



This consists of **developing lighter materials** to lighten vehicles and thereby reduce the impact that their weight has on the **consumption of fuels and energy sources**. Reducing overall vehicle weight is one of the most effective ways to improve mileage from fuel, but there are other options that contribute to this ultimate objective, such as incorporating hybrid powertrains, reducing the size of the engines or the number of cylinders (downsizing). To reduce vehicle weight, **plastic and aluminium** stand out among the lightest materials. In the plastics industry, the **application of composites** is particularly relevant.

ORIGIN OF THE INVESTMENT OPPORTUNITY



Reducing vehicle weight is one of the main objectives of car manufacturers to meet **global environmental regulations** such as the Kyoto Protocol, the rules of the European Commission or the US Corporate Average Fuel Economy (CAFE) establish CO₂ emissions standards from industry for 2020.

Specifically in Europe, the use of cars accounts for 12% of total emissions of CO₂ (the main greenhouse gas). Therefore, in order to reduce **energy dependence, pollution and improve the future competitiveness** of the automotive industry and transport in the future, the European Union establishes the maximum emissions of new cars that are manufactured to be 95 g/km of CO₂ by 2020.

Spain has set the aim of building 3 million vehicles again in 2017 (*Plan 3 Milliones*), supported by the investments announced by manufacturers and new models allocated to Spanish factories. To achieve this, production needs to increase to 200,000 units annually.

LOCATION OF THE INVESTMENT OPPORTUNITY IN THE SECTOR VALUE CHAIN



The use of lightweight materials to reduce vehicle weight, and thus the emission of polluting gases, requires the **introduction of new components suppliers in the manufacturing process** as well as new functionality of lighter materials. To do this, vehicle manufacturers should contact auxiliary industries that supply the automotive industry.

DIFFERENTIATING FACTORS OF THE INVESTMENT OPPORTUNITY

CONSUMER/USER	COMPANY/INNOVATION	SOCIETY
<ul style="list-style-type: none"> ● ● ○ Innovation ● ● ● Price ● ● ○ Quality 	<ul style="list-style-type: none"> ● ● ● Operations ● ○ ○ Supplies ● ● ● New business lines 	<ul style="list-style-type: none"> ● ● ● Environment ● ○ ○ Well-being ● ○ ○ Safety
<ul style="list-style-type: none"> Reducing fuel consumption allows cost savings for vehicle use. It is estimated that for every 10% that weight is reduced, fuel use will improve about 7%. Achieve a longer distance without recharging the battery in electric cars. Improved vehicle performance. A reduction in mass significantly dampens noise, vibration and softens the ride. 	<ul style="list-style-type: none"> Compliance with environmental regulations, avoiding payment of fines and penalties for exceeding emissions limits. Development and involvement of the whole value chain (raw materials, components and assembly industries). Improved corporate image because of concern for environmental sustainability. 	<ul style="list-style-type: none"> Reducing greenhouse gas emissions. Reducing air pollution and resulting costs in healthcare. It is estimated that the total benefits of improved air quality in the European Union could reach 88 billion euros per year by 2050. Ecosystem improvement and global warming relief.

INVESTMENT OPPORTUNITY LIFE CYCLE

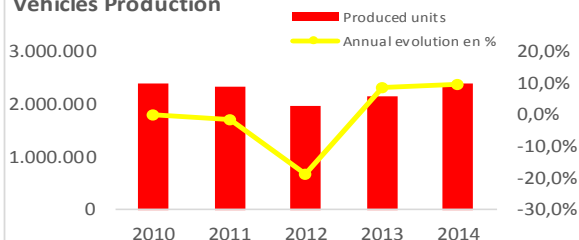


It is anticipated that by 2020 **the total weight of steel will decrease to 46%** of the total weight of the vehicle. It currently represents 56% on average. Whereas, for the same dates, it is estimated that the **aluminium engine blocks will represent 69%** of global production of these components against 59% today. Recently, **various projects have been carried out and various technologies developed that will incorporate composites reinforced with carbon fibre** in the large-scale manufacture of vehicles, which until now was limited to the construction of the structure of cars in the early stages of technical development. It is expected that in **2030** the automotive industry will use composites in complying with environmental regulations.

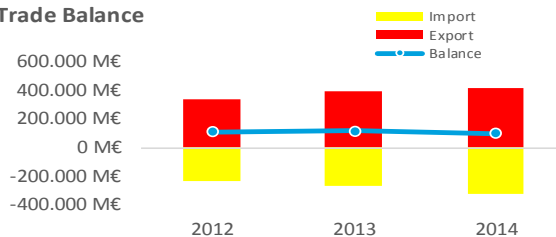


CHARACTERISTICS OF THE AUTOMOTIVE SECTOR (1)

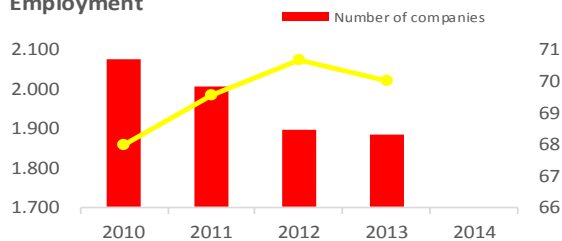
Vehicles Production



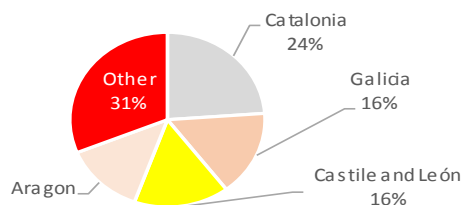
Trade Balance



Employment



Territorial distribution of turnover (2014)



SUPPLY

TOP 5 COMPETITORS IN SPAIN

#	Company	Net sales	Last available data
1	Hexcel Composites	€153.65 M	2013
2	Carbures	€22.19 M	2013
3	Constellium*	N. avai.	-
4	Sapa Group*	N. avai.	-
5	DowAksa*	N. avai.	-

* Data not available in the queried database. SABI.

DEMAND

GROWTH

- The aluminium industry predicts that the demand for this metal from **carmakers will double by 2025**, due to the demands of fuel consumption in the United States and the European Union.
- The third biggest market for the potential growth of **carbon fibre and carbon fibre reinforced plastics** is the Automotive sector. It is anticipated that by 2020, the sector will consume about 23,000 tons of carbon fibre.

SUCCESS STORIES



Recently at its El Burgo de Osma (Soria) plant, **Carbures**, a multinational specialised in the manufacture of parts and structures with carbon fibre, unveiled a line capable of producing **75,000 carbon fibre structural car pieces** annually, opening up an **international market with a potential turnover of 800 million**. This Carbures facility uses the Rapid Multi-Injection Compress Process technology that means that a line can manufacture car parts in carbon fibre at the same speed as traditional metal components. This plant will be the **only one in the world** that can currently produce parts with carbon fibre, except for BMW in Germany.



Ford and DowAksa are driving a joint research project to develop manufacturing techniques for large volumes. The goal is to get **lighter vehicles** that allow more efficient consumption, better performance and competition by creating lighter parts than those made from steel but without sacrificing the properties of strength and endurance. One example is the **Ford Lightweight Concept Fusion**, in the manufacture of which lightweight materials such as aluminium, high-strength steel, magnesium, composites and carbon fibre are used for almost every vehicle system, successfully **reducing the weight of the car by almost 25%**.



The Andaltec technological centre for plastics participates in the European project PMjoin which, led by the Basque Tekniker-IK4 technological centre, aims to develop a system for **joining plastic to metal** using laser technology contributing to lighter and cleaner vehicles. The current development of technology is based on the use of adhesives or mechanical bonds, or a combination thereof, which requires a series of assembly operations. The aim is to reduce the weight of the polymer components by inserting those pieces that have lower mechanical requirements, so that the complex process of transformation required by metals is eliminated while design specifications are still met.



POSITIVE FACTORS FOR INVESTING IN SPAIN

Favourable factors in Spain for the development of the opportunity

Strong components industry

The Automotive Components Sector is a key sector and a benchmark of competitiveness in Spanish Industry. There are 1000 manufacturers of automotive equipment and components in the country, belonging to 720 business groups, geographically installed close to the production plants and ensuring service delivery to those business groups. The components sector turns over 30 billion euros, of which 60% were exports into major global markets. ⁽²⁾

Research and excellence centres

The **Plastics Technological Centre (AIMPLAS)** works with companies in the automotive industry to **improve the properties of plastic materials** used in the manufacture of components both inside and outside of vehicles. It has carried out projects, analysis and testing for manufacturers such as Ford, Seat-Volkswagen, General Motors, Opel, Toyota, Nissan and PSA-Renault. It also coordinated the European project Coaline which was based on the development of innovative manufacturing processes for a **pultruded composites** coating line to reduce the manufacturing time and their environmental impact. Currently, AIMPLAS is carrying out several projects to reduce the weight of materials and plastic products. It has been shown, at laboratory-scale, that a **low load of graphene** can significantly improve the mechanical and physical properties of polymers by reducing the weight of the final piece.

Social factors and habits

Consumption is the third most important factor when buying a vehicle, only behind incorporated safety features and the price of the car according to the "evolution of different generations at the wheel" report. Consumers are **looking for and value** solutions to reduce the consumption of their vehicles, when making their decision, both from the point of view of the engine and the design and structure. ⁽³⁾

Favourable factors for the sector in Spain

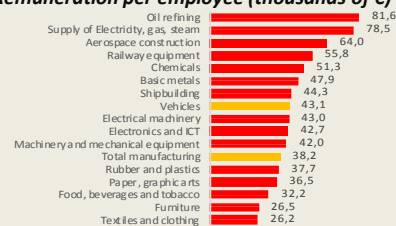
Macroeconomic situation

The **Added Value of automotive sector** in 2013 was 8.382 billion euros, representing 6.73% of the manufacturing sector. Sector **exports** totalled **39.0495 billion euros**, representing **18.5%** of the exports of the industrial sector. ⁽⁴⁾

Labour market

The **average productivity per employee** in the automotive sector is **63,600 euros** per year. Their **average individual remuneration** is **43,100 euros** per year. The **Unit Labour Cost** accounts for **67.8%** of the ratio between the remuneration per employee and the individual productivity (productivity defined as value added per employee). ⁽⁴⁾

Remuneration per employee (thousands of €)



Graph created using data from the Sectoral Presentation: automotive sector, April 2015. Ministry of Industry, Energy and Tourism

Incentives

The Spanish government has launched a new set of incentives for the purchase of efficient vehicles, the **PIVE Plan**, which aims to promote a reduction of energy consumption nationally through incentives for the **modernisation** of the fleet of production vehicles (M1) and commercial vehicles (N1) with energy-efficient models, with lower fuel consumption and CO₂ emissions, all under the **2011-2020 Energy Saving and Efficiency Strategy**. The previous seven editions of this programme have seen the replacement of 890,000 old cars with new, cleaner and safer cars. The central government and car manufacturers have each earmarked **890 million euros** for the programme.

R+D+i

There are 390 **innovative companies** in the automotive and aerospace sector and the **percentage** of innovative companies is 39.3%, **spending** a total of 2.610475 billion euros on innovation. ⁽⁵⁾

Suppliers, Supplies, Raw materials

An sector with a great tradition in Spain and directly linked to the car industry is that of the **machine tool**, which stands out as one of the most advanced in Europe. It is important to highlight the industries producing materials such as **plastic and steel** that are the raw materials for the construction of vehicles and their components. **Spain is a leading producer and exporter** of these materials. ⁽⁶⁾

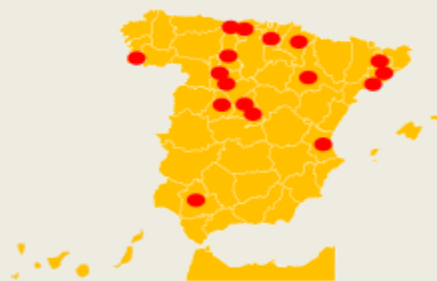
Geographic location

Spain is **within reach of three main regions**: the **European** region, the **Mediterranean** region and the **Atlantic** region. Spain is considered to be the **gateway** between **North Africa and Europe**, and a key **link** to **Latin America**, not only because of its geographical location but also because of its strong historical and cultural ties with the region. In Spain the **Canary Islands** play a key role with regards to **maritime traffic** with **West Africa**.

Technological and research infrastructure

Spain has **17 manufacturing centres** distributed throughout Spain and belonging to **10 different vehicle manufacturers**. Most of the **production of family vehicles** has been specialised in mid-range and small vehicles, with Spain being one of the European leaders in this competitive segment. These centres have a high level of **automation and robotics**, with 89 robots per 10,000 workers, positioning the country 5th in Europe. In addition, there are 9 parks and **34 technology centres** with projects related to vehicle manufacturing in Spain. ⁽⁶⁾

Manufacturing Centres Locations



Graph created using data from the Spanish Automotive Equipment and Components Manufacturers Association (2015).

Transport infrastructure and logistics networks

Spain has the **best high-speed rail network** in Europe and has excellent sea connections to its **46 ports** distributed along the Atlantic and Mediterranean coasts. The agreement signed in 2013 between the Ministry of Public Works and Transport and the Manufacturers Association ANFAC will bring the rail networks together with the automobile manufacturing plants to connect them to the ports with greater importance in the sector and the Spanish border.