



PLASTIC OMNIUM

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# FRANKFURT MOTOR SHOW

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**INNOVATING FOR A BETTER FUTURE**

BODY PANELS AND MODULES

FUEL SYSTEMS

LIGHTWEIGHT AND EMISSION CONTROL SOLUTIONS







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# INNOVATING FOR A BETTER FUTURE

## // PLASTIC OMNIUM AT A GLANCE

Independent, innovative and present in large key markets, Plastic Omnium is a key developer of technology designed to enhance sustainable mobility and the living environment, delivering solutions to environmental challenges faced by automobile manufacturers, local communities and their inhabitants.

Plastic Omnium continues to pursue its commitment to growth while strengthening its global leadership position in its two businesses:

- Automotive: body panels and modules, fuel systems, lightweight and emission control solutions.
- Environment: products and services for sustainable waste management.

Operating in 29 countries with 107 manufacturing facilities, of which 94 are dedicated to the production of automotive components, Plastic Omnium is able to address the challenges of a fast changing world. In 2012, the company generated revenue of 4.8 billion Euros.

By constantly pushing back boundaries and accelerating the development of operations, Plastic Omnium has become a global player and trusted partner over the last decade and plans to further increase its footprint and product lines over the next 5 years. With its 360° offering aimed at clean mobility, Plastic Omnium takes its customers and partners to a new dimension, where innovation is the gateway to a better future.

### KEY FIGURES

**29** countries

**107** manufacturing facilities

**5%** of revenue allocated to R&D

**22,000** employees

### PLASTIC OMNIUM: TWO ACTIVITIES

2012 Revenue: €4.8 Bn

#### AUTOMOTIVE

2012 Revenue: €4.3 Bn

##### AUTO EXTERIOR

Body panels and modules

Composite solutions

World leader

##### INERGY

Fuel tank systems

SCR systems

World leader

#### ENVIRONMENT

2012 Revenue: €0.5 Bn

##### ENVIRONMENT

Waste equipment and data management systems

World leader



# WORLDWIDE INDUSTRIAL EXCELLENCE AND INNOVATION

## // THE PLASTIC OMNIUM GROUP

Plastic Omnium is a key enhancer of sustainable mobility and the living environment as a world leader in developing automotive and environmental technology.

Plastic Omnium Automotive Divisions partner with car manufacturers to develop innovative solutions that respond pro-actively to customers' expectations of weight saving, emissions reduction, recyclability and pedestrian protection. Plastic Omnium is constantly broadening its product portfolio and offers a wide range of plastic body panels and modules, composite structural parts, fuel tank systems and emission control systems.

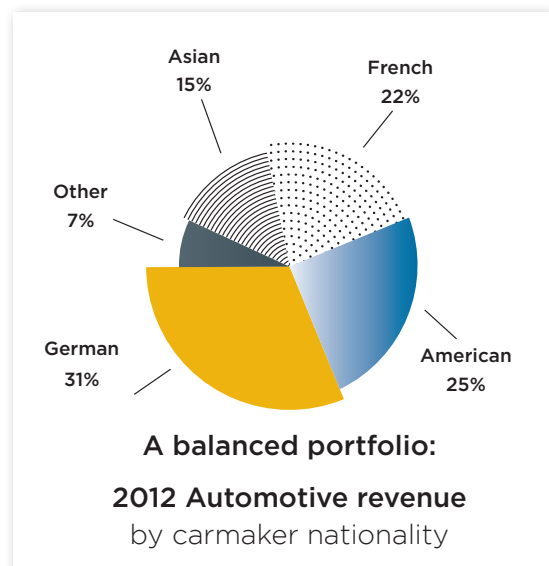
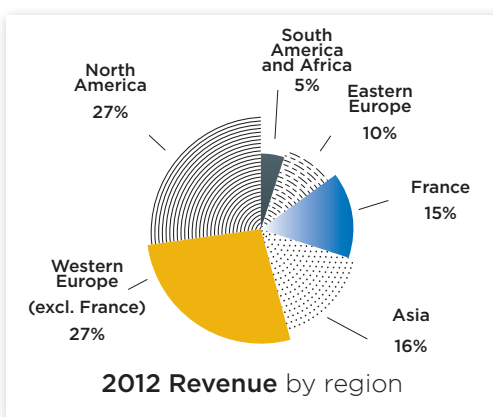
Plastic Omnium Environment Division assists local authorities in city planning and waste management by offering optimized cost solutions, from waste containers to maintenance services.

Driven by the same entrepreneurial spirit since its creation in 1947, the Plastic Omnium Group conducts its affairs responsibly and is focused on the future. It closely monitors new opportunities and trends with the goal of delivering innovative solutions tailored to meet the needs of communities and road users in a fast-changing world.

## INNOVATION DRIVING PAST AND FUTURE GROWTH

Innovation is part of the Plastic Omnium corporate DNA and relies on a network of 1,400 engineers and technicians worldwide. The R&D network is composed of 14 global research and certification centers and regional development centers. At the end of year 2012, Plastic Omnium was managing a portfolio of 2,585 patents.

Technological study, applied research, product innovation and development - the R&D and Marketing teams assess changes taking place around the world to find solutions to improve environmental performance and reduce costs with a focus on cleaner, lighter and safer products. The success of the Plastic Omnium Group can not only be attributed to product development, but also to the Company's world-class knowledge of key industrial processes such as injection and blow molding, painting, assembling, sequencing and logistics.



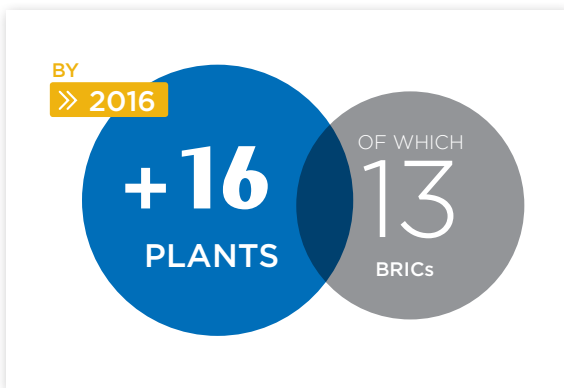
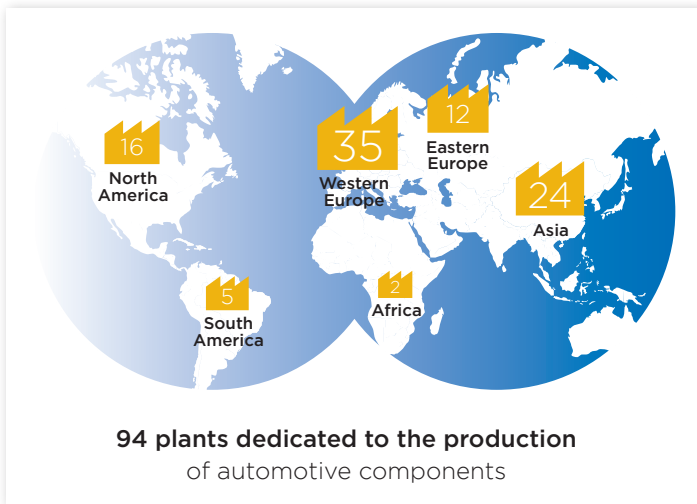
**1,400** engineers and technicians worldwide

**14** R&D centers

**2,585** patents

**// PLASTIC OMNIUM AUTOMOTIVE:  
A KEY PARTNER TO THE WORLDWIDE  
AUTOMOBILE MANUFACTURERS**

A global player and leader, Plastic Omnium is pursuing its growth in the world's largest markets. Backed by a sustained investment policy, which is one of the foundations of its strategy, the Company generated 85% of its revenue outside France in 2012.



**GLOBAL PERFORMANCE THROUGH INDUSTRIAL EXCELLENCE AND TALENT**

With its global industrial footprint and R&D network, Plastic Omnium collaborates with car-makers across the globe on the development of new programs. Each project is thoroughly monitored according to standardised processes designed to guarantee quality, performance and reliability. The high quality of Plastic Omnium products and industrial processes demonstrates the level of expertise and excellence required throughout the entire project's life - from development (design, simulation and validation) to industrialisation (mass production).

Plastic Omnium is able to manage several complex programs, on global platforms, with an increasing demand in model diversity. Fuel tanks, for example, are designed to adapt to various types of fuels - gasoline, diesel, biofuel - and different emission categories.

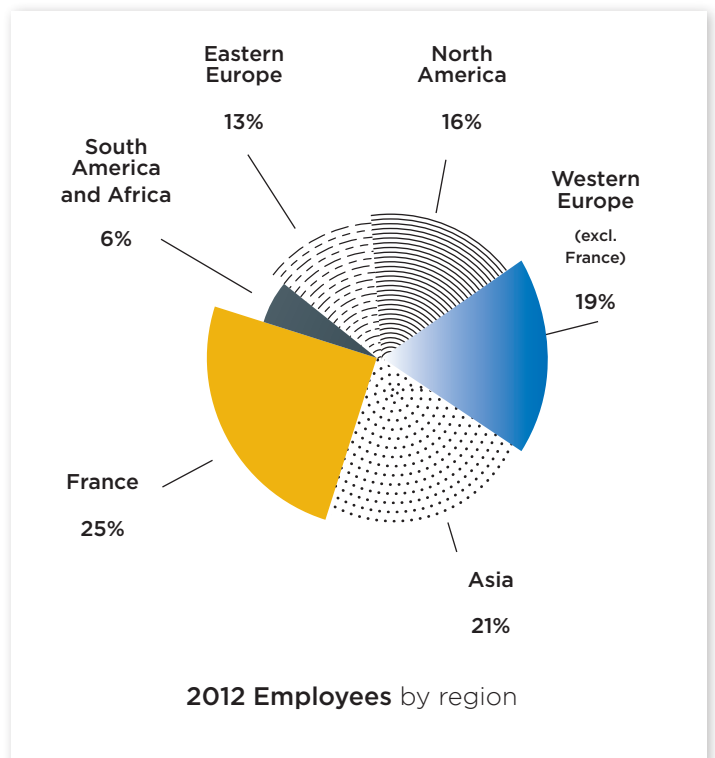
With a worldwide workforce of 22,000 employees (75% of whom are based outside France), the growth and development of Plastic Omnium is driven by the talent of its staff.

Since its creation, Plastic Omnium's strategy is supported by a commitment to its five I's - Independence, Investment, Innovation, Internationalization and Integration.

By promoting talent and excellence, empowering teams, charting their career paths, focusing on dialogue and communicating the "PO Way", Plastic Omnium enables employees to support its projects and serve its customers around the world.

Employee training is a key driver of excellence, enabling Plastic Omnium to adapt to changes in specific job skills and transmit expertise to local managers and operators as new facilities open.

A global company that operates locally, Plastic Omnium promotes job mobility between countries as a means to create multicultural teams within a decentralized organization.





# SPIRIT OF INDEPENDENCE

DRIVEN BY TECHNOLOGY



Plastic Omnium is the world leader in automotive components and body modules, automotive fuel tank systems, and waste container solutions. The Group employs more than 22,000 people in 29 countries around the world.

As a company we are focused on independence, investment, innovation, international expansion and integration of new talents to pursue our growth.

Live a unique experience with us, driven by technology.

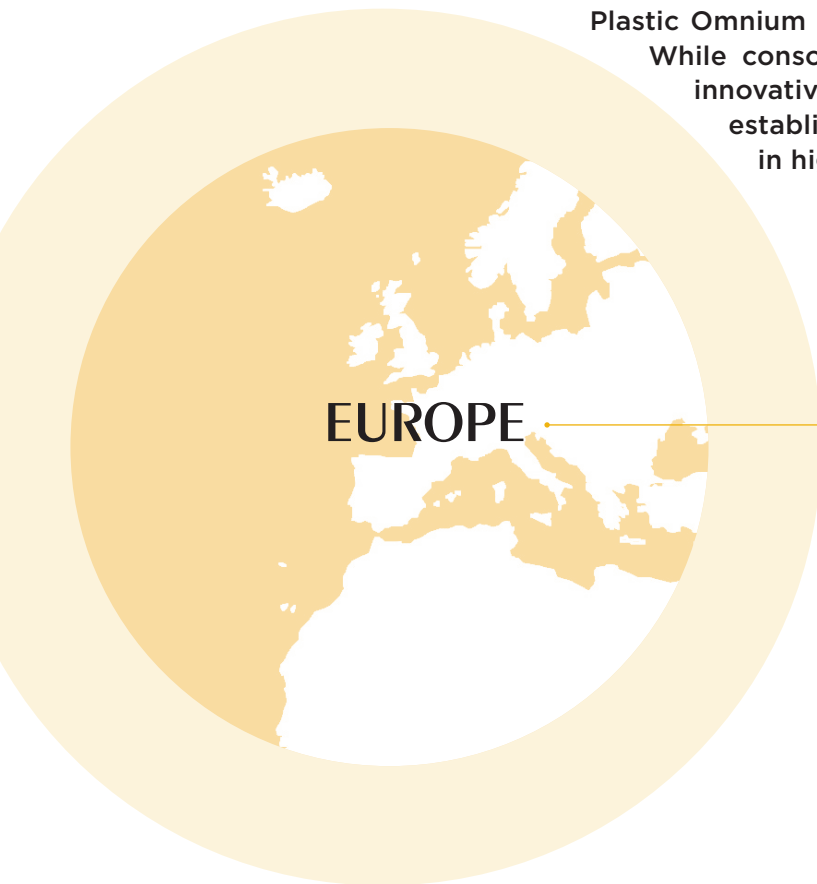
[plasticomnium.com](http://plasticomnium.com)



PLASTIC OMNIUM

# PLASTIC OMNIUM, A GLOBAL PLAYER

Plastic Omnium is constantly reinforcing its worldwide leadership. While consolidating its presence in mature markets through innovative product design, Plastic Omnium works to establish operations in fast-growing markets and expand in high potential regions.



## PLASTIC OMNIUM IN EUROPE

- **49 plants** in Belgium, Czech Republic, France, Germany, Hungary, Netherlands, Poland, Romania, Russia, Spain, Slovakia and United Kingdom
- **9 R&D** facilities
- **€2.1 Bn** sales generated in 2012
- **Delivering to** Audi, AvtoVaz, BMW, Daimler, Ford, Jaguar Land Rover, Nissan, Opel, Porsche, PSA Peugeot Citroën, Renault, Seat, Skoda, Suzuki, Toyota, Volkswagen

France being the historical “birthplace” of Plastic Omnium, it continues to host not only the Group’s headquarters, but the heart of the R&D network as well.

During 2012, Plastic Omnium reinforced its R&D network in Europe. Whilst two new manufacturing plants have been established in the UK and Spain in order to support the new tailgate business, R&D investments have increased and engineering teams extended also.

In addition to its international R&D center close to Lyon - $\Sigma$ - Sigmatech - dedicated to exterior equipment and composite materials, Plastic Omnium is building a new R&D center - $\alpha$ - Alphatech - in Compiègne to the north of Paris. Aimed at reinforcing the fuel system activity, it will be operational in September 2014. Together, these two sites will accommodate more than 1,000 engineers and technicians.



**IN TODAY'S FAST-CHANGING WORLD,  
WE HAVE COMPETITIVE STRENGTHS  
THAT WILL ENABLE US TO MEET NEW  
CHALLENGES AND MANAGE NEW  
PROJECTS IN OUR MARKETS**

**Laurent Burelle**, Chairman and Chief Executive Officer  
of Plastic Omnium

In response to the quickening pace of development of automobile production in Eastern Europe, Plastic Omnium is extending its footprint. Following the acquisition of Plastal in 2010, Plastic Omnium Auto Exterior is now operating 3 factories in Poland which manufacture components for Audi, BMW, Fiat, Ford, General Motors/Opel, Seat and Skoda. In April 2012, Plastic Omnium Inergy and Detalstroykonstruktsiya (DSK), Russia’s leading producer of fuel systems became partners. With two plants already in operation, in Stavrovo and Togliatti, both of which work mainly for Renault Dacia and AvtoVAZ, the company announced it would build a new plant in St. Petersburg that will be brought on stream in early 2014. The new plant will enable Plastic Omnium Inergy to meet demand in a fast-growing market and deliver 1.5 million fuel systems in Russia by 2015.





## THE AMERICAS

With more than 19.5 million vehicles produced in 2012, of which 15.5 in North America, and an expected production increase of 2.5% in North America and 5.6% in South America by 2018, the Americas are dynamic markets with major car-makers.

Plastic Omnium set up a new facility in Huron, Michigan. This second-largest Plastic Omnium Inergy plant worldwide with a surface area of 30,000 sq.m, was brought on stream in August 2012. Built to produce fuel systems for Ford, it can house up to eight blow molding lines. With the new plant, the Company has strengthened its presence in North America and has become a key global partner to Ford.

In order to accompany Volkswagen, Plastic Omnium Auto Exterior installed a new paint line at its plant in Puebla, where bumpers for the new Golf 7 are manufactured. In addition, Plastic Omnium Inergy has built its second plant in Mexico, in Puebla, which began delivering fuel systems for the Jetta in November 2012.

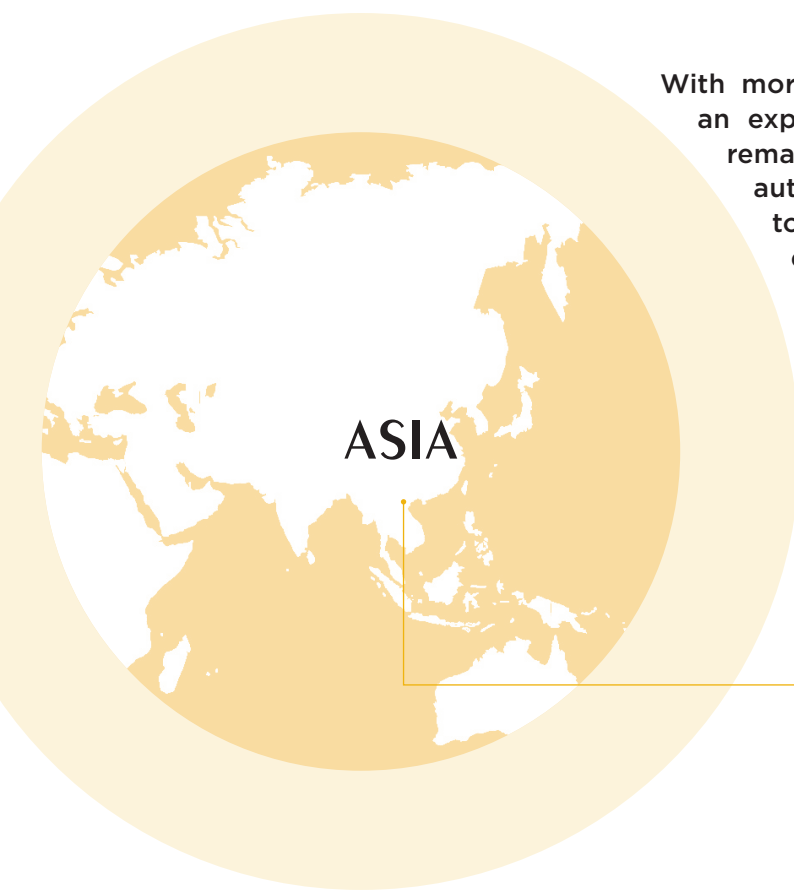
Already benefiting from a plant in Curitiba, Brazil, Plastic Omnium Inergy has inaugurated a new plant in Sorocaba. This facility, which will serve Toyota and Hyundai, will further reinforce its industrial footprint in Brazil.



### PLASTIC OMNIUM IN THE AMERICAS

- **21 plants** in Argentina, Brazil, Canada, Mexico, United States
- **2 R&D** facilities
- **€1.5 Bn** sales generated in 2012
- **Delivering to** BMW, Chrysler, Daimler, Ford, General Motors, Hyundai, Nissan, PSA Peugeot Citroën, Renault, Toyota, Volkswagen

**> THE COMPANY HAS BECOME  
A KEY GLOBAL PARTNER  
TO CAR MANUFACTURERS  
WORLDWIDE**



## ASIA

With more than 40 million vehicles produced in 2012 and an expected production increase of 33% by 2018, Asia remains the world's largest automotive market. The Asian automotive industry is transforming rapidly as it attempts to diversify its base by introducing fuel efficient and ecologically friendly cars. To cater to growing local and regional demand, a number of car-makers are working on expanding their production capacities.

According to its sustainable growth strategy within the Asia region, Plastic Omnium started to pro-actively support regional car-makers through strategic alliances with leading local manufacturers in 2006. Today, Plastic Omnium continues to invest in this market with the aim of supplying local and global customers.

In China, with an average annual production growth rate of 9% and output expected to reach 24.8 million vehicles by 2016, Plastic Omnium first established its presence in 2006 through the creation of the joint venture "XieNO" - today, a 100% subsidiary known as Plastic Omnium Composites China - for the manufacture of composite truck parts. This was followed by a second JV in 2007 between Plastic Omnium Auto Exterior and Yanfeng Visteon - YFPO - for exterior automotive components. At that time, Plastic Omnium Inergy opened its first factory in Wuhan. Since then, the Group has been investing to increase its production and development capacity for exterior components and fuel tank systems. By the end of 2013, the Group will run 20 factories and YFPO will open a new development center in Anting. In 2012, of the 98 automotive programs launched worldwide, 30 were launched in China. The Company is aiming for 25% of the country's bumper market and 12% of its fuel tank system market by 2016 through supplies to both its traditional global customers and new, local customers such as BAIC, FAW, GAC, Geely, SAIC, JAC.

### PLASTIC OMNIUM IN ASIA

- **24 plants** in China, India, Japan, South Korea, Thailand and Turkey
- **3 R&D facilities**
- **New Asian headquarters** in Shanghai
- **€0.8 Bn** sales generated in 2012
- **Delivering to** BAIC, BMW, Ford, General Motors, Hyundai, Isuzu, Mazda, Nissan, PSA Peugeot Citroën, Renault, Skoda, SsangYong, Suzuki, Toyota, Volkswagen

**> IN 2012, 30 PROGRAMS WERE LAUNCHED IN CHINA**







**FROM INNOVATION TO JUST-IN-TIME  
DELIVERY, A CONSTANT HIGH QUALITY  
PERFORMANCE IS ASSURED**



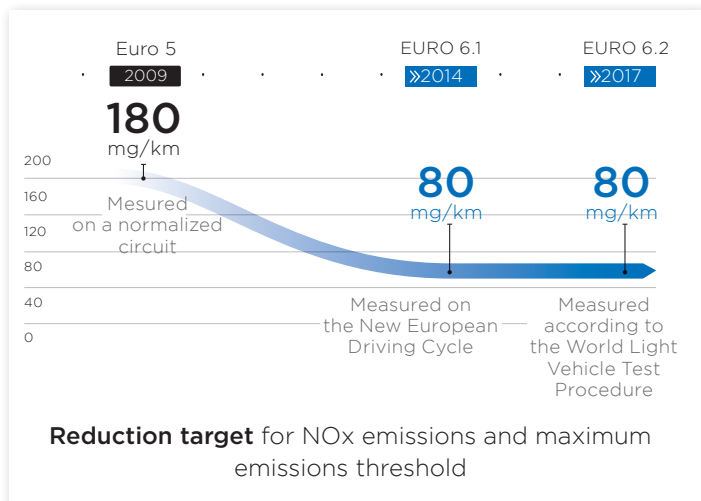
# A POSITIVE COMMITMENT TO CLEAN MOBILITY AND TO LIVING ENVIRONMENT ENHANCEMENT

With 5% of its revenue allocated for Research and Development in 2012, innovation, ingrained in Plastic Omnium's genetic code, is a day-to-day concern all over the world. As part of its commitment to environmentally responsible growth, Plastic Omnium designs green solutions for car-makers, from initial concept to the final product, while reducing costs and shortening development cycles.

This commitment is reflected in a wide range of innovative products that are designed to make vehicles lighter and cleaner, and solutions that support governments' and local authorities' initiatives to optimize and upgrade waste containerization, collection and management systems.

Global warming and natural resource conservation are among the key challenges facing the automotive industry and governments. Plastic Omnium contributes by engaging these issues with its '360° offering', responding to car-makers' needs for vehicle weight reduction, emissions reduction, recyclability and safety.

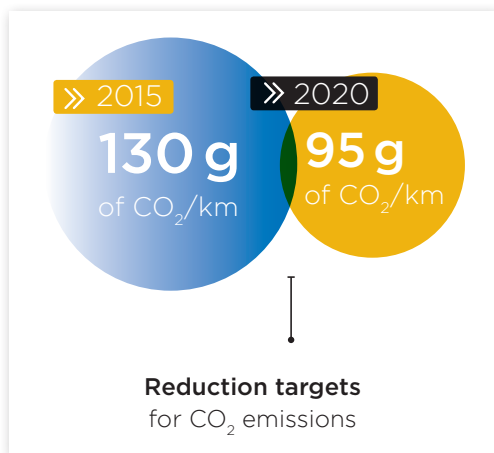
Plastic Omnium technology will help to create tomorrow's more ecologically-friendly vehicles with plastic components that are lighter and better suited to function integration than steel. Plastic Omnium also takes into account all aspects of environmental protection and the conservation of natural resources from design to end of the product's life, also addressing end-of-life plastic components recycling.



## //BUMPERS, BODY PANELS AND MODULES

Plastic Omnium Auto Exterior produces over 70,000 outer panels (bumper covers, fenders, tailgate panels, spoilers, rocker panels and claddings) daily. These thermoplastic-injected panels are 35% lighter compared to steel panels. In some vehicles, plastic panels account for 50% of the painted outer surface. Progress in painting technologies allows lower costs and better environmental performance.

Plastic Omnium is recognized for its expertise and capacity to produce worldwide best-in-class painted bumpers and plastic panels. Increasingly, global car-makers are releasing vehicles across 3 or 4 continents at the same time. With an excellent footprint and industrial standards deployed in its 56 production plants and 30 sequencing centers Plastic Omnium can accompany car-makers all around the globe. For instance, Plastic Omnium is supplying the BMW group in China with the next X1 bumpers (picture 1) produced in Shenyang plant, and VW group with the Golf A7 bumpers in Mexico (Puebla plant).





Thus, whatever the region, Plastic Omnium can achieve car-makers' most stringent requirements in terms of dimensional accuracy, paint and aspect quality. Furthermore, a network of 12 engineering centers worldwide applies best-in-class design and manufacturing standards adapted to car-makers' requests making worldwide project industrialisation a daily task, which further enhances Plastic Omnium's expertise.

Beyond today's products, Plastic Omnium continues to innovate and find ways to improve its product offerings to meet the demands of the automotive industry in the future. LightAir is a concept bumper (picture 2) showing how tomorrow's technologies can further improve performance of Plastic Omnium automotive exterior products.

This new aerodynamic bumper together with the use of air-shutters can reduce the CO<sub>2</sub> emissions of a mid-size SUV by 3 g/km. Finally, the modular composite architecture of the LightAir concept-bumper enables the fitting of thin-wall plastic body panels offering new possibilities in terms of part cut-lines, shapes and aspects.

Besides this, the use of carbon composite thermoplastic technology provides the possibility to cut the weight of the front crash beam and absorbers by 45% (3.5 kg) and allows greater styling freedom of the bumpers.

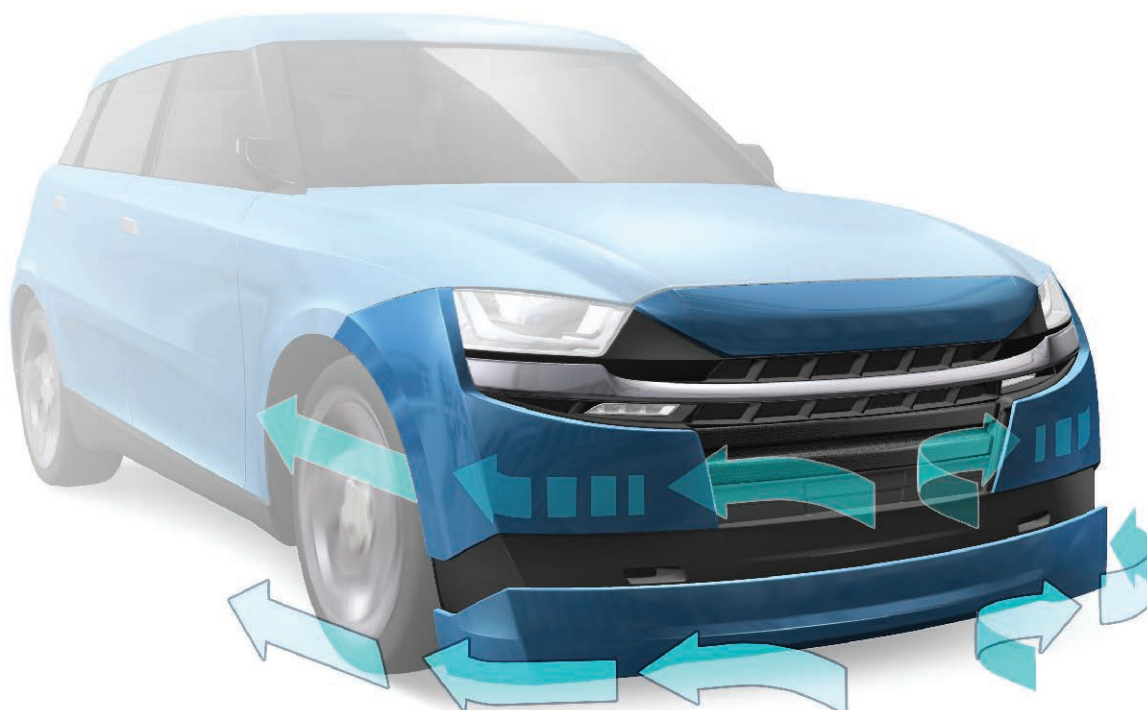
**PICTURE 1**

**BMW X1 bumper - worldwide best-in-class manufacturing**



**PICTURE 2**

**LightAir concept bumper - 3g/km CO<sub>2</sub> emissions saving; weight saving**



Already a global leader in the plastic bumper market, Plastic Omnium introduced a plastic fender into mass-production in 1997. Today, fenders can either be assembled on-line before painting, or painted off-line and added on the assembly line at a later stage. A plastic fender can be up to 40% lighter compared to a steel one while bringing better impact performance and additional function integration, especially when assembled off-line.

BMW asked Plastic Omnium to design and produce off-line painted fenders for the new BMW X5 SUV (picture 3). The part is injection molded with a specific TPO compound to guarantee dimensional accuracy, low expansion under heat, surface quality and impact resistance. The fenders are then painted with a waterborne paint system. For each set of fenders produced, the color is measured at 6 different points thanks to a spectrocoulometer installed on a robot arm at the end of the paint-line in order to ensure a perfect color-match with the X5 main body. This new fender also incorporates an air-guidance feature which improves the air-flow in the wheel-arch area.

Thermoplastic technology also allows greater styling-freedom and more aerodynamically-designed parts in order to reduce fuel consumption. Fascia air-inlets can be optimized and equipped with shutters when engine cooling is not necessary (the equivalent of a 1 g CO<sub>2</sub>/km reduction). Front and rear spoilers reduce turbulence around the car and improve road-handling stability.

For example, roof spoilers are integrated into the rear end of the car. Not only do these parts play an important role in the vehicle aerodynamics, but they also add to the design of the vehicle giving new personality to the car as well as integrating functions such as stop lights, wipers and various wiring and antennae. The roof spoiler of the new Nissan Leaf electric vehicle (picture 4) is manufactured by Plastic Omnium in its Measham plant in the UK. It is a twin-shell design with the top cover in thermoplastic alloy giving high dimensional stability and aspect quality after body-color painting. The part incorporates a solar panel to power auxiliary equipment in order to preserve the battery charge and to enhance further the driving range of this vehicle.

PICTURE 3

BMW X5 fender - thermoplastic injection molded



PICTURE 4

Nissan Leaf roof spoiler - large and complex painted body panel part



## // NEW GENERATION OF REAR CLOSURE SYSTEMS

Plastic Omnium Auto Exterior will produce over 1 million tailgates in 2013, and more than 5 million vehicles have been equipped with Plastic Omnium tailgates so far. Plastic Omnium has developed and produced composite rear closure systems since 1996. In 2010, Plastic Omnium launched the first hybrid composite and thermoplastic tailgate, called Higate, for the Peugeot 508 SW followed by Range Rover Evoque in 2011, Jaguar XF and new Range Rover in 2012 (picture 5). The first composite tailgate in China is now in production for the Roewe E50 electric vehicle.

PICTURE 5

Range Rover Higate - hybrid thermoplastic/thermoset tailgate





In 2013, Plastic Omnium will launch 5 additional composite tailgates among which, the new Range Rover Sport and the new Citroën C4 Picasso (picture 6). These 2 tailgates also exploit the advantages of the Higate technology where the inner panel – made of thermoset SMC and contributing a high level of geometrical accuracy – comes together in a clam-shell design with a PP thermoplastic outer panel providing a Class-A surface finish and styling freedom. In the case of the C4 Picasso such a design would be extremely difficult to realise in steel or aluminium technology. Also in 2013, Plastic Omnium will introduce a further new technology into the market in the form of hybrid thermoplastic. This technology utilises glass-filled thermoplastic olefin for the tailgate structure (PP LGF). It is applied on the new Peugeot 308 tailgate (picture 7) weighing less than 12 kg which equates to a 25% weight reduction compared to its steel equivalent.

These two technologies allow for a large number of vehicle applications, from larger tailgates to high-volume mid-size and smaller tailgates providing weight reductions of 5 to 10 kg per vehicle. Besides the styling freedom and weight saving the tailgate provides, a wide variety of function integration makes composite materials a popular choice for closure systems. Low speed crash compliance, integration of rear lighting, antennae and motorization can all be carried out at an optimised cost.

To meet the existing demand for hybrid thermoset and thermoplastic tailgates, as well as assist new customers in developing composite solutions, Plastic Omnium is strengthening its industrial capacity through investment dedicated to these technologies in Spain and the UK. Using its already extensive expertise and knowledge, Plastic Omnium is now concerning itself with the next generation of composite tailgates (picture 8).

So far, a large number of functions have already been incorporated from steel design solutions. Designing tailgates using composite material solutions will allow further function integration and styling freedom as well as additional weight saving. The prototype tailgate presented features a large inner panel in Carbon SMC material [left visible on the prototype] in order to obtain a maximum weight reduction. Lighting functions are integrated either in exterior panels or in the composite structure, and aerodynamic spoilers and side deflectors reduce the drag coefficient. Combined, the use of new composite materials and the associated design and

integration opportunity can deliver a 10% weight reduction compared to progress already made with all-aluminium design.

**PICTURE 6**

**Citroën C4 Picasso Higate - hybrid tailgate molded in color**



**PICTURE 7**

**Peugeot 308 - full thermoplastic tailgate**



**PICTURE 8**

**Carbon reinforced tailgate - a 10% weight reduction compared to progress already made with all-aluminium design**



## // STRUCTURAL COMPOSITE PARTS FOR AUTOMOTIVE MASS PRODUCTION

### FROM SEMI-STRUCTURAL COMPOSITE PARTS...

With 25,000 tons of composites compounded annually, Plastic Omnium is the major manufacturer in Europe, accounting for 30% of the composite applications produced for the automotive market. Plastic Omnium's range includes products that can be assembled either:

- Directly on the vehicle assembly line (on-line), before painting, with minimum disruption to the production process (fender carrier, front-end carrier, trunk floor, inner hood)
- Or after painting (off-line), with modules that can be pre-assembled such as tailgates.

Plastic Omnium can offer the best of both thermoplastic and thermoset composites and offers efficient hybrid solutions of composites with steel or aluminium. Over-molding of steel or aluminium inserts can make all these products compatible with the vehicle's metal structures. A first application of a composite trunk floor spot-welded to the car body goes into production in 2013 on the new PSA Peugeot Citroën EMP2 platform (picture 9). It brings a 40% weight saving compared to the traditional steel solution while keeping the assembly process unchanged for the car-maker.

Plastic Omnium has acquired a unique expertise for pedestrian safety, developing a bumper system and fender carrier that protect pedestrians' legs and head. Hoods with integrated protection structure are currently being developed for future application, with metal skins assembled by hemming to composite inner panels designed for outstanding head impact criteria values (picture 10).

PICTURE 9

Peugeot 308, Citroën C4 Picasso - on-line steel over-molded composite trunk floor



### ...TOWARDS HIGH PERFORMANCE

#### COMPOSITE SOLUTIONS

As a global leader in providing composite solutions, Plastic Omnium Auto Exterior broadens its range of innovative product offerings with high performance composites that provide significant reductions in vehicle weight. The new generation of high performance composites that are in development will use new types of fabrics, resins and fibers, including carbon. With these new formulations, the mechanical properties of new composites will be significantly improved. These composites can be applied directly to the structure of the vehicle as they are able to withstand significantly higher levels of stress. High performance composite structural parts will begin to develop on the market by 2017. A potential above 100 kg weight saving has been identified on the car body thanks to the development of these plastic and high performance composite solutions.

In order to propose the best material and process for a given application, Plastic Omnium is developing both thermoplastic and thermoset composite solutions. Production-tooled parts have been designed and produced in thermoplastic composite insert molding (HTPC), advanced SMC and high pressure RTM. Results obtained so far allows Plastic Omnium to develop the optimum material and technology choice for each application to achieve specifications. Extensive research into materials' characteristics has been conducted and composite applications can now be designed by finite element analysis (FEA) for static, crash, vibration and fatigue specifications.

PICTURE 10

Hybrid aluminium /composite hood specifically designed for head impact management





Structural parts targeted to apply these high performance composite materials are main floors, pillars, cross members as well as reinforcements to improve closures' stiffness-to-weight ratio. Plastic Omnium has started the validation of these applications in mass-production for the automotive industry thanks to a unique dedicated pilot line installed in its  $\Sigma$ -Sigmatech international R&D center in France. Scale 1 parts are being designed, processed and validated for market readiness in 2017.

A first example of a main floor using High Performance Composites is displayed (picture 11). This part has been designed to achieve a 50% weight saving using chopped and continuous fibers (glass and carbon) in an advanced SMC process. It comprises a twin-shell design, bonded and riveted together. The floor is compliant with crash requirements (side, lateral, pole) and can replace a complex, multi-piece steel design with over 20 separate stamped parts. It features a flat under-body shape for aerodynamic performance and is compatible with an on-line assembly process with steel parts using bonding and riveting techniques.



**PICTURE 11**

**On-line high performance composite main floor**



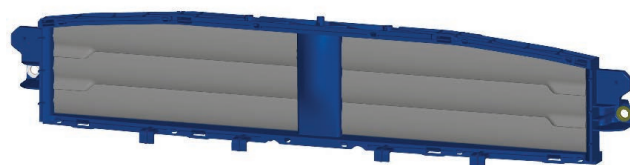
## // FRONT END MODULES

### ACTIVE GRILLE SHUTTER

Global market leader in front-end modules, HBPO has now moved successfully into the active grille shutter sector. At the 2011 IAA, HBPO unveiled a specially designed active grille shutter, to widespread acclaim. This new technology is gaining in popularity, and customers trust in HBPO's hard-won expertise. Series production of the latest HBPO product is slated to begin shortly. Through ongoing development in this area, new generations of the technology have already been created, allowing HBPO to supplement the components of its front-end modules with active grille shutters and thus expand its product portfolio. This technology has allowed HBPO GmbH to secure a solid foothold in the market in just two years (picture 12).

**PICTURE 12**

**Active grille shutter**



## NEW CLASS CLA MERCEDES-BENZ

### FRONT END MODULE

HBPO is setting new standards with the Mercedes-Benz MFA platform. Following the successful launch of the B-Class, the A-Class has been rolled out with a completely new appearance. The latest member of the A-Class family is the new CLA. All front-end modules for this platform are supplied by HBPO to the Rastatt (Germany) and Kecskemét (Hungary) assembly plants on a just-in-sequence basis (picture 13).

These new models posed special challenges. HBPO met them all, succeeding in reducing the weight of the front-end module by more than 20% compared with the preceding model. This weight saving also contributes to greater fuel efficiency, and thus to a reduction in CO<sub>2</sub> emissions. Due to the special design of the assembly carrier as a structural front-end member, a high degree of rigidity is achieved.

This is only possible by means of a special process applied to the center-piece of the front-end module where the polymer interior high-pressure forming technology provides the desired result. Thanks to the process know-how and experience of HBPO's engineers, further suitable technologies can be used for the front-end module, reducing the time required for assembly by some 30%. The assembly of the front-end module to the vehicle presents a particular challenge. For design reasons, with the MFA models it is not possible to install the front-end module from the front.

Instead, an installation and attachment technique developed by HBPO is used, in which the module is installed from the side via the wheel housing. The difficult task of aligning and adjusting the headlamps is solved by orienting the units using specific reference surfaces. The precision achieved in this manner does not affect only the time required for assembly; the greater impact is the reduced investment in expensive alignment and adjustment technology.

This module is a showcase for the know-how and expertise of HBPO, the front-end module specialist. The module is regarded as an integral whole. Only in this way can the full synergy effects and advantages be recognized and implemented.

PICTURE 13



## // FUEL TANK SYSTEMS

With 17 million plastic fuel tank systems produced in 2012, Plastic Omnium Inergy equips 1 out of 5 vehicles produced in the world.

A blow molded high-density polyethylene fuel system brings an average weight saving of 20% to 30% in comparison with an equivalent steel system, helping to significantly reduce CO<sub>2</sub> emissions. This positive weight differential is the reason why almost 70% of vehicles produced worldwide in 2012 are equipped with plastic fuel tank systems. The increase in use of plastic has been greatest in Asia, where strong growth in automobile production has been accompanied by the replacement of steel fuel tank systems (which still represent 47% of the Asian market).

In addition to the significant weight reduction advantage, a plastic fuel system offers the best compromise between technical requirements and cost. Through various manufacturing processes, a plastic fuel system is able to meet the highest standards for evaporative emissions. Its shape flexibility optimizes the available space in the vehicle, allowing for complex architecture and a high degree of integration of functions and components. A plastic solution therefore optimizes fuel load and offers a corrosion-proof system suited to carrying types of liquid fuel including bioethanol and biodiesel.

In particular, fuel filler pipes benefit as well from the weight saving brought by the use of plastic. INERGY proposes attractive blow molded filler pipe solutions which match the performance of steel ones and are compatible with the most stringent evaporative emission regulations. Finally, they can be welded directly to the tank, which provides a significant cost saving opportunity for this function (picture 14).

The elasticity and strength provided by plastics guarantee unequalled performance during crash. Because all vehicles with internal combustion engines can be equipped, the plastic fuel system remains a key-component for the car of tomorrow. As an undisputed world leader in this field, Plastic Omnium Inergy continues to provide technological solutions for vehicle manufacturers to create the mobility solutions of tomorrow.

PICTURE 14

BAIC C71 filler pipe



PICTURE 15

Cadillac CTS TSBM fuel tank



# TSBM

## TSBM - A BREAKTHROUGH TECHNOLOGY FOR FUEL SYSTEM ENHANCEMENT

TSBM - Twin Sheet Blow Molding - is a patented process from INERGY which combines the component integration possibilities of half-shell processes with the advantages of the standard blow molding process. With this innovative process, INERGY is able to reach new performance levels with regards to:

- Weight saving - TSBM allows further optimization of wall thickness control and internal components' shapes.
- System efficiency - TSBM allows more design flexibility and freedom in the positioning of inner components, thus reaching higher useable capacity and optimizing venting function.
- Permeation control - inserting components inside the fuel tank allows the reduction of the number of openings in the tank shell which helps TSBM fuel systems meet the most severe emission regulations.
- Acoustic performance - TSBM allows for the integration of anti-slosh noise devices (INBAFFLE) (picture 15).

This patented process enabling the integration of large and complex shape components, offers an easy way to integrate internal reinforcements in all locations for sealed fuel tank systems, becoming a solution of choice for plug-in hybrid vehicles.



## PLASTIC FUEL TANK SYSTEMS FOR HYBRID VEHICLES

The electrification of vehicles brings new challenges for fuel tank systems: slosh noise reduction, smaller capacity, management of fuel vapors during long electrical driving only. Plastic Omnium Inergy is developing a complete range of solutions for any type of hybridisation from Mild to PHEV and even EREV.

Among those solutions, INWIN is INERGY's solution for PHEV (picture 16). Benefiting from TSBM technology, it consists of a reinforced light-weight plastic fuel tank system that can withstand pressures from -160 mbar up to +350 mbar with minimal deformation. Compatible with the most stringent emissions norms such as Lev3/PZEV or Euro6, it provides a weight saving of 5 to 10 kg compared to similar fuel tank systems in steel. Plastic Omnium Inergy is in pre-development with car manufacturers for such sealed fuel tank systems.

PICTURE 16

Plastic fuel tank system for PHEV

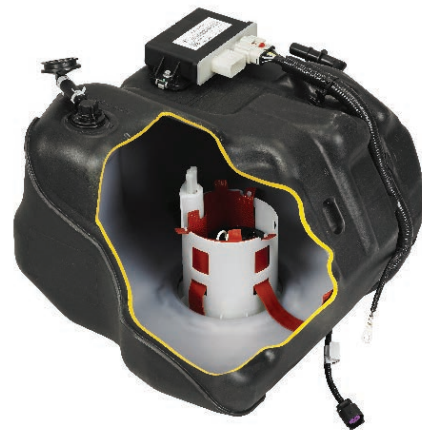


## // SCR SYSTEMS

As exhaust emission regulations become more and more stringent, the automotive industry is taking the challenge and investing in order to answer the most severe ones. This requires the development of new technologies like the on-board conversion of nitrogen oxides (NOx). Plastic Omnium Inergy develops unique inventive and environmentally friendly solutions that pre-empt upcoming regulations to provide long-standing solutions to the challenge of cleaner mobility.

PICTURE 17

Dodge RAM 2500/3500 HD SCR tank system



## DINOx TECHNOLOGY BY INERGY

Selective Catalytic Reduction (SCR) is a very effective and widely used diesel emission control technology, which is based on a very simple system. A urea solution, called AdBlue® or DEF (Diesel Exhaust Fluid), is injected into the exhaust line upstream of an SCR catalyst. Upon contact with the hot exhaust gases, it is transformed by hydrolysis into ammonia and then reacts with nitrogen oxides (NOx) to create non-polluting nitrogen and water vapor. Using its experience in managing on-board fluids, INERGY has developed storage and delivery solutions for passenger cars and light commercial vehicles; its latest product offer is DINOx Premium. This system integrates all required functions (filling, storage, delivery, venting and heating) into a plastic urea tank for on-board Adblue® management and offers further options such as temperature and fluid level sensing according to OEM specifications (picture 17).

## DINOX COMPACT

At this IAA, INERGY introduces DINOx Compact, its next generation SCR tank system technology.

Compatible with Euro 6 stage 2 applications, this next generation offers even more flexibility and integration possibilities.



## // CONTROLLED SYSTEMS

Plastic Omnium Inergy has acquired key competencies in electronics to be able to offer intelligent tank systems combining hardware, proprietary software and On-Board Diagnostics (OBD) (picture 18).

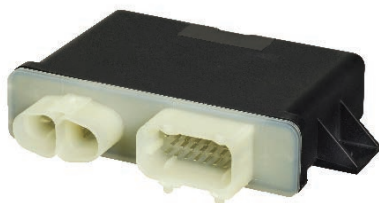
Thanks to its participation to the Autosar Consortium, Plastic Omnium INERGY softwares and strategies can be seamlessly integrated into the vehicle. The level of control and share of responsibility can be adjusted to match each OEM's unique practices and needs.

INERGY continues to develop specific strategies for both controls and OBD required specifically on both fuel or SCR tank systems.

Come and discover these latest developments on our booth in our Innovation Lab.

PICTURE 18

DINOx Control Unit



This document also exists in French and German.

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INNOVATING FOR A BETTER FUTURE



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