

PRESS KIT

**THE VALEO INNOVATIONS
AT THE EPICENTER OF THE REVOLUTIONS
SHAPING PASSENGER TRANSPORTATION**

BUSWORLD, BRUSSELS – OCTOBER 2019



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Valeo at Busworld 2019 in Brussels

Valeo will be present at the 25th Busworld exhibition taking place in Brussels from October 18 to 23, 2019. This key event on the industry calendar has become the biggest bus and coach show in the world.

After 48 years of existence, during which it was always held in the Belgian city of Kortrijk, Busworld is moving to the country's capital in 2019 for the first time. This major change echoes the one currently transforming the passenger transportation industry – the powertrain revolution. In the interests of both the climate and public health, now and in the future, powertrains must reduce or eliminate their CO₂ emissions. Around the world, cities are taking action to restrict road access exclusively to clean vehicles, limiting emissions of greenhouse gases and fine particles (see Did You Know? on pages 5 and 6). The world's major cities, and even some smaller ones, have become the new regulators, stipulating which vehicles can and cannot use their roads.

The solution being adopted for buses and coaches is powertrain electrification, a change that has a significant impact right from the vehicle design phase. How, for example, can vehicle manufacturers continue to ensure passenger comfort when there is no longer an internal combustion engine to help regulate temperature? The increasing popularity of more environmentally friendly vehicles raises the critical question of how much energy is needed to produce heat or cool air in the cabin. Batteries, which are highly sensitive to changes in temperature, also pose a challenge because they need to be constantly maintained within the optimal operating range.

Valeo is the world leader in CO₂ emissions reduction and also in air conditioning systems for buses and coaches. Valeo's innovations provide practical, efficient solutions, regardless of the weather, the size of the vehicle, its powertrain type, and the nature (whether urban, peri-urban or long-haul) and duration of its journey. The technologies developed by Valeo generate the right air flows, while using the minimum amount of energy necessary and reusing recoverable energy. These actions are driven by electronics and software programs that are also developed by Valeo.

Valeo is also innovating in the area of battery cooling, with new systems that extend vehicle range and improve the preservation of battery service life. All these innovations work together to reduce the total cost of operating buses and coaches.

The innovative technologies presented by Valeo at the 25th Busworld exhibition offer clear insights into what mobility will look like in the future. And given that some of them are already being fitted in vehicles coming off the assembly line today, that future is very near. All of these technologies are designed to bridge the gap between the challenges facing our planet today and the need for people in every part of the world to get around, both in urban areas and elsewhere. Innovation is the driving force behind the future of transportation. It is also central to Valeo's strategy, as illustrated by the fact that the company invested over 2 billion euros, or close to 13% of original equipment sales, in Research and Development in 2018.

DID YOU KNOW?

Two United Nations agencies have warned that urgent action must be taken. Valeo is playing its part.

The World Meteorological Organization issued a warning in September 2019 that "carbon dioxide (CO₂) levels and other key greenhouse gases in the atmosphere [have reached] new records, with CO₂ growth rates nearly 20% higher than the previous five years". And according to the World Health Organization, an estimated 4.2 million premature deaths in 2016 were caused by ambient air pollution in cities and rural areas.

Valeo has long specialized in designing systems that help to reduce emissions of CO₂ and other pollutants such as NO_x and particulate matter. Today, Valeo is the world leader in this area. One in every three cars worldwide is equipped with a Valeo electric system and Valeo offers the most comprehensive portfolio of solutions to support the CO₂ emissions reduction revolution, including in the bus and coach market.

In 2018, products that directly or indirectly contribute to reducing CO₂ emissions accounted for more than 50% of Valeo's total original equipment sales (products sold directly to manufacturers for new vehicles).

From one revolution to another: Increased electrification of buses and coaches and the innovations required in their air conditioning systems

When a global market has expanded by almost one third in just one year, it's clearly worth taking note. According to a report published in May 2019 by BloombergNEF¹ (see Did You Know? below), the global electric bus fleet grew by around 32% in 2018.

This massive shift toward electric buses is having a significant impact on vehicle design, and more particularly on the design of vehicle systems that are linked to the powertrain. The first to be affected are the air conditioning (a/c) systems used to heat and cool vehicle interiors. Valeo is the world leader in this area and its comprehensive product offering covers all applications and all types of vehicles used for passenger transportation, including minibuses, shuttles, school buses, standard and articulated buses, coaches and double-deckers.

Valeo offers a range of roof-mounted a/c units, some of which operate via heat pump systems. Its product portfolio also includes electric water pumps, heating systems with very high heating capacity, and control units to manage all these systems easily and accurately from the driver's seat. Valeo also markets very compact heating and air conditioning units that are perfectly adapted to smaller vehicles, such as vans and minibuses. In a world first, Valeo will be unveiling at Busworld 2019 the new Valeo REVO-E HP R744, an all-electric rooftop a/c unit that uses a natural refrigerant and generates zero emissions.

Valeo REVO-E HP R744: Zero-emissions heating and cooling unit

Valeo has taken inspiration from the construction industry to develop a small scale (a technological feat in and of itself) reversible heat pump, which heats, cools and demists electric vehicle cabins.

The new Valeo REVO-E HP R744 system is an electric rooftop a/c unit equipped with a heat pump function, for hybrid and electric buses. The environmentally neutral, zero-emissions HVAC system operates with R744, a natural coolant, at outside temperatures of -20°C to 44°C. The fully automatic, energy efficient system selects the appropriate operating mode, switching from air conditioning to the heat pump or de-icing function. The de-icing function is automatically activated when outside temperatures drop below 5°C, preventing it from icing up, which can happen with traditional heat pumps.



Did you know?

99.05% of the world's electric buses operate in China

According to a report published in May 2019 by BloombergNEF¹, out of almost 425,000 electric buses worldwide at the end of 2018, some 421,000 were in China. The report also notes that the global e-bus fleet grew by about 32% in 2018. Thanks to increasingly strict regulations on CO₂ emissions in major cities, the market is set to continue developing at a brisk pace over the coming years.

More generally, China is leading electric vehicle production worldwide and accounted for 47% of the global electric vehicle market in 2018. Valeo has a solid footing in the country with 36 plants and 14 R&D centers, with China accounting for 15% of the Group's total sales.

¹ Bloomberg New Energy Finance Limited.

Valeo SPump electric circulation pump family welcomes a new version



Valeo has supplemented its latest generation of SPump circulation pumps with a 120W version that is particularly suitable for smaller water circuits and electric buses. The 120W model has 40% fewer individual parts than a traditional electric water pump, making it the lightest weight and most compact system of its kind. It also features a smart diagnostic function that provides alerts to limit consumption. This is a major advantage for all hybrid, plug-in hybrid and all-electric commercial vehicles, which are dependent on efficient energy management.

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Valeo Thermo HV: A modular high-voltage heater

Valeo's engineers have developed an innovative high-voltage heating system for electric buses. Thanks to its modular design and compact size, the new Valeo Thermo HV system can fit into even the tightest space. Small, light and noiseless, it is perfectly suited to the electric vehicle market.



The Valeo Thermo HV modular heater is part of a comprehensive portfolio of heating units offered by Valeo, which range from 12 to 32kW in accordance with vehicle manufacturers' needs.

Valeo Minisphere-E rooftop a/c units: small e-cooling with strong impact



Valeo's Minisphere-E is the right answer for the rising demand for air conditioning in the fast-growing market of electrified mini-, midi- and minibuses in Europe, North and South America.

Besides a consequent lightweight construction, the unit provides different energy saving features, such as a flat aerodynamic design and full system controllability via CAN (Controller Area Network). The fresh air ventilation is thus done in the most efficient way.

Did you know?

A tour of the world's cities – Part 1

More than 165 million city-dwellers using electric buses?

In October 2017, 12 cities led by London, Paris, Los Angeles and Copenhagen announced their intention to provide their citizens with "greener, healthier" roads. They signed a Declaration of Intent* aimed at improving air quality and pledged to work with their partners to procure only zero-emission buses from 2025. They also announced their intention to create major zero emissions areas by 2030.

Another 14 cities have since joined the cause and made the same commitments. In total, that makes 26 signatory cities, representing more than 165 million people. While they may not all be able to ride in electric buses in the near future, they will undoubtedly benefit from cleaner air. If the 26 signatory cities each had a full fleet of electric buses, a total of 2.8 metric tons of greenhouse gas emissions would be avoided each year.

* [View the full text of the Declaration and current signatory cities](#)

Batteries: Supplying energy to buses and coaches and driving innovation at Valeo

Hybrid and electric vehicle batteries are very sensitive to changes in temperature, particularly when charging. For optimal longevity and performance, the batteries' operating range must be maintained at between 15°C and 45°C, with temperature consistency across the cells. An increase of just 10°C above the limit determined for the battery would halve its service life.

Valeo plays a key role in the development of the electric vehicle through its expertise in battery thermal management, an area in which it is a world leader. Valeo offers a full range of battery cooling solutions, including direct, refrigerant-cooled technology and indirect, water-cooled systems.

Going a step further, Valeo will soon offer thermal modules as aftermarket components. This means that systems already on the market will be able to benefit from the latest cooling technologies, depending on the desired vehicle charging speed. Smart control of all thermal systems ensures optimum battery performance, during both charging and driving, while also preserving the battery's life span.

Did you know?

A tour of the world's cities – Part 2 From Amsterdam to Jakarta, via Moscow and Paris

Among the many cities worldwide taking action to acquire electric buses, some of them deserve a closer look.

- **Amsterdam** (urban population: 1.14 million) aims to have a 100% electric municipal bus fleet (operated by GBV) by 2025, and not just “from 2025”, as indicated in the C40 Declaration. For coaches, the target date is even sooner. By 2022, only coaches that emit zero greenhouse gases will be allowed into the city.

- **Moscow** (urban population: 20.2 million) has announced that all new buses acquired by the city from 2021 will be electric. Given its size, the bus fleet operated by state-owned Mosgortrans will therefore be 100% electric by 2032.

- **Jakarta** (urban population: more than 30 million; city population: 10 million) is severely congested.

In April 2019, Indonesian president Joko Widodo indicated that the country's capital would be relocated to the island of Borneo from 2024. Jakarta, on the island of Java, will continue to serve as the country's business center. Transjarkata, the city's transportation operator, has announced that its bus fleet will be 50% electric by 2025.

- In **Paris** (urban population: 12.5 million), public transportation operator RATP has said that no diesel buses have been purchased since 2014 and it continues to target a zero-emission fleet for 2025. However, the project launched in 2017 to reorganize the Paris bus network led to the modification of 53 lines and the addition of around 250 bus stops in April 2019. Given the insufficient number of clean buses available, the RATP therefore extended the life span of 118 diesel buses in 2019.

Valeo E-Cooler BTM: Affordable battery cooling and heating

In the area of batteries for passenger transportation vehicles, Valeo has developed the E-Cooler system, to maintain battery cells at the right temperature.



In addition to the field-proven 5kW version, Valeo has introduced a more powerful 7 to 10kW solution suitable for high temperatures. At temperatures of 15°C or less, the Valeo E-Cooler BTM system (for “battery thermal management”) uses ambient air for an energy-saving passive cooling mode. At high outside temperatures, the E-Cooler (see image below) automatically switches to an active cooling circuit. The batteries are then cooled by a refrigerant circulating through an exchanger inserted optimally into the battery pack.

Valeo can design battery cooling systems of all sizes to adapt to any vehicle type, whether hybrid, plug-in hybrid or all-electric.

Valeo, the technology leader at the epicenter of the revolutions shaping mobility

Valeo partners with all automakers worldwide. As a technology company, Valeo proposes innovative products and systems that contribute to the reduction of CO₂ emissions and to the development of autonomous and connected vehicles.

A leader in each of its businesses

- Powertrain Systems: world no. 1
- Driving Assistance Systems: world no. 1
- Visibility Systems: world no. 1
- Thermal Systems: world no. 2

Strategically integrated areas of expertise

Leaders in their segments, Valeo's four Business Groups pool their respective know-how to offer innovations that meet market needs. For example, the combined expertise of the Comfort & Driving Assistance Systems and Visibility Systems teams has enabled the development of cleaning technology to ensure that the sensors used in driving assistance systems continue to operate optimally. Synergies have also been generated between the Comfort & Driving Assistance Systems teams, which have developed cameras that can measure the physiological data of vehicle occupants, and the Thermal Systems teams to develop a smart system that creates a localized thermal comfort bubble for each vehicle occupant.

An impressive pace of five Valeo innovations per day

- 13% of Valeo's original equipment sales were invested in Research and Development in 2018, a ratio comparable with that of the world's tech giants (source: survey published by U.S. magazine "Strategy+Business").
- More than 2 billion euros were invested in R&D in 2018.
- 2,145 patents were filed worldwide in 2018, representing more than five inventions developed and patented each day.
- Valeo is the leading patent filer in France and among the top 20 in Europe.
- The number of people working in R&D at Valeo has risen from 6,000 in 2009 to 20,000 today.
- 53% of 2018 order intake was for innovative products released in the last three years.
- Open innovation: Valeo diversifies its sources of inspiration by forging partnerships with universities, laboratories, industry leaders and start-ups.
- Cutting-edge processes: Valeo's robot density is three times higher than the average for the automotive industry.

A leader in AI for automotive and transportation applications

- In 2018, Valeo recorded 1 billion euros in order intake for AI-enabled products.
- Its teams already include 200 experts in artificial intelligence, machine learning and deep learning.
- Created in 2017, Valeo.ai is the first global research center dedicated to AI for automotive applications.