## Contents

Valeo at auto Shanghai 2017........................................................................................................... 3  
Valeo and China leading the way in the electrification revolution ............................................... 4  
The autonomous car revolution: artificial intelligence as integral to valeo’s system................................................................. 6  
See and be seen more clearly: a key safety challenge................................................................. 8  
Valeo in China ........................................................................................................................................ 11  
Valeo’s innovation strategy ............................................................................................................. 13
VALEO AT AUTO SHANGHAI 2017

Valeo, a world leader in CO₂ emissions reduction and intuitive driving, is presenting 14 new products at the 17th Shanghai International Automobile Industry Exhibition (Auto Shanghai 2017):

- Three powertrain electrification systems that reduce pollutant emissions.
- Two demonstrations and artificial intelligence (AI) systems designed to accelerate the development of automated driving.
- Four safety-enhancing lighting and sensor cleaning devices.
- Two filters and a sensor to ensure a healthy cabin environment.
- Three thermal systems that simultaneously keep the car cabin at a comfortable temperature while maintaining the batteries at an ideal operating temperature.

Serving powertrain electrification, automated and connected car as well as new mobility services segments, these innovations once again demonstrate Valeo's remarkable ability to leverage growth opportunities across the auto industry.

Within this industry, Asia and China in particular are emerging as the new powerhouses. More than 50% of the world's vehicles are now produced in the region.¹ With 27 million units manufactured in 2016, representing 29% of global production, China has become the world's largest vehicle manufacturer.

However, these emerging hubs also pose new challenges for the auto industry, such as demographic growth, with the world population expected to reach 9.7 billion by 2050, rising household car ownership levels and, above all, increasing urbanization in Asia, where the proportion of people living in cities is slated to rise from 54% to 66% by 2050.²

To meet these new challenges, cars will have to be greener, more automated to improve safety and smooth traffic flows, and more connected to their environment in terms of other users and road infrastructure. Valeo has developed technology in each of these areas by investing heavily in research and development (R&D). In 2016 alone, Valeo devoted 1.6 billion euros to innovation-focused activities, particularly in China, where Valeo is consolidating its presence and involvement in R&D through 13 dedicated centers. As a result, at the global level, 50% of Valeo products that are currently being ordered by automakers did not exist three years ago. And 28% of Valeo's total order intake is from China alone.

¹ Source: US market intelligence firm LMC Automotive.
VALEO AND CHINA LEADING THE WAY IN THE ELECTRIFICATION REVOLUTION

Auto manufacturers, car users, lawmakers and new regulators such as municipalities around the world, including in China, are converging in their demand for vehicles that save on fossil fuels and pollute less.

One in every three cars worldwide is already equipped with a Valeo electrical system. Building on its status as a pioneer, and the world No. 1 in low voltage vehicle electrification, Valeo is presenting the most comprehensive product portfolio at this year's Auto Shanghai to support CO₂ emissions reduction revolution. What makes Valeo’s electrification technologies so relevant is that they are compatible with all vehicle types, including those with conventional engines. Valeo’s 12- and 48-volt mild hybrid systems are perfect for urban and multi-purpose vehicles while its high-power solutions in excess of 60 volts, developed by the Valeo Siemens eAutomotive GmbH joint venture, are ideally suited to the needs of premium sedans and SUVs.

In this market, Chinese automakers today account for 50% of Valeo Powertrain Systems’ customers.

Valeo’s 12-volt belt-driven starter-alternator: turning engines over in the blink of an eye

Valeo invented the Stop-Start system, which automatically cuts off the engine when the vehicle stops and then instantly starts it again when the driver accelerates, thereby avoiding fuel waste. First marketed in 2004, this innovation has since become standard around the world. Valeo took the solution to the next level in 2010 by integrating the control electronics onto the machine. Replacing conventional alternators, this starter-alternator can be seamlessly and easily integrated into the engine, reducing installation costs. Powered by a belt drive linked to the crankshaft, it shuts the engine down gently as the vehicle comes to a halt and then starts it up again silently and without vibration, almost instantly after the slightest, softest tap of the accelerator. The mechanism restarts in a mere 400 milliseconds – the same unit of time used to measure a blink of the human eye, which takes between 100 and 400 milliseconds.

Valeo’s 12-volt starter-alternator can be adapted to all gearbox types, be they manual or automatic.

Valeo’s 48-volt belt-driven starter-alternator: the affordable hybrid solution

Designed to replace the alternator, Valeo's starter-alternator with integrated control electronics onto the machine is the pragmatic and competitive solution to the challenge of transitioning hybrid vehicles from niche to mass market technology.
Coupled with a conventional internal combustion engine, the 48-volt starter-alternator recovers braking energy and stores it in a 48-volt battery for a variety of later uses, such as:

- Increasing engine torque for enhanced driving comfort.
- Driving in all-electric mode over short distances and in urban traffic jams.
- Supplying electricity to the vehicle cabin.

Together, these three modes can reduce fuel consumption and CO₂ emissions by around 10%.³

Valeo's 48-volt solutions can be applied across all vehicle types, to both gasoline and diesel engine models.

Valeo is currently working on new, even more highly evolved 48-volt systems intended first and foremost for the Chinese market. These future solutions will appear over the next three years.

**Valeo’s high-voltage electric propulsion motor: more power, less fuel**

Formed in 2016, the Valeo Siemens eAutomotive GmbH joint venture supplies a range of innovative and affordable high-voltage components and systems. The portfolio comprises e-motors, range extenders, onboard chargers, inverters and DC/DC converters for the entire range of hybrids, plug-in hybrids and full electric vehicles. Valeo has contributed its high-voltage power electronics activities, range extenders and charging solutions to the joint venture and Siemens its e-motors and power electronics operations.

At Auto Shanghai 2017, Valeo is revealing a high-voltage electric propulsion motor that has been specially designed for the new Volvo XC90 high-performance SUV. The system comprises an electric motor and an inverter. The powerful Drive-E powertrain delivers 400 horsepower of energy for 640 newton-meters of torque, all with extremely low CO₂ emissions of 59 grams per kilometer. Valeo also supplies the onboard charger. It also features high energy efficiency, with fuel economy of 2.5 liters per 100 kilometers (New European Driving Cycle – NEDC).

This high-voltage electric propulsion motor can be sized to suit the expectations of automakers, with power ranging from 30 kilowatts to 200 kilowatts.

³ Non-contractual Valeo estimate made prior to approval testing.
With the rise of intuitive driving, Valeo is making electronics and intelligence an integral part of mechanical systems, harnessing artificial intelligence (AI) to solve complex problems. Moving beyond algorithm-based systems, where all possible outcomes are calculated definitively in advance, **artificial intelligence is now giving vehicles the ability to adapt to different situations like people.** The technology is based on a neural network that learns to perform specific functions and improves with every experience. In 2016, Valeo enhanced its AI expertise by investing in CloudMade, a start-up that has developed specific vehicle and cloud-based AI systems to pool the knowledge gained from monitoring the driving behavior of connected motorists.

Artificial intelligence is fundamental to the development of the automated car and new mobility services as it will contribute to how vehicles understand the outside world. Valeo has created a virtual rally racing game to give people a first-hand look at a machine learning system and demonstrate how these technologies can enhance system performance.

**“Race against the machine”, a virtual racing game**

Unveiled at CES in Las Vegas in January 2017, the “Race against the machine” game is being presented again at Auto Shanghai 2017 to show what the machine has learned after several months of use. Today, for example, it knows how to avoid obstacles that appear suddenly on the road, a skill that can be used to develop an automated car’s ability to learn to overtake or to merge into traffic at a roundabout.

**The most comprehensive portfolio of sensors on the market**

In the same way that people rely on several senses to drive, autonomous vehicles need input from several sensors. **Valeo boasts the most comprehensive portfolio of sensors on the market**, with solutions ranging from cameras and ultrasound detectors to radars and LiDAR (Light Detection and Ranging) lasers. These technologies work together to enable the vehicle to decipher every aspect of the surrounding environment, addressing one of the major challenges of the intuitive driving revolution by allowing the vehicle to see, understand and act accordingly. Valeo has expertise in merging data collected in real time, which guarantees that objects will be detected and information provided — two prerequisites to performing any driving task in total safety.

**A new human-machine interface revealed at Auto Shanghai 2017**

**The second major challenge is to get people to accept the technological revolution that is the automated car.** To this end, Valeo is working on a **new human-machine interface (HMI)** known as Situational AWAreness, or SAWA for short. This technology is being presented in a film at Auto Shanghai 2017.

SAWA is a fully immersive human-machine interface based on a 3D screen, which displays a 360-degree, real-time reproduction of the vehicle in its environment, including roads, lane markings, traffic signs, stationary objects and nearby vehicles. In **manual driving mode**, the driver enjoys decision-making support from such Valeo-developed features as hazardous area indication and lane change assistance. The SAWA human-machine interface increases driver safety, making it possible to keep the safest distance from other vehicles and to anticipate situations requiring braking, avoidance and
lane changing. In automated driving mode, SAWA provides the driver with relevant information about the surrounding environment, indicating any potential hazards and shedding light on the vehicle’s behavior. The aim of this technology is to improve the driver’s trust in the system by facilitating safe driving in manual mode, ensuring sound knowledge of the environment in automated mode and smoothing the transition from one mode to the other.
SEE AND BE SEEN MORE CLEARLY: A KEY SAFETY CHALLENGE

When it comes to car lighting innovation, the challenge is not to shine more light onto the road but to allow drivers to see more clearly at night while being more visible to others.

LED technology
At the same time, Valeo is once again pushing the limits of innovation with new lighting based on LEDs, which are commonly found in rear lights and are now increasingly replacing halogen and xenon in headlamps. On display at Auto Shanghai 2017 are:
- Second-generation BiLED systems, which have already been selected by eight auto brands.
- The second generation of PeopLED, which efficiently couples LED technology with optimized thermal management. Eleven customers have adopted this technology to date.
- A high-tech line of LED rear lighting solutions to enable even greater freedom to vehicle designers.

Interactive lighting
The rise of the automated car will spur a transformation in lighting systems toward greater interactivity, notably between pedestrians and vehicles. Valeo is also working to enhance communication between vehicles by displaying pictograms within the lights themselves.

A full range of sensor cleaning solutions
The issue is just as crucial for automated cars. Here, however, seeing clearly is more than simply a question of lighting; it is also linked to the sensor’s ability to operate correctly. To provide reliable information, the sensors must stay clean under all circumstances. In line with this, Valeo’s visibility innovations on display at this year’s Auto Shanghai focus on lighting systems and sensor cleaning solutions.

For the 17th Auto Shanghai, Valeo is presenting a full spectrum of sensor cleaning innovations, ranging from entry-level models to high-performance, all-season varieties. Valeo-designed systems are characterized by the fact that they use less cleaning fluids. They also offer safety and comfort.
CLEANER AIR AND MORE EFFICIENT COOLING AND HEATING

Valeo has made reducing pollutant emissions one of its two main innovation focuses. The Group has taken a comprehensive approach to the issue, working to develop powertrain electrification, transmission automation, and clean engine technology. Valeo also develops technologies to produce fresh, clean air inside the cabin, even when the outside environment is polluted.

At Auto Shanghai 2017, Valeo is showcasing its range of innovative cabin air purification systems as well as its specially designed thermal solutions for electric vehicles.

**Two filters and a sensor to trap pollution**

*Very high efficiency PM$_{2.5}$ filter, the ultrafine particle trap*

Valeo has developed cabin air filters featuring layers of activated carbon. These have the ability to prevent ultrafine particles from penetrating the cabin and can also absorb harmful gases and unpleasant odors. In all, the Valeo filter blocks 98% of PM$_{2.5}$, a level of efficiency high enough to comply with the related provisions of China’s new pollution standard, which came into force in 2016.

Made from reinforced, close-knit fibers, the Valeo very high efficiency PM$_{2.5}$ filter reduces particle concentration inside the vehicle to levels that also meet the World Health Organization (WHO) air quality guidelines of 25 micrograms per cubic meter per day. This performance makes the filter suitable for regions such as North China, where particle concentration can reach up to 900 micrograms per cubic meter. The cabin air filter will be brought to market in 2017.

**Anti-allergenic cabin filter**

Valeo has developed filters that can neutralize up to 96% of pollen allergens in addition to trapping dust, harmful gases and odors. Patented by Valeo, these filters feature a surface coating made from a natural plant extract, which inhibits the effects of the allergenic particles of pollen.

**Valeo’s PM$_{2.5}$ sensor for clear, instant air quality information**

Valeo has designed a PM$_{2.5}$ sensor to reassure passengers about indoor air quality. According to a study, three in four people in China would like to have access to accurate information about the air quality in their living environment. The PM$_{2.5}$ sensor detects pollution in the form of incoming particles, gives passengers real-time information about pollution levels inside and outside the

---

*DID YOU KNOW?*

According to WHO, more than 2 million premature deaths worldwide every year are linked to air pollution in urban areas.

The International Agency for Research on Cancer (IARC) has classified outdoor air pollution as “carcinogenic” to humans.

Aware of the seriousness of the problem, the Chinese government introduced a new National Ambient Air Quality Standard (NAAQS) in January 2016 to monitor the presence of PM$_{2.5}$.

---

4 Fine particles refer to particulate matter with a diameter of less than 2.5 micrometers, or PM$_{2.5}$. Fine particles are suspended in the atmosphere, where they can stay for several days. They are small enough to penetrate the alveoli of the lungs.

5 Sigma study.
vehicle and activates the air recirculation function to maintain the lifespan of the filter. Connection to the cloud enables this information to be shared with other connected users.

Thermal management for electric and hybrid vehicles
Air quality concerns are likely to significantly accelerate the pace of vehicle electrification. The challenge will be to ensure that these vehicles can match their ICE counterparts in terms of range without sacrificing passenger comfort. This will require specific new thermal management solutions, an area in which Valeo excels with its heat pump heating systems and solutions for maintaining stable battery temperatures.

Electrically driven compressor with integrated inverter
The electrically driven compressor (EDC) has a duel function: air condition the cabin and cool the battery. Ultra compact and quiet, it offers the highest cooling capacity on the market while maximizing the energy efficiency of the air conditioning system. EDC production will begin in China in 2019.

Battery thermal management system
The batteries of an electric vehicle account for nearly half of its value. For this reason, it is important to protect them from fluctuations in temperature, especially during fast charging cycles. To ensure optimal longevity and performance, the batteries’ temperature must be maintained at between 15°C and 45°C, with a consistent temperature across all cells. Valeo has solid experience in this field and offers technologies suited to all hybrids, plug-in hybrids and all-electric vehicles, in both low- and high-power models.

Heat pump systems
Valeo develops several heat pump architectures that deliver optimal cabin heating and superior air conditioning performance, with a minimal impact on electric vehicle range. Valeo heat pump systems are also available with a water-cooled condenser, which won the 2016 PACE Award. The Valeo heat pump system will hit the Chinese market via a major local automaker in 2019.

DID YOU KNOW?
In urban driving conditions in winter, a vehicle operating in all-electric mode uses as much energy to heat the cabin as it does to drive.

In this situation, the thermal management challenge is to ensure passengers enjoy the level of comfort they expect without sacrificing on vehicle range.
Key figures in 2016
- China accounted for 14% of total Group sales in original equipment, up 22% on 2015 and outperforming the market by 8 percentage points and generated 28% of order intake.
- Chinese automakers represented 30% of the Group’s sales.

Valeo’s teams and industrial presence
- 18,000 employees – Valeo’s leading country in terms of workforce
- 30 plants
- 13 R&D centers
- 5 distribution platforms
- 12 projects under construction

Valeo – Chinese in China
2017 Opens a R&D center in Wuhan
2016 Inaugurates two new sites: TFE Wuhan and VWS Changshu
2015 Sets up two new plants in Wuhan for thermal system and in Shanghai for comfort and assistance driving systems; extends two plants, in Shenzhen and Guangzhou for comfort and assistance driving systems.
2014 Inaugurates four production sites in Shanghai (electrical), Yantai, Shandong and Foshan Sanshui, Guangdong (thermal), and Shenyang (transmission).
2013 Sets up four new plants in Shenyang, Liaoning (lighting), Jingzhou, Hubei and Tianjin (thermal systems), and Wuxi (powertrain) and three plant expansions, in Wuhan and Foshan (lighting) and Nanjing (transmission).

2012 Acquisition of an 80% stake in Ruby Lighting from Chinese automaker Chery at Wuhu, Anhui. Two new sites opened in Guangzhou, Guangdong, for switches, and Wuhu, for lighting.

2011 Inaugurates two new sites: an electronics expertise center in Shenzhen, and a plant in Wenling to boost capacity for wiper systems.

2009 Completes the 100% acquisition of the compressors joint venture in Changchun.

2006 Opens a second R&D center in Shanghai and a lighting plant at Foshan, Guangdong. Acquires all the capital stock of the Wuhan lighting business.

2005 Sets up new joint ventures for air-conditioning compressors in Changchun, Jilin, and for switches and detection systems in Shenzhen, Guangdong. Builds a new security systems plant in Wuxi, Jiangsu.

2004 Increases stake in Nanjing joint venture for clutches. Opens first R&D center in China at Wuhan (wiper systems) and opens 5 Axes School to provide induction programs for new employees in line with the Group's corporate culture.

2003 Increases stake in three joint ventures: 50% in electrical systems (Shanghai), 55% in wiper systems (Shanghai) and 75% in lighting systems (Wuhan).

1997 Sets up a new joint venture for transmission systems in Nanjing, Jiangsu.

1995 Pursues development by setting up two new joint ventures, in Wuhan, Hubei, for lighting and Shanghai for electrical systems, and, in parallel, acquires shares in another joint venture in Shanghai for wiper systems.

1994 Sets up first joint ventures in Wenling, Zhejiang (Wiper Systems) and Shashi, Hubei (Climate Control).
VALEO'S INNOVATION STRATEGY

Valeo’s growth strategy is based on two key focuses: innovation and expansion in Asia and other emerging markets.

Start-up spirit

The connected, automated and clean car of tomorrow will have little in common with that of previous generations. To design and produce this vehicle, today’s automotive industry integrates a wide variety of skill sets. For this reason, Valeo works with players of varying size and vocation, ranging from start-ups and universities to major groups.

Open innovation

Valeo pursues an adaptable innovation strategy based on agility and flexibility to keep abreast of social megatrends and continue tailoring products to its customers’ needs. With this in mind, the Group has diversified its sources of inspiration and its partnerships, with initiatives such as the Valeo Innovation Challenge for students, now in its fourth consecutive year; the acquisition of a stake in Cathay Capital, a cross-border investment vehicle dedicated to venture capital financing for innovative start-ups; collaborations with Safran and Mobileye; the acquisition of an equity interest in navya and Cloudmade and the acquisition of gestigon.

In China, Valeo signed a partnership agreement with Shanghai Jiao Tong University in November 2016 for a joint R&D lab, which will cover all the Group’s businesses. This agreement strengthens the Group’s ties with one of the best universities in China, which began in 2014 with collaboration in two areas: battery technology and the solidity of low-voltage hybrid technology (12 V and 48 V).

The Valeo Innovation Challenge

In a bid to create more opportunities to reach students directly, Valeo started a new breed of contest in 2013 called the Valeo Innovation Challenge. The contest asks students to come up with a new product or system, or a new way of using cars, that will make vehicles smarter and more intuitive by 2030. With this contest, Valeo aims to build on its open innovation strategy by strengthening ties across the academic world.
Start-up incubator

**Valeo continuously nurtures its start-up spirit.** Refusing to centralize innovation, the Group instead harnesses 19 research centers and 35 development centers around the world, staffed with autonomous teams working to quickly roll out useful mobility solutions for end customers worldwide.

Valeo believes in collaborative innovation and regular, personalized interactions with start-ups. Some encounters culminate in an acquisition, as was recently the case with gestigon, a start-up specialized in developing 3D image processing for the vehicle cabin. Others result in the purchase of equity interests, as with Cloudmade last November, specialized in big data processing.

Valeo strengthened its open innovation ecosystem in 2016 by acquiring interests in several venture capital funds, thereby ensuring worldwide access to thriving local start-up networks in the San Francisco Bay Area, Shanghai and France. This initiative is boosting Valeo’s visibility and attractiveness among up-and-coming entrepreneurs, and is already generating a deal flow of some 100 opportunities a month.
Follow our latest news on social media

Twitter: https://twitter.com/Valeo_Group

Facebook: https://www.facebook.com/Valeo.Group/timeline

LinkedIn: https://www.linkedin.com/company/valeo/

YouTube: https://www.youtube.com/user/ValeoGroup