Europe
COMPOSITES

May 2022

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European Composites Market Overview

The European composites market is important for U.S. manufacturers looking to expand globally. In 2021, it represented 19% of the global composites market volume, reaching 2.29 million tons, and 21% of the global composites market value ($7.7 billion)[1].

The European composites market is expected to grow at a CAGR of 4% during the forecast period 2021 to 2026.

Prior to the pandemic, the European composites market suffered from European political environment uncertainty, the rise of new trade barriers including Brexit, international trade conflicts, protectionist policies, and growing commodity production outsourcing trends to low-cost countries. In addition, Europe's composite market declined 13.8% between 2019 and 2020 due to the COVID-19 pandemic[2]. Rising raw material and energy prices, mixed with supply chains disruptions, semiconductors crisis and the Ukraine war, will continue to have a negative effect on the industry.

The European composites market is fragmented and characterized by many small-sized firms, where 80-90% of the volume is produced by just 10-20% of existing companies. Each country has industries with various strengths in different applications. Market growth tends to follow economic development and GDP trends of each country respectively.

[1] JEC Observer Current Trends in the global composites industry 2021-2026

[2] AVK 2021

Thermoplastics & Thermosets

European shortfiber production represented 1190 kilotons in 2020 compared with 864 kilotons for long & endless fiber reinforced thermosets. Shortfiber reinforced thermoplastics sub-segment is expected to grow at 4% annually until 2026[3].

Growth in thermoplastics demand is a result of their advantageous properties which include higher performance and lighter weight, compared with steel or aluminum, as well as ease of processing and recyclability. New developments have emerged using long & endless fiber reinforced thermoplastics (LFT/GMT/CFRTP) with manufacturing hybridization processes.

Fibers

A. Glass Fibers

Glass-reinforced plastics (GRP) remains the most used composite with more than 95% of the European market[4]. Thermoplastics GRP production reached 1,322 kilotons in 2020 compared with thermosets GRP with 1,134 kilotons. The construction and transport industries each represent one third of total production in the European GRP market.

B. Carbon Fibers

European carbon fiber reinforced plastics (CRP) market is growing fast, despite its 2% market share of the entire composites market, with 42 kilotons production in 2020[5]. Carbon is frequently used in cost-intensive markets such as aerospace, defense, sports, and racing/luxury cars. Europe's demand for carbon fiber reinforcements is much higher than North America or Asia.

[3] Mordor Intelligence reports – Europe Thermoplastics market
[4] AVK 2021
[5] AVK 2021

Because carbon fiber production has a high-energy requirement, Europe tends to be more import-dependent, with carbon fiber integration concentrated in processing and end-use applications. Over the next five years, the composites industry expects a virgin carbon fiber shortage, creating a significant market opportunity for recycled carbon fibers.

C. Natural Fibers

Despite having the same weight as glass fibers, natural fibers are 25-30% stronger. This also makes them more environmentally sustainable than glass and carbon fibers since they require less CO2 emissions during production. Natural fibers (hemp, jute, kenaf, sisal) potential is on the rise due to environmental benefits and overall climate issues focus within the EU. Nearly twenty European natural fiber and reinforced plastics producers are located mainly in Germany, France, Italy, and the Netherlands. This market is larger than the CRP one and is estimated at 90 kilotons[6].

Composites Recycling

In the wake of EU's stringent environmental standards implementation, Europe is a leader in composites recycling. There are 16 established companies leading the composites recycling market and several smaller, but rapidly growing companies. The EU has provided funding to projects which demonstrate circular economy applications which will support a low-carbon, resource-efficient, sustainable, and competitive economy.

The market for Fiber-Reinforced Plastic (FRP) recycling is dominated by the co-incineration (use of cement kilns) technique, with 60% of composite materials recycled from co-incineration. It is the most cost-effective and energy efficient option for GFRP waste recycling so far.

[6] GlobeNewswire – Trends & Opportunities & Competitive analysis of the natural fiber composite market

As of today, only 2% of composite materials are recycled. This is because thermosets and glass fibers (the largest volume of composites) are difficult to recycle. The volume of composite waste is expected to increase over the coming decades. Industry sectors such as wind energy, automotive and aerospace will drive the need to stimulate the European composites recycling market.

Europe is working on new sustainable recycling techniques such as thermal treatment via the pyrolysis process - a chemical treatment via the solvolysis process, as well as mechanical crushing. FiberEUse is a good example of what is being done in Europe with the collaboration of 20 partners from seven European countries.

The European Composites Industry Association (EuCIA) has taken the lead to define the size of composite end-of-life waste streams per market segment and to develop an inventory of applicable legislation around Europe. The association has also been working on new tools such as *the Eco Calculator Tool*, which will provide a reliable and credible ecological impact calculation from composites parts production.

With carbon fiber high demand and production costs, fluctuating price of energy and oil, as well as the EU directive requiring 89.6% of vehicle materials to be recyclable, companies developing an efficient recycling strategy will see a huge opportunity for growth.

Lack of proper CFRP recycling techniques remains an issue. CFPR long service life is causing limited composite waste availability, further hindering market growth[7].

[7] Mordor Intelligence reports –Fiber-Reinforced Plastic FRP Recycling market

Composites Manufacturing Processes

We have observed trends in the modern composites market – a transition from traditional manual and continuous manufacturing processes to injection and compression processes such as resin infusion, injection molding, and sheet/bulk molding compounds. This is a causal result of the increase in thermoplastics, which are predominantly made via injection and compression processes.

SMC (sheet molding compounding) and BMC (bulk molding compounding) account for one quarter of GFRP production and are still the largest market segment, as those processes allow the use of CFRP and large-scale production series.

Open mold remains the second largest segment of market production, mainly because of low investment costs, but EU legislation related to volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) will likely limit their use.

The Resin transfer molding (RTM) method presents significant potential in Europe as it allows for lower environmental impact while forming a product with a larger, more complex shape, better surface quality, greater strength, tooling flexibility as well as reduced production cycles.

In consequence thermoplastics increased usage, GMT (glass-mat reinforced thermoplastic sheets) and LFT-G (long-fiber reinforced thermoplastic granules) market has grown since 2020.

As far as continuous processes are concerned, pultrusion technology remains the main driver for growth in sectors like construction and infrastructure, whereas filament winding is most used to produce the cylindrical shapes characteristic of pipes and tanks, pressure vessels, and rocket motor casing[8].

[8] AVK 2021

Main End-Use Industries

A. Automotive

The COVID-19 pandemic and subsequent supply chain issues, component storage and supply chain disruptions have slowed the growth of composites use in the automotive industry.

Even if the penetration rate of composites in vehicles has increased over the past 40 years, growth opportunities for composites could significantly increase if hydrogen battery-electric vehicles (BEVs) become more prominent in the future.

The EU is highly committed in reaching climate target emissions for the transportation sector in the next 30 years and hydrogen is set to play an important role. As outlined in the **European Green Deal report**, 90% of emissions must be cut by 2050. The European Commission is funding hydrogen tanks development initiatives to support its **Sustainable and Smart Mobility Strategy Action plan**. European OEMs such as BMW, Audi, Mercedes and Lamborghini are driving market adoption. Other European OEMs are likely to follow.

By 2030, 2% of vehicles in Europe are envisaged to be BEVs powered by hydrogen tanks. This would represent approximately 2 million BEVs and 4 million hydrogen tanks[9]. Composite materials are used in a range of hydrogen vehicle parts such as tanks and battery housings. Hydrogen storage requires carbon fibers, and therefore the need for this fiber is expected to double in the next couple of years.

Europe is also developing initiatives using natural fibers, well-known for their excellent moisture resistance, reduction in carbon footprint and eco-friendliness. Thermoplastic liner wet filament winding, and additive manufacturing technologies have great potential to support those developments, as they do not require finishing and generate very little waste.

[9] AVK presentation JEC Dach Forum 2021

B. Aerospace

This sector has been highly impacted with the COVID-19 crisis. Prior to the pandemic, the European aerospace composites market was anticipated to see a CAGR of over 5% between 2021-2026. However, these estimates have now changed. The rate of aircraft manufacture is expected to reach the before COVID-19 levels in approximately 5 to 7 years.

Nevertheless, composites have the highest added value when used in the aerospace industry. This sector is a driver in the CRP market due to its strict performance requirements and its process improvement research involving composites usage.

The European aerospace industry is heavily investing in Research and Development (R&D). For example, the French aeronautical equipment supplier Latécoère is investing $5.7 million in a new R&D center dedicated to composite materials. First composite applications are expected in 2025. Spain also announced a new project in partnership with Airbus to develop aircraft hydrogen energy storage.

Europe is also at the forefront of space exploration. Carbon fiber composites are used frequently in parts such as booster rockets, solar array panels, optical platforms, fairings, and antennae reflectors.

C. Wind Energy

The offshore wind energy industry is a key sector for composites in Europe, using a relatively high amount of carbon fiber to produce turbine blades. Europe has the highest share of worldwide demand for wind energy carbon fiber * *MarketWatch Wind Energy Composites Market 2021.*

The EU's ambitions is to generate at least 60 GW of offshore capacity by 2030 and get to 300 GW by 2050. The European Commission also wants to receive a 3% contribution from current offshore projects to the electricity market, go up to 15% in 2030 and 30% by mid-century.

As of today, around 5,000 offshore turbines generate a total of 25 GW of installed capacity across twelve countries. In addition, the United Kingdom (UK) is the world leader in electricity generation in the world with plans to quadruple current offshore capacity to 40GW by 2030[10].

European demand for carbon fiber wind energy will continue to increase and reach its goal sourcing 20% of its energy from renewables.

Composite materials are at the heart of new wind energy projects. Next generation of turbines will be a key enabler in this plan. The UK launched the Joule Challenge project (valued at $6.6 million) through the UK's Net Zero Innovation Portfolio, setting out a plan for incorporating new composite-based materials in the next generation offshore wind turbines.

D. Construction/Infrastructure

This sector has seen less dramatic cuts than in other sectors such as aerospace, automotive or the marine industry. 2020 was a record year with an 5% increase and a slight 3.5% decrease in 2021 *(AVK 2021)*.

Some European countries such as Portugal, Finland and Denmark achieved slight growth despite facing a difficult economic situation.

The construction/infrastructure sector is the largest GRP applications user in Europe. Despite little carbon fiber composites penetration in this sector, experts predict significant growth for construction manufacturers and processors due to the increasing demand for anti-corrosive, non-conductive materials with high strength and low weight.

The construction/infrastructure sector is likely to see a vast majority of production using continuous processes, especially pultrusion. Examples of construction projects include concrete framework, facade cladding, window profiles, bridge elements, light wells, cable ducts, and manhole covers.

[10] Saur Energy International online magazine

Market Entry

Prospective international market entrants must keep in mind that sales of input materials like resins, prepregs, pellets, and fabrics are regularly issued directly between suppliers and end-users. Due to the composite raw material nature, it is necessary to have a manufacturing plant located near potential buyers.

Additionally, intermediaries are required for processing needs such as additive manufacturing, software, tooling, and machinery.

While we see many opportunities for U.S. companies in Europe, there are also challenges to entry and expansion. Any market entry strategy should begin with a thorough understanding of the costs and benefits of doing business in a specific country. In most cases, it is essential to visit the market and establish relationships with local partners. Investing in these relationships early and routinely will increase the likelihood of a more successful venture.

Before entering the European market, U.S. companies should consider their own resources, previous export, or business experience abroad as well as long-term business strategy. For many companies, representation in Europe by agents, distributors, liaison offices or partners will be key to their success. A local partner can provide knowledge of the local regulatory framework, language assistance and valuable business contacts. As business develops, companies may establish subsidiaries and make further local investments to expand their market share.

European countries have their own characteristics. Having a representative covering several countries might work in some geographies and not in others.

Country Profiles

Germany

Germany is home to the largest composites market in Europe. Like in other countries, most processed composites in Germany are based on glass fiber reinforced plastics (GFRP). Despite substantial cost, demand for carbon fiber composites is still growing in Germany, particularly by the aerospace and automotive industries. The special material characteristics of carbon fibers, such as tensile strength, lightweight and other features offer clear advantages for these industries over the traditional GFRP. Consequently, growth expectations for carbon fibers in Germany are higher than for the already well-established glass fiber materials.

While most of the approximately 3,000 German composite firms are small- to medium-sized, a few are larger: Evonik supplies core materials and BASF is active in pellet production for intermediate processing. BASF also manufactures primary materials, both thermosets as well as thermoplastics. Krempel and Covestro are also well-established as composite material processors. Germany hosts concentrations (or clusters) of composite companies in a few regions. These local clusters are active in composites research and development. Some are more specialized than others. The clusters are focusing on advanced materials, lightweight or carbon fibers. The cluster members network among each other joining forces to provide major OEMs or end-users in a certain region and beyond. Carbon fiber cluster MAI Carbon, located in Bavaria, for example, mainly works with the automotive and aerospace industries in the south of Germany.

The main industry applications of composites (as well as the best prospect industry sectors) in Germany are Aerospace; Automotive; Construction; Transportation; Sports & Leisure and Wind Energy.

A survey by the German composites association among composites companies in the second half of 2021 revealed that the positive trend in the composites industry has continued. It contained entirely positive ratings for Germany, despite the COVID situation.

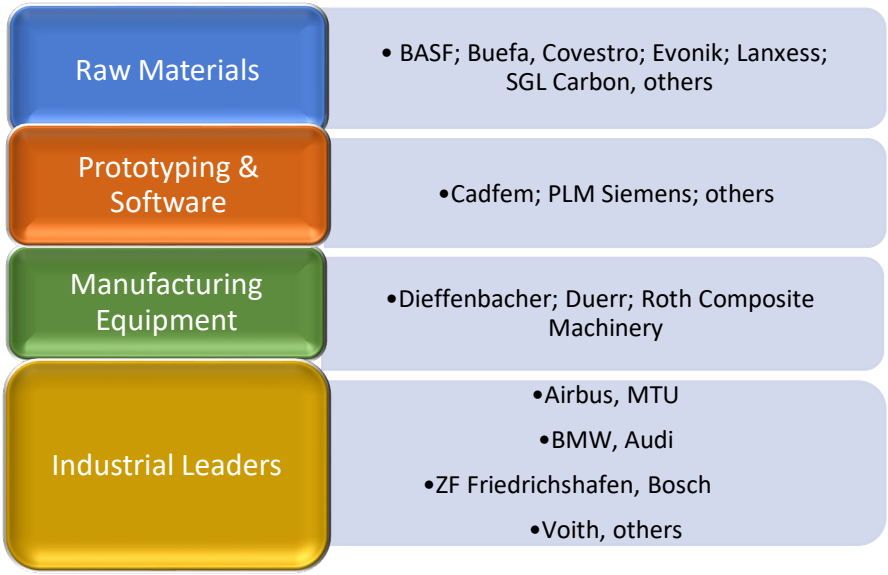
For example, 80% described the current general business situation as either positive or indeed very positive. In general, market expectations for the leading industry applications aerospace and automotive remain high. Currently both industry sectors are suffering from the overall stagnation in both industries. Hence, the annual growth rate for the German composites market in 2022 is estimated at a moderate 2-3% and, for 2023 around 5% or more.

The German market is highly receptive to U.S. composite products, particularly to materials. U.S. companies that offer materials at competitive pricing and high-quality meeting the following criteria have best market prospects: Lightweight; materials with special characteristics; recycling solutions; reduced energy consumption; minimal maintenance and, automated production technology.

Advantages of the German market:

- Germany is home to the largest composites market in Europe
- U.S. companies use Germany as a hub for other European markets
- Germany is highly receptive to U.S. composite products, particularly to materials
- High demand in industries such as: Aerospace; construction; transportation; automotive; sports
- Good growth for carbon fiber composites; 1.5% growth rate for GFRP materials
- Positive Outlook for innovative composites machinery and peripherals
- Germany hosts a strong local composite cluster network
- As a major high-tech market Germany offers many opportunities for composites
- Best prospects: Lightweight; materials with special characteristics; recycling solutions; reduced energy consumption; minimal maintenance; high performance composites and, automated production technology.

Main Players



Trade fair

Lightcon, Frankfurt, June 01-02, 2022.

Associations

- Composites Germany: https://www.composites-germany.org/index.php/en/
- Composites United: https://composites-united.com/en/about-us/

France

With a GDP of approximately $2.60 trillion in 2020 (- 7.8% decline), France is the world's fifth-largest economy and Europe's third largest economy after Germany and the UK. While manufacturing has declined as a percent of GDP, many of France's remaining industries, such as aerospace, automotive and construction, are still world leaders and receptive to foreign partners and suppliers.

France is a European leader in the fight against climate change. Through its France Revival Plan 2030 and its 2020 Plan de Relance, France will invest in new technologies with the goal of becoming the first European country to reach carbon neutrality in 2050. In this context, France is expected to prioritize bio-composite materials, which use reinforcements and resins of vegetable (or animal) origin, as a sustainable alternative to conventional composites.

France has developed an expertise in composites reinforced with natural fibers. The association FiMaLin (https://www.fimalin.com/en/flax_home) oversees the promotion of bio-composites.

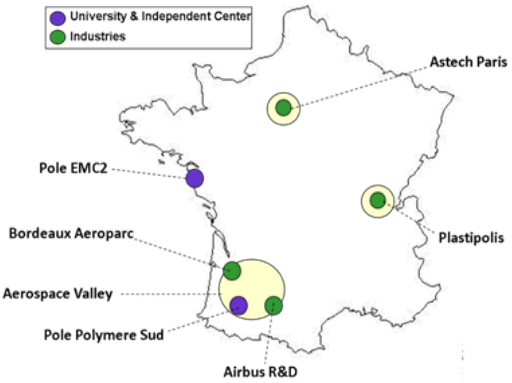
New sectors are being introduced such as the production of hydrogen for automotive hydrogen storage, and the creation of an R&D center for thermoplastic composite aerostructures in Nantes.

Commercial recycling of carbon fiber is also another area where France is progressing. Fairmat, a deeptech start-up behind the technology for recycling carbon fiber composite materials, has signed a double partnership with Hexcel, a global player in the manufacture of composite materials.

The number of French firms whose main activity is in the composites sector is estimated to be between 500 and 550. However, when including the entire value chain, this number rises to over 2,000 companies. A large majority of these firms are SMEs.

Many of them are located within a “pôle de compétitivité,” a cluster dedicated to a specific sector and located in one region of the country.

Of the 71 clusters in France, 24 are directly or indirectly involved with composites. Each cluster is comprised of large enterprises, SMEs, research centers, training organizations, and partner companies. The sectors represented are aerospace, biochemistry, energy, materials engineering, and transport, with the latter two being the most common.

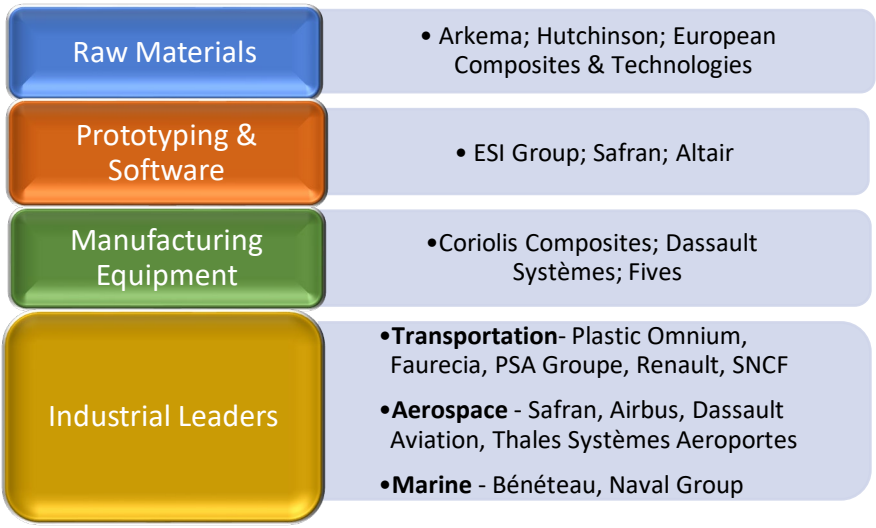


Below are the most active French clusters in the composites market:

<u>Advantages of the French market</u>

- An educated workforce with first-class universities,
- Sophisticated financial markets, strong intellectual property protections, and innovative business leaders.
- World-class infrastructure, including high-speed passenger rail, maritime ports, extensive roadway networks and public transportation
- The ninth largest global market for foreign direct investment (FDI)
- 9th in terms of global competitiveness economic transformation readiness

Main Players



Trade fairs

- JEC World 2022 (JEC World - The Leading International Composites Show (jec-world.events)) – May 3-5 Paris, France
- SAMPE Europe - SE Summit Paris 2022 | SAMPE Europe (sampe-europe.org) – May 2, Paris, France
- Composites Meetings Nantes - Composites Meetings, Convention d'affaires des matériaux composites - November 2023

Magazines

- Knowledge - JEC Group (jeccomposites.com)

Associations

- JEC Group (jeccomposites.com)
- Polyvia | Syndicat Plasturgie : filière Plasturgie et Composites
- Centre Technique Industriel de la Plasturgie et des Composites - IPC (ct-ipc.com)
- Présentation | amac-composites.org

United Kingdom

The UK is one of the leading countries in Europe in the composites industry with strong research and manufacturing capability. Around 1,500 companies are involved in the UK industry with circa 400 companies having composites their main activity. More than 85% of activity is undertaken by the 50 largest companies (including GKN, NP Aerospace, Airbus UK, Hexcel, BAE Systems, Rolls-Royce, and Bombardier). In comparison to the U.S., the UK has approximately three times lower composite consumption per capita.

According to *UK Composites Industry Competitiveness and Opportunities* research carried out by Lucintel for Innovate UK, the UK composites industry was valued at total of $5.29bn (both raw materials and parts) in 2019. The future of the UK composites market looks attractive with opportunities in aerospace & defense ($2bn opportunity), automotive ($670 million) and wind energy ($320 million). The industries most relying on imports to the UK are automotive and wind energy. COVID has impacted the composites industry with the exceptions of wind energy and defense. Demand of all other industries declined.

Aerospace & defense represent increasing demand for lightweight materials to achieve higher fuel efficiency and to reduce greenhouse gas emissions. Wind energy is expected to witness high growth due to acceleration in offshore wind turbine installations in the UK and limited impact of Covid on the industry. However, due to the size of the parts, most of the manufacturing is going to be local.

Different types of UK composites such as glass composites and carbon composites are used as fiber in the UK. Increasing penetration of carbon fiber in weight sensitive applications is expected, although the slow growth of industries such as aerospace due to Covid will affect this segment. In composites value chain, the UK has its own strong manufacturing base for resin, intermediates, and composites parts, but it presents opportunities for U.S. fiber companies.

Emerging trends, which have a direct impact on the dynamics of the UK composites industry, include development of low-cost carbon fibers as well as high performance glass fiber, and development of rapid cure resin systems.

One of the major inhibitors to the uptake of composites in new sectors is that regulations, codes, and standards are often inappropriate for composites. This is because they are both explicitly and implicitly based on named materials, such as steel, and do not permit consideration of composites applications despite the strengths and benefits of the materials in many cases.

The competitive advantage for U.S. firms is in innovation in composite component structures achieved through the R&D in the aerospace and defense sector that is supported by the U.S. Government.

The UK Composites Strategy - The document aims to reduce the market barriers for the composites industry, including addressing the skills gap and investing in sustainability and recycling. The current strategy focuses on advanced composites: Structural Fibre-reinforced Polymer and Matrix Composites and was published in 2016:
Composites Leadership Forum

Trade fairs & Industry events

- MACH 2022 (https://www.machexhibition.com/) – April 2022 – Birmingham, UK
- Advanced Materials Show (https://advancedmaterialsshow.com/) – June 2022 - Birmingham, UK
- International Composites Summit (https://www.internationalcompositessummit.com/) - September 2022 – London, UK

Magazines

- https://www.composites.media/
- https://www.materialsforengineering.co.uk/

Associations & Industry Organizations

- https://compositesuk.co.uk/
- https://compositesuk.co.uk/leadership-forum/about-clf
- https://www.nccuk.com/
- https://www.iom3.org/group/british-composites-society.html
- https://www.makeuk.org/
- https://ktn-uk.org/

Major Players

Raw Materials	• Nippon, SGL Carbon Fibre, ELG Carbon Fibre, Hexion, Polynt, Ashland, Scott Barder, Virtrex
Prototyping & Software	• Fenton Precision Engineering Ltd; Faulkner Moulds; Standex International LTD; Lawday Enginnering
Manufacturing Equipment	• Composite Integration Ltd; Atlas Composites; AMRC; Norco Composites; Paxford Composites
Industrial Leaders	•**Aerospace & Defense** - GKN, Spirit, Bombardier, Aernnova, BAE, Meggit, Leonardo •**Automotive** - MCT Carbon, Prodrive, Formaplex, Creative Composites •**Wind -** Siemens, MHI Vestas, Exel •**Construction** - Pultrex, Exel, Epwin, Kingspan

Italy

The composites market in Italy is characterized mainly by glass fiber and carbon fiber reinforcement. In tonnage terms glass fiber represents more than 90 percent of all reinforcement fibers used in composite worldwide and in Italy GRP production decreased from 161 Kt in 2019 to 135 Kt in 2020. As other European countries, Italy has seen a decrease in production and use of composites due to the Coronavirus pandemic. Major sectors affected are transportation, aviation, and construction.

In Italy composites have major applications in sectors such as aerospace, transport, and industry, while the energy and building sectors are slowly opening to composites materials.

The Italian aerospace sector is currently leading the edge in innovation for the use of carbon fiber reinforced composites. The Italian company Leonardo supplies 14% of the components of the new Boeing 787 Dreamliner commercial airplane. They also produce components in composites for Airbus and other manufacturers, using both conventional autoclave polymerization and innovative resin fusion processes. Other collaboration programs with Boeing include the construction of the 767 steering rudder and the 777 radome and external flaps, all made in composite materials. In the transport sector, Italian companies are at the forefront in the production of profiles and components for train body.

Italian companies in the automotive sector are developing innovative technologies to produce structural parts for mass production, while sport carmakers already make a widespread use of advanced composites. Large and innovative uses of composites are made in the building and construction sector and in the nautical industry for pleasure and racing boats.
All composites' applications related to renewable energy, environmental protection, nanotechnologies, and life science will gain importance and conquer new market segments.

Advantages of the Italian market

- Constant growth of Italian composites market
- Aerospace – the largest market in terms of sales and services, followed by transportation
- Several aerospace clusters: Piedmont, Lombardy, Lazio, Campania, Umbria, and Apulia
- The presence of key players, such as Leonardo, Avio, Boeing, Lockheed Martin,
- Advanced and sophisticated industries, with technological skills such as transportation
- R&D centers

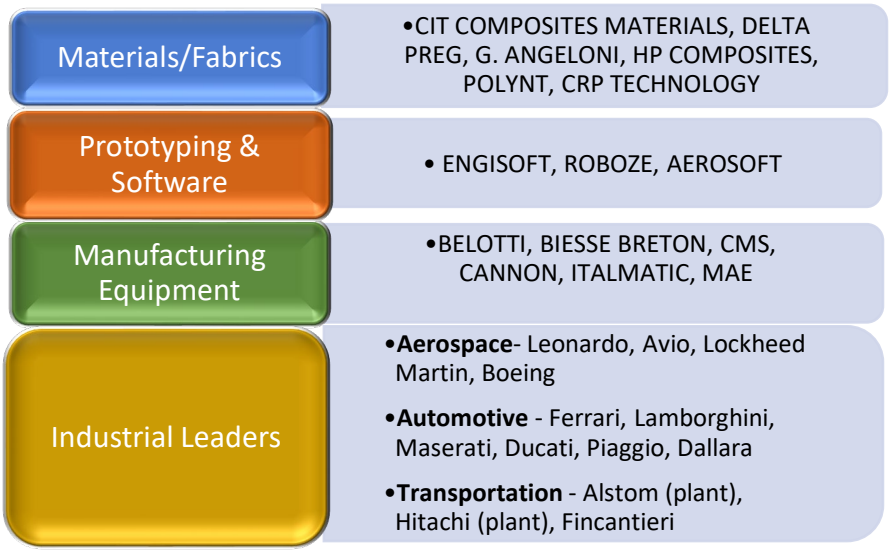
Trade fairs

- Compotec, Marina di Carrara, Italy, 2022 Date TBD, http://www.compotec.it

Associations

- Assocompositi: Italian Industry Association for Composite Materials: http://www.assocompositi.it
- Lombardy Aerospace Cluster: https://www.aerospacelombardia.it/en/
- Apulia Aerospace District: https://www.dtascarl.org/en/
- Campania Aerospace Cluster: https://www.daccampania.com/en/
- Piedmont Aerospace Cluster: https://www.distrettoaerospazialepiemonte.com/
- Umbria Aeropace Cluster: http://umbriaerospace.com/en/
- Lazio Aerospace Cluster: http://www.aerospace.lazio.it/
- Italian Transport Cluster: http://www.clustertrasporti.it/

Major Players



The Netherlands

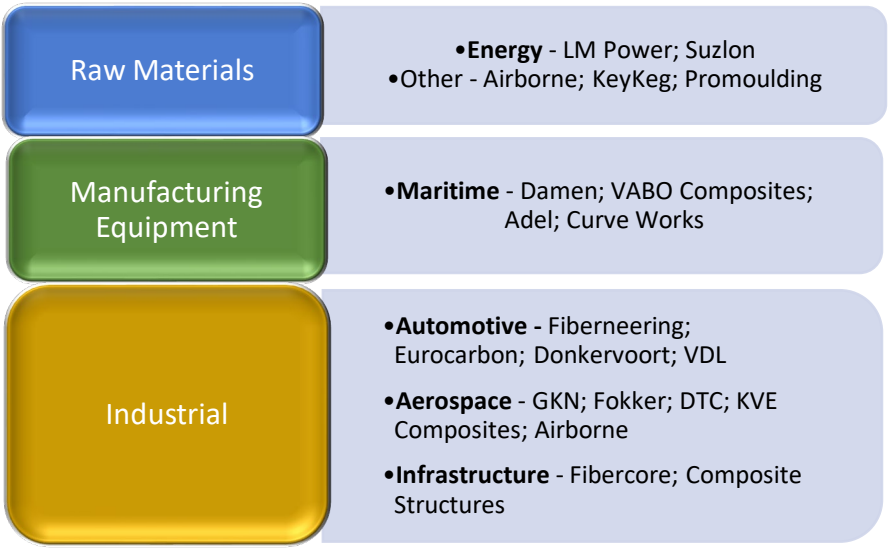
The Netherlands has expanded its potential in the composite market from only focusing on aerospace to diverting to different sectors within the composite market. This is due to the high-quality academic knowledge in the field of materials chemistry that the Netherlands offers: its rich and diverse landscape for knowledge and innovation development for composite technology, often embedded in regional initiatives and field labs. Over 200 composites companies exist in the Netherlands, which make use of the field labs that the Netherlands offers in terms of research and new innovations in the composite sector. These companies mainly focus on the aerospace, automotive, energy, infrastructure, and maritime sectors.

The Netherlands traditionally holds a strong position in the European composites industry, driven by parties such as the
Netherlands Aerospace Laboratory, Fokker, Damen, Ten Cate and VDL. From a technological perspective, the Netherlands are global players in the field of the design and industrialization of products, material development and sustainability in high-grade fiber-reinforced plastics. Worldwide, the pace of innovation is increasing, and increasingly stringent requirements are attached to robust, automated production solutions. Everything is aimed at reducing the cost price of composite products or products containing composite.

<u>Advantages of the Dutch market</u>

- A well-educated workforce
- Access to field labs and regional initiatives
- Major players like Airborne, Fokker, and VDL
- Various top sectors like Aerospace, Automotive, Energy, Infrastructure and Maritime
- The Netherlands ranks as the 5th top-European country in the composites market
- Dutch government plans to invest a total of € 2.5 billion in the composites market

Major Players



Trade fairs

- ESEF Maak Expo 2022, Utrecht, March 15-18, 2022, https://www.maakindustrie.nl/

Associations

- NAG (Netherlands Aerospace Group), https://nag.aero/
- Netherlands Maritime Technology, https://maritimetechnology.nl/
- The Dutch Composites Association, https://compositesnl.nl/
- AutomotiveNL, https://www.automotivenl.com/

Spain

Spain has a long history of expertise and experience with composites, globally recognized for its work within the sector. The country ranks 5th in the European composites market. In 2019, the Spanish industry grew by 2.6%, while the country's entire GDP reached $1.3 trillion. The global demand for carbonfiber has been steadily increasing in tons. The number of Spanish composite manufacturers accounts for approximately 500 and their production is primarily directed at the transportation and construction sectors, including automotive,aerospace, railway, marine, health as well as the energy sector.Most of the market players are SMEs. Covid 19 has negatively affected the demand for composites across the globe and in Spain due to a decrease in demand from various end-use industries. Aerospace & defense being one of the major consumers of composites has been the most affected.

Spain is the third European composite industry for aviation after Germany and France. The aerospace industry in Spain pioneered the use of composite materials in the manufactureof parts and section of aircraft. Spain's investment in the field, both in research and production, has led to the popular use of these materials. The prevailing manufacturing methods that are in use in Spain include hand lay-up, RTM, and pultrusion methods.

Spain boasts of some of the largest research facilities in Europe.Much of the research on carbon fiber composites in Spain takesplace at the Airbus facilities in Madrid, Toledo, and Seville.

Spain has six R&D centers and two clusters. AESICOM, Cluster of the Spanish composites Industry was established in 2005 to actively contribute and to promote the competitiveness and economic development of Spanish companies of the composites sector. AESICOM's mission is to promote and represent the Spanish companies of the composites sector in Europe.

Advantages of the Spanish market

- Spain is a significant potential export market for American suppliers of composites technologies, especially in the aerospace, automotive, construction, and sport equipment sectors.
- The Center for Aerospace and Advanced Technology (CATEC) located in the south of Spain, is one of the major European research centers in the aerospace industry.
- The presence of key players, such as Airbus, Ford, PSA, Nissan, Renault, Boeing, Lockheed Martin
- Advanced and sophisticated industries, with technological skills such as transportation
- R&D centers

Trade fairs

- MetaMadrid 22, Spain, October 19-20, 2022
  www.metalmadrid.com/en/composites-madrid-en/

Associations

- AEMAC (Spanish Association of Composite Materials) www.aemac.es
- AESICOM (Cluster of the Composites Industry) www.aesicom.es
- CATEC - FADA (Advanced Center for Aerospace Technology) http://www.catec.aero/es
- AIMEN (Technology Center) www.aimen.es
- AIMPLAS (Technological Institute of Plastics materials) www.aimplas.net
- CTAG (Automotive Technologic Center of Galicia) www.ctag.com
- FIDAMC (Research Foundation for composite materials) www.fidamc.es
- METERPLAT (Advanced Materials and Nanomaterials Spanish Technological Platform) http://materplat.org/en/

Major Players

Turkey

The rapid growth of the Turkish composites industry has paralleled that of the industries it serves, with growth of 8% to 12% in the past years. In addition, the Turkish composites industry is projected to grow by 30% over the next five years. There are currently 180 medium and large sized companies in the industry. However, this number increases to 700- 800 when firms in related subsectors are included, employing around 12,500 in all. The value of the Turkish composites market is $1.7 billion, and total market capacity is 280,000 tons.

Turkey has a balanced trade in the composites sector, with exports and imports each valued at about $304 million.

Product	Import (Million $)	Export (Million $)
Polyester Resin	17	56
Glass Fiber	79	11
Carbon Fiber	-	28
Technical Textile	6	11
GRP Pipe	-	68
Chemical Raw Products	191	-
Other Composite Products	11	130
TOTAL	**304**	**304**

Turkey produces one of the most used materials - glass and carbon fiber. Turkey exports polyester resin, GRP pipe, carbon fiber, glass fiber and technical textiles and primarily imports the chemical raw materials needed by the industry - glass and polyester resin and other composite products.

Among the resins, while unsaturated polyester resin and vinyl ester resin are produced in Turkey, the rootstocks of epoxy resins and thermoplastic resins are imported. Domestic production of styrene, phthalic, maleic, and glycols used in the production of unsaturated polyester do not meet market demand; therefore, Turkey relies on imports of these materials. Production of technical textiles used in composite production, however, is sufficient to meet the demand.

Experts point to consumption of composite materials as an important indicator of the development of a country. While average global consumption of these materials is 4-10 kgs/person, in Turkey it is only 3 kgs. Globally, composite materials cost around $7.8/kg, whereas the cost is around $5.99/kg in Turkey.

Composite materials are used predominantly in the transportation-automotive (29%), pipe-tank-infrastructure (25%) and construction-building (23%) industries in Turkey. In the upcoming years, composite use and production is expected to increase in nearly all industries, including renewable energy, (wind power, solar panels), construction (greenhouse applications, building reinforcements), pipe-tank (polypropylene random co-polymer (PPRC), glass-reinforced plastic (GRP)), electronic goods (combi boilers), marine and aviation sectors.

In addition, thermoset composite processing, pultrusion, resin transfer molding (RTM) (used primarily in the wind power, maritime, transportation and automotive industries), as well as usage and production of sheet molding compound (SMC) and injection molding are also expected to increase in the Turkish market.

Trade fairs

- Composite Summit Turkey, Istanbul, 06-08 October 2022
- Eurasian Composites Show, Istanbul, 07 February 2022

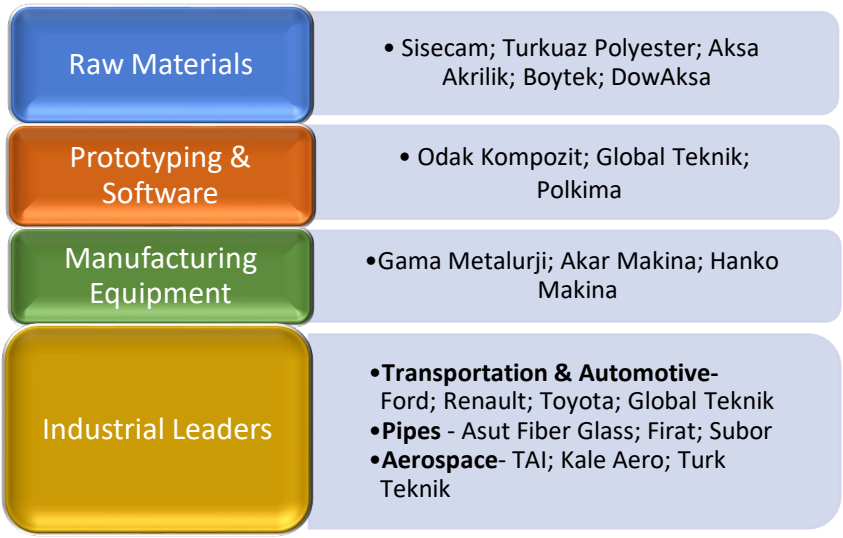
Associations

- Turkish Composites Manufacturers Association, http://www.kompozit.org.tr/en/home/
- Plastic Industrialists Association, http://www.pagder.org/
- Automotive Manufacturers Association, http://www.osd.org.tr/homepage
- Automotive Distributers Association, http://www.odd.org.tr/

Advantages of the Turkish market

- Educated workforce
- Geographic Location: Crossroads of Europe, Asia and Middle East
- Automotive – powerful market in the region in terms of production, sales and services
- Presence of international investors, such as TPI Composites, Enercon, and Ford Motor
- Access to investment funds
- Need to implement innovative solutions.
- Expected growth in usage of composite materials in nearly all sectors.

Main Players



Relevant EU Regulations

Raw Materials:

U.S. suppliers of raw materials need to assess the applicability of the REACH and CLP regulations to their products. REACH requires the registration of all chemical substances imported into the European Union in quantities exceeding one metric ton. The CLP regulation implements the UN Global Harmonized System of classifying, labeling, and packaging of hazardous substances. Both regulations contain specific provisions defining the categories of substances that fall within the scope of applicability. U.S. suppliers of raw materials should assess whether their products fall within the scope of each regulation and, if so, what compliance measures they need to undertake as a result.
The Member States of the European Union have established the European Chemical Agency (ECHA) to implement the REACH and CLP regulations. The agency's website contains a wealth of information about the registration and classification of chemical substances. For more information see, https://www.echa.europa.eu/

For more information on the practical aspects of registering a substance, although published in 2016, this article published by ECHA remains relevant and useful today:
https://newsletter.echa.europa.eu/home/-/newsletter/entry/2_16_reach-for-non-eu-manufacturers

Manufacturing Equipment:

CE Mark: To enter the EU market, most manufacturing equipment requires a CE Mark. The CE Mark certifies that a product meets EU health, safety, and environmental requirements. These requirements are set in EU law (Directives or regulations). Manufacturers must demonstrate that their products comply with the various EU regulations related to the machinery they produce. This involves testing, including risk assessment.

Depending on the risks associated with the product, self-certification is possible, or a third-party conformity assessment must be done (for higher risk products).

Machinery manufactured in conformity with European Harmonized standards, which have been drafted by EU standards organizations such as CEN-CENELEC and published in the Official Journal of the European Union, are presumed to comply with the essential health and safety requirements of the law. Companies can use other standards, but these will not give the same level of legal certainty. At the end of the process, manufacturers will issue a declaration of conformity to the relevant directives and affix the CE mark on their machine. CE marked products can be sold in the EU, the European Economic Area and Turkey. It is a "passport" to the European market.

Machinery Directive:

One of the main laws governing the health and safety requirements for machinery at EU level is the Machinery Directive 2006/42/EC. The Directive specifies a number of essential health and safety requirements which are designed to guarantee that any piece of industrial machinery will be safe to use.

Under EU law, 'machinery' means: 'an assembly, fitted with or intended to be fitted with a drive system other than directly applied human or animal effort, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application'. Self-certification by the manufacturer is possible for low-risk machines whereas a Conformity Assessment Body located in the EU (Notified Body) must be involved for higher risk machines. The Directive lists high-risk machines that need conformity to be certified by a third-party. These include machines such as sawing or wood working.

Watch out! The Machinery Directive is currently being revised by the EU to, among other things address safety issues linked with emerging digital technologies e.g. A.I, IOT, cybersecurity for industrial machines. More information about the ongoing update of the directive can be found on the below pages: Briefing document by the European Parliament's think tank:
Machinery Directive: Revision of Directive 2006/42/EC | Think Tank | European Parliament (europa.eu)

Public consultation feedback on Commission's proposal:
https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/2019-Machinery-Directive-revision/feedback_en?p_id=24213008

You can also contact us for latest updates:
http://www.export.gov/europeanunion/contactus/index.asp

More information on the Machinery Directive:
https://ec.europa.eu/growth/sectors/mechanical-engineering/machinery_en

In addition to the Machinery Directive, manufacturing equipment is likely to be covered by other directives on:
The **low voltage directive** (LVD) (2014/35/EU) is the European Directive that outlines safety requirements for all electrical equipment sold within the EU - specifically, 50-100V AC or 75-1500V DC. The type of products covered under the Low Voltage Directive, include the following Electrical appliances, Lighting equipment, Cables and wires. Self-certification is possible under the Low Voltage directive: Any test lab in the US or EU can do the testing. The legal requirements and European Harmonized Standards that can be used to prove conformity with these requirements, as well as guidance, are available on the European Commission website:
https://ec.europa.eu/growth/sectors/electrical-engineering/lvd-directive_en

The **electromagnetic compatibility Directive** (EMC) (2014/30/EU) ensures that electrical and electronic equipment does not generate or is not affected by electromagnetic disturbance. Conformity assessment modules, Notified Bodies (including US labs), Standards and guidance are available on the European Commission website:
https://ec.europa.eu/growth/sectors/electrical-engineering/emc-directive_en

Other relevant legislation for manufacturing equipment includes the ATEX directive (Explosive Atmospheres), Radio Equipment directive, Pressure Equipment Directive, Gas Appliances Directive, Eco-design, construction products, lifts, personal protective equipment, Restriction of Hazardous substances in Electrical and Electronic Equipment (ROHS), etc. For example, Non- Road Mobile Cranes must conform to the regulations on the safety of machinery, electromagnetic compatibility, Noise Emission Directive, and the engines on the machines must conform to the regulation on the emission of gaseous and particulate pollutions from internal combustion engines.

For more information:

- Contact us! The U.S. Foreign Commercial Service can help you through the process of getting the CE mark: http://www.export.gov/europeanunion/contactus/index.asp

- General information about placing products on the market in the EU can be obtained in the EU Blue Guide: https://ec.europa.eu/growth/content/'blue-guide'-implementation-eu-product-rules-0_en

For an introduction to the CE mark, see our video 'CE marking': https://www.export.gov/article?id=CE-Marking

Web Resources

Associations

- EUCIA (https://eucia.eu/)
- European Society of Composites Materials (http://www.escm.eu.org/)
- Glass Fiber Europe (European Glass Fiber Producers Association) (http://www.glassfibreeurope.eu)

Sources

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- Expert Market Research – Europe composites Market
- Mordor Intelligence reports – Europe Thermoplastics market; Fiber-Reinforced Plastic FRP Recycling market; Europe Aerospace Composites Market
- Innovation In Textiles
- GlobeNewswire – Trends & Opportunities & Competitive analysis of the natural fiber composite market
- FiberEUse.eu

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(www.trade.gov/advanced-manufacturing-industry)

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