



# **MAGNETI MARELLI COMPANY PROFILE**

**2017**



## Summary

The Company	pag 3
Magneti Marelli in the world	pag 4
Magneti Marelli: production highlights	pag 4
Short history of Magneti Marelli	pag 5
<i>MAGNETI MARELLI: BUSINESS AREAS</i>	
• Magneti Marelli Automotive Lighting	pag 6
• Magneti Marelli Electronic Systems	pag 8
• Magneti Marelli Powertrain	pag 9
• Magneti Marelli Exhaust Systems	pag 11
• Magneti Marelli Suspension Systems	pag 11
• Magneti Marelli Shock Absorber	pag 12
• Plastic Components and Modules	pag 13
• Magneti Marelli After Market Parts and Services	pag 13
• Magneti Marelli Motorsport	pag 14
○ Motorsport in the DNA and in the history of Magneti Marelli	pag 15
Technological Excellences	pag 17
Magneti Marelli: future automotive challenges and integration approach	pag 23
The Research	pag 23
Sustainability	pag 24
Magneti Marelli Awards: the best of 2016-2012	pag 25



## The company

Magneti Marelli is an international company founded in Italy in 1919, committed to the design and production of hi-tech systems and components for the automotive sector, based in Italy (Corbetta, Milan).

With a turnover of **€ 7,9 billion in 2016**, **about 43,000 employees**, **86 production units and 12 R&D Centres**, the Group has a presence in **19 countries** (Italy, France, Germany, Spain, Poland, Czech Republic, Russia, Serbia, Slovak Republic, Turkey, USA, Mexico, Brazil, Argentina, China, Korea, Japan, India and Malaysia)

Magneti Marelli supplies all the leading car makers in Europe, North and South America, and Asia Pacific region.

Within the scope of its mission as a world-wide automotive systems and components supplier, Magneti Marelli aims at combining quality and competitive offer, technology and versatility, with the goal of making key technologies available to the final user at a competitive price.

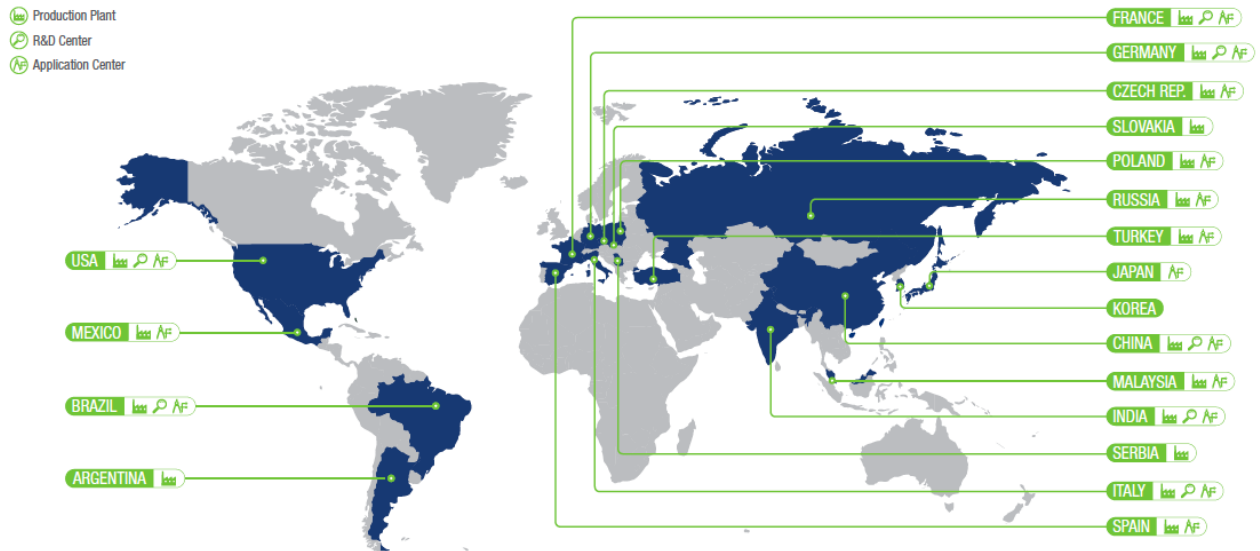
Through a process of constant innovation, Magneti Marelli aims at optimising transversal know-how in the electronics field in order to develop intelligent systems and solutions that contribute to the advancement of mobility, according to criteria relating to environmental sustainability, safety and quality of life onboard the vehicles.

Magneti Marelli is part of FCA.

Magneti Marelli's business areas are:

- **Automotive Lighting** (front and rear lighting systems),
- **Electronic Systems** (instrument clusters; infotainment & telematics, lighting & body electronics),
- **Powertrain** (engine control systems for gasoline, diesel and multifuel engines, hybrid electric systems and components, transmissions)
- **Suspension Systems** (suspension systems, shock absorbers. dynamic systems),
- **Exhaust Systems** (exhaust systems, catalytic converters and silencing systems)
- **Motorsport** (electronic and electro-mechanical systems specifically for championships at the cutting edge of technology, in F1, MotoGP, SBK and the WRC)
- **Plastic Components and Modules** (activity under integration process in Magneti Marelli)
- **After Market Parts and Services** (Spare Parts for the Independent Aftermarket – IAM, Service Network – Magneti Marelli Checkstar Workshops)

## Magneti Marelli in the world



## Magneti Marelli: production highlights

Here below, some relevant figures about production activity in 2016, concerning various systems and components of all the business areas

- **HEADLAMPS (INCLUDING XENON AND LED):** 21,4 million units
- **HEADLAMPS (ONLY XENON):** 3,8 million units
- **HEADLAMPS (ONLY LED):** 3,6 million units
- **REARLAMPS (INCLUDING LED):** 29 million units
- **REARLAMPS (ONLY LED):** 15,1 million units
- **ECU LIGHTING:** 12,8 million units
- **INSTRUMENT CLUSTERS:** 4,7 million units
- **GDI INJECTORS:** 700.000 units
- **ECU (electronic control units) gasoline:** 1,5 million units
- **AMT/Freechoice robotized gearbox:** 430.000 units
- **DISPLAY (Central Information Displays):** about 400.000 units
- **TELEMATIC BOX:** about 200.000 units
- **SHOCK ABSORBERS:** 25,5 million units



## **Short history of Magneti Marelli**

Magneti Marelli was founded in Sesto San Giovanni in **1919**, with share capital underwritten in equal parts between **Fiat** and the company **Ercole Marelli**. The company started producing magnets and **automobile components**, but soon expanded its production to include electrical equipment, sparkplugs and batteries. Since its founding, Magneti Marelli has been involved in **sports competitions**, for which it provides technology and assistance on all racing fields, from automobiles to motorcycles, from boating to aeronautics.

Through the years, Magneti Marelli has picked up the industrial legacy of historical and renowned European trademarks in the automotive field, such as **Carello** and **Siem** in the lighting sector, **Veglia Borletti** and **Jaeger** in the area of instrument clusters, **Weber** and **Solex** in the field of engine control and fuel supply.

Not just automotive, but **telecommunications** too: in **1930**, Magneti Marelli began the mass production of radios under the brand **Radiomarelli**, and in **1939** it tested the first **television broadcasts**, almost twenty years before their official launch. Between the 1950s and 1960s, Magneti Marelli made it possible for RAI, Radio Televisione Italiana, to broadcast its first television programmes, designing and producing movie cameras, transmitters, receivers, radio bridges for RAI's first and second channel, in addition to the famous Radiomarelli televisions.

In **1967**, the entire share capital was taken over by Fiat, and between the **1970s** and **1980s**, Magneti Marelli **focused its activity exclusively in the automotive field**, turning into an industrial holding. With the founding of Marelli Autronica, Magneti Marelli took on a major role in the study and production of electronic control devices of ignition and fuel supply systems. Along this line, in the **1990s** Magneti Marelli became a **key player in the field of electronics** – which has become increasingly important in terms of the functioning of the automobile-system – also commencing its activities in the field of navigation and infotainment devices.

In the second half of the **2000s**, Magneti Marelli strengthened its presence in the sectors of **lighting, powertrain and electronic systems**, and on the main global markets such as **Brazil, China** and **India**, expanding its vocation of major component manufacturer with the ability to design and produce hi-tech automotive systems and components for all the best carmakers in the world, with a significant presence throughout its history in the world of aftermarket and service networks, and motorsports competition (Formula 1, WRC, MotoGP, SBK, ecc.).



## **MAGNETI MARELLI: BUSINESS AREAS**

### ***MAGNETI MARELLI AUTOMOTIVE LIGHTING***

Automotive Lighting (AL) was formed in 1999, from a 50-50 joint venture which merged the lighting technology divisions of Robert Bosch GmbH and Magneti Marelli Spa. After having incorporated the Seima Group (a leading manufacturer of rear lights) in 2001, the Automotive Lighting division also took over Robert Bosch's shareholding in 2003, becoming the sole owner.

Automotive Lighting concentrates on research, development, production and sale of the complete range of technologies for front and rear lighting, fog lights, front headlight wiper systems, level adjustment systems, electronic components and stoplights fitted to the top of the rear hatch.

Customer focus and global presence are the key factors in the success of Magneti Marelli Automotive Lighting's global operations, 26 different sites worldwide, located in 15 different countries: Brazil, Czech Republic, China, France, Germany, India, Italy, Japan, Malaysia, Mexico, Poland, Russia, Spain, Turkey and the U.S.A.

In Europe and in U.S.A., the R&D centres concentrate on innovations in front and rear lighting, and are located at Reutlingen, Germany, Tolmezzo (UD) in Italy, Auburn Hills (Michigan) in U.S.A. There are also local R&D centres distributed over three continents, who work in close contact with customers.

Headlights and rear lamps are becoming increasingly important as far as safety is concerned, and also for design and the way the car looks. Headlights and rear lamps are important in defining the image and identity of a particular model, both during the day and at night: this is why the styling departments at Automotive Lighting work closely with their counterparts at the car manufacturers.

Magneti Marelli Automotive Lighting was the first to launch Xenon, in **1991**, taking front lighting to a new dimension.

In **2003**, AL equipped its first car with the dynamic curve light, one step towards the Adaptive Frontlighting System, AFS.

In **2005**, the world's first-ever front headlight with an active infra-red module was sold. A subsequent innovation was the introduction of LEDs (light-emitting diodes) in front and rear lights. These offer new styling possibilities as well as cutting down on energy consumption.

In **2005**, AL began mass producing the first rear light based on LED technology.



**2006** saw the launch of the first complete AFS headlight which adapts to changing road and weather conditions.

In **2007** Automotive Lighting presented the world's first Full-LED headlamp in series production (for Audi R8).

Since **2010**, Automotive Lighting has been supplying the first all-LED headlight with adaptive light function (for Mercedes-Benz CLS).

The technological evolution resulting from LED and Xenon technologies has opened up new frontiers in terms of safety, reduced energy consumption and CO<sub>2</sub> emissions, as well as new possibilities for designers. LED technology reached new standards in 2010 with the marketing of the first full-LED adaptive headlamp fitted on the Mercedes-Benz CLS. Thanks to this evolution, Magneti Marelli Automotive Lighting once again confirmed its leadership and ability to innovate in the area of lighting technology, and provided a preview of the main topics for the future of lighting: design, technology and reduction in energy consumption.

In **2013** were opened manufacturing plants in Foshan (China), Pulaski (Tennessee - USA) and Batu Kawan, (in the state of Penang, Malaysia) and is signed a new joint venture in China with China South Industries Group Corporation (CSI).

In the month of March **2014**, the EU has officially included Magneti Marelli Automotive Lighting's "E-Light" LED technology among the Eco-innovations for automobiles. This solution guarantees those carmakers that fit the E-Light a bonus of 1 g CO<sub>2</sub>/km per vehicle, allowing considerable potential savings on the strict sanctions set for automobile manufacturers by European regulations "2020" on vehicle emissions.

The new Audi R8, officially launched in Geneva **2015**, has a front lighting system with additional main-beam laser module developed in collaboration with Magneti Marelli Automotive Lighting.

Automotive Lighting, received in 2015 two "Red Dot Award 2015", one of the most prestigious international awards in design and industry. First award was recognised for the Full LED smart headlamp developed together with Audi for the Audi TT3, MY 2015 - "Red Dot Best of the Best" award - for the high quality of the design and the innovative project. The second award was recognised for an OLED (organic led) technology rear light prototype - "Red Dot" award - for the design quality. These are two absolute level awards that provide further evidence of the company's technological excellence within the most advanced solutions for automotive lighting.



## **MAGNETI MARELLI ELECTRONIC SYSTEMS**

**Magneti Marelli Electronics** is the Magneti Marelli business line that deals with the development and production of instrument clusters, displays and Infotainment & Telematics.

### **Infotainment & Telematics**

Magneti Marelli has twenty years of experience in the development and production of satellite navigation, connectivity, infotainment and telematics system, with integrated Human Machine Interface (HMI) solutions, to guarantee a high level of comfort, safety and entertainment onboard the vehicle. The company offers a complete and modular range: from connectivity systems with external electronic devices up to the multimedia platform complete with integrated navigation. Thanks to such systems, Magneti Marelli allows drivers to access a wide range of functions and services.

Magneti Marelli Infotainment & Telematics stands out as a 360° innovative partner in the Digital Car Era.

**Infotainment** systems can be equipped with TFT color display ranging from 6,5" to 8" (10"). Design architecture can be the double-DIN type with built-in display or the single DIN (or 1 and half DIN) type with embedded or remote display.

Since 2012, the multimedia connectivity platform SMEG, with its Touch Screen interface, represents Magneti Marelli's ultimate innovation in HMI for Infotainment, Connectivity and Navigation.

The 2014 has seen the launch of the first Magneti Marelli Open platform Multimedia system. It was the first Linux GENIVI compliant product in the market.

In order to offer a modular and complete range of Infotainment and Telematics, Magneti Marelli **Telematics** division offers a complete and scalable range of telematics products and solutions enabling delivery of mobility services into the vehicle. Telematics market is driven mainly by market needs for what concerns After Market solutions, and legislations for what concerns OEM developments. The telematics devices are intended for both Car and Truck OEM-s and the Aftermarket.

Magneti Marelli supplies Telematics components to many vehicle makers and main players of the Telematics value chain.

### **Telematic box**

The telematic box is an electronic control unit that incorporates a GSM/GPRS module for wireless connection with communication networks, a GPS/Galileo/Glonass multi-constellation module for the satellite localization of the vehicle, and a triple-axis accelerometer to detect acceleration and braking parameters associated with direction.

A device such as the telematic box, capable, at the same time, of detecting vehicle position and operating data and of sending and receiving information from the outside thanks to the GSM module, can fulfil multiple functions: vehicle protection and control





(tracking); information on traffic, road conditions, parking areas, limited traffic areas; payment of tolls (e-toll); remote vehicle behaviour and diagnostics (tele-diagnostics); management of logistics and of industrial vehicle fleets; “insurance box”; automatic emergency call (e-call for quick rescue management) and car pooling.

### **MAGNETI MARELLI POWERTRAIN**

Magneti Marelli Powertrain is the business area which produces engine and transmission components for cars, motorbikes and light vehicles. Its historic headquarters have been based in Bologna since 1923. Its product range focuses on engine control systems and transmission technologies. Magneti Marelli Powertrain produces both hardware components, the electronic control units that pilot the engine, and their sophisticated software.

The systems supplied to car manufacturers also include certain parts which are crucial for engine performance and emissions: injectors, air-gasoline and air-diesel manifolds, throttle bodies.

Magneti Marelli Powertrain produces also the **AMT** gearbox (Freechoice), an electro-hydraulic automation technology for manual transmissions, derived from Formula 1, that combines comfort of use with reduction in consumption. Apart from applications on many vehicles with a small to medium engine capacity, versions of the AMT gearbox have been installed on several supercars such as Ferrari, Maserati and Aston Martin.

As for the hybrid-electric engine area, on the other hand, Magneti Marelli maximizes the experience acquired in Formula 1 with **KERS** (the Kinetic Energy Recovery System—fitted on the racing cars of some top team), and other electrical solutions for energy recovery, applied for the first time in “series” with the solutions provided by the HY-KERS hybrid system of “LaFerrari”.

In particular, Magneti Marelli is aiming at the market areas of the highest growth rate for hybrid-electric solutions, for example the 48 volt “compact”, a low-voltage solutions with a power of less than 16 kW, extremely flexible and easily applicable to internal combustion engines, with limited impact on the system.

The Powertrain business area also produces the **GDI** (Gasoline Direct Injection) systems and makes injectors, pump, electronic control unit and management software. The GDI technology, that originated from mass production, has already been applied in the Motorsport as well, and in 2014 will also be used in Formula 1: for this racing application, Magneti Marelli is currently testing injectors and pumps for engines with petrol pressures of up to 500 bar.

Magneti Marelli Powertrain is among the world leader in certain key areas regarding the environmental impact of automotive technology, such as gasoline direct injection (GDI) and Flexfuel technology.



Launched in 2003 in Brazil, under the name of Flexfuel SFS, this technology allows the car to use ethanol, the plant-based fuel, produced and used in great quantities in Brazil, and gasoline, in variable proportions from 0 to 100%. In 2007, all new cars in Brazil will run on Flexfuel technology, while in Brazil Magneti Marelli is the leader of this market with a share of 58%.

Magneti Marelli has also developed Flexfuel technology with the TetraFuel system, which allows a car's engine to run on four different types of fuel (gasoline, gasolina – a blend of petrol and 22% ethanol – pure ethanol or compressed natural gas), thanks to the use of a special microprocessor in the engine control unit.

Located at the Magneti Marelli Powertrain facilities in Bologna, the new Laboratory for Reliability Tests is opened in 2012 to carry out testing and qualitative validation activities in the development of modern technologies for automobiles, with the aim of ensuring the best quality possible of the components over time.

### **Magneti Marelli powertrain systems and components for two-wheelers**

In the area of motorbike components, Magneti Marelli Powertrain produces:

- Electronic control units
- Mechatronic systems
- Throttle bodies
- Injectors
- Low-pressure fuel pumps
- Ride by Wire

The customers of the Powertrain divisions include manufacturers such as Aprilia, BMW, Ducati, Gilera, Harley Davidson, Moto Guzzi, Moto Morini, MV Agusta, Piaggio and Vespa.

As proof of the division's ability to innovate, Magneti Marelli Powertrain has launched on the market of mass-produced motorbikes the Ride by Wire systems, which represents an absolute novelty in the sector of engine control systems.

For the first time ever, the principle of fully electronic injection management is applied, with no "mechanical" connection between the gas knob and the throttle valves.

A new industrial plant created from the Joint Venture signed in December 2013, between Hero MotoCorp Ltd. (60%) and Magneti Marelli S.p.A. (40%), dedicated to the production of engine control systems for two-wheeled vehicles, was opened in Manesar, India. The new site is operational with solutions dedicated to the production of powertrain and fuel injection technologies aimed primarily at the Indian two-wheelers market.



## ***MAGNETI MARELLI EXHAUST SYSTEMS***

Magneti Marelli Exhaust Systems develops and produces exhaust systems for cars and motor vehicles in general with advanced technologies in terms of performance and quality.

The purpose of an exhaust system is twofold: on the one hand, the reduction of pollutants contained in the exhaust gases (via catalytic converters) and, on the other hand, the reduction of noise (by means of the silencing system).

The reduction of pollutants is achieved by designing catalytic converters that are able to meet the increasingly stringent and restrictive laws in force.

In Europe, emissions are currently governed by the Euro 6 standard. Products that are able to comply with these pieces of legislation are among the most innovative on the market.

For example, for diesel engines there are the particle filters in the engine compartment (compact system), the NOx reduction systems, such as the Selective Catalytic Reduction with the Ad blue additive, and the NSC (Nox Storage Converter) systems integrated with clean EGR (Exhaust Gas Recirculation) system.

Regarding noise attenuation, Magneti Marelli has produced a wide range of silencers that are manufactured using different technologies, differentiated depending on customer requirements by conducting research and development activities for the detection of "sounds" which are characteristic for each type of car or make (Sound Design).

Innovative solutions are then being studied both for the "hot" and the "cold" part of the exhaust and involve as many new technical solutions as new production technologies to improve quality, to reduce weight and costs.

## ***MAGNETI MARELLI SUSPENSION SYSTEMS***

The Suspension System business area designs and manufactures suspension modules and components for motor vehicles. The division has its headquarters in Turin.

Within the "suspensions" product line, the products available range from an individual component (swinging arms, crosspieces, axles, uprights, brake discs and drums) to assembled modules (wheel and semicorner units). Magneti Marelli Suspension Systems is able to satisfy every type of technical request received from the customer, with the possibility of development from component specifications or as a refinement of an existing design.

Mastery of the main technological processes in the Automotive sector allow the creation of suspension components in various materials which dominate the performance and quality characteristics.



Innovative products include the front arm made of composite material, the twist beam axle with passive steering, the front crosspiece in composite material and the twist axle with variable thickness tubular crosspiece. Our company's commitment to reducing the weight of the chassis components is accompanied by a careful "Life Cycle Assessment", in order to propose to carmakers the best solutions in terms of environmental impact.

### ***MAGNETI MARELLI SHOCK ABSORBERS***

The shock absorbers product line includes the two main groups of “structural” shock absorbers (essentially for McPherson suspensions) and “conventional” shock absorbers (for all the rest), as well as the niche market for gas springs.

The guidelines of Magneti Marelli's Shock Absorber innovation are developing along the axes of eco-sustainability and performance. Among the innovations, of particular interest is the electronically-controlled shock absorption system that is able to generate electricity to be stored in the battery to reduce emissions on vehicles with thermal engine and/or to increase autonomy for electric or hybrid vehicles.

The recently-formed Dynamic Systems product line is based on the concept of developing an electronically-controlled shock absorption system with an electrovalve that adapts in real time to the passage of damping fluid, thus adjusting the response in accordance with various parameters from the relevant sensors.

This produces a real improvement in the vehicle's dynamic performance, by reducing the compromise between suspensions designed more to provide comfort than “sporty” driving.

The main stages of development of the business area:

2006: birth of the Powershock shock absorber with internal spring that acts in extension for roll control.

2008: start of the production of the SDC (Smart Dynamic System), the electronically-controlled shock absorption system

2009: start of production of shock absorbers with a "position dependent" device for commercial vehicles.

2011: start of mass production (world premiere) of F-Respond shock absorbers with "frequency dependent" devices.

2011: introduction of shock absorbers with "full displacement" valves for improved comfort.

2013-2014: the development of valves and a product range for heavy-duty applications (heavy industrial vehicles).



## **MAGNETI MARELLI PLASTIC COMPONENTS AND MODULES**

Plastic Components and Modules designs, develops and produces complex systems in plastic, such as dashboards, central consoles, bumpers and fuel systems..

*Dashboard and centre consoles:* Over time, the constantly **evolving interior ergonomics**, the desire to live in an environment featuring different colours and tactile feelings, the need for compartments and containers capable of improving the usefulness of the **vehicle's interior space** have expanded the technological needs and the resulting potential solutions offered to the Customer.

*Bumpers:* Over the years, the bumper has changed from a simple element of protection into a crucial part in **style definition and characterization**, as well as an important component of improved safety in case of collisions with pedestrians.

In time, this has led to significantly bigger bumpers and to the related completion in the sides of the automobile.

It is the first and last thing that one sees in a vehicle.

*Fuel System:* Historically, there has been a gradual shift from metal fuel tanks to plastic ones, with the consequent **optimisation of available space** in the underbody thanks to the excellent formability of the new material, thus increasing system capacity to the full advantage of better vehicle autonomy.

Other benefits offered by thermoplastic materials include **weight reduction, elimination of the risk of sparks and explosions** as well as of the corrosion problem typical of the versions made in sheet metal

## **MAGNETI MARELLI AFTER MARKET PARTS AND SERVICES**

Magneti Marelli After Market Parts and Services S.p.A. is the Magneti Marelli trading area dedicated to the field of multi-brand spare parts and to the network of workshops.

It distributes automotive components, offers training services and technical know-how on the Independent Aftermarket.

Through a network of **4,000 workshops worldwide** (1750 in Italy) it offers motorists assistance, products and services through the "**Checkstar Service Network**" concept and trades in four European countries (in Italy, Spain, Germany and Poland), in two countries in South America (in Brazil and Argentina), in the United States, in Russia and in China.

It also covers, through the network of importers, over eighty countries in Europe, Asia, America, Africa and Oceania.

Thanks to the collaboration with excellent partners, it researches and offers a complete range of original products that are able to meet the needs of different market segments.



In Europe, Magneti Marelli After Market Parts and Services operates in the repair market with the trademark Magneti Marelli Checkstar, while in Latin America, in addition to the Checkstar trademark, the Magneti Marelli Cofap trademark has historically been used.

Magneti Marelli places importance on the professional retraining of its network of workshops and offers innovative technical, management and marketing courses organised both in the classroom and online through the portal [www.magnetimarelli-campus.com](http://www.magnetimarelli-campus.com).

Magneti Marelli combines technical and specialist training, with services of **Help Desk** and online technical support.

Distributed brands: **NGK NTK, Mahle Original, Pagid, Roulunds Rubber, Brembo, Autodata, Philips, Alldata Europe, Cool Weather, Denso, CF Gomma, NTN SNR.**

### ***MAGNETI MARELLI MOTORSPORT***

Magneti Marelli's Motorsport division develops electronic and electro-mechanical systems for two- and four-wheel competition vehicles. In particular it supplies systems for engine & chassis control and data acquisition in addition to the related key components, powertrain for hybrid and electric applications with electric motors and smart power electronics, telemetry systems, electric & electro-hydraulic systems for gearbox control and software applications.

From 2008 Magneti Marelli Motorsport also developed a kinetic energy recovery system (KERS) for Formula 1 cars applications, which is adopted by some top F1 team also in the current championship.

The business line is based in Corbetta (MI), with plants at Venaria (TO) and Bologna, and application centres in Brazil, China, France, UK and USA.

Magneti Marelli has been involved in motorsports since its very beginning in 1919, and throughout its history the company has been supporting several world champion teams in their two-wheel and four-wheel victories.

Magneti Marelli's involvement with motor racing is connected to the great impulse which Magneti Marelli has always devoted to innovation – of which motor racing is the perfect exponent.

In the recent seasons of motorsport championships, Magneti Marelli Motorsport has supplied systems and components to the winners of several world championships of Formula 1, MotoGP, WRC, Superbike, FIA GT1, WTCC .

#### ***Motorsport in the DNA and in the history of Magneti Marelli***

Magneti Marelli has been involved in motorsport competitions since 1919, the year the company was founded, where mechanical components and electrical devices were



subjected to extremely heavy-duty uses, amidst dust, rocks and mud, consequently sturdiness, reliability and effectiveness of the assistance service on the competition fields were often the basic key to a team's success. Way back then, Magneti Marelli was already betting on the performances and reliability of its magnets, ignition coils and distributors, providing constant support on all racing fields to drivers and vehicles which thus receive the necessary technical assistance from highly qualified and specialised personnel. Quality chosen by the winning teams. In 1930, for example, three Alfa Romeos, all equipped with magnets made by Magneti Marelli, placed first, second and third in the legendary race "1000 Miglia".

Newspapers continued to report on the victories obtained by vehicles equipped with Magneti Marelli components, and record after record was broken: both drivers and manufacturers sent telegrams, autographed photos and thank you letters to show their appreciation and gratitude towards Magneti Marelli.

1950 was the year of the first Formula 1 World Championship. The first Grand Prix was held on the English racetrack of Silverstone, and that year the Championship was won by Nino Farina behind the wheel of an Alfa Romeo, of course equipped by Magneti Marelli. At the end of the 1960s, Magneti Marelli was a leader in the design of the newly-born electronics and in its applications to competitions.

In the 1970s and 1980s, Magneti Marelli developed the control electronics for the first Weber-Marelli injection systems used in the Formula 1 and fitted on Ferrari engines. The Ferrari-Magneti Marelli association, which started way back in the 1930s with the Alfa Romeos of the Ferrari Stable and which continued without interruptions with the start of the activities of the Prancing Horse Carmaker, has been particularly significant.

Grand Prix after Grand Prix, Magneti Marelli's fame in Formula1 continued to swell, and was enriched by the cooperation with numerous teams and by many supplies: in addition to Ferrari, there were Renault, Ford-Cosworth-Hart, Matra, BRM, Lotus, Ligier, Osella, Toleman, Spirit, and others.

Between the 1980s and the year 2000, all of the major Formula1 teams relied on Magneti Marelli for electronic and electro-mechanical systems installed on the car and for the technology of electronic infrastructures and communication, for which Magneti Marelli is a leader in terms of testing and know-how. This is the case, for example, of the introduction of telemetry in race management or the development of the complex steering wheel of the single-seaters.

Since the 1980s, Magneti Marelli has become richer with the experience and competitive know-how of Carello and Weber, legendary brands in the field of lighting and engines supply, both successfully involved in competitions.

Magneti Marelli's commitment in the world of competitions has also made history in the Rallies, for example with legendary cars such as the Fiat 131 Abarth, Lancia Stratos, Lancia 037 and the fabulous Lancia Delta Integrale.



Hence, Magneti Marelli Motorsport has contributed significantly to the technological evolution of modern sport competitions, thanks to the development and introduction of certain innovative solutions that represented a turning point: in 1989 the semi-automatic transmission with steering wheel controls (developed together with Ferrari); in 1994 the intelligent steering wheel; in 2000 the electronic engine and vehicle control system with distributed architecture and miniaturised components; in 2001 advanced real-time telemetry (DST Data Stream Telemetry), and in 2008 the KERS (Kinetic Energy Recovery System).

In the last twenty years, Magneti Marelli's name has been associated with many Formula 1 world championship titles: from 1992 until 1997 with the Williams-Renault team, from 1999 until 2004 with Ferrari and, after two years full of victories with Renault, again with Ferrari in 2007 and in 2008. The list of titles in the motorcycling world is just as prestigious, with five world championship titles in MotoGP with Yamaha and one with Ducati and, since 1988 in the Superbike World Championship 15 titles with Ducati and one with Yamaha.





## **TECHNOLOGICAL EXCELLENCES**

### **LIGHTING**

#### ***The Full-Led Technology For Automotive Lighting***

Magneti Marelli Automotive Lighting has developed in 2007 the world's first mass-produced full-LED headlamp, featured by more than 20 innovative concepts. The first full-LED headlamp also traces the path for the future with regards to reduction in fuel consumption and emissions. In the most advanced version, the headlamp full-LED uses LED technology with "matrix beam", i.e. the light beam is electronically and adaptively operated and oriented. In fact, a management control unit handles the three reflectors which direct the light beam while a front camera provides information to the system on driving conditions and on the traffic proceeding in the opposite direction in order to avoid dazzle.

#### ***Dynamic All Led Reflector Headlamp With Variable Light***

The innovative all LED reflection headlamp made by Magneti Marelli Automotive Lighting combines the attractive aesthetics of reflectors with adaptive lighting functions in the past fulfilled by projectors. The result is a strong energetic appearance and an extraordinary lighting performance.

#### ***Fully Integrated Lighting Electronics***

Magneti Marelli Automotive Lighting's electronics for intelligent LED headlamps. Engineered as fully-integrated electronic modules for the carmakers' model-specific lighting applications.

Control of all the lighting and actuator functions of an intelligent semiconductor-based headlamp

#### ***LED Multi-beam***

Smart Full LED headlamp with main-beam light composed of 24 separately controlled LEDs. Thanks to the car's sensors and the electronic control unit, it is possible to switch the LEDs on and off individually thereby enabling precise control of the light beam and avoiding dazzling the traffic approaching from the opposite direction, in addition to illuminating the relevant areas for safety.

It is a smart lighting system that is able to direct the beam with millimetric precision according to requirements. In this way, visibility on the road increases exponentially as does safety, both for the driver and for the other cars.

#### ***E-Light LED technology***

The technology offered by Automotive Lighting is thus officially acknowledged as being innovative and effective in cutting down CO2 emissions by automobiles, an objective sanctioned by European regulations.

The "E-Light" LED low-beam module ensures certified energy savings, allowing carmakers to obtain a credit of 1 g CO2/km for every vehicle that fits this module in its headlamps.



The innovative content of the “E-light” LED low beam module lies in the advanced use of light refraction/reflection techniques through the use of lens that concentrate, in an extremely effective way, the light beam generated by a limited number of light diode sources (LEDs).

During the analysis and certification phase of this solution, the term of comparison used to prove the efficacy of E-Light in reducing emissions was the halogen light bulb. Even when compared to the power in watts, the difference is quite clear: the E-Light LED low beam uses up 11 watts compared to the 68 watts of a regular halogen low beam light bulb, with superior performance in terms of lighting power.

E-Light can be applied to newly developed models of cars currently in existence, and the credit of 1g CO<sub>2</sub>/km will be acknowledged for the specific model that adopts the solution as from the design phase, for greater flexibility in vehicle design from the standpoint of CO<sub>2</sub> emissions.

### ***Laser lighting***

The blinkers, DRL and parking lights that make up the headlamp are based on light guide LED technology; the low-beam function is based on an evolution of the LED modules, but the real revolution is concentrated into the high-beam unit.

The driver can activate the laser high-beam that generates a cone of light with dual capacity with respect to the LED high beams and complies with the ECE requirements. Upon activation of the function, a camera monitors the driving conditions, recognising oncoming cars and those in front of the vehicle in order to avoid dazzle. If driving conditions so permit, and the car is travelling at a speed of more than 60km/h, the function is activated and the depth of illumination increases. The laser module for the high beam function has a light source of 2 mm<sup>2</sup> to produce a high-intensity light beam obtained thanks to the development of very high-precision optics. A phosphorus converter turns the laser beam into white light with a temperature of 5,500 degrees Kelvin - the ideal conditions for the human eye that allow the driver to recognise the contrast more easily and help prevent fatigue.

### ***25W Bi-Xenon***

Headlamp technology based on Xenon source, with a powerful and concentrated light colour, that is closer to white (and, consequently, to daylight) in a compact size and with low power consumption. With the special dedicated lenses, it gives the car a unique design.

The Xenon 25W represents the evolution of the Xenon system. It is constituted by the combination of light performance that is typical of traditional Xenon but with a reduced weight of the headlight bulb, a long-lasting light bulb and a system that significantly reduces the energy absorption.



## **ELECTRONIC SYSTEMS**

### ***High-end infotainment system***

The new high-end infotelematic system is a device that incorporates multi-media entertainment, telematics, and telephony functions. It represents the natural evolution of the current high-end telematic platform, today made even more performing by the use of 30-GB hard disk (used for storage, music and for maps of the entire Europe), a 3D graphic processor and solutions that further improve audio system performances.

### ***Open Platform infotainment & Navigation System***

Magneti Marelli has developed and produced the first Linux Open Platform based Infotainment system.

The new multimedia system originates from the technological contribution that Magneti Marelli can provide, and offers a sophisticated set of features, including navigation, brilliant graphics, Internet access and connectivity, wired and wireless, available for the first time on entry-level systems. The most significant innovation of the Business navigation system is represented by Graphic images, which are now displayed 10 times faster on the TFT color display, High-resolution maps, 3D animations and elements, and faster itinerary calculation.

The new infotainment system uses Magneti Marelli's open platform to enable a wide range of in-vehicle connectivity and Infotainments applications. System features include wireless connectivity, mobile office, advanced navigation and telematics.

### ***Navigation, Multimedia & Connectivity Platform***

The multimedia connectivity platform represents Magneti Marelli's ultimate innovation in the sector of Infotainment, Connectivity and Navigation integrated Systems.

The system features a 7" high-resolution touch-screen display with advanced easy-to-use Human-Machine Interface based on a powerful 3D graphic processor. The CAN interface ensures the display of remote controls directly on the screen, along with the front panel, diagnostics and data export.

The entertainment and full multimedia interfaces consist of an AM/FM Radio (RDS and TMC compatible with 3 tuner configuration, double antennas, 15 memories, AF switching), a USB port (2nd USB available as option) with full iPod™ / iPhone™ control, audio player, picture viewer and audio jack. The system can even be connected to an external CD. Hands-free telephone operation and audio streaming (A2DP) are ensured by a Bluetooth® interface. Users can access the Internet through a special 3G USB key. In the high-end version, on-board navigation is also available with full TTS (Text-to-Speech) and TMC (Traffic Message Channel) management, complete with enhanced map information (street name, road book) and POI (Names, and Branded icons).

### ***Telematic Box***

In order to complete the product range and satisfy emerging market requirements, Magneti Marelli developed "Connectivity and Telematic boxes", highly integrated and low-cost systems for entertainment and safety applications.



#### Connectivity Platform

The connectivity box is an open platform based on the Microsoft Auto O.S. that guarantees connection with external devices. It covers a range of features that include the hands-free kit with Bluetooth® technology, voice recognition, USB port and MP3 player.

#### E-Call box

The E-Call telematic box is the result of Magneti Marelli's experience in telematics applied to safety functions: thanks to a GPS module and the integration with the CAN network of the vehicle, the device can make an automatic emergency call in case the vehicle crashes or flips over, with the vehicle being localised immediately.

#### E-Toll

On the wave of new opportunities that are opening up at the national and European level, Magneti Marelli is currently developing an automatic toll paying system based on satellite technology (GSM/GPRS plus GPS) associated with Dedicated Short Range Communications (DSRC) modules: the in-vehicle telematic box will be able to trace the itinerary travelled, allowing for automatic calculation of the tolls that must be paid.

#### Aftermarket platform

Specifically with regards to the aftermarket Telematic Boxes, Magneti Marelli's solution includes a tracking unit that monitors the vehicle conditions and sends information to a specific service centre: this way, these telematic devices can provide access to services tied intelligent mobility management currently available – such telematic insurance services, fleet management, tracking, infologistics, car pooling and e-call (emergency call).

Moreover, these devices and solutions help motorists monitor their vehicle, identify the ideal itinerary, optimise transfer times and minimize both fuel consumption and emission; they also provide them with important information about traffic, car parks, limited traffic areas, payment of tolls, vehicle behaviour and remote diagnosis. They also allow motorists to access new types of insurance policies, thanks to applications such as Vehicle Tracking, Crash Detection and Antitheft.

#### ***Instrument Clusters***

The traditional business of this division, the instrument cluster provides drivers with information such as speed, revs, fuel level and water temperature. Magneti Marelli Electronic Systems develops and manufactures instrument panels with integrated monochromatic displays (dot matrix), or the increasingly common colour display. It also manufactures more complex, fully reconfigurable clusters which can perform gateway functions.



## **POWERTRAIN**

### ***Solutions For Hybrid/Electric Drive***

Magneti Marelli maximized the experience acquired in Formula 1 with KERS (the Kinetic Energy Recovery System), and in systems and components aimed at mass-produced hybrid and electric engines.

### ***KERS***

Developed for some Formula 1 teams, the KERS (Kinetic Energy Recovery System) it's a system that turns mechanical energy under braking into electrical energy that can be stored into devoted batteries. This energy is made available to the pilot, who can decide to reuse it in specific situations – straight stretches, while overtaking other cars or at strategic points of the track.

### ***Gasoline Direct Injection Technology (GDI)***

An advanced injection system for gasoline engines that, combined with turbocharger, allow engine downsizing, improved performances, and significant reductions in fuel consumption and emissions.

### ***AMT (Automated Manual Transmission)***

A electro-hydraulic mechanism for automating manual transmission which derives from Formula 1 which combines comfort of use with a reduction in consumption. The AMT can be applied to any transmission, with production costs that are consequently lower compared to traditional automatic transmissions.

### ***Multifuel Technologies: Flexfuel Sfs® E Tetrafuel®***

The TetraFuel® system enables a car's engine to run on four different types of fuel. This allows consumers to choose whether to refuel with petrol, alcohol/petrol (a blend of petrol and 22% alcohol), pure alcohol or compressed natural gas.

## **SHOCK ABSORBERS**

### ***Smart Damping System***

The SDC is a system that changes the shock absorber damping in real time and consists of four shock absorbers and five accelerometers that interact with an electronic control unit that is able to calculate the need for damping and to drive the proportional electromechanical valves of the shock absorbers according to the road profile and the driving conditions.

### ***Lifter***

The Lifter system is an axle lifter for sports cars. The predominant usage is on the front axle in order to overcome obstacles such as bumps or ramps without bumping the spoiler against the ground.



The system consists of a hydraulic actuator located beneath the suspension spring, hydraulic pump and control unit.

***Valve technology***

In relation to shock absorbers, hydraulic valves are of maximum importance as they are responsible for the primary function of shock absorbers, namely to dampen oscillations of the box and hub.

The continuing engineering development has contributed, through different architectures, to significant improvements of comfort and handling of cars in recent years and in particular with the latest generation of hydraulic valves that are divided into two large families: mechanical valves (full displacement valves) and electromechanical valves (DSV - Dual Stage Valve).



## **Magneti Marelli: future automotive challenges and integration approach**

In terms of its mission, Magneti Marelli is projected towards developing sustainable mobility solutions and technologies: the “smart mobility” wave presents a future that is upon us, in which automobiles will be equipped with sophisticated systems to allow drivers to interact with the vehicles in a new way - through advanced and customizable interfaces - as well as to enjoy a new extended and integrated connectivity, in which all mobility players are able to communicate at the same time. A technological “wave” that - with the possibility of autonomous driving enabled by “deep” connectivity - is leading towards a single solution to the often conflicting problems of safety and reduced consumption and emissions.

On the basis of its historical experience in the automotive sector and of the acquired technological assets, of the current dominance over the strategic business areas in this field and of the cross-sectional competence in electronics and in its evolutionary dynamics, Magneti Marelli can grasp this picture as a whole and provide integrated and “systemic” technological answers.

Understanding and anticipating the problems faced by carmakers during the design, development and construction of a vehicle; contributing to the building of a balanced and sustainable relationship between vehicle and external environment; enabling the vehicle, its technology and its systems to communicate with central infrastructures, with other vehicles and with other “consumer” electronic devices which everybody owns today: when faced with such complex challenges, an integrated approach and knowledge represent a decisive answer.

In this context, then, Magneti Marelli aspires to be an enabling element and player for the purpose of encouraging an optimal integration of the “automobile system” in connection with its components, with the industrial process that creates it, with the people who “inhabit” it, and with the world that surrounds it.

### **The Research**

**Innovation is the key factor to create competitive advantage.** This assumption is one of the laws of our world, the automotive world. Moreover, if generally it is the car maker to drive the evolution of systems and components, anticipating its needs thanks to research and development activities can grant a crucial advantage on the market and improve both production policies and product strategies.

Magneti Marelli has created, within its own organization, **Research & Development** departments capable of optimising the scientific requirements of the Business Units’ sectors of activity. Mechanics, Hydraulics, Fluid Dynamics, Thermodynamics, Vehicle dynamics, Acoustics, Optics, Electronics, Automation, Information Technology, Chemistry, Science of Materials and Ergonomics are the research areas present in and widely covered by Magneti Marelli’s internal resources.



## **Sustainability**

For Magneti Marelli, **sustainability**, together with technology, is one of the most important drivers of change and development.

The company is part of a system together with its stakeholders (customers, suppliers, environment, employees, local communities and institutions) and also believes that by acting correctly, it will improve itself, contributing to triggering a virtuous evolution cycle.

In summary, improving themselves by improving the system.

This is the objective that guides the Magneti Marelli's approach to sustainability on its three axes: **environmental, social** and **financial**.

**Environmental sustainability** considers natural heritage as a limited resource whose use must not affect the rights of future generations.

**Social sustainability** prioritises society, the respect for human and civil rights, the protection of working conditions and of equal opportunities and dialogue with local communities.

**Financial sustainability** is based on the company's ability to generate a return in excess of the capital cost in respect of economic, financial and asset-related equilibrium conditions.

Magneti Marelli sustainability therefore means listening to the needs and expectations of its stakeholders and adopting self-regulatory policies that impact on the business model, on the organisation and on the corporate processes, combining achievement and responsibility.

Magneti Marelli's **commitment** to sustainability has been consolidated thanks to the establishment of the Sustainability Program which aims to promote a culture of sustainability within the company and to manage, implement and communicate on a global level the actions and the social and environmental projects.

The program is managed by the **Sustainability Committee**, coordinated by the Corporate Communications department and whose members belong to the HR, Marketing, Internal Communications, Manufacturing, Compliance, Quality, Innovation, Industrial Relations, WCM, Aftermarket, Purchasing and EHS departments. The main tasks of the Committee include the proposal and evaluation of the actions and the cross-fertilization of corporate best practices.

The stories, data, performance and sustainability-related initiatives of Magneti Marelli can be explored in **Start**, the sustainability publication distributed to all internal and external stakeholders internationally.





## **Magneti Marelli Awards: the best of 2016-2012**

### **2016**

- «FCA APAC Best supplier of the year - category Body & Raw materials» Magneti Marelli Automotive Lighting Foshan China
- «REI - Recognition for Excellence and Innovation 2016» Magneti Marelli Brazil
- «Panda d'Oro» Magneti Marelli China

### **2015**

- «Ford Q1 Award» Magneti Marelli Automotive Lighting Juarez Mexico
- «Premio Hibiscus» Magneti Marelli Automotive Lighting Penang Malaysia
- «Migliore Azienda del Settore Automotive 2015» Magneti Marelli Brazil
- «Transmission Technology of Year» Magneti Marelli Powertrain India
- «Automotive Pioneer of the Year» Magneti Marelli Powertrain India
- «Technology of the year 2015» Magneti Marelli Powertrain India
- «Volkswagen Award for Powertrain Innovation and Technology» Magneti Marelli Powertrain
- «Red Dot Best of the Best» and «Red Dot» Magneti Marelli Automotive Lighting

### **2014**

- «Volvo Cars Quality Excellence Award 2014» Magneti Marelli Automotive Lighting Brotterode Germany
- «Panda d'Oro – The Sustainable Panda» Magneti Marelli China
- «REI - Recognition for Excellence and Innovation» Magneti Marelli Brazil
- «Mercedes Benz Environmental Responsibility» Magneti Marelli Shock Absorbers Lavras Brazil

### **2013**

- «Casco d'Oro» Magneti Marelli Motorsport
- «GM Supplier Quality Excellence Award» Magneti Marelli Santo André Brazil
- «100 Best HRM Companies» Magneti Marelli China
- «Supplier of the year» Magneti Marelli Suspension Systems
- «Sindirepa SP-Best of the Year» Magneti Marelli Aftermarket Brazil
- «Chrysler Innovation Award» Magneti Marelli
- «Respect to Human Reward 2012» Magneti Marelli Automotive Lighting Bursa Turkey

### **2012**

- «MC Mutual Antonio Barò» Magneti Marelli Barberà del Vallès Spain
- «Gazzella del Business» Magneti Marelli Aftermarket Sp. z o.o. Poland