****

9B21M016

Valeo: Innovating to Lead the Mobility Revolution

Amita Mital and Krishnan V wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

This publication may not be transmitted, photocopied, digitized, or otherwise reproduced in any form or by any means without the permission of the copyright holder. Reproduction of this material is not covered under authorization by any reproduction rights organization. To order copies or request permission to reproduce materials, contact Ivey Publishing, Ivey Business School, Western University, London, Ontario, Canada, N6G 0N1; (t) 519.661.3208; (e) cases@ivey.ca; www.iveycases.com. Our goal is to publish materials of the highest quality; submit any errata to publishcases@ivey.ca. i1v2e5y5pubs

Copyright © 2021, Ivey Business School Foundation Version: 2021-03-10

Jacques Aschenbroich, chairman and chief executive officer of Valeo, recalled the incredible journey Valeo had gone through from 2009 to the COVID-19 crisis in 2020.[[1]](#footnote-1) In 2020, he had spoken about the smart car revolution, comprising three revolutions: vehicle electrification, vehicle autonomy, and digital mobility. While vehicle’s electric mobility was growing at a rate of 70 per cent, autonomous mobility was expected to become a reality sooner than expected. Valeo was one of the key players shaping these revolutions and the future of mobility by enabling companies to develop new services and create new business models. Because of Valeo’s leading position in all three revolutions, Aschenbroich saw immense growth potential. With electrification, Valeo could multiply the value it added to cars from two to seven, depending on the solutions. With autonomous driving, Valeo could multiply the value by 10. Though the crisis had shifted the focus to the health of the people above everything else, Aschenbroich faced two additional main challenges: to maintain speed while Valeo was growing and to find the right balance between growth and profitability.[[2]](#footnote-2)

Growth of Valeo

Valeo started as an automobile component enterprise in 1923, manufacturing brake linings in Saint-Ouen, France. By World War II, it had almost all the patents for the manufacture of clutches, which it had started producing in 1932. When the war partially destroyed the factories, the firm modernized and moved outside the Paris region, and manufacturing clutches remained the main business activity. Diversification into thermal systems for automobiles started in 1962 with the acquisition of SOFICA (Société de Fabrication Industrielle de Chauffage et d’Aération, or Industrial Heating and Ventilation Company), which specialized in heating and air conditioning. During the 1960s and 1970s Valeo added spark plugs, alternators, starters, lighting, and wiping systems to its portfolio through a series of acquisitions, and expanded into Spain and Italy. A research centre was also established in Paris in 1970.

In 1980, the firm came to be known as Valeo, meaning “I am well,” and started operating in the United States. International expansion continued with Valeo foraying into Mexico (1982); Tunisia (1984); Spain, Italy, Germany, Brazil, and Japan (1985); South Korea and Turkey (1988); China (1994); Poland and Czech Republic (1995); and India (1997). Valeo was simultaneously adding to its technology base through acquisitions as well as research and development centres worldwide. Research centres handled technologies at lower levels of maturity by combining knowledge gained through acquisitions and partnerships to create new products. Development centres handled mature, customer-ready technologies, where products were customized to meet original equipment manufacturer (OEM) requirements before being manufactured on a larger scale. Valeo developed security systems, electrical and electronic systems, and parking assistance systems using ultrasonic sensors, stop-start technology, efficient powertrain systems, interior controls, and artificial intelligence in its technology portfolio. By 2013, when Valeo turned 90, it was an automotive supplier and partner to automakers worldwide, designing innovative solutions for smart mobility with a focus on intuitive driving and reducing carbon dioxide emissions (see Exhibit 1).

Business Groups of Valeo

Valeo had a leading position around four coherent business groups: comfort and driving assistance systems, powertrain systems, thermal systems, and visibility systems (see Exhibit 2). Each group was responsible for global growth and operating performance for its respective product lines.

Comfort and Driving Assistance Systems

Valeo offered a wide range of smart sensors and features to improve vehicle safety and comfort, such as automated parking systems and enhanced automated driving systems, which made driving safer, more autonomous, and better connected through perception systems and artificial intelligence. The *Driving Assistance Group* designed ultrasonic sensors, radars, and cameras in conjunction with mobile applications (apps) to detect obstacles around vehicles to facilitate driving and parking. Valeo produced approximately one billion sensors between 1997 and 2017 and was the world’s leading manufacturer of driving-assistance sensors. The *Intuitive Controls Group* was a world leader in human-machine interfaces. It used extensive experience and in-depth knowledge of vehicle architectures to develop high-quality, robustly designed solutions for premium markets as well as for emerging and mass markets to strengthen the concept of intuitive driving. *Connected Car* systems offered enhanced communication options for drivers through a full range of connectivity solutions, from short-range connectivity (hands-free access) to long-range connectivity (telematics units to connect to mobile phone networks). It also enabled the integration of smart phone applications such as car-sharing services and remote-parking systems. These reinvented mobility solutions and human-machine interfaces resulted in an innovative user experience.

Powertrain Systems

Electric mobility was on the rise in cities across the globe. The *Powertrain Systems Group* developed and produced powertrain solutions to improve currently used engines and to design electric mobility for the future. By using simple and affordable technologies to make the internal combustion engines cleaner, this business group developed comprehensive, integrated electric powertrain solutions to power all vehicle categories from small urban cars and plug-in hybrid cars to premium sedans. Transmission automation was a growing global trend with technologies such as automatic transmissions, automated manual transmissions, and dual-clutch transmissions. Valeo offered products enabling the automation of transmission to reduce fuel consumption and improve driving comfort. The clean engine approach specialized in efficient solutions, including air circuit management for air intake and exhaust that reduced carbon dioxide (CO2) and gas emissions, while enhancing the driving experience and engine performance.

Thermal Systems

The *Thermal Systems Group* designed and manufactured systems, modules, and components with the threefold objectives of reducing pollution emissions from internal combustion engines, optimizing the driving range and battery life of hybrid and electric vehicles, and improving passenger comfort in the cabin. Electrification required new thermal management solutions for passenger comfort without impacting vehicle range and while keeping battery temperature at ideal operating conditions. The group offered a portfolio of cooling systems optimized for both rechargeable hybrid vehicles and all-electric vehicles and developed systems to optimize the thermal management of the engine, improve the energy efficiency of passenger comfort systems, enhance aerodynamics, and lighten front-end modules to reduce both fuel consumption and the emission of noxious gases. A user-centric approach to interior comfort, *Oxy’Zen*, was adopted through cloud-enabled technologies and machine learning in which the car provided cleaner air and enhanced in-cabin well-being based on preferences of passengers.

Visibility Systems

The *Visibility Systems Group* provided visibility and safety for drivers in all weather conditions during day and night through augmented visibility. The group comprised lighting and wiper systems, and designed and produced innovative technologies with optimum design and comfort. Valeo ranked number one worldwide in lighting systems. Along with its Japanese alliance partner, Ichikoh Industries Ltd. (Ichikoh), it designed interior and exterior lighting solutions tailored to meet all automaker model requirements. Valeo produced a range of lights for adaptive lighting technologies, interior lighting solutions, design-centric external lights (headlamps and lights), light-emitting diode (LED) lights, and non-blinding road beams. Valeo won a research & development award for its PictureBeam Monolithic technology, the first high-definition LED smart lighting solution in 2019. Capable of projecting approximately 4,000 pixels onto the road from a single lighting module, this technology produced a very wide beam of light for an optimal field of vision, and offered the best anti-glare function available. It improved the night visibility of pedestrians and obstacles on the road by shining more light on the surrounding area when a pedestrian was detected without blinding the pedestrian. It could detect bends in the road, improving both safety and driving comfort.[[3]](#footnote-3) The wiper systems group developed lightweight, cutting-edge technologies for clean windshields, clean rear windows, and clean optical sensors to offer excellent visibility for drivers and autonomous cars.

The automotive industry was changing at a rapid pace with new technologies turning obsolete in a matter of a few months. A high level of coordination was required at the group level and across geographies to make impactful strategic decisions. Simultaneously a high level of control was required at the corporate level to monitor the areas of investment.

Partnerships and Acquisitions

Valeo leveraged co-operative innovation across a wide ecosystem spanning universities, laboratories, companies in other industries, and start-ups to diversify and streamline its development cycles. Market leadership and access to technology also came through acquisitions of market leaders in certain domains (see Exhibit 3).

Comfort and Driving Assistance Systems

Driving Assistance

In 2002, Valeo Raytheon Systems, a joint venture (JV) with Raytheon, a US-based defence equipment and auto component manufacturer, was formed to design and manufacture a blind-spot detection system. The JV manufactured sensors and vehicle navigation systems for autonomous vehicles. In 2018, another research partnership was formed with Lero, an Irish research centre with strong industry focus. Lero integrated software teams from universities and institutes of technology across Ireland and spanned a wide range of application domains, including driverless cars, artificial intelligence, and cybersecurity. This collaborative effort enabled the development of sensor technology that could see farther and adapt to difficult driving conditions such as fog, heavy rain, and darkness. In 2018, having developed the technologies, Valeo signed a memorandum of understanding (MoU) with WABCO Vehicle Control Systems (WABCO), a US-based provider of electronic braking, stability, suspension, and transmission automation systems for heavy-duty commercial vehicles. With this MoU, Valeo could access the commercial vehicle market in the autonomous driving space by supplying advanced short- and mid-range sensors, including a 77-gigahertz (GHz) radar and a solid-state LiDAR (Light Detection and Ranging), to develop and industrialize the next generation of Advanced Driver Assistance Systems (ADAS), among the key building blocks for vehicle autonomy. LiDAR sensors gave a 360-degree view of surroundings, thus improving driver safety, assistance, and vehicle automation.[[4]](#footnote-4) However, the partnership could not achieve its full potential due to WABCO having been acquired by ZF Friedrichshafen. In 2005, Valeo Hangsheng Automotive Switches & Detection Systems, a 75:25 JV with Hangsheng Electronics, was formed to produce parking-assist sensors and switches.

In 2007, Valeo acquired Ireland-based Connaught Electronics, which produced camera applications for driving assistance and radio frequency applications for remote vehicle access and security. This acquisition extended Valeo’s line of camera-based vision solutions for low-speed manoeuvring. In 2013, Valeo collaborated with Safran, a French multinational airspace engine and aerospace component company, to develop electronics, sensors, autonomous vehicles, and human-machine interfaces. Both organizations contributed technology with the understanding that the ownership of intellectual property rights would be with Safran if the technology supported the aerospace industry and with Valeo if the technology supported the automotive sector. As an outcome of this collaboration, Valeo developed driver-attention monitoring, 360-degree visibility, visibility in extreme weather, and vehicle robotization and dronization.

In 2017, a €33 million[[5]](#footnote-5) acquisition of Gestigon, a German start-up specializing in 3-D image-processing software for vehicle cabins provided high-growth technologies such as interior cameras, image processing, and a comprehensive offering of object and occupant detection features. Cyber Valet Services was a strategic co-operative agreement with Cisco in 2017 that enabled vehicles equipped with Valeo Park4U® Auto technology to park safely and autonomously.

Intuitive Controls

In 2016, Valeo paid €28 million to acquire a 50 per cent stake in UK-based CloudMade, which specialized in developing smart and innovative big data-driven automotive solutions. Through this investment, Valeo improved and personalized vehicle comfort and safety for motorists and passengers through a unique solution, MyMobius. MyMobius used artificial intelligence to learn from drivers’ habits, which were collected and processed in the cloud to anticipate driver needs and activate vehicle functions to customize onboard environment and enhance safety without the need for user intervention.[[6]](#footnote-6)

With the objective to increase the development, testing, and implementation of self-driving cars through a collaboration between tech companies and car manufacturers, Valeo partnered with the Apollo Platform of Baidu in 2018. Baidu was a Chinese multinational technology company specializing in Internet-related services and artificial intelligence. Valeo derived value from the full range of software, hardware, and data tools such as operating systems, high-precision positioning and high-definition (HD) mapping services, simulation engines, cloud, and algorithms provided by Apollo through its open, reliable, and secure platform.

In 2019, Valeo developed and promoted a new autonomous vehicle safety standard based on Responsibility-Sensitive Safety through a partnership agreement with Mobileye, an Intel company. Valeo gained access to Mobileye’s mathematical safety model, with the goal of industry adoption. In the same year, Valeo also signed a strategic co-operative agreement with Meituan-Dianping, China’s leading e-commerce platform for food delivery services, to design and develop an autonomous last-mile delivery solution. The companies jointly developed an autonomous, electric delivery droid prototype, Valeo eDeliver4U, which could deliver up to 17 meals per trip, autonomously negotiating dense and complex urban environments at approximately 12 kilometres (km) per hour without generating any pollutant emissions.

Valeo also joined the 5G Mobix Alliance comprising 58 partners whose objective was to develop and test automated vehicle functionalities using 5G core technological innovations along multiple cross-border corridors and urban trial sites, under conditions of vehicular traffic, network coverage, service demand, as well as considering the inherently distinct legal, business, and social local aspects.

Connected Cars

Minda Valeo Security Systems Private Limited, a JV with A K Minda Group, was established in India in 2007 to manufacture Valeo’s auto security products by integrating Minda’s four-wheeler security systems business. To accelerate the pace of adoption of open source In-Vehicle-Infotainment (IVI), Valeo became a core member of the GENIVI Alliance in 2010. GENIVI was a non-profit automotive industry alliance driving the adoption of open-source IVI software and providing open technology for connected cars to help accelerate the pace at which new solutions could be made available to automakers.

In 2011, through an agreement with RHJ International and Nissan, Valeo acquired the capital stock of Japanese automotive supplier Niles for €313 million to become the world leader in the automotive human-machine interface market. Valeo acquired German-based Peiker, a major supplier of onboard telematics and mobile connectivity solutions, for €283 million in 2016. The acquisition enabled Valeo to widen its range of connectivity solutions and strengthen its leadership in autonomous and connected vehicles and offer new telematics systems equipped with high-speed connectivity and cybersecurity features. A technology partnership with Capgemini in 2016 led to the creation of Mov’InBlue, a solution for intelligent fleet management service for car rental companies. This connected, secure, and interoperable system of shared mobility allowed drivers to unlock a vehicle with a smart phone, thereby optimizing fleet vehicles’ utilization rate.

In 2017, to enhance digital mobility and fleet management using machine-to-machine (M2M) technology, Valeo acquired a 33 per cent stake in Kuantic, which specialized in telematics and M2M connectivity, for €6 million. This car-sharing solution combined Mov’InBlue with Kuantic’s platform to operate vehicle data in real time. Vehicles could be managed with digital keys, while personalized alerts flagged any anomalies.

Another technology partnership with Ellcie Healthy in 2018 accelerated the development of smart-connected eyeglasses for driving, leading to improved road safety, more comfortable driving, and enhanced human-machine interfaces. In the same year, Valeo signed another technology partnership with NTT Docomo to develop new mobility services for connected cars. The agreement provided telecommunication services and on-board equipment for connected cars, including next-generation mobility services in the era of 5G V2X (vehicle-to-everything), digital services for cars using smart phones and enhanced controls for on-board equipment. Additionally, in 2020, a tri-party strategic co-operation between Hyundai, Hexagon, and Valeo developed high-precision positioning (HPP) with centimetre-level accuracy in ascertaining position of the vehicle. Hexagon had high-quality, low-cost chips TerraStar X correction technology, which was compatible with Valeo’s navigation systems. This technology supported OEMs in autonomous mobility and the digital mobility. Valeo brought in telematics control, and Hyundai integrated these communication systems in the vehicle. HPP was launched at the 2020 Consumer Electronics Show.

Powertrain Systems

Electric Mobility

Valeo Shanghai Automotive Electrical Systems was a JV with Huayu Automotive Systems formed in 1995 to produce starter motors, alternators, and hybrid power systems, including 12 volt (V) and 48 V belt starter generators and other high-voltage e-motors. Valeo was the pioneer and world leader in 48 V automotive systems that could adapt to individual situations and be mounted in different positions within the vehicle, depending on the automaker’s requirements. Valeo acquired the starters and alternators business of Mando Automotive for €150 million in 1999 to strengthen the electrical and electronic activities, that represented almost 60 per cent of its total turnover in 1999. Valeo Minda Electrical Systems was a JV with Minda Industries India in 2007 to manufacture starter motors and alternators, first to Indian markets and then to global markets. In 2002, Valeo formed a long-term strategic alliance with Electronic Motion Systems, a unit of International Rectifiers (IR), to develop advanced proprietary power electronics systems for automotive applications in automotive electronics by combining Valeo’s strength in electrical systems and IR’s power-switching expertise. Valeo Furukawa Wiring Systems, a JV with Furukawa Electric in 2003, supplied automotive harnesses on a global scale. Eltek Electric specialized in the entire process from design to commercialization of high-efficiency, on-board chargers for vehicles. Valeo acquired the company for €3 million in 2013 to expand offering for hybrid and electric vehicles.

Transmission Automation

In 1988, Valeo Eaton, a JV with Eaton in the United States, manufactured clutches for heavy trucks. A JV with Transturk in Turkey in 1989 manufactured transmission systems for trucks. Valeo Friction Material, a JV with Anand Automotive India in 1996, focused on producing friction materials for brakes and clutches. Amalgamations Valeo Clutch Private Ltd., a JV with Amalgamations Group in India in 1997, focused on the friction material business and complete clutch assemblies for Indian automakers. Valeo fully managed Nanjing Valeo Clutch Co., a JV started in 1997 with Donghua Automobile Korea, for the manufacture of clutches, dual clutches, fly wheels, and torque converters for various automotive segments, which employed 550 people.

France-based Johnson Electricals manufactured engine management systems, engine control units, electric motor drives, and engine components, including injectors, ignition and emission-control components, and sensors. Valeo acquired the engine electronics division of the company for US$432 million in 2005 to strengthen its expertise in the electronic management of engine cooling, power electronics for starter-alternators, electrical actuations for clutches, automatic manual transmissions, and exhaust gas recirculation systems. Valeo also acquired FTE Automotive, a market leader in clutch and gear actuators for €819.3 million in 2017. This acquisition enabled Valeo to expand its offering of active actuation systems for transmissions, a strategic and fast-growing market driven by dual-clutch technology and the growth of hybrid vehicles. Valeo-Kapec a JV with PHC Automotive in 2017, specialized in torque converters, a key component in the automatic and continuous variable transmission.

Clean Engine

I Mo Gen, a strategic co-operation with Ricardo in 2001, developed a combination of down-sized engine, integrated starter-alternator, and 42 V system to deliver fuel savings without altering the performance of the vehicle. Valeo acquired the Variable Torque Enhancement System business of British automotive technology development company Controlled Power Technologies for €35 million in 2011 to supply electric superchargers to OEM customers.

Thermal Systems

Cooling Systems

In 1994, Valeo formed Valeo Automotive Air Conditioning (Hubei), a JV with a Chinese state-owned enterprise as partner, to produce air-conditioning systems; heating, ventilation, and air-conditioning (HVAC) units; evaporators; control panels; filters; and GMV (Groupes moto-ventilateurs or Motor Fan Unit). It became wholly owned by Valeo in 2012. FAW-Valeo Climate Control Systems Co. Ltd. (FAW-Valeo) was a 40:60 JV established in 1994 with FAW Automotive of China to produce HVAC systems. The climate control business of FAW-Valeo was acquired in 2005 and renamed FAW-Zexel Climate Control Systems in 2009. Zexel Valeo Climate Control, a JV that Valeo formed with the Japanese company Zexel in 1999, produced automotive heating and air-conditioning systems. Valeo Climate Control Tomilino was a JV with Itelma, a Russian automotive component manufacturer in 2008 to produce HVAC systems for the Russian market. Detroit Thermal Systems (DTS), a JV with Johnson Enterprises in 2012 was formed after purchasing the climate control business of ACH Holdings from Ford. DTS supplied HVAC climate-control products and components, manufactured for automakers in the United States.

Huada Automotive Air Conditioner (Hunan) a JV with Supervision Commission of the People’s Government of State-Owned of Loudi in 1996 produced compressors for climate control systems. Valeo Compressor (Changchun) a 60:40 JV with the Chinese government in 2005 produced compressors for air-conditioning systems for the Chinese and overseas markets.

Valeo Motherson Thermal Commercial Vehicles was a JV with Motherson Group India in 2004 to cater to the air-conditioning requirements of India’s commercial vehicle market. Motherson Group produced electrical distribution systems, automotive rear-view mirrors lighting systems, air intake manifolds, and HVAC systems for the automotive industry. The JV provided complete solutions for air-conditioning systems for all models of commercial vehicles. Valeo extended thermal management activities to the bus market by acquiring Spheros from Deutsche Beteiligungs AG (DBAG) for €326 million in 2016. Spheros was the worldwide leader in air conditioning systems for buses with a global sales network and vast industrial footprint, with plants in Germany, Finland, Turkey, United States, Brazil, China, and India.

Energy Efficiency

Valeo Armco Engine Cooling, a JV with Armco Iran in 2005 produced engine-cooling systems, operating from a production facility in Saveh, near Tehran. Tianjin Valeo Xinyue Auto Parts, a JV with the Chinese government in 2013, produced brazed radiators and mechanical radiators for the Chinese market. Valeo Samsung Thermal Systems, a JV with Samsung Climate Control Group was formed by acquiring a 50 per cent stake in Threestar Co. in 2005. The remaining 50 per cent was owned by Samsung Climate Control Group. The JV developed and manufactured automotive heat exchangers for local carmakers such as Kia and Hyundai.

Valeo-Siemens eAutomotive, a 50:50 JV with Siemens dedicated to high-voltage powertrains started operating in December 2016.[[7]](#footnote-7) It was headquartered in Erlangen, Germany, and employed approximately 1,000 employees. It had research and development (R&D) centres in France, Germany, Norway, and China, as well as plants in Germany, Hungary, Poland, and China. The JV aspired to become a strong player in the growing automotive electrification market. It produced e-motors, range extenders, onboard chargers, inverters, and DC/DC converters for vehicle electrification and hybrid vehicles. Klaus Helmrich, a member of Siemens’s managing board, was confident that thenew company would become a global leader in the growing electro mobility market. Through this JV, Valeo became the world’s number one producer of high-voltage (greater than 60 V) systems for electric vehicles. An outcome of the alliance, the eDrive, was exhibited at the 2019 Frankfurt Motor Show. The eDrive integrated an electric motor, an inverter, and a speed reducer, and was smaller and more efficient than internal combustion engines of the same output class. Vehicles equipped with eDrive could accelerate from 0 to 100 km per hour within four seconds without emitting CO2. The JV also enabled Valeo to provide powertrain electrification solutions for all vehicle manufacturers. The technologies developed by the JV sharply increased the value of Valeo content per vehicle: between sevenfold (for all-electric vehicles) and ninefold (for plug-in hybrid vehicles).[[8]](#footnote-8)

Another JV with Iran-based Ezam Automotive Parts Group (Ezam) in 2017 provided Ezam with a licence to produce ignition coil and charging systems. Valeo and Dana Incorporated signed a global collaboration in 2019 to develop and supply 48 V electric-vehicle systems for new mobility applications, including low-speed electric and hybrid e-AWD (all-wheel drive) vehicles. This collaboration strengthened Valeo’s position in low-voltage electrification, which was expected to be the standard for one-third of all cars manufactured worldwide by 2030.[[9]](#footnote-9)

Visibility Systems

Lighting Systems

Valeo Sylvania, a JV with Osram Sylvania was formed in the United States in 1997 to manufacture exterior lighting systems. Valeo Ichikoh Lighting, a JV with Ichikoh Industries Ltd. in 2000, was an industrial and commercial collaboration for the design and development of new systems, products, and technologies. Both partners could offer products and solutions throughout the world. It was a cross-shareholding partnership where each firm held a 20 per cent stake in the partner’s company. Ichikoh Industries Ltd. was acquired by Valeo in 2017. In 2005, Foshan Ichikoh Valeo Auto Lighting Systems, another alliance between the same companies, produced head lamps and rear lamps, including halogen, xenon and LED technologies. Wuhu Valeo Automotive Lighting Systems, a JV formed in 2012 with Wuhu Chery Technology, focused on the Chinese market, engaged in R&D, and in the manufacture and sale of Valeo’s lighting products used by Chery Automobile.

Valeo signed a technology partnership with Leddar Tech in 2014 to develop detection and ranging solutions for active safety. A new infrared sensor for series-produced vehicles was developed and deployed for road obstacle detection and tracking functions. In 2017, Valeo joined the ISELED (Intelligent Smart Embedded LED) alliance comprising automotive lighting solution manufacturers and semi-conductor component manufacturers as a core member. ISELED promulgated a technology that integrated microcontrollers, a lightweight interconnect, and LED light engines. The objective of the platform was to facilitate development and sale of LED solutions for the automotive industry.

Wiper Systems

Taizhou Valeo Wenling Automotive Systems was established in June 1994 and became wholly owned by Valeo in 2005. It was Valeo’s first JV with a Chinese state-owned enterprise as partner. It manufactured wiper systems and components, including motors, arms, blades, and linkages. Valeo Shanghai Automotive Electric Motors & Wiper Systems, another JV in China formed with Shanghai Industrial Traffic Electric Appliance in 1996, also produced wiper systems and components such as motors, arms, blades, and linkages.

Aschenbroich realized that having invested in the right technologies at the appropriate time was possible due to long years of experience and knowledge acquired as a result of operating in the automotive industry. Valeo could anticipate the technology shift 10 years in advance and make investments in developing 12 technology platforms to be on the forefront of the three revolutions. The platform-based approach enabled Valeo to move along the learning curves, reducing its (hardware and software) development costs and its investments. Aschenbroich stated:[[10]](#footnote-10)

These technological platforms provide us with a competitive edge by creating high barriers to entry, allowing us to sharply increase our average content per vehicle and deepen our resilience in the face of an uncertain market environment, while at the same time reducing our Research and Development and capital expenditure as a percentage of sales.

A pioneer in vehicle electrification aimed at driving down CO2 emissions, Valeo offered wide-ranging product offerings to support the electric mobility revolution, such as affordable hybrid solutions that could be applied to the widest number of cars. Valeo developed innovative technologies designed to lower energy consumption by electrifying powertrains, optimizing overall thermal management, and improving aerodynamics. These three areas of focus helped increase the efficiency of all engine types.

Autonomous vehicles relied on various sensors to act as their eyes and ears. Valeo had the widest portfolio of sensors in the auto industry with ultrasonic sensors, cameras (front, rear, and surround views), radars, and LiDAR (Light Detection And Ranging). Together, this technology enabled the vehicle to “see” what the human eye could not always fully distinguish, from just a few centimetres to up to 250 metres away. Artificial intelligence and deep learning were becoming key drivers for the challenges of the automated cars, from high-performance sensors capable of perceiving and understanding the vehicles context, to advanced automated driving functions in complex environments, smart interaction with users, and learning capabilities through connected cars. Hence, Valeo launched the first global research centre in artificial intelligence and deep learning dedicated to automotive applications.

Aschenbroich highlighted that in sprawling cities, private cars spent most of their time in the garage or parking lot, and when on the road, they generally crawled along in congested traffic, with drivers spending up to a third of their time looking for somewhere to park. The solution was a digital mobility revolution with connected and autonomous cars. Valeo’s expertise in broadband telematics allowed connected cars to communicate with other vehicles and road infrastructure. Vehicles could also ease traffic flow by anticipating traffic signal changes at intersections and flexibly adapting their speed so as not to accelerate or brake unnecessarily. The car could also find free parking spaces, and its smart, virtual car key not only locked/unlocked and started the car but also geolocated it and shared it with another person via a smartphone.[[11]](#footnote-11)

While speaking to innovator news about the successes of Valeo he stated:[[12]](#footnote-12)

First of all, there are the commercial successes: for instance, we have had tremendous success with the robotaxi. We always ask ourselves whether it will come or not, it will come, it has already come as a matter of fact. We have received 1 billion euros order intake for robotaxi both from new mobility players based in Silicon Valley and from our traditional customers. That’s the first success. The second success is the fact that . . . we speak a lot about artificial intelligence and we have a network of artificial intelligence in Valeo and we’ve got 1 billion euros of orders with products in which artificial intelligence is embedded. I could add that we had another order intake—53 per cent of new products which we have been able to sell to our customers. That is a positive point.

What should Aschenbroich do to achieve the twin challenges—to maintain the company’s speed of growth while balancing growth with profitability—while not losing sight of the three revolutions—vehicle electrification, vehicle autonomy, and digital mobility?

Exhibit 1: Product Profile of Valeo



|  |  |
| --- | --- |
| **Business/Product** | **Description** |
| **Comfort and Driving Assistance Systems** | |
| *Driving Assistance Group* | |
| Rain, Light, and Humidity Sensor | An intelligent sensor measures the volume of rain, automatically activates lamps depending on ambient light levels, recognizes tunnel entrances to turn on lights in time, and measures temperature and relative humidity to assess the risk of misting. |
| 360Vue® | Miniature cameras record 3-D surroundings and transmit the images to an intelligent control unit, which displays them on the screen to enable visibility around corners. |
| Lane Change Assistance | A radar sensor system on the side and rear of the car detects any vehicle near or behind by using multiple radar beams. |
| LaneGuide® | A compact camera based on Mobileye EyeQ technology, assists in changing lanes, interpreting road signs, monitoring the vehicle’s relative position, and warning the driver when the vehicle is too close to another vehicle. |
| Park4U® Automated Parking | Ultrasonic sensors detect space, allowing the parking manoeuvre to take place in hands-free mode using available space, while the driver continues to control the speed. The driver can leave the vehicle before parking via smartphone control. |
| Valeo Scala® | A laser scanner detects obstacles and creates of a map of the environment to analyze and anticipate events around the vehicle. |
| Cruise4U | **Automated driving using SCALA,** through extended detection range, wide field of vision, and precision. |
| Sightstream® | A camera system with cameras wherein the rear-view mirrors are mounted to see the outside view, enhancing the driver’s vision. |
| *Intuitive Controls Group* | |
| Head-Up Display | Building on expertise in optics, screens, air conditioning, and smart faceplates, Head-Up Display systems reduces driver distraction and facilitates intuitive driving. |
| Smart Faceplate | The intelligent faceplate reconciles the number of functions to operate with the need for man-machine interfaces, which are simple, intuitive, and fluid, thus reducing the cognitive workload on the driver and ensuring safety. |
| Top Column Modules (TCM) | TCM incorporates functions such as steering wheel heating, bend lighting, and active steering to improve comfort and ease of use. |
| Steering Wheel Switches | The buttons on the steering wheel are limited to 5 or 6, while commanding 15 functions. The switches are grouped by application type (ADAS, infotainment, onboard computer, telephone) to avoid a high number of buttons in an effort to reduce distraction. |
| Driver Monitoring | A camera-based system monitors driver alertness, and alerts the driver when signs of drowsiness or distraction are detected. |
| *Connected Cars* | |
| Telematics Module | Combines geolocation and mobile telecommunications to provide connected in-vehicle services and meet safety and security regulations, making it possible to locate a stolen vehicle or to contact vehicle fleet remote management services. |
| Valeo InBlue® | Integrates the capabilities of the Passive Entry Passive Start system with the Internet of Things to operate through smartphones |
| Passive Entry Passive Start System | Hands-free access and start system allow the user to automatically operate car doors without the key; the engine is started by pushing the ignition button. |

Exhibit 1: Product Profile of Valeo (Continued)

|  |  |  |
| --- | --- | --- |
| **Business/Product** | **Description** | |
| **Powertrain Systems** | | |
| *Electrification* | | |
| Entry-Range Hybrid | A 12 V Li-ion battery with starter and generator recovers energy while braking and use it during acceleration. | |
| 48 V Affordable Hybrid | An additional 48 V lithium-ion battery, a 48 V DC/DC Converter, and a 48 V Starter Generator supply the vehicle electrical network. | |
| Plug-in Hybrid Vehicle Solution | Automated transmission and high-voltage products such as inverters, battery chargers, DC/DC converter, crankshaft motor generator, gearbox motor generator, and electric rear-axle drive provide electric autonomy up to 50 km. | |
| Battery Electric Vehicle Solution | Zero-emission vehicles use high-voltage technologies such as inverters, battery chargers, electric motors, and DC/DC converters. | |
| *Transmission Automation* | | |
| Torque Converter | Helps reduce CO₂ emissions and enhances performance for automatic transmissions | |
| Dual Dry Clutch | Combines the low drag of a dry clutch and the high efficiency of a manual gearbox technology to eliminate torque interruption | |
| Dual Wet Clutch | Allows torque control around the pistons, while enabling high cooling | |
| Actuator’s Range | Comprises e-clutch, clutch master cylinder, and clutch slave cylinder to reduce of mechanical and thermal losses | |
| Dual Mass Flywheel | Provides filtering at very low rpm; can be used with the electric supercharger | |
| Blade Damper | Provides effective stiffness without internal friction to reduce noise, vibration, and harshness at all speeds | |
| *Clean Engine* | | |
| Exhaust Gas Recirculation Valve | The Exhaust Gas Recirculation (EGR) Valve Recirculates exhaust gas, reducing CO₂ and pollutant emissions. | |
| EGR–Air Intake Module Water CAC | Mixes recirculated exhaust gas with cool air, then re-injects it into each cylinder with the EGR low-pressure valve, reducing fuel consumption and gas emissions | |
| EGR–Air Intake Module, Water+ | In addition to the air intake module and the Water CAC, it combines the electricSupercharger to improve the efficiency of turbo-charged combustion engines. | |
| Electric Superchargers | Supercharger responds instantaneously, thus strengthening engine torque at low revolutions, eliminating turbo lag and improving vehicle acceleration. | |
| **Thermal Systems** | | |
| *Electrification* | | |
| Electrically Driven Compressors (EDC) | | Compact, efficient and quiet EDCs with a high cooling capacity for cabin air conditioning, heat pump systems, and battery thermal management |
| Battery Thermal Management | | Refrigerant, liquid cooling, and air-cooling solutions that cater to different uses to keep the battery temperature between 15 and 35 degrees centigrade |
| R-744 A/C System | | Non-flammable and non-toxic air-conditioning system made of natural CO₂ |
| Heat Pump System | | Cabin heating and air conditioning with minimum impact on driving range |
| Dual Layer HVAC | | Upper cabin air conditioning is complemented by 100% recirculated air in the lower cabin, and fresh air is used on the windshield to lower misting. |
| Flat & Light Engine Cooling Module | | Ultra-light and flat modules maintain engine temperature at optimal level, hence avoiding overheating. A module is composed of radiators, condensers. and the fan system, with slight variations depending on the type of powertrain. |
| Plastic Water Charge Air Cooler (WCAC) | | Uses water, plastic ducts (lighter than steel and less polluting), high-energy–density heat exchangers and a high-pressure EGR valve, which mixes charge air with recirculated exhaust gas to reduce both CO2 and NOx emissions, increase efficiency, and achieve overall weight reduction. |
| Safe & Green Front End | | It is a front frame beam made of composite materials and carries the engine-cooling module. It is 30% lighter than the norm. Active Grille Shutters control and adjust airflow to improve aerodynamics and thermal performance. As a result, vehicle fuel consumption and CO₂ emissions are as low as 2 grams per km. |

Exhibit 1: Product Profile of Valeo (Continued)

|  |  |
| --- | --- |
| **Business/Product** | **Description** |
| **Thermal Systems** | |
| *Interior Ambience Design* | |
| Aquarius® Cooling Mist Diffuser | Ultrasonicmisting system diffuses micro water droplets, providing heat relief and humidity balance for rear passengers. |
| High Performance Filters | Long-life PM2.5 combined filter provides 100% efficiency against fine particles and gases to protect against pollution. |
| Air Purifier | Smart and integrated air blower, high-efficiency cabin air filter, ionizer, and a PM2.5 sensor remove lingering odours. |
| Thermal Bus Systems | Entelligence (Electrification + Intelligence) provides a higher level of climate control. |
| **Visibility Systems** | |
| *Lighting* | |
| PeopLED® | Entry-level solutions produce a more powerful beam, with less energy consumption, and a colour that is close to daylight. |
| LED Rear Lighting | Instant activation of LED rear lighting reduces the response time in emergency braking. |
| BiLED® | The concept of LED for rear lights was applied to replace xenon with LED lighting. |
| Cockpit | Solutions for interior lighting and thermal systems during three distinct phases: when the driver is in control, when the semi-autonomous vehicle is driving itself, and when the driver takes back control of the vehicle. |
| Matrix Beam | A digitalsolution that turns off precise segments of the light beam, allowing drivers to keep their high-beams on, without projecting glare toward other motorists. |
| ThinLens | ThinLens are monofunction modules for both low-beam and high-beam functions, offering high performances and a light source with a longer-lasting life-cycle. |
| *Wiping* | |
| Reversible Motors | By integrating electronics and software, reversible motors offer precision wiping, noise reduction, optimized wiper motor sizing, and increased wiper blade life. |
| AquaBlade® | Made up of a sensor, software, and a wiper blade with channels that distribute fluid through holes located along its length. Cleaning quality is preserved at all speeds. |
| Dual Direct Drive Motors | A light and energy-efficient wiping system where each arm is powered by its own reversible motor, eliminating the need for mechanical linkage. |
| Clean4UTM | A remote windshield defrosting system controlled via a smartphone application. |
| Sensors Cleaning | Systems for washing optical sensors (e.g., cameras, infrared cameras, and LiDARs) to ensure an uninterrupted video flow, and thereby providing greater safety and comfort for drivers. |

Note: ADAS = Advanced Driver Assistance Systems; V = volt; Li-ion = lithium-ion; DC/DC convertor = a device that converts a source of direct current (DC) from one voltage level to another voltage level; km = kilometres; CO2 = carbon dioxide; rpm = revolutions per minute; CAC = charge air cooler; A/C = air conditioning; HVAC = heating, ventilation, and air conditioning; NOx = nitrogen oxide; PM2.5 = fine particulate matter; LED = light-emitting diode; LiDAR = light detection and ranging.

Source: Company records.

Exhibit 2: Valeo’s Business Groups, 2019

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **2019** | **Comfort and Driving Assistance Systems** | **Powertrain Systems** | **Thermal Systems** | **Visibility Systems** | **Others** | **Total** |
| Revenue (€ millions) | 3,591 | 4,998 | 4,316 | 5,923 | 449 | 19,277 |
| Assets (€ millions) | 2,813 | 3,561 | 2,861 | 3,124 | 300 | 12,659 |
| EBITDA  (€ millions/%) | 599  16.4% | 685  13.4% | 502 11% | 660  11% | 50 | 2,496 |
| Manufacturing Units | 31 | 57 | 68 | 51 | – | 207 |
| Research Centres | 7 | 7 | 3 | 5 | – | 22 |
| Development Centres | 9 | 18 | 10 | 16 | – | 53 |
| R&D Expenditure  (€ millions) | 579 | 293 | 274 | 360 | 44 | 1,550 |
| Employees | 22,100 | 23,500 | 25,100 | 38,900 | 5,100 | 114,700 |

Note: € = European euro; EBITDA = earnings before interest, taxes, depreciation, and amortization; R&D = research and development.

Source: Company records.

Exhibit 3: Valeo’s Partnerships and Acquisitions

**Comfort and Driving Assistance**

**Partnerships**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Driving Assistance* | | | |
| 2002 | Raytheon Technologies Coporation | USA | Sensors and navigation systems |
| 2005 | Shenzen Hangsheng Electronics Co. Ltd. | China | Ultrasonic products and switches |
| 2013 | Safran S.A. | France | Driver attention, robotization, and dronization |
| 2017 | Cisco Systems France Sarl | USA | Safe and autonomous parking |
| 2018 | Lero, the Science Foundation Ireland Research Centre for Software | Ireland | Sensors for difficult conditions |
| 2018 | WABCO Holdings, Inc. | USA | Commercial vehicle market in an autonomous space |
| *Intuitive Controls* | | | |
| 2018 | Baidu, Inc.’s Platform (Apollo) | China | Software, hardware, and data tools |
| 2019 | Mobileye Vision Technologies Limited | Israel | Autonomous vehicle (AV) safety standards |
| 2019 | Internet Plus Holdings Limited (Meituan Dianping) | China | Valeo technology for last-mile delivery |
| 2019 | 5G Mobix Alliance | Belgium | Test automated vehicle functionality |
| *Connected Cars* | | | |
| 2007 | Spark Minda – Minda Industries Limited | India | Manufacture auto security products in India |
| 2010 | GENIVI Alliance, Inc. | USA | Open-source technology for connected cars |
| 2018 | Ellcie Healthy SAS | France | Smart-connected eyeglasses |
| 2018 | NTT Docomo Inc. | Japan | Telecom and other equipment for connected cars |
| 2019 | Hyundai Motor Group, Hexagon AB | South Korea | High-precision positioning (centimetre-accuracy) |

**Acquisitions**

|  |  |  |  |
| --- | --- | --- | --- |
| *Driving Assistance* | | | |
| 2007 | Connaught Electronics Limited | Ireland | Camera-based vision solutions |
| 2017 | Gestigon GmbH | Germany | Interior cameras and image processing |
| *Intuitive Controls* | | | |
| 2016 | CloudMade Limited | UK | Big data–driven automotive solutions |
| *Connected Cars* | | | |
| 2011 | Niles Co. Limited | Japan | Automotive human-machine interface |
| 2016 | Peiker Acustic GmbH | Germany | Telematics systems and cybersecurity |
| 2016 | Capgemini SE | France | Intelligent fleet management for car rental |
| 2017 | Kuantic SAS | France | Digital mobility and fleet management-M2M tech |

**EXHIBIT 3 (CONTINUED)**

**Powertrain Systems**

**Partnerships**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Electric Mobility* | | | |
| 1995 | Huayu Automotive Systems Co. KG | China | Starter motors, alternators, and hybrid power systems |
| 2002 | Electronic Motion Systems Limited | USA | Power electronics systems for auto applications |
| 2003 | Furukawa Electric Co. Limited | Japan | Automotive harnesses on a global scale |
| 2007 | Uno Minda - Minda Industries Ltd. | India | Starter motors and alternators for the Indian and global markets |
| *Transmission Automation* | | | |
| 1988 | Eaton Corporation plc | USA | Clutches for heavy trucks |
| 1989 | Transturk Holding A.S. | Turkey | Transmission systems for trucks |
| 1996 | Anand Automotive Pvt. Ltd. | India | Friction materials for brakes and clutches |
| 1997 | Amalgamations Private Limited | India | Friction material and complete clutch assemblies for India |
| 1997 | Donghua Automotive Industrial Co. Limited | China | Clutches, fly wheels, and torque converters |
| 2017 | PHC Co. Limited | South Korea | Torque converters |
| *Clean Engine* | | | |
| 2001 | Ricardo plc | UK | Down-sized engine, integrated starter-alternator |

**Acquisitions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Electric Mobility* | | | |
| 1999 | Mando Machinery Corporation | South Korea | Electrical and electronic activities |
| 2013 | Eltek ASA | Norway | Design to commercialization of on-board chargers |
| *Transmission Automation* | | | |
| 2005 | Johnson Controls Inc. | France | Engine management systems, control units, electric motor drives, and engine components |
| 2017 | FTE Automotive GmbH | Germany | Active actuation systems for transmissions, driven by dual-clutch technology |
| *Clean Engine* | | | |
| 2011 | Controlled Power Technologies Limited | UK | Electric superchargers for OEM customers |

**EXHIBIT 3 (CONTINUED)**

**Thermal Systems**

**Partnerships**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Cooling Systems* | | | |
| 1994 | FAW Group Corporation Limited | China | Condensers, evaporators, and AC assembly |
| 1994 | CSOE-Valeo Automotive Air Conditioning (Hubei) Co. Ltd. | China | Air-conditioning systems, HVAC, evaporators, control panels, filters, and GMV |
| 1996 | CSOE-Huada Automotive Air Conditioning (Hunan) Co. Limited | China | Compressors for climate-control systems. |
| 1999 | Zexel Corp. | Japan | Automotive heating and AC systems |
| 2004 | Samvardhana Motherson International Limited | India | Air conditioning of commercial vehicles in India |
| 2005 | CSOE-Valeo Compressor (Changchun) Co. Limited | China | Compressors for AC in the Chinese market |
| 2008 | OOO “NPP Itelma” | Russia | HVAC systems for the Russian market |
| 2012 | V. Johnson Enterprises LLC | USA | HVAC products and components for the US market |
| *Energy Efficiency* | | | |
| 2005 | Armco Group Co. | Iran | Engine cooling systems in Iran |
| 2005 | Samsung Climate Control Co. Limited | South Korea | Heat exchangers for Korea |
| 2013 | CSOE-Tianjin Valeo Xinyue Auto Parts Co. Ltd. | China | Brazed and mechanical radiators for China |
| 2016 | Siemens AG | Germany | E-motors, range extenders, onboard chargers, inverters, and DC/DC converters |
| 2017 | Ezam Automotive Parts Group | Iran | Ignition coil and charging system |
| 2019 | Dana Incorporated | USA | 48-volt electric-vehicle systems for low-speed electric and hybrid e-AWD vehicles |

**Acquisitions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Cooling Systems* | | | |
| 2016 | Spheros GmbH | Germany | Air-conditioning systems for global bus market |

Exhibit 3 (Continued)

**Visibility Systems**

**Partnerships**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Lighting Systems* | | | |
| 1997 | Osram Sylvania Inc. | USA | Exterior lighting systems |
| 2012 | Wuhu Chery Technology Co. Limited | China | R&D, manufacture, and sale of Valeo’s lighting products used by Chery Automobile |
| 2014 | Leddar Tech Inc. | Canada | Infrared sensor for series-produced vehicles for road obstacle detection and tracking |
| 2017 | Innova Semiconductors GmbH (ISELED Alliance) | Germany | LED solutions |
| *Wiper Systems* | | | |
| 1996 | Shanghai Industrial Traffic Electric Appliance Co. Ltd. | China | Wiper systems and components |

**Partnerships That Were Later Acquired**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Company** | **Headquarter Country** | **Technology / Market** |
| *Lighting Systems* | | | |
| 2000 | Ichikoh Industries Limited | Japan | New lighting systems, products, and technologies |
| *Wiper Systems* | | | |
| 1994 | CSOE-Taizhou Valeo Wenling Automotive Systems Co. Limited | China | Wiper systems and components |

Note: USA = United States; UK = United Kingdom; M2M = machine-to-machine; OEM = original equipment manufacturer; AC = air conditioner; HVAC = heating, ventilation, and air conditioning; GMV = Groupes moto-ventilateurs or Motor Fan Unit; DC/DC converters = devices that convert a source of direct current (DC) from one voltage level to another voltage level; AWD = all-wheel drive; R&D = research and development; LED = light-emitting diode; ISELED = Intelligent Smart Embedded LED; CSOE = Chinese state-owned enterprise.

Source: Company records.

1. “[Corporate] Valeo Case Study by Jacques Aschenbroich,” YouTube video, 08:04, posted by “Valeo Group,” December 18, 2020, accessed December 18, 2020, www.youtube.com/watch?v=uP9xpxR5AB0&feature=youtu.be. [↑](#footnote-ref-1)
2. Jennifer L Schenker, “Interview of the Week: Jacques Aschenbroich,” *The Innovator News*, June 1, 2018, accessed April 28, 2020, https://innovator.news/interview-of-the-week-jacques-aschenbroich-4e551471ddd8. [↑](#footnote-ref-2)
3. “Valeo Wins R&D Award for Its High Definition LED Smart Lighting Technology at the Innovation Awards for Franco-Chinese Teams,” Valeo, press release, December 16, 2019, accessed May 6, 2020, www.valeo.com/en/valeo-wins-rd-award-for-its-high-definition-led-smart-lighting-technology-at-the-innovation-awards-for-franco-chinese-teams. [↑](#footnote-ref-3)
4. “Valeo’s LiDAR, Driving the Autonomous Vehicles,” Valeo, September 10, 2019, accessed May 6, 2020, www.valeo.com/en/valeos-lidar-driving-the-autonomous-vehicles. [↑](#footnote-ref-4)
5. € = European euro; €1 = US$1.07 on March 12, 2017; all currency amounts are in € unless otherwise specified. [↑](#footnote-ref-5)
6. “Digital Mobility: A Societal Challenge,” Valeo, accessed May 6, 2020, www.valeo.com/en/digital-mobility-a-societal-challenge/. [↑](#footnote-ref-6)
7. “The Joint Venture by Valeo and Siemens Dedicated to High Voltage Powertrains Starts Operation,” Valeo, press release, December 1, 2016, accessed June 9, 2020, www.valeo.com/en/the-joint-venture-by-valeo-and-siemens-dedicated-to-high-voltage-powertrains-starts-operation/. [↑](#footnote-ref-7)
8. “Valeo Innovations at the Epicenter of Transformations in Mobility,” Valeo, press kit, January 2020, accessed May 6, 2020, www.valeo.com/wp-content/uploads/2020/01/PK\_Valeo\_CES\_2020\_ENG.pdf. [↑](#footnote-ref-8)
9. “Valeo and Dana Incorporated Collaborate to Bring End-to-End 48V Systems to Hybrid and Electric Vehicles,” Valeo, press release, October 3, 2019, accessed May 6, 2020,  www.valeo.com/en/valeo-and-dana-incorporated-collaborate-to-bring-end-to-end-48v-systems-to-hybrid-and-electric-vehicles. [↑](#footnote-ref-9)
10. Valeo, *Universal Registration Document 2019,* February 20, 2020, accessed June 10, 2020, www.valeo.com/wp-content/uploads/2020/05/valeo\_deu\_2019\_uk.pdf. [↑](#footnote-ref-10)
11. “Our Strategy,” Valeo, accessed June 10, 2020, www.valeo.com/en/our-strategy/. [↑](#footnote-ref-11)
12. “[Corporate] Valeo - Jacques Aschenbroich's interview - Results 2018,” YouTube video, 00:59, posted by “Valeo Group,” March 6, 2019, accessed April 28, 2020, www.youtube.com/watch?v=2cfBjhB7sPY. [↑](#footnote-ref-12)