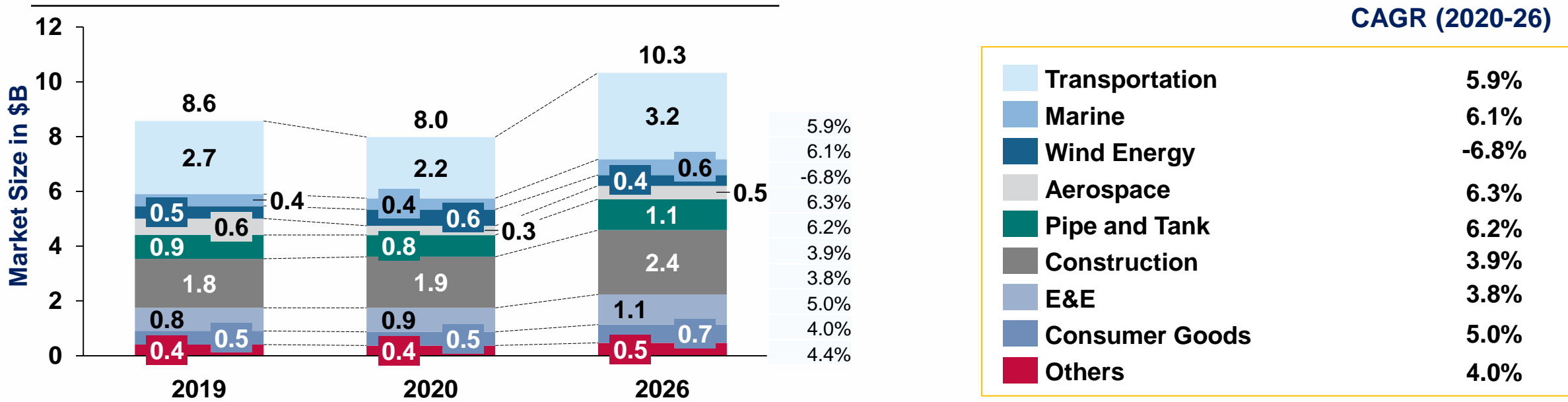


- Hulls
- Decks
- Masts

- Aluminum
- Wood
- Steel
- Plastics

Composites Materials Market Declined in 2020 due to Covid but Expected to Pick Up from 2021 due to Favorable Demand from Most of the End Use Industries

Composite Materials Market Forecast in North America

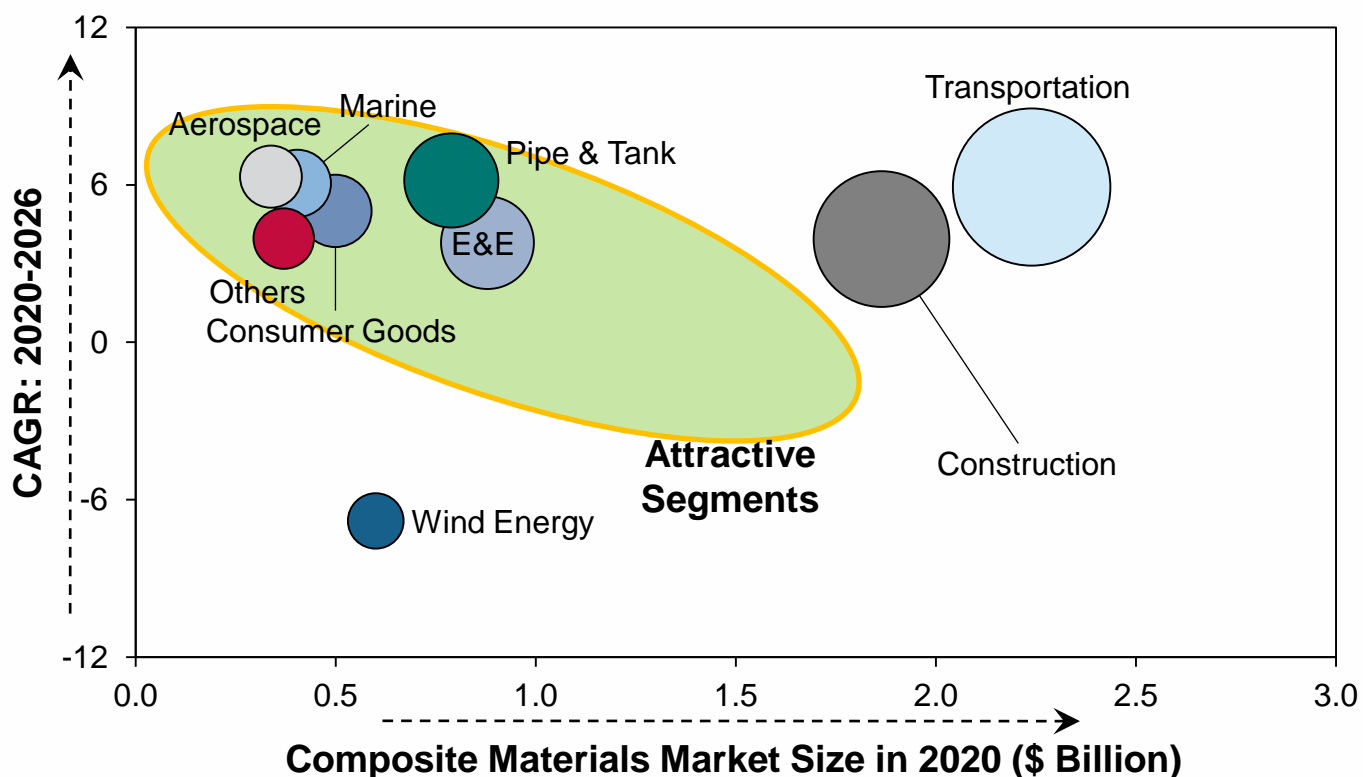


Key Insights

- The North American composite materials market declined by 7% in 2020 due to the pandemic's impact in most of the end use industries
- Aerospace, pipe and tank, marine, and transportation are expected to grow at more than 5% CAGR
- Increasing demand for lightweight materials in the aerospace, automotive & other end use industries will drive composites growth
- Improving infrastructure development, urbanization, and economic development are likely to increase composites usage in the construction industry

Lucintel Identified Aerospace, Pipe and Tank, Marine, and Transportation as the Most Attractive Segments

Growth Attractiveness: Composites Materials Market in North America



Note:

- The bubble size represents the value of composite materials market in the North America in 2020
- Y axis depicts CAGR from 2020-2026

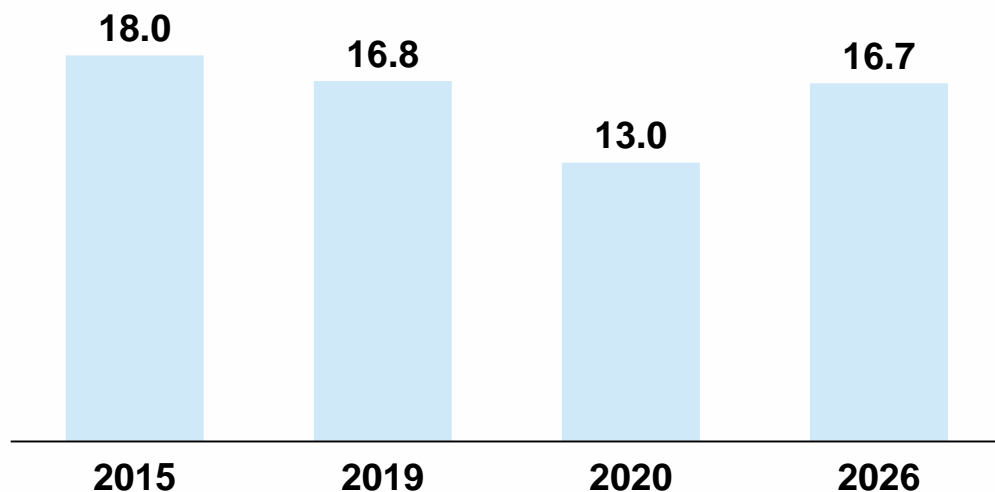
Key Insights

- Almost all the segments experienced sharp decline in 2020 due to the pandemic's effect on supply chain disruption, cash flow imbalance, plant shutdown, and resource issues. The markets are expected to recover from 2021
- Aerospace, pipe and tanks, marine, and transportation applications are expected to grow at a higher rate during the next six years, driving the demand for composites
- Government regulations on fuel efficiency are putting pressure on auto OEMs to make their vehicles lighter. Automakers such as BMW, Mercedes, Ford, and GM are putting efforts into incorporation of carbon composites in mass volume cars

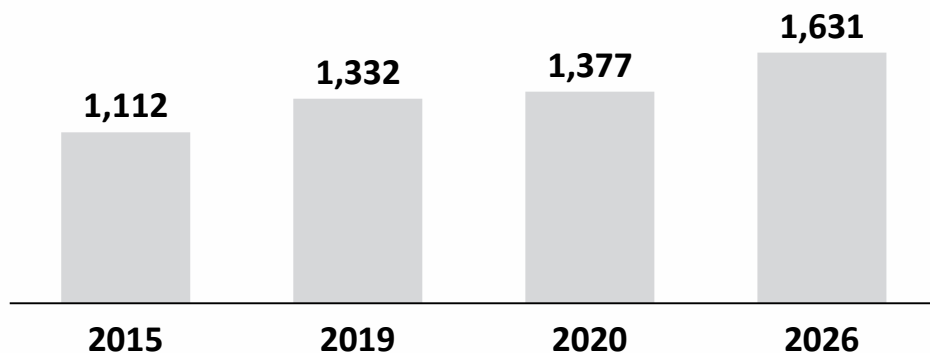
Source: Lucintel

Increasing Automotive Production and Housing Starts are Expected to Drive Composites Demand in North America

North American Automotive Production Trend and Forecast (In Million Units)



US Housing Starts (Single and Multi) Trend and Forecast (No. of House in Thousands)



Key Insights

- North America automotive production (passenger car & commercial vehicle) declined at -6.3% CAGR from 2015-20 and it is expected to register 4.3% growth during 2020-26
- Automotive production declined severely in 2020 due to the pandemic. COVID-19-related shutdowns dramatically and negatively affected light vehicle supply and demand in 2020. The market is expected regain its demand from 2021
- US housing start grew at 4.4% CAGR from 2015-20 and is expected to register 2.9% CAGR during 2020-26 due to a hit in construction activities and followed by the financial crises by COVID outbreak

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High Material Cost, lack of Ability to Produce High Volume, etc. are the Major Limitations of Composites to Deliver Better Solutions/ Increase Penetration

Limitation

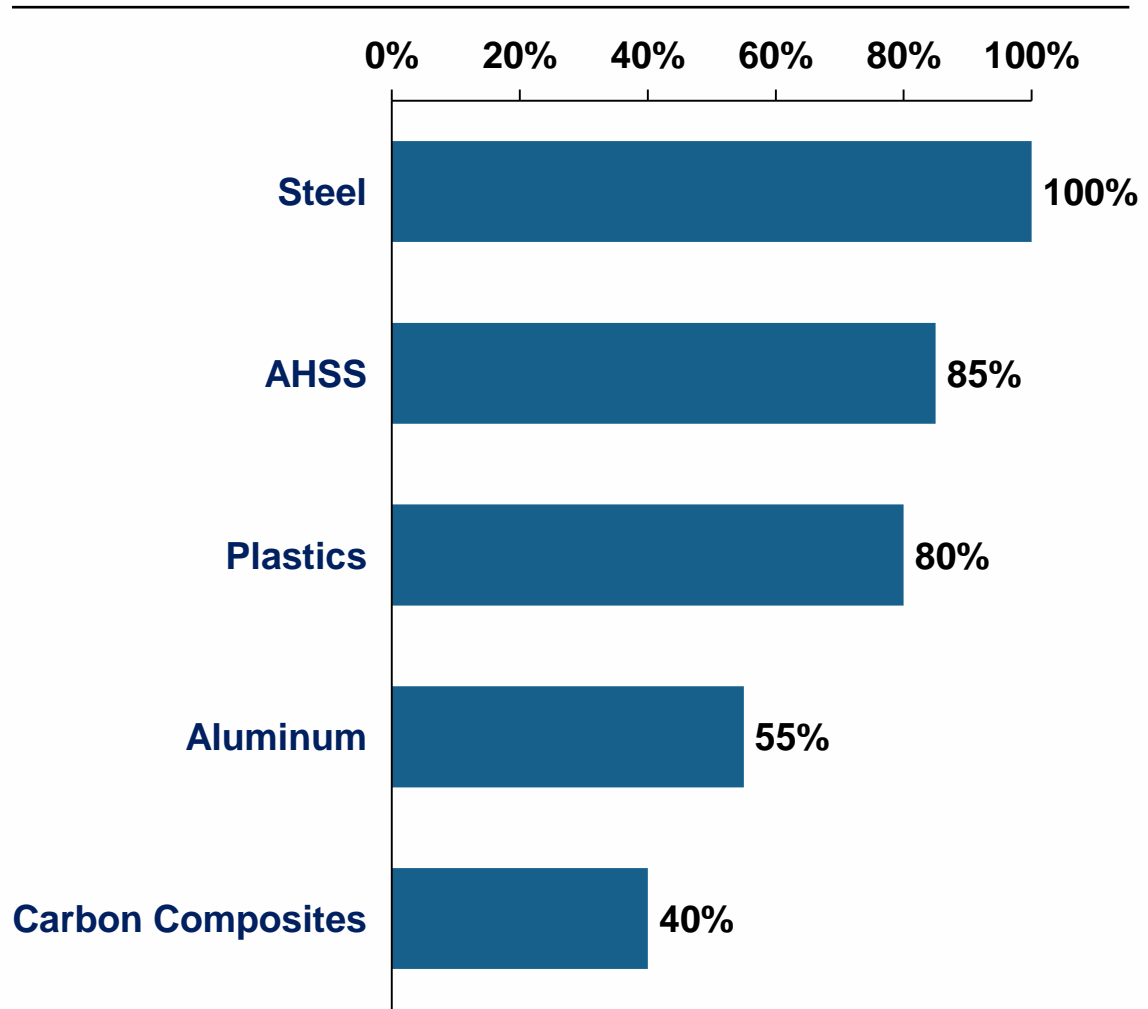
- **High Materials Cost**
- **Lack of High Volume Process for Structural Parts**
- **Print Thru**
- **Machining & Joining**
- **Repair and Recyclability**

Industry Expectation

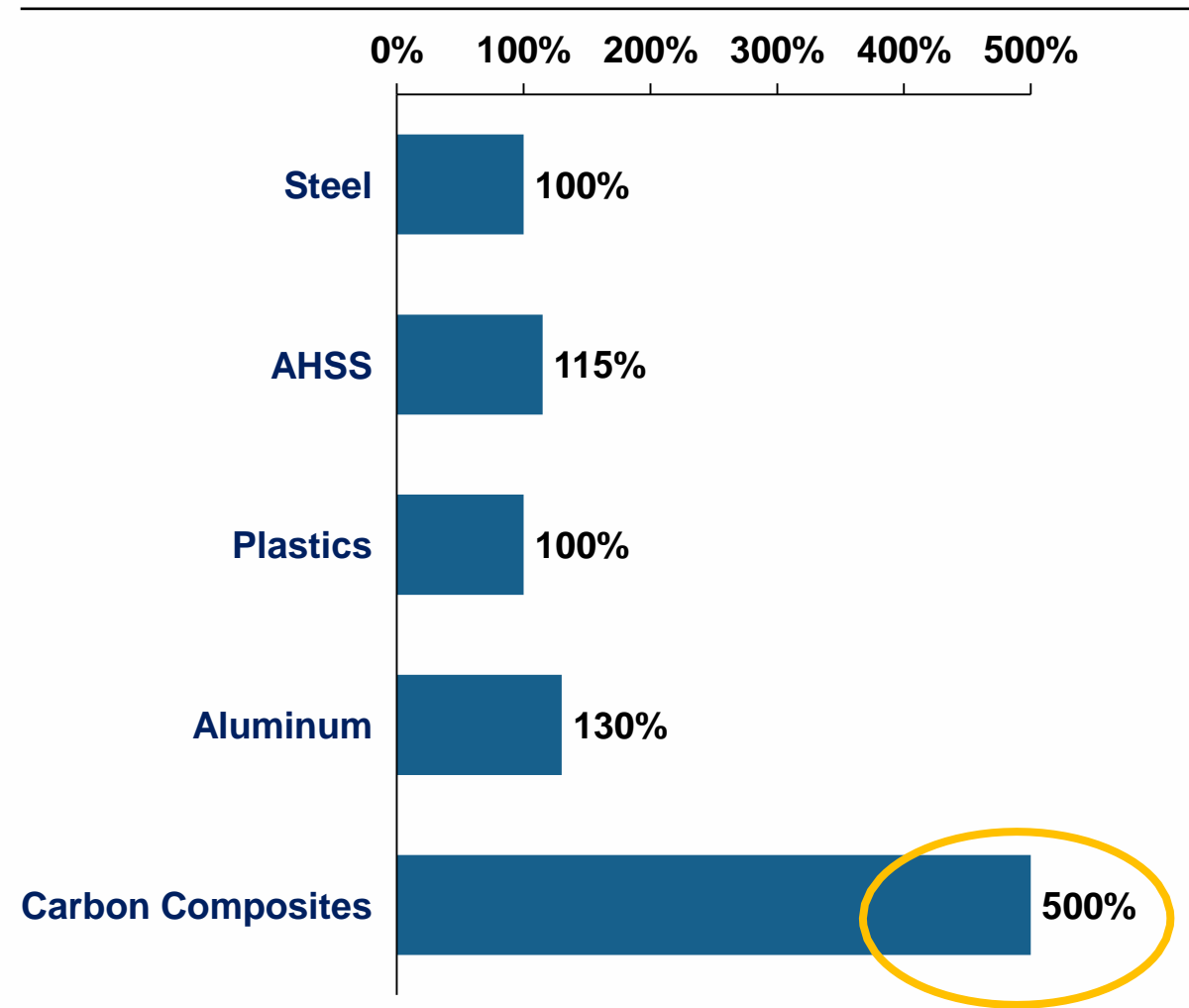
- Carbon fiber price reduction by 50%-60% (~\$5/lb)
- Glass fiber price reduction by 10%-30%
- Resin price reduction by 10%-40%
- More than 30,000 parts annually using continuous fiber composites
- Part manufacturing cycle time 1-2 minutes
- Materials layup rate upto 150 kg/hr
- Class A surface finish for exterior applications
- Improved machining and joining technologies for composites
- Improved technologies for composites part repairing and recycling

Limitations: Parts Made of Carbon Composites is Five times Costlier than Steel Parts

Relative Part Weight



Relative Part Cost



Driver in Construction: Increasing Urbanization and Growing Housing Starts Will Drive the Composites Market

<u>Materials</u>	<u>Initial Cost (\$)</u>	<u>Average Life (Years)</u>	<u>Initial Cost (\$)</u>	<u>Maintenance Cost (\$)</u>	<u>Lifecycle Cost/Year (\$)</u>
Wood	\$250	30	\$8,000	\$210	\$282
Steel	\$260	35	\$9,000	\$245	\$272
Concrete	\$350	35	\$12,000	\$245	\$360
Composites	\$900	80	\$5,000	\$74	

Note: Costs are based on a 40ft, class 4 pole
 Maintenance costs apportioned at US \$35 per pole per 5 year maintenance cycle

Despite Limitations, Good Weight Saving Potential Makes Composites a Good Material of Choice

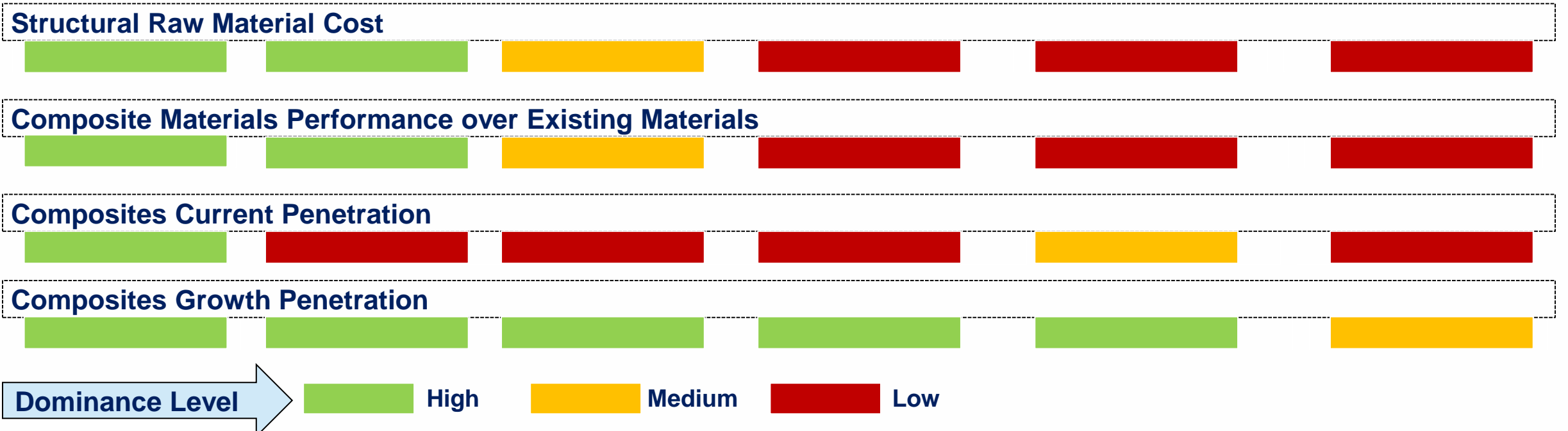


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Push and Pull Strategy: Civil Engineering, Oil & Gas, Industrial, and Medical Segments Need to have Push Strategy for Growth

Push Strategy

Civil Engineering
Oil & Gas
Industrial
Medical



- 1 Educate OEMs and government agencies such as DOTs and DOEs
- 2 Participate in seminars, conferences, and trade shows
- 3 Organize workshop and join efforts with concerned parties and customers
- 4 Lobbying and publishing articles in magazines

Pull Strategy

Aerospace
Automotive
Wind Energy



- 1 Several demand pull factors are creating opportunities for composites
- 2 Address many areas such as reduction in materials cost, manufacturing process with low cycle time and high layup rate to leverage demand pull

Factors Creating Demand Pull and Areas to Leverage Demand Pull

Factors Creating Pull Demand for the Composites Industry

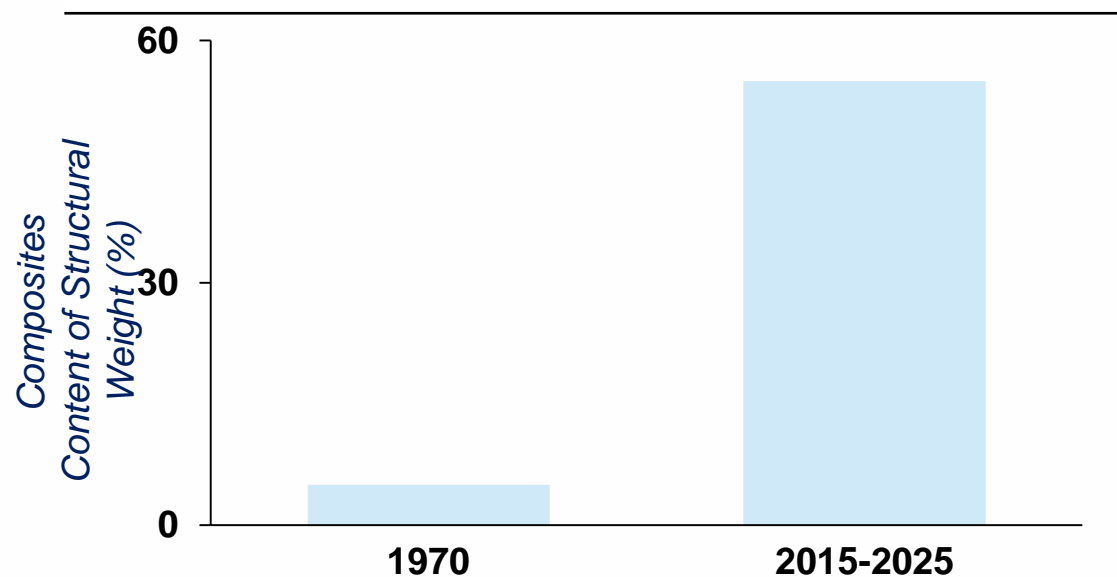
- Fuel Efficiency
- Lightweight
- Government Policies
- Corrosion and Chemical Resistance
- Intensifying Competition
- Green Energy

Areas that Need to Be Addressed to Leverage Pull Demand

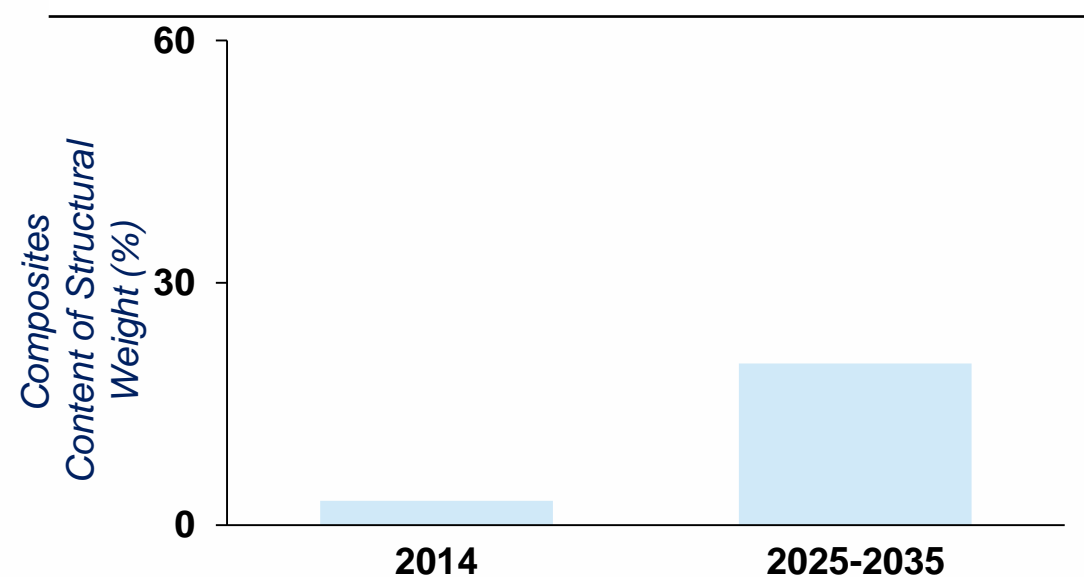
- Reduction in Cost of Material
- Reduction in Processing Cost
- Improved Cycle Cost
- Better Value Proposition
- Sustainability
- Data Analytics

Advanced Composites Usage in Mass Automotive Today is Where Aerospace Industry was 40 Years Back. Automotive Will be the Next Growth Segment

Aerospace Trend



Automotive Trend



Composites Content (% Structural Weight)	5%	50%-55%
Fuel Efficiency (Miles Per Gallon)	0.2-0.3 (MPG)	0.3-0.4 (MPG)
Aircraft	B737, A320	B787, A350

Composites Content (% Structural Weight)	Less than 5%	10%-30%
Fuel Efficiency (Miles Per Gallon)	27 (MPG)	54-70 (MPG)
Vehicles	BMW, Honda, Daimler	GM, Ford, BMW, Audi, Porsche, Mercedes

Civil Engineering Strategy: Educate DOTs and Related Parties via Workshop, Trade Shows, and Lobbying

Application



Rebar / Cable



CFRP Plates



CFRP Girders



FRP Pole



Putrudded Profiles

Push Strategy: Educate Related Particle

Workshops: Conduct workshops for DOTs & stakeholders to educate them about the offerings and their benefits

Participate in Civil Engineering Tradeshow and Exhibitions: ASCE Annual Civil Engineering conference, AASHTO Annual Meeting, International Bridge Conference

Lobby: With the help of key lobbyists, influence DOTs, and other concerned Govt. agencies

Publish & Advertise in Magazines such as "Civil Engineering." The flagship monthly magazine of ASCE. A huge readership (primarily from civil engineering) base of ~79,000

Develop Cost-Effective Composites Solutions

Lucintel discussed with many DOTs during the last five years and found increasing awareness on composites; however, there is still lack of awareness to leverage potentials

Oil & Gas Push Strategy: Educate Oil & Gas Companies via Workshop, Trade Shows, and Magazines

Application



Risers



Tether



Drill Pipes



Umbilical



GRE Pipes



Frac Balls



Frac Plugs

Push Strategy: Educate Related Particle

Workshops: Conduct workshops for Oil & Gas Equipment & Service Companies such as Transocean, Seadrill, Saipem, Tecnip, and Nation oil well varco and Integrated Oil & Gas Companies such as Royal Dutch Shell, Exxon Mobil, Chevron Corporation, and Conoco Philips

Participate or exhibit in various oil & gas tradeshow and exhibitions: Offshore Technology Conferences (OTC), GITA Oil & Gas Pipeline Conference & Exhibition, Abu Dhabi International Petroleum Exhibition & Conferences

Publish & Advertise in Magazines such as "Oil & Gas": Monthly and weekly magazine of the world's most widely read petroleum industry publication. A huge readership base of ~95,000

Develop Cost-Effective Composites Solutions

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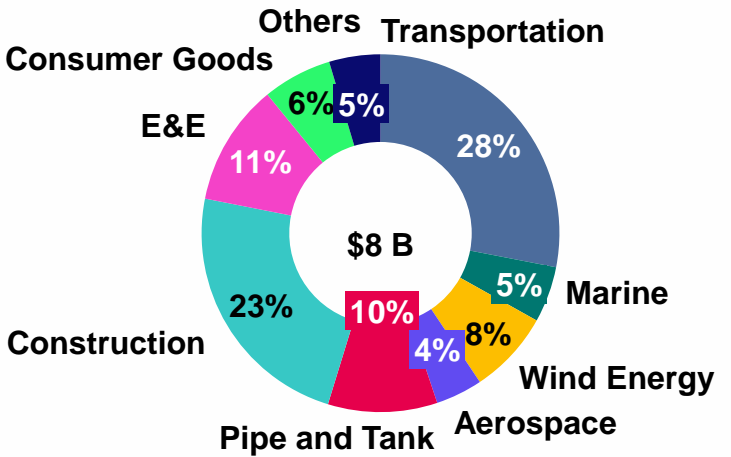
Transportation Accounted for 28% of the Market, Govt. Initiatives for Lightweight Materials in Various End Use Industry is Major Driving Factor for Growth ,

North America Composites Market

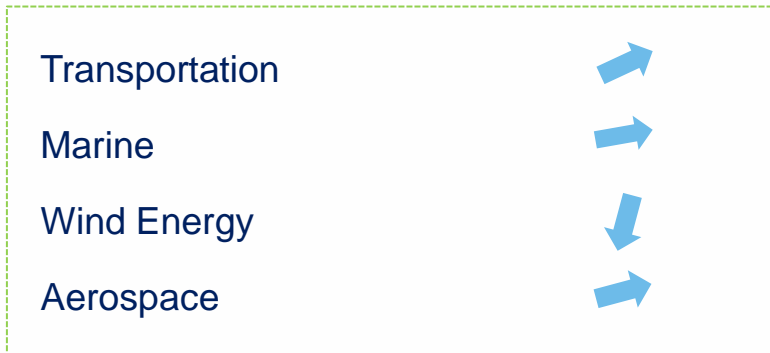


- The North American composites market is anticipated to grow at 4.4% CAGR during the forecast period.
- Government initiatives for lightweight materials in different end use industries will benefit the demand for composites
- Demand for lightweight materials in transportation to meet fuel efficiency regulation, increasing demand on electric vehicle are driving composites growth in transportation
- Demand for composites will pick up for aerospace post-COVID. The new generation of aircraft such as Boeing 787, A350 XWB will drive the demand for composites

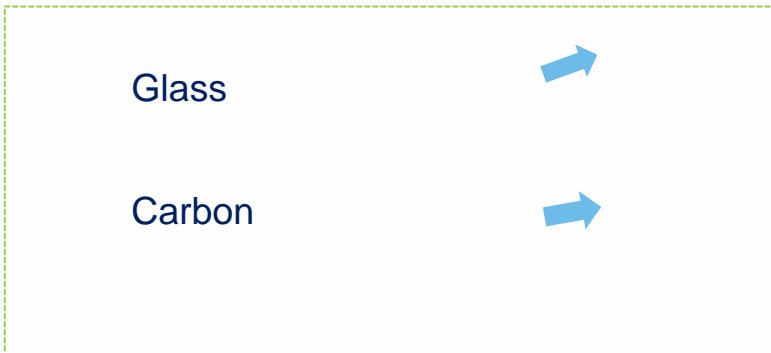
NA Composites Market by End Use (2020)



Future Outlook: NA Composites Market by End Use

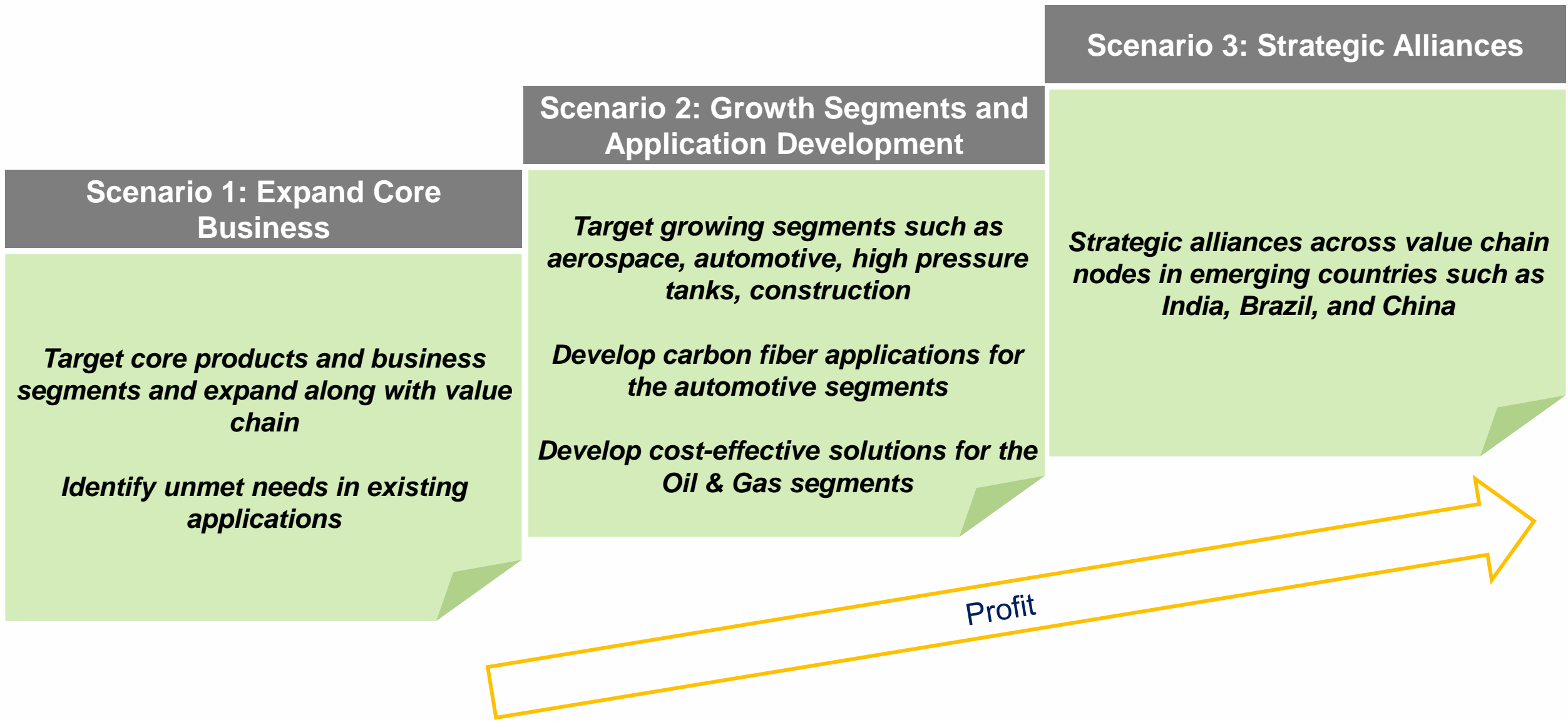


Future Outlook: NA Composites Market by Fiber Type



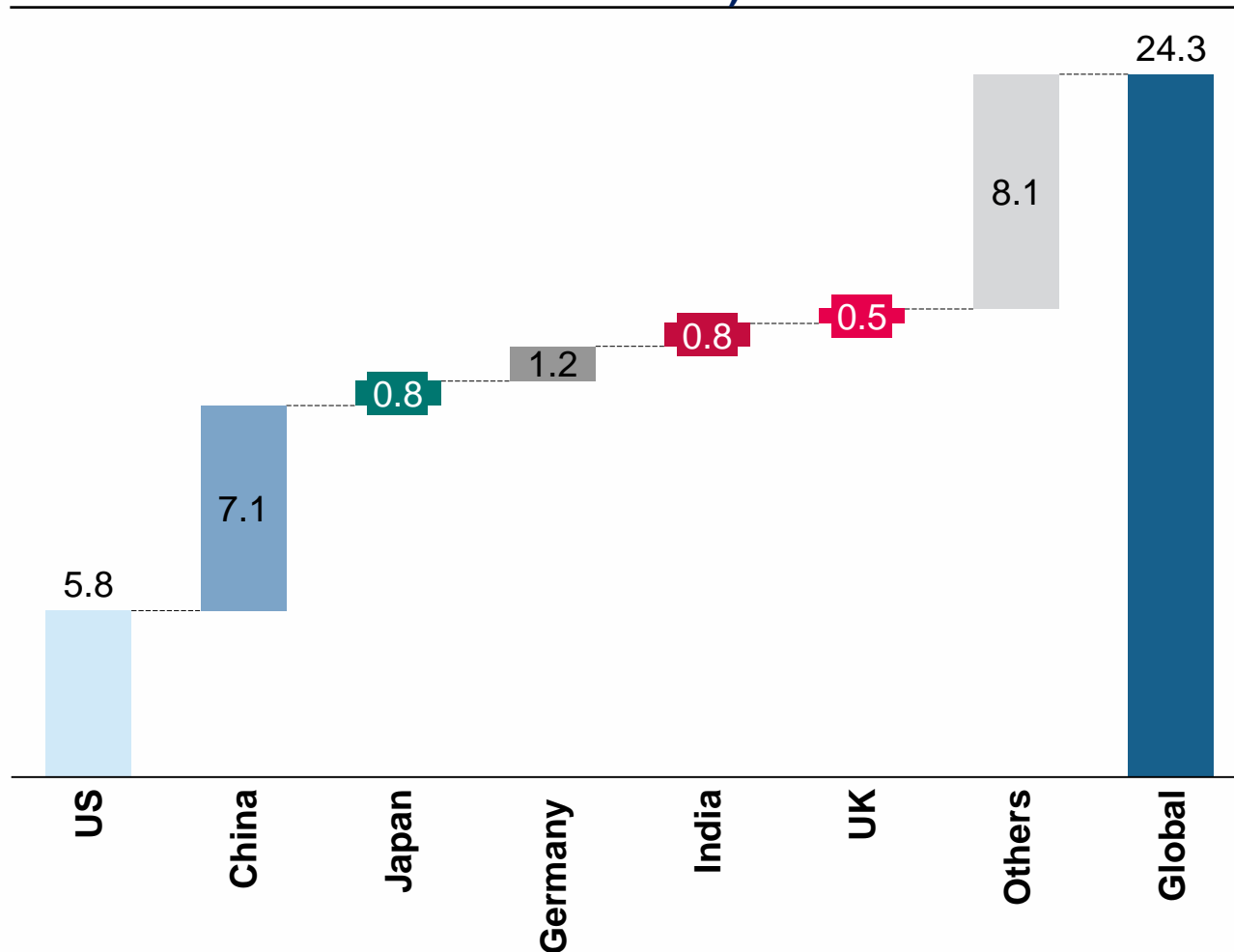
➤ Note: Position of arrow denotes the future growth potential

Companies can Expand Core Business, Target Growing Segments and Strengthen Position by Strategic Alliances for Growth and Profit



Viability Opportunities Exist for Composites Players to Grow in Other Countries Organically or Inorganically

Global Composites Materials Market by Countries (In Billion lbs in 2020)



Pull Strategy

- Significant opportunities exist outside the US
 - Most of the large material suppliers already expanded globally by setting up plants in China, India, and Brazil
 - Significant opportunities exist for part fabricators within and outside the US
-
- Kaman Aerospace and Kinenco entered into a JV to fabricate parts for the aerospace industry
 - Luxfer group acquires Vexxel Composites LLC (manufacturer of high-pressure composites cylinders)
-
- Lucintel has been assisting companies in creating JV and acquisition targets outside their region for long-term profitable growth

Composites Opportunities Across the Globe: CO2 Emission Regulations, Emphasis on Green Energy etc. are Creating Good Opportunities Across the Globe

- Growing wind energy installations
- High demand of composites rich content aircraft (C Series)



- Automotive: CAFÉ standards (54.5 MPG by 2025)
- Recovery of housing market
- High demand of composites rich content aircraft (B787)
- High automotive production



- Growing wind energy installations
- Increasing automotive production

- Automotive: CO2 emission standards (130 g/km by 2015)
- Significant order backlog of A350XWB
- Sustainable growth in wind energy
- Significant order of high-speed trains



- High demand for commercial aircraft and helicopters
- High investment in infrastructure
- Significant wind turbine installation
- Continuous shift of E&E and sporting goods



- Offset Requirement (30%)
- High investment in infrastructure
- Increasing automotive production
- Significant order of metro and monorail
- No indigenous advanced material production capability

Application Development, Cost and Cycle Time Reduction, etc. are few of the Areas for Composites Innovations and R & D Projects to Address the Current and Future Market Needs



- ▶ • Automotive: Develop lightweight and cost-effective auto parts such as suspension control arm, roof panels, wheels, deck lid, crash resistant bumpers
- ▶ • Wind Energy: Spar caps, blades, towers, drive shafts
- ▶ • Develop industrial grade low cost carbon fiber (\$5 - \$7/lbs)
- ▶ • Make composite materials & products costs competitive with Aluminum, High Strength Steel (HSS)
- ▶ • Develop high pressure RTM (Cycle time 2- 10 minutes)
- ▶ • Continuous fiber thermoplastic technology (<1 minute)
- ▶ • Increase mechanical performance (strength, stiffness) of fibers (glass and carbon fibers)
- ▶ • Develop better resin system (low cure, low gel, higher strength)
- ▶ • Develop recycling technologies (BMW developed Closed-loop CFRP Recycling Technology)
- ▶ • Collaborate between OEMs, equipment suppliers, and federal agencies for composites recycling solutions

Source: Lucintel

Growth Strategies: Identification of New Opportunities, Cost Reduction, Technological Development, and Strategic Alliances are the Major Keys for Growth

1. *Identify Growth Applications based on Synergy*



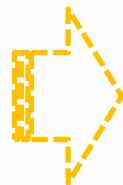
- Identify new opportunities with good synergy and profitability
- Identify growing regions

2. *Cost Reduction and Improved Processes*



- Reduce cost of composites products to make it cost-effective alternative to steel and aluminum
- Improve process characteristics such as high cycle time and low energy consumption

3. *Strategic Alliances (M & A)*



- Develop strategic alliances to gain competitive advantages
- Enter into new markets and regions

Lucintel has Strong Capability in Developing Growth Strategies for Companies

Automotive, Civil Engineering, Oil & Gas, and Medical will be the Future Growth Engines

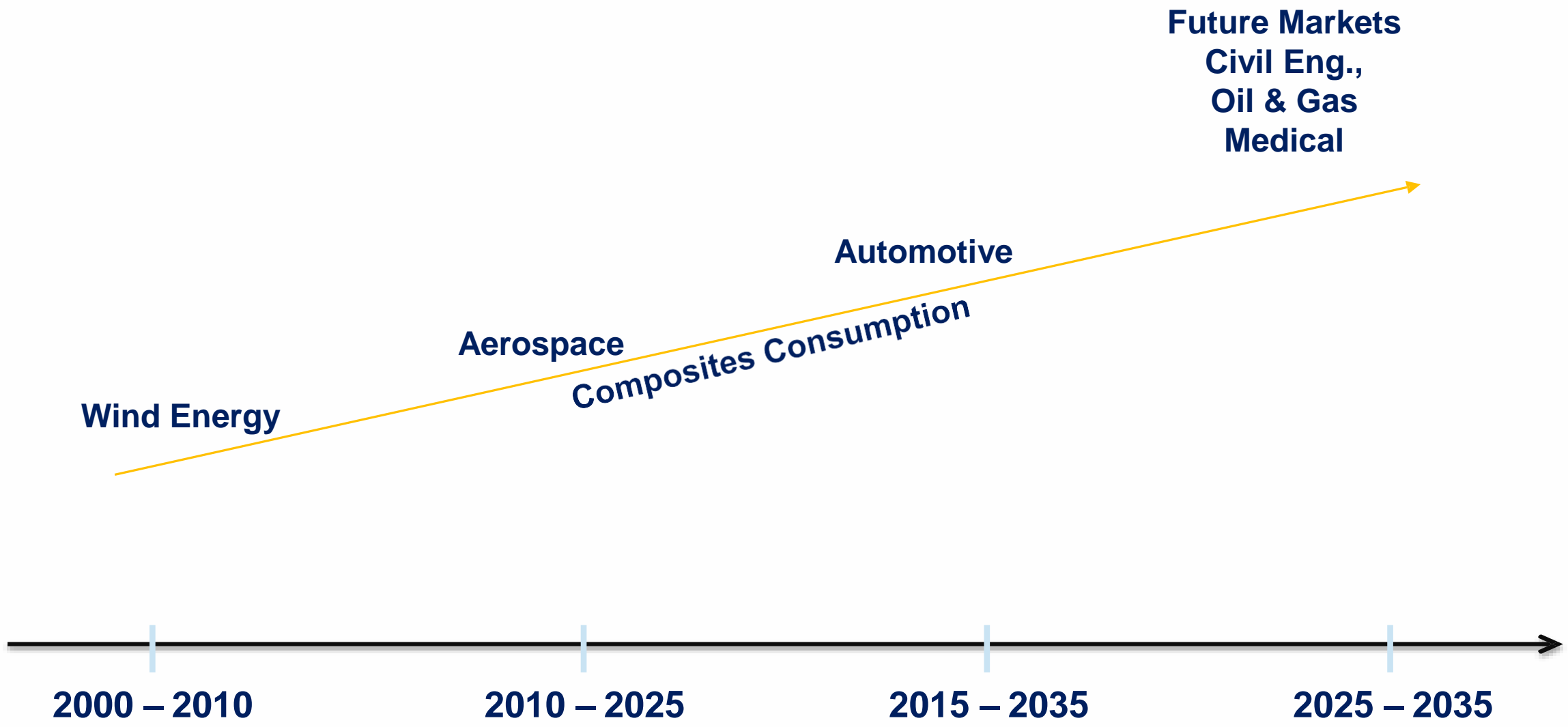


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Lucintel - At a Glance

- Premier management consulting and market research firm. Founded in 1998.
- Deep global insights into major industries. Team of over 120 analysts / consultants across globe
- Management comprised of PhDs, MBAs, and subject matter experts. Head quarter in Dallas, USA.

Conducted 500+ consulting projects across industries for 3M, Audi, Dupont, Carlyle, GE, etc.

Consulting Services



Why Lucintel

Trusted insights: Reliable insights. Widely cited in Wall Street Journal, Financial Times, Forbes, etc.

Clients we serve: Over 1000 clients from 70 countries – Fortune 500 companies

Strategic advice: Over 20 years of proven global strategic management consulting experience

Industries Served



1000+ Clients in 70 Countries Value Our Service



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