

# CONNECTED

A MAGAZINE BY  **LEMO**

SUMMER 2016 N° 6

Formula E — the Future?

The New Age of Car Pollution Testing

Stade de France connected for the Euro





LEMO's design processes have greatly improved since the early 1980s



EDITORIAL

Every journey begins with a first step.

This first step was taken by my grandfather, Léon Mouttet. A humble precision engineer, he founded LEMO exactly 70 years ago. With the help of my grandmother and my mother, he started off by designing and manufacturing contacts for the Swiss post and for watchmakers.

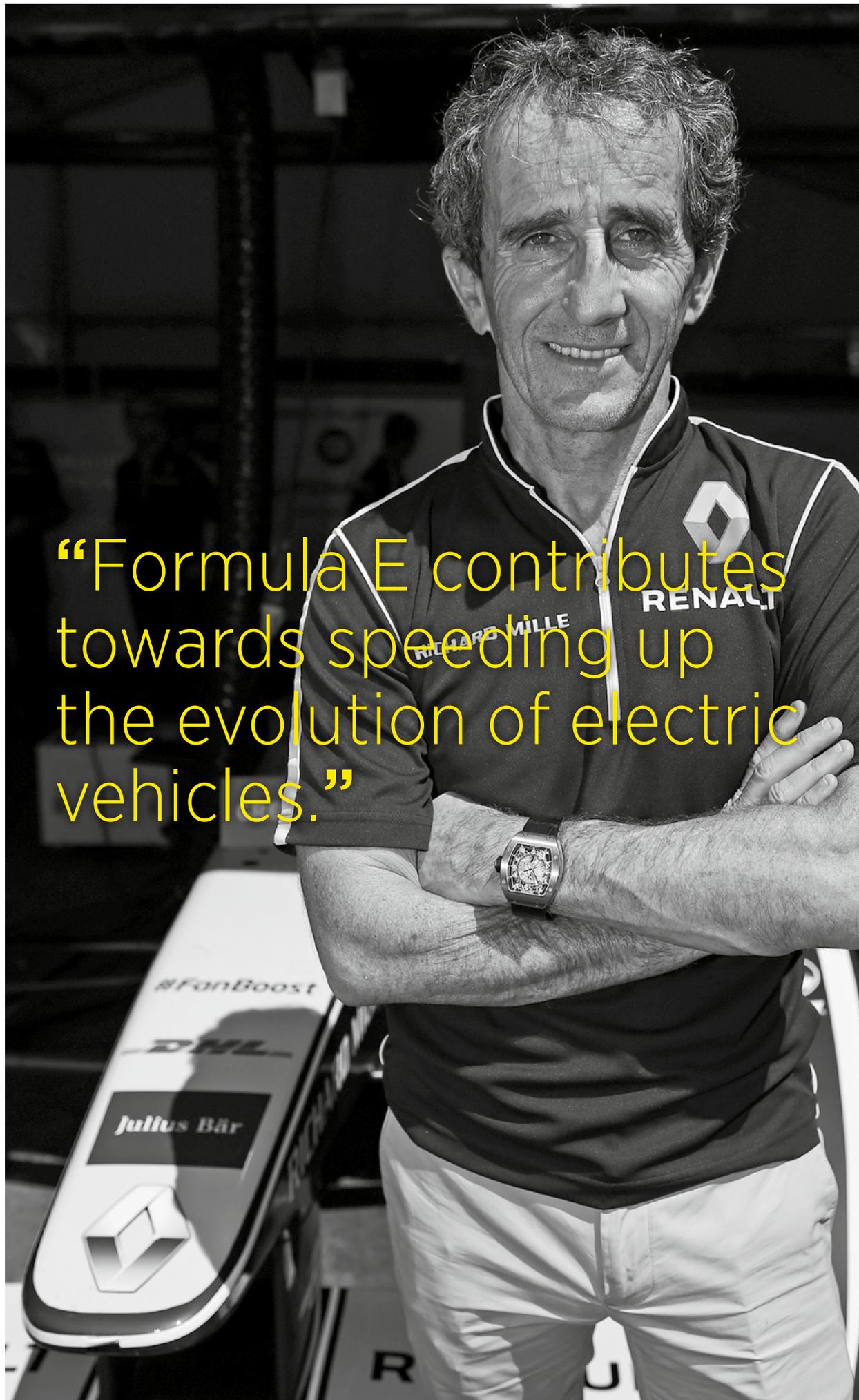
In 1957 the journey took a leap forward: Léon Mouttet invented the Push-Pull latch system. Very easy to use and reliable, this new invention made LEMO become renown.

The next step to the LEMO journey was crossing the Swiss borders and founding the first foreign subsidiary (Italy 1964). The world is a big place. Since my father took over, the pace has sped up. In 2000 it was my turn to take over. Today, LEMO is 25 subsidiaries, a distribution network covering 80 countries, a staff of over 1500 and 100,000 customers.

The journey goes on. The number of steps has become less important than the driving force behind them. LEMO's is very simple: without human contacts, our connection solutions would not lead anywhere. True to Léon Mouttet's values, LEMO has always focused on human relationships — with customers, partners and employees.

The journey continues and we look forward to sharing it with you.

Alexandre Pesci  
Corporate CEO  
LEMO



“Formula E contributes towards speeding up the evolution of electric vehicles.”

ALAIN PROST  
4 TIMES FIA WORLD CHAMPION,  
CO-OWNER OF RENAULT E.DAMS  
(SEE SPECIAL FEATURE PAGE 13)

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# TECH-BITS FROM AROUND THE WORLD



## 1. WATLY, THE WATER-FRIENDLY MONSTER TO HELP UNDERPRIVILEGED REGIONS

An Italian-Spanish start-up company managed by Marco Attisini has just presented the 3.0 version of his invention, Watly, which could present enormous potential. The result of the contraction of the words “water”, “friendly” and “lively”, this giant computer brings drinking water, electricity and internet, using only solar energy. Tested in the village of Abenta in Ghana, Watly is a 40 meter-long cylinder weighing almost 15 tons, packed with technology and covered in solar panels. It can produce up to 5,000 liters of drinking water per day, electricity for 3,000 people and provide them with internet access. In short, resources that almost 1.2 billion people are still lacking today.

## 2. QUIETER SUPERSONIC JETS

The last supersonic commercial flight took place in 2003 by the Concorde which flew passengers from Paris to New York in less than 4 hours. The major issue with this plane was its deafening noise when breaking the sound barrier, which could even shatter windows of the surrounding buildings. No other supersonic device of equal technology has been given permission to supersede it since. New technology had to be developed and therefore, NASA launched its new X-Plane project. They have just signed a 20-million-dollar contract with aerospace manufacturer Lockheed Martin in order to improve their Quiet Supersonic Technology and to develop a first concept. The objective is to pilot test a supersonic jet by 2020 and outpace the competition, namely Airbus and its Concorde 2.

2.



© Lockheed Martin

3.



© Ohio State University



### 3. NEW TECHNOLOGY GIVES PARALYSED THE POWER OF MIND CONTROL

In 2011, John Donoghue implanted electrodes into a woman's motor cortex, enabling her to control a robotic arm. This was the first time ever. Research teams from Ohio State University and the Battelle Memorial Institute of Technology in Columbus have just gone one step further. They have used a brand new neural bypass technology on a young paralyzed patient. He can now control his fingers thanks to a neuromuscular electronic stimulation system fitted to his forearm, without having to go through the damaged spinal cord. It works! When he thinks about picking up a bottle, his fingers grasp it. The young man has even started training his fingers on a "Guitar Hero" video game.

### 4. NEW SOLAR PANELS GENERATE POWER FROM RAINDROPS

Scientists from Ocean University of China in Qingdao and Yunnan Normal University in Kunming have developed a flexible solar cell covered in an atom-thick graphene layer. This new technology produces electricity in all weather conditions, as these cells react to light as well as to raindrops. Even if their conversion rate only reaches 6.53%, against the 15% of classic solar panels, they could become very useful in regions where it often rains. Solar panels used in rainy weather conditions produce up to 25% less energy than in sunny regions.



### 5. A THERMOMETER 20,000 TIMES FINER THAN A HUMAN HAIR

It's well-known that DNA twisted molecules unwind themselves when reaching a given temperature. This is the phenomenon that a group of scientists from the University of Montreal have explored when inventing their revolutionary device. After having proven that DNA molecules unwind at various temperatures depending on their nucleotide sequence, they have created molecules that are capable of emitting optical signals when the given temperatures are reached. In other words, they have created nanoscale thermometers (5 nm). They are capable of taking the temperature of a single cell. Possible applications include cancer diagnosis or their integration into nanoscale electronic components.

### 6. THE BLINK OF AN EYE MAY THREATEN YOUR PRIVACY

Be aware: in the near future, a stranger's wink could be even less innocent than today. After Microsoft, Google and Samsung, the Japanese giant Sony has just entered the market of connected vision by filing a patent for a bionic eye in USA. The invisible device would take the shape of a contact lens linked to a wireless unit such as a smartphone. Its user would be literally able to take photos or start a video recording with the blink of an eye. Yet another way of invading one's privacy.



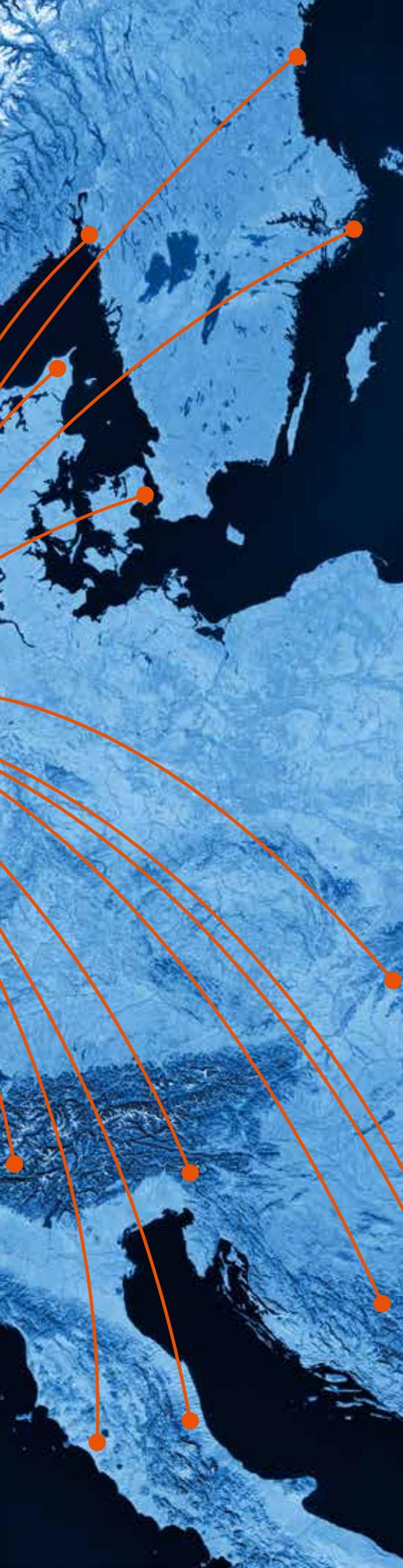
# EDC:

By Renzo Monti

## SMALL DEDICATED TEAM, GREAT "EXPRESS" SERVICE

LEMO's new European Distribution Centre is dedicated to providing express shipment of class A connectors (the standard high volume range) as well as Northwire cables all across Europe. The subsidiaries and especially the customers therefore benefit from faster delivery and even better service.





Thanks to its maritime ports, which are among the biggest in the world, its excellent road networks and Amsterdam Schiphol airport, which is the third largest European freight airport, Holland, despite its small size, is a global trade hub. This is why LEMO has decided to open its new European Distribution Centre (EDC) in Heemskerk, a small town ideally located between Amsterdam and the North Sea. Moreover, LEMO Benelux, dedicated to serving Dutch and Belgian customers, had already been implemented there.

The distribution centre stores 1,300 types of LEMO's top selling connectors, referred to as "A Class." It also stocks cables manufactured by LEMO's US factory Northwire, specially designed to perfectly adapt to LEMO connectors. These cables range from the most simple PVC and PUR cables to hi-tech SMPTE-HD-TV or Biocompatic cables, used for medical applications.

From Heemskerk, in the heart of the EU, these products can now be shipped at any time to almost all European countries. For LEMO and its customers, this simplifies customs procedures and saves on additional handling costs.

*"Today, explains Niels Zonneveld, managing director of LEMO connectors Benelux, every LEMO subsidiary located within EDC's area of distribution, can provide the same high-level logistical support to its customers, no matter what their size is."*

The new distribution centre is managed by a small team. Robert Cornelisse is the logistics manager. He's responsible for the stocks and manages the inventories with maximum efficiency, with the help of the latest labeling and tracking devices. Dilan Van der Aar looks after Northwire clients, whereas Ruben Wokke advises subsidiaries on connector orders. Niels Zonneveld has absolute confidence in his colleagues'

skills and capabilities. *"For example, Ruben, in his previous job, processed incredible order volumes, sometimes with very small quantities, ensuring perfect protection and traceability. This experience made him the perfect candidate for managing these complex processes and liaising with the subsidiaries."*

This competent, dynamic little group with a strong team spirit enables EDC to honour their biggest commitment: speedy delivery. LEMO's new strategic unit guarantees a delivery of any order within three days. EDC management has committed to same-day-shipment for all orders placed before noon. Until now, this objective has been a 100% achieved. *"We do all we can to keep up with this 100%, adds Niels Zonneveld, even if this requires longer working days whenever there's a strong demand."*

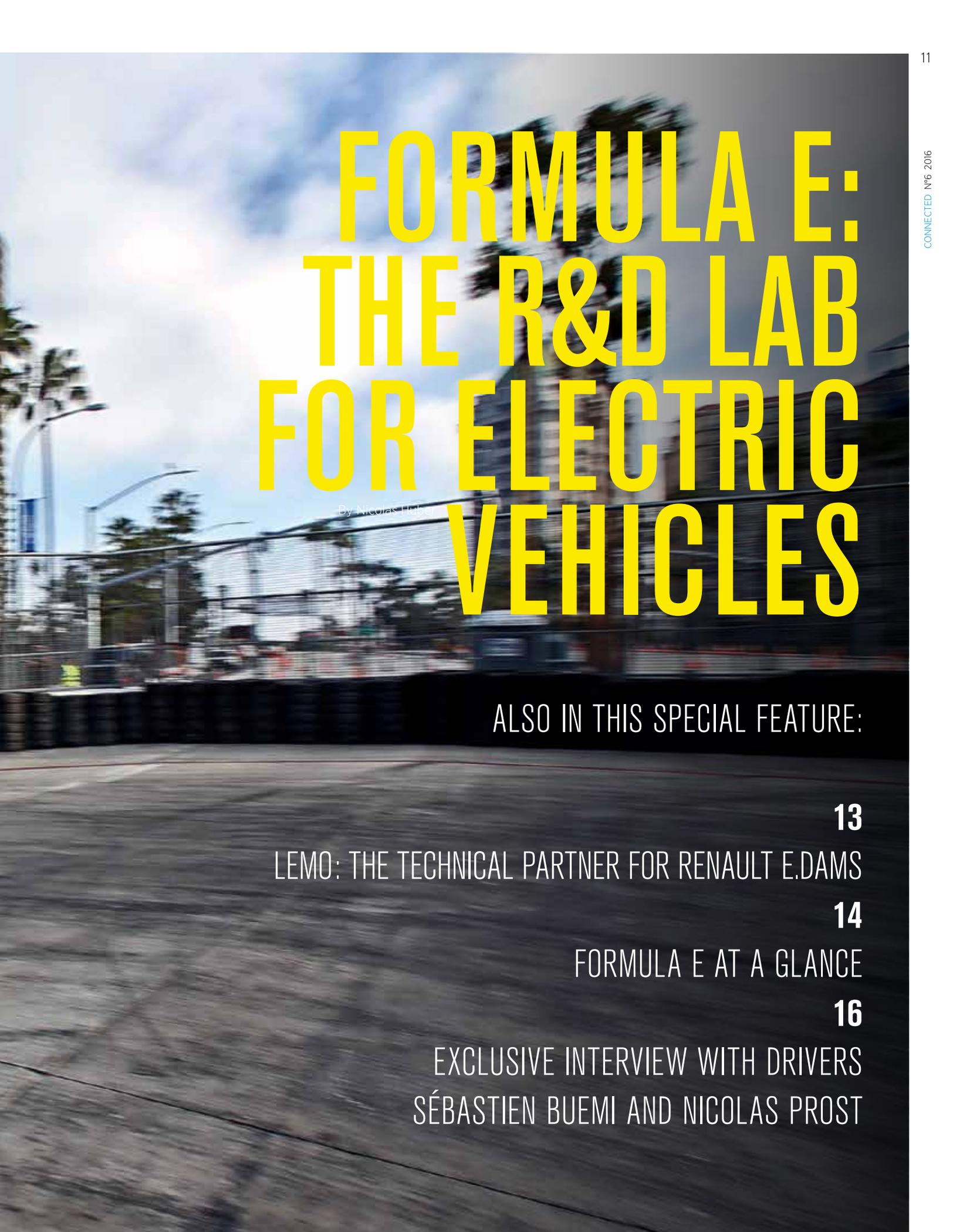
Ruben Wokke comments on this major achievement: *"From now on, all the class A are in the same location. They can therefore be shipped very quickly."* As for technical response-time, thanks to his in-depth process knowledge, Ruben can find a solution to almost any problem in less than 30 minutes. Another example of EDC "Express" service.

*"Not only does the distribution service solve logistics problems and offer quicker service to our subsidiaries, adds Niels Zonneveld, it also means time-saving and quality service which have a major impact on our customers: our subsidiaries now have even more energy and time to dedicate to customer care."*

The EDC team is already looking further ahead. In the coming months, the product range ready for speedy delivery will further increase. The distribution centre will also be able to provide standard cable assembly for small orders of 1 to 20 pieces. |

**Formula E is not only a series of spectacular urban races, but also a laboratory for electric mobility. Four time F1 world champion Alain Prost talks about this new FIA category which combines two essential driver qualities: speed and control.**





# FORMULA E: THE R&D LAB FOR ELECTRIC VEHICLES

By Nicolas Huet

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SÉBASTIEN BUEMI AND NICOLAS PROST

“I’M DELIGHTED TO SEE THE INTEREST SHOWN BY CONSTRUCTORS.”

Alain Prost is happy with the successful launch of Formula E and of his Renault e.dams team

Ten racing cars running at the speed of over 220 km/hour in the heart of a big city. They look like Formula 1 cars, but they do not emit any exhaust gas and they make a whistling sound of 80 decibels, which is about half of their siblings’ roar. Welcome to the world of Formula E, a race launched by the FIA in 2014, solely for electric racing cars.

Along the race track set in the city streets, there is a calm and watchful man, legendary F1 driver and 51 time Grand Prix champion Alain Prost. The Frenchman is the co-founder and co-proprietor of Renault e.dams, one of the nine racing teams competing in this second season. He thinks (just like many others involved with F1) that it is out of the question that Formula E is the future of F1. One shouldn’t even compare the two “*these two races are too different to compare.*” By the way, what attracted him to this new challenge was also what fascinated

him in Formula 1: the fusion between sports and technological innovation. On the one hand, there are the rushes of adrenaline and on the other, the research and development likely to influence the automotive industry.

*“Electric cars have been thought of for a long time, but they have never really taken off, explains Alain Prost. We have been lacking the right technologies and an economy of scale. It has now started growing rapidly and Formula E was launched to promote its boom. Everything we do — research, experiments — contribute to accelerating this evolution. We are still at the beginning which makes it all extremely exciting.”*

Everything is always fast paced in car racing. Technical evolution is even faster than in F1, points out Alain Prost. *“Processes are extremely responsive. We don’t have development plans for every race, but almost! We assess every competition in order to make immediate adjustments. Even so, a new car model has to spend four years in laboratory before being launched.”*

The rules are made to give everyone the same chance, leaving at the same time some flexibility to encourage innovation.

During the first season all the cars were identical. Carbon shells produced by Dallara, electric powertrain by Renault Sport, batteries by Williams Advanced Engineering, electric engines by McLaren Electronics Systems, running gears and car assembly by Spark Racing Technology.

For this second season, the regulations have been loosened: for example, constructors could design their own engine, gear box, rear suspension, or electronic control housing.

Batteries are a perfect illustration of everything that is at stake in this sector. This year again, they are identical for all. Very heavy (at 200 kilos), they only last 30 minutes, which is the half of a race. The drivers need to change cars half way through the race. They also have to manage energy efficiently: if they run at full capacity, their batteries will die out a few laps before the end! This is done on purpose, as it encourages the racing teams to come up with the best possible way of using the permitted 170 kW (230 hp) battery output.

At this performance level, the battery technology is rather complex. *“A lot depends for example on temperature, says Alain Prost. As all smartphone users know, the cold is terrible for batteries! We have also run in temperatures of over 30 degrees, which is not good either. Some thought we would never make it, but we have managed to control the cold as well as the heat. We learn and progress.”*





## “IF YOU DON’T SAVE ENERGY, YOU DON’T FINISH THE RACE!”

In a few years, the constructors will be able to use batteries other than those manufactured by Williams. “The preferred solution is to work together to develop the best possible batteries, which would benefit all the racing teams, as of the fifth season. In the future, maybe everyone could have their own batteries.”

This gradual opening-up is strategic. “Requesting from each constructor to develop its own batteries as of the first season would not have been reasonable.” This requires very specific technology and the development would have been extremely expensive, therefore, not many racing teams would have committed to the project. “Formula E has to be reasonable. It has to manage its development and costs — which F1 has not always been able to do — otherwise it will not last.” These restrictions do not hinder progress: the regulations foresee that, as of the fifth season, a battery will last the full hour of the race (no longer necessary to change cars), whilst producing more power than today.

The second season ended on 3rd of July in London. Alain Prost is happy with the fact that there only ten races. Organizing additional competitions would cause conflicts with other racing schedules, which would create major problems for the drivers who compete in different categories.

Having top drivers, among them several F1 such as Sébastien Buemi (see our interview on page 16) is part of Formula E’s success.

Again, thought out strategy has paid off. “I’m delighted to see the interest shown by

constructors, confirms Alain Prost. Several major constructors have been participating since the first season, such as Audi, Mahindra, DS, Renault... Jaguar and Williams have already announced their intention to join the next season. Others like Mercedes or BMW are interested and are waiting to see how the regulations will evolve.”

The FE has also attracted the public. Races are organized intentionally in the heart of big cities, sometimes major capitals, such as Beijing, Paris or Berlin. This impressive setting, up until now only seen at the Monaco Grand Prix, or video games, involves enormous organizational constraints. Consequently, the cities only sign up for one or two editions and the competition (test runs and the race) are run in one single day.

Being such a “rare” event makes Formula E very attractive and popular, highlighted even more by the eVillage on site, with concerts, various entertainment, sports events, driving simulators or stands promoting electric power.

Compared to Formula 1, the public can get closer to the drivers and the race cars. The FIA is also promoting new technologies and interaction. For instance, the public can vote for its favorite drivers. The three most popular drivers can also benefit from a “fan boost”, additional power they can use at some point in the race.

Two years after its launch, the image of Formula E has confirmed: Formula E is like Formula 1, but greener, more urban, more fun,

### LEMO: THE TECHNICAL PARTNER FOR RENAULT E.DAMS

LEMO has a strong presence in the world of extreme motor sport. Notably, in Formula 1 (F series connectors have been widely adopted since their launch in 1995) and in WEC (endurance) with the Rebellion racing team. A new innovative category of competition, known as Formula E could but raise the interest of a high-tech company such as LEMO. Renault e.dams, last year’s winning constructor, as well as the current leader, seemed to be an ideal partner.

Formula E provides LEMO with an excellent platform to develop and promote its new connector and cable technologies. Renault e.dams has won an experienced partner, passionate about motor sport, who can supply them with lightweight (every single gram counts at this level), but most of all extremely high performance and reliable connectors.

“Today one can not be successful on his own, confirms Alain Prost, co-proprietor and co-founder of the race team. With such new, cutting-edge technology, every single detail counts. We need to call upon the best specialists in order to progress.”

The partnership was signed back in February, just before the ePrice in Buenos Aires. Since then, the LEMO logo has featured on the Renault e.dams Z.E. 15 car.

more “hip” and more contemporary. Also more popular with women (there is even a Swiss female driver taking part in the competition, Simona de Silvestro for Andretti). The jet set is also present, notably the actor Leonardo di Caprio who is very much involved in the cause of sustainability and is the co-founder of the Venturi team, whilst Richard Branson is with the DS Virgin team, enough to attract a new type of spectator. Even in USA a race is held this year in Palm Beach, where Formula 1 has never managed to break through.

Alain Prost has made this observation: “By racing in big cities, we get closer to our public, who is apparently younger and open to new technologies, compared to the public of Formula 1. Urban people are also the ones who suffer most from pollution and therefore more receptive to the image of electric mobility promoted by FE. I am not for exclusively electric energy, I prefer to be able to choose from various technologies. However, if there is one place where all the vehicles should be electric, it is in cities.”

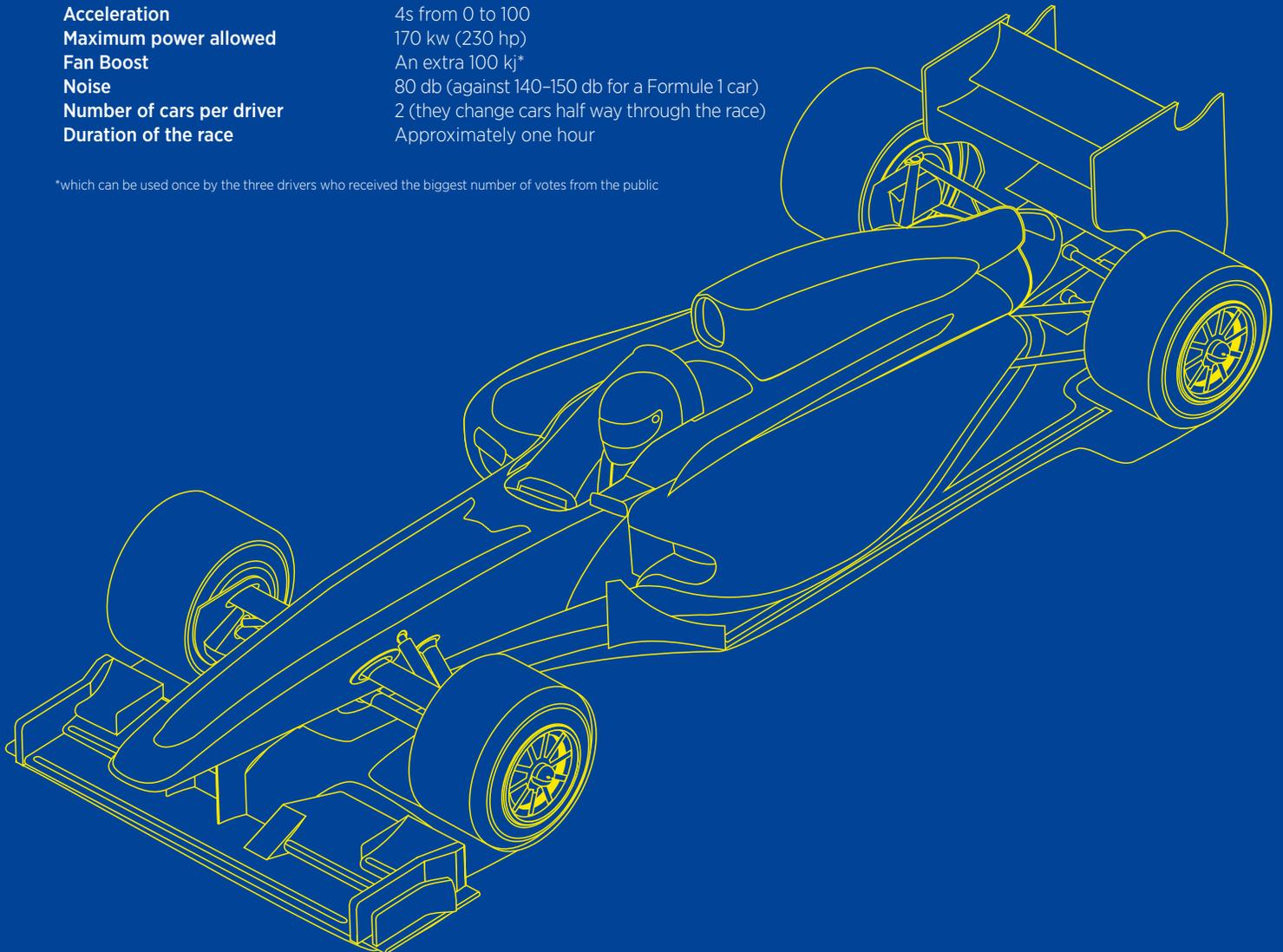
The notion “right time, right place” has worked for FE, an excellent concept, concludes Alain Prost. Whether this new form of competition replaces or not one day its elder brother, the FIA has opened up to a new promising road. |

# FORMULA E *AT A GLANCE*

## THE CARS

<b>Overall size</b>	5 m x 1.8 m x 1.25 m max
<b>Weight with the driver</b>	880 kg (including 200 kg for the batteries)
<b>Maximum speed allowed</b>	225 km/h
<b>Acceleration</b>	4s from 0 to 100
<b>Maximum power allowed</b>	170 kw (230 hp)
<b>Fan Boost</b>	An extra 100 kj*
<b>Noise</b>	80 db (against 140-150 db for a Formule 1 car)
<b>Number of cars per driver</b>	2 (they change cars half way through the race)
<b>Duration of the race</b>	Approximately one hour

\*which can be used once by the three drivers who received the biggest number of votes from the public



## CITIES AND RACES SEASON 2016



1. Beijing (China)
2. Putrajaya (Malaysia)
3. Punta del Este (Uruguay)
4. Buenos Aires (Argentina)
5. Mexico City (Mexico)
6. Long Beach (USA)
7. Paris (France)
8. Berlin (Germany)
9. London 2x (UK)

## THE DRIVERS AND THEIR RACE TEAMS :

**TEAM AGURI (Japan)**

Ma Qing Hua (China)



Rene Rast (Germany)

**AMLIN ANDRETTI (USA)**

Simona de Silvestro (Switzerland)



Robin Frijns (Netherlands)

**AUDI SPORT ABT SCHAEFFLER (Germany)**

Lucas di Grassi (Brasil)



Daniel Abt (Germany)

**DS VIRGIN RACING (UK)**

Sam Bird (UK)



Jean-Eric Vergne (France)

**DRAGON RACING (USA)**

Jerome d'Ambrosio (Belgium)



Loic Duval (France)

**MAHINDRA RACING (India)**

Bruno Senna (Brasil)



Rene Rast (Germany)

**NEXTEV TCR (China)**

Nelson Piquet (Brasil)



Oliver Turvey (UK)

**RENAULT E.DAMS (France)**

Nicolas Prost (France)



Sébastien Buemi (Switzerland)

**VENTURI (Monaco)**

Mike Conway (UK)



Stéphane Sarrazin (France)



**“WE DRIVE  
THROUGH  
*INCREDIBLE  
SCENERY!*”**

Sébastien Buemi and Nicolas Prost are both amongst the top drivers who have made Formula E a success. Thanks to them, Renault e.dams have excelled in both the first and the second season. Exclusive interview.

Are you happy with the development of Formula E during these first two seasons?

**Sébastien Buemi:** Yes, very much! When I joined the first season, I didn't know how the competition would evolve. What Formula E required was constructors, beautiful cities and good drivers. They found all three and success followed very quickly. I didn't think it would reach such proportions in so little time.

In what way is it different driving a Formula E single-seater?

**Sébastien Buemi:** The first thing you notice is the lack of noise. It feels a bit strange at first, you realize less how fast you are running. As for the rest, what surprised me most was how similar it was to a thermal car. I thought that driving an electric car would be completely different, which was not the case.

**Nicolas Prost:** It is true, they are "normal" cars, similar to Formula 3. I think that the biggest difference is the constant torque of the electric engine: you press the accelerator by a certain percentage to obtain the same percentage of acceleration. Consequently, the drivers are in perfect control of their actions. Otherwise, these cars are also slightly heavier, due to the battery.

**Sébastien Buemi:** The battery weighs 200 kg, a quarter of the total weight. This load at the rear of the car affects the car's performance, creating oversteering.

The cars are similar, is it the regulations then that make the driving different?

**Sébastien Buemi:** Yes, indeed. Formula E aims at promoting energy efficiency...

**Nicolas Prost:** ... therefore, the races are designed and laid out in a way to make us better manage energy.

**Sébastien Buemi:** This is the reason why the number of laps is not easy to complete with the limited energy we are given: if we raced at maximum speed, we would break down two laps before the end! This is done on purpose. We have to drive the fastest possible, whilst saving energy.

How do you manage?

**Nicolas Prost:** By adapting our driving. By lifting our foot off the pedal in the straight lines, whenever we can and by saving a maximum of energy when braking.

Do you always know about your energy consumption?

**Nicolas Prost:** We get a summary of consumption after each lap. We manage and decide when we spend more and when we save. The drivers must make a lot of their own decision, since there is no system in place to help them — unlike F1 where everything is electronically controlled.

▼ The two Renault e.dams drivers Sébastien Buemi (Switzerland) (on the left) and Nicolas Prost (France)



The races take place in the heart of big cities, what difference does that make for you?

**Sébastien Buemi:** There are bumps and walls everywhere!

**Nicolas Prost:** ...bumps, walls, potholes, limited visibility and a lot of bends. These are Grade 3 FIA circuits, a relatively hostile environment, difficult to drive in. This tends to raise the level of competition.

Do urban environments provoke any particular emotions?

**Sébastien Buemi:** For sure! We have raced in incredible settings. We certainly don't get the time to look at the buildings, but when you are racing at over 200 km/h around the "Invalides" in Paris, or in front of the Kremlin in Moscow's Red Square, it is just an amazing feeling!

**Nicolas Prost:** Being in a city centre, Miami or London, creates a special and unique atmosphere.

**Sébastien Buemi:** Off-track, the public gets much closer to us than in Formula 1, they can almost touch the cars. This close contact with

the audience is part of Formula E's concept. The fans are very much involved, just like on social networks. Host cities are fully supportive. It's in cities that people suffer most from pollution, so the fact that we are promoting electric vehicles attracts a lot of people.

*“CITIES CAN BE HOSTILE ENVIRONMENTS TO DRIVE IN: THERE ARE BUMPS AND WALLS EVERYWHERE.”*

▼ Racing in big cities (here in Paris), Formula E runs through impressive settings in a very special atmosphere.



In order to avoid blocking the city centres for too long, the races are all organized in a single day. Is this tough for you?

**Nicolas Prost:** the race itself is not exhausting, as the cars are not necessarily physically demanding. However, the day is carefully planned and very intense. We have a preparation session at 8 in the morning, another at 10, the qualifiers at 12, then the race at 4 in the afternoon. At the end of such a day, we are pretty tired.

Alain Prost is the co-proprietor of Renault e.dams. How does it feel to race for a Formula 1 legend?

**Sébastien Buemi:** It's great, because I have a lot of respect and admiration for him and because, thanks to his experience, he gives us a lot of input and ideas. Moreover, Alain is a driver: he knows what we feel and live through, he knows that we can have good times and bad times. Working with him can only be positive.

For you Nicolas, it is even more special, since he is your father...

**Nicolas Prost:** I also benefit from his massive experience. What is maybe a bit different, is the way we communicate: when there is a problem, your dad does not beat about the bush, he goes straight to the point! (chuckle). I have no room for error and my attitude has to be exemplary — the team must know that I don't benefit from any kind of favoritism. This means a little added pressure, but everything is going very well. Moreover, it is a privilege to share such an experience with your dad. |

The test runs and the races take place in one single day, an intense challenge for Nicolas Prost (on the photo) and other drivers

#### Sébastien Buemi

Swiss

Born on 31st October, 1988

Married with a son

5 victories, 7 podiums in Formula E

Also competing in Endurance (Toyota) and in Formula 1 (Red Bull)

#### Nicolas Prost

French

Born on 18th August, 1981

Married with a son

1 victory, 3 podiums in Formula E

Also competing in Endurance (Rebellion)



# STOCKS RUNNING LIKE SWISS CLOCKWORK

By Corine Fiechter

Stock management is a key element to a company's performance. Especially when, like at LEMO, your stocks comprise of 47 million parts including 27,000 different types! Constantly looking to improve its processes, LEMO has completely modernized its stock management, by investing in Cube machines, designed by the Italian company Modula. The days of endless lines of drawer cabinets and operators searching for parts with their trolleys are long gone.

*"This new system has completely changed our way of working", confirms Jeffrey Warren, stock manager. "First and foremost, it has significantly increased our efficiency."* Instead of walking around the stock area, each operator is now assigned to a machine and can prepare up to 12 orders simultaneously.

Modula works with a combination of double drawers, allowing much faster operations. ▼

LEMO has acquired seven Modula machines in total, each of them containing between 48 and 121 drawers. All these machines work with a combination of double drawers. *"This combination is the reason why we chose this particular system", adds Jeffery Warren. "While the operator is working on the first drawer, the machine prepares the next step in the second one."*

The LEMO IT system gives assembly orders to the Warehouse Management System through the integrated Modula Software. It makes it possible to optimize the order as the operator scans the bar code of the requested part number. The machine prepares and conveys the different parts thanks to its large drawers measuring 430 cm by 65 cm. Each drawer contains 20 to 220 boxes, each storing a different part.

Each box can be identified in a drawer through a control screen. This is much faster than it used to be, when the operator had to actually read the references on each container to find the right one. Once an order line is completed, the operator confirms it on a touch screen. Without this operation, the machine does not propose the rest of the order. This rules out the risk of incomplete deliveries.

*"Today we process an average of 2,000 order lines per day, with a staff of only thirteen people."* In addition to efficiency, there are other advantages for the operators. First of all, work has become less tiring, since the never-ending comings and goings between the lines of drawer cabinets have ceased. Let's not forget about the greater autonomy and responsibility, as each operator has to manage his or her inventory on the machine to which he or she has been assigned. *"Where inventory was managed inconsistently in the past, the system makes it possible to be more rigorous, whilst the work load has been reduced."*

As spectacular as it may seem, transition towards this modern stock management system went fairly smoothly. *"We were able to keep the same premises, with practically no modifications. On an IT level, we simply developed an interface to allow our system (which we wanted to keep) to communicate with Modula's Warehouse Management System. Thus, the next step may very well be the use of Modula for finished parts. Watch this space!" |*





**Almost 50 million parts: a challenge that Modula can handle with no difficulty whatsoever. Acquired two years ago by LEMO's Swiss headquarters, the storage system proved to be a real asset: efficiency has doubled in the Stock department.**

# REVOLUTIONIZING GREENHOUSE EMISSION TESTING

By Alexis Malalan

Vehicle pollution tests have made headline-catching news in the media last year. European legislation is now tougher and Austrian company AVL is here to help with M.O.V.E., a pioneering solution which measures emissions under real conditions.



With the official publication of the "RDE package 1" on 31st March 2016 the long awaited start of RDE testing is now fixed. Twenty days from the release in the official journal of the European Union monitoring tests will be required in conjunction with type approval certification of new vehicle types in the European Union. This event, on 20th April 2016, marks a milestone in the development of RDE for LDV and is the first of a series of four RDE packages to fade-in real world testing of passenger cars in Europe.

The RDE emission legislation is a big challenge for the passenger car industry and the test systems suppliers. It adds the "road" as a new test environment with all the variability of real world driving. From now on vehicles need to be optimized over the entire operating range which will increase the development effort and the amount of data dramatically. Leaving the well-conditioned surroundings of a test-bed, measurement under real driving conditions reveals new challenges for the test equipment such as vibrations, inclinations, accelerations as well as temperature and pressure drops. Moreover, an efficient pre-treatment is necessary to ensure precise and reproducible measurements for the entire bandwidth of possible real driving conditions.

The Austrian based company AVL, developed M.O.V.E. iS, a complete solution for Real Driving Emissions testing.

This solution was designed especially for all touring cars, from city cars to SUVs. Its primary aim is to measure NO/NO<sub>2</sub> and CO/CO<sub>2</sub> emissions, the quantities of fine particles, as well as the exhaust gas flow emitted by the vehicle. Installed on the rear of the vehicle on the tow hook, the measuring instrument uses cutting-edge technology, such as UV or infrared sensors or high precision exhaust gas flow sensors.

M.O.V.E. iS is more than a sophisticated device. A control unit (the AVL M.O.V.E. System Control) records all the data and enables to monitor emission tests from a laptop placed inside the car, via a user-friendly interface. Connected to the measuring device via Wi-Fi or an Ethernet cable, it can follow the entire process: the user can start or stop the measurements and carry out all the necessary steps. Finally, a software developed by AVL, (the Concerto M.O.V.E.) processes automatically all the data after the test and automatically generates the final report for the type approval authorities. It only takes a few minutes to obtain the required information.

Measuring the actual emissions of a vehicle involves a number of technical challenges. The first one is to be able to comply with all legal requirements, by supplying extremely accurate data. To achieve these results, the measuring device needs to be rugged (externally fitted, it has to function in temperatures ranging between -7 and +35 degrees at altitudes of 0 to 1350 m), be robust\* and lightweight. It also needs autonomous batteries – were it power-supplied by the vehicle, this would modify the vehicle's performance and therefore its emissions.

The M.O.V.E. solution is marketed all over the world, wherever stringent emission legislation comes into force. This is the case in Europe, in Korea, in Japan, in China and in the USA. Designed for and together with car manufacturers, it takes into account all their requirements and helps them to further enhance engine performance.

AVL is the world's largest independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems. With M.O.V.E. iS, AVL is the clear global marked leader in the field of RDE testing solutions. |

\* Binding criteria which drove AVL to choose LEMO connectors.



To provide accurate measurements, M.O.V.E. needs to be rugged, robust and lightweight. ▲

# FITTED FOR FEVER PITCH BROADCAST

By Alexis Malalan

**The Euro 2016 football final took place in Stade de France on 10th July. It was an exciting time, with millions of fans following the match in Ultra-high-definition 4K quality, thanks to the high technology cable network installed by Synoptic Broadcast.**

With almost 40 km of fibre optic cables, 240 connectors, 30 plus cameras and dozens of OB-vans lining up outside the stadium: this summer Stade de France in Paris was perfectly equipped to ensure that television viewers could follow the live coverage of unmissable matches.

Even though many players, such as Antoine Griezmann and Cristiano Ronaldo were certainly aiming to be among the top scorers, the best performance had already been achieved by Synoptic Broadcast from Colombes, France. The company, specialized in fibre optic transmission technologies, has been responsible for the complete updating of the cable system at Stade de France. This new state-of-the-art equipment guarantees perfect signal quality between the cameras fitted around the pitch and the OB-vans parked outside.

The project was fairly impressive, due to all the challenges. Stade de France can be subject to bad weather conditions, pollution, not to mention the crowds and the constant comings and goings during major events. This is why highly resistant cables and connectors are necessary.\* Connectors are made of stainless steel to avoid rust, the camera housings are strongly protected by IP67 aluminum casings. The set-up of the cabling system is ergonomic and user-friendly. On the one hand, you can find fixed points in strategic places all over the stadium, on

which the cameras can be connected, on the other hand, technical areas to which OB-vans of the main broadcaster and all the other TV channels can connect.

It took four months for Synoptic Broadcast and its team of ten people to complete the project. Originally, there was a need for replacing the weathered cable system dating from 1998. More importantly, the system needed to be modernized.

In our age of Ultra-high-definition, only fibre optic cables can ensure the necessary signal quality over long distances, such as the ones required at Stade de France. For instance, more than 500 m of cable was required to connect the famous "Spidercam", suspended at 40 m above the pitch, providing spectacular views of the matches.

Not only television viewers could benefit from such high-quality equipment, as the television broadcasters' work has become much easier as well. With such a cable system, they can save hours of preparation and disassembly. The EURO's, the Six Nations, or concerts featuring international stars: major events organized in the Parisian capital can put on a constant show. |

\*Synptic has selected LEMO connectors.

**40** *KM OF FIBRE  
OPTIC CABLES*

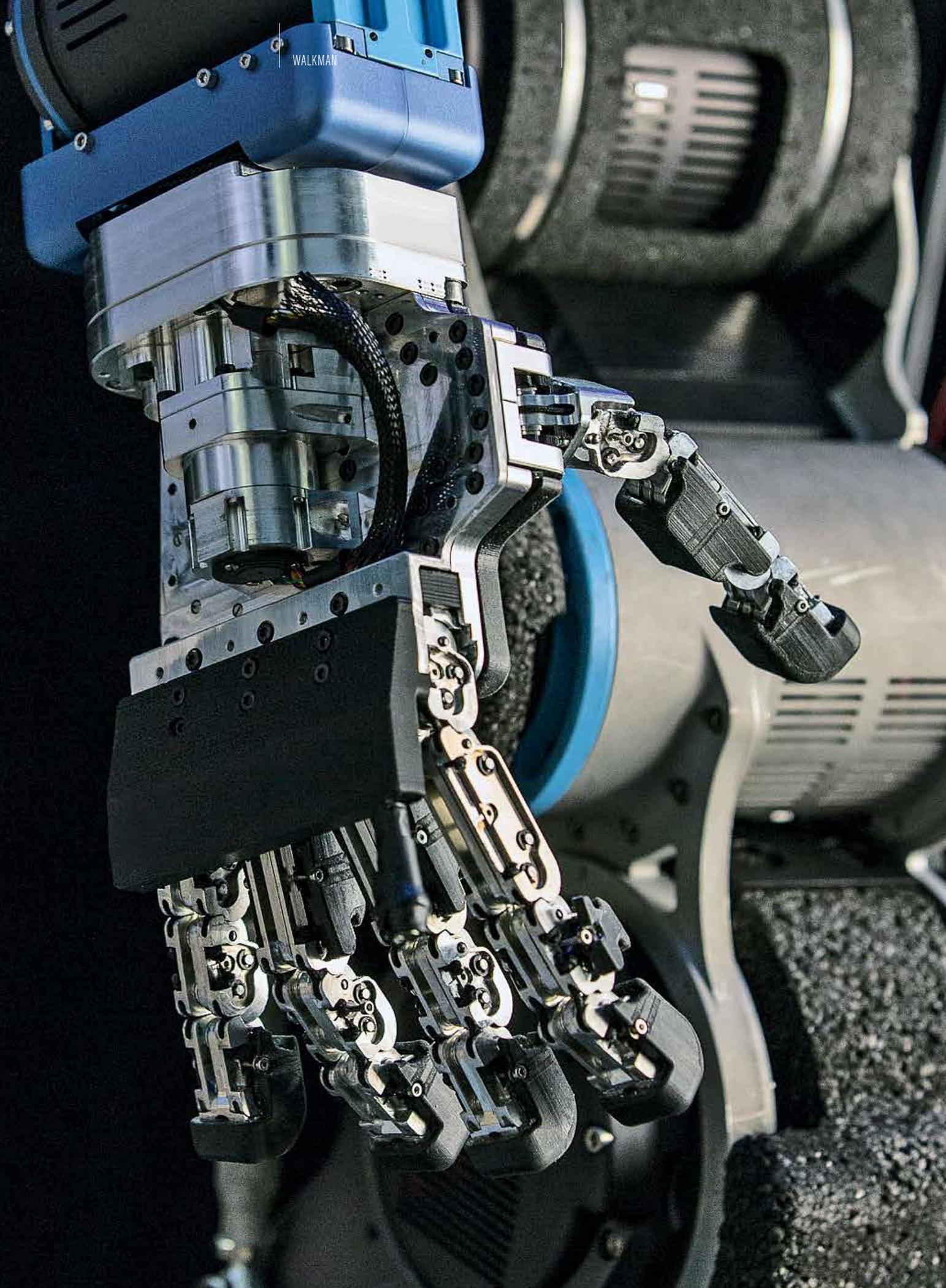
**240** *CONNECTORS*

**30** *CAMERAS*



FO mounting bay for OB vans  
at the Stade de France. ▶

WALKMAN



# THE ROBOT WITH *A HUMAN TOUCH*

By Alexis Malalan

Walkman mimics human movements in a strikingly accurate way. It has met extreme conditions and could be used for supporting people in need. Its designers have developed it in record time and predict a great future for it.

Almost 1m90 and 120 kg. These powerful proportions are not those of a rugby player, but those of Walkman, the humanoid robot entirely developed by the Advanced Robotics Department of the Italian Institute of Technology (IIT) in Genoa.

Originally, Walkman was designed to take up a challenge: build a robot able to rival the best during the DARPA Challenge, a robotics competition organized in June 2015 in Pomona, near Los Angeles.

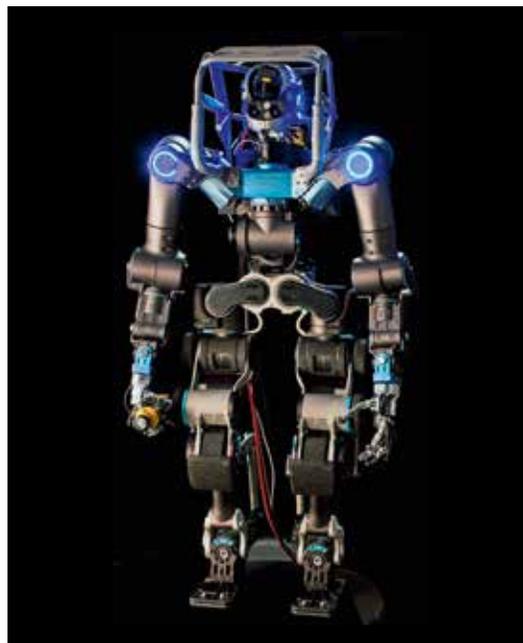
In competition with 24 teams from all over the world, the Italian robot had to handle a series of challenges simulating emergency rescue operations in a disaster area: driving a quad, opening valves, overcoming obstacles... Walkman ranked in 17th place, but that wasn't what counted most: with only a few months to create, assemble and test this technological wonder, the team of 80 IIT people working on the project have brilliantly demonstrated their skills.

It was a major challenge, to say the least. First of all, they had to create a robot whose behavior matched that of a human being. Special attention was therefore paid to reproducing human gestures. The robot's hand, in particular, developed in cooperation with the University of Pisa, is a small masterpiece. Instead of using a separate motor for each finger, it is controlled by a single motor and perfectly simulates a human hand's movements. Walkman is capable of grasping objects, turning a wheel, opening doors, handling a drilling machine... Its vision has also received special attention. The robot is equipped with a stereo camera and laser scanner for 3D mapping of its environment, as well as with additional lighting in case it needs to operate in the dark. The technician remote-controlling it can literally "see through the eyes of the robot" and direct it accordingly.

Remotely controlled, Walkman is not totally independent yet. However, its tailor-made batteries en-

sure 30 minutes to 2 hours of autonomy. Heat resistant and robust, thanks to its skeleton made of Eral (or Aluminium 7075, a metal used in aerospace), it is particularly adapted for use in emergency situations to replace rescuers. Although it is still too heavy and too powerful to be used safely alongside humans, research continues in order to develop increasingly sophisticated movements. IIT are hoping to use it in applications where it will be able to prove its full "human" potential, such as supporting and caring for disabled people.

For the moment, Walkman is a unique prototype, but it has met a great deal of interest. Disney studios have bought a child-sized smaller version. The Italian army has financed the development of a half-human, half-quadruped "centaur" version. |



*CUTTING-  
EDGE  
TECHNOLOGY  
FOR BETTER  
WATER  
QUALITY*

By Corine Fiechter

**At a time when new technologies keep emerging and replacing each other, LEMO provides a rare, even unique, service. In a sector where life cycles tend to shorten due to obsolescence, LEMO offers not only innovative cutting edge products, but also parts and sub-components that date back to decades, whenever necessary.**

Aqualabo has won over cities, factories and other water treatment plants in Europe, Asia and the Americas with its instruments dedicated to water analysis and control.

H<sub>2</sub>O is the key element of our ecosystem and, as such, it has been a major concern and the focus of considerable attention. Oxygen, pH, redox, salinity, conductivity, temperature, turbidity, chlorides, iron, copper, zinc and many other chemical and physical properties are measured and analyzed throughout its processing cycle. Municipal authorities, companies, laboratories and farmers can count on a wide range of high precision instruments, used for detecting pollutants, setting limits in the field of sanitation. In this highly competitive, constantly evolving market, Aqualabo has managed to solve a complex equation: offer cutting-edge products (sensors, spectrophotometers, samplers, overflow detectors, etc.) fully designed and manufactured in France, at competitive prices.

The Aqualabo group includes Aqualabo Contrôle and Aqualabo Analyse, following the merger of several companies. Each of them has contributed with several decades of know-how in the field of water analysis and control, explains Séverine Vary, Product Manager and Deputy General Manager. *"Together, we are able to provide a complete range of materials and reagents throughout the water cycle, be it for drinking water sys-*

*tems, industrial water, natural waters, or wastewater. Combining the expertise of our various entities makes it possible to offer turnkey solutions for very specific requirements."*

For instance, Aqualabo has developed a complete water management concept for fish farms in Portugal and Russia. *"Namely, we have combined intelligent sensors manufactured by our Ponsel unit for water control, equipped with automatic devices designed by Perax. These devices are capable of analyzing the data measured by the sensors and manage the alerts, by triggering automatically the aeration of water tanks or activating the pumps, for example."*

With a staff of about a hundred employees based in France and over 80 distributors all over the world, Aqualabo invests a great deal in R&D. *"We have for example developed a duo sensor\* This design, unique on the market, is much more cost-saving and eco-friendly: one of the components is a consumable that the customer can replace himself, instead of buying a whole new sensor."*

What truly makes the group stand out from among its competitors is its flexible approach in terms of software technology. *"We are the only ones who can offer such a wide range of intelligent products without the need of purchasing our own specific transmitter,"* explains Séverine Vary. *We offer our customers the possibility of purchasing only the sensor that*

High precision pollutant detection in rivers. ▼

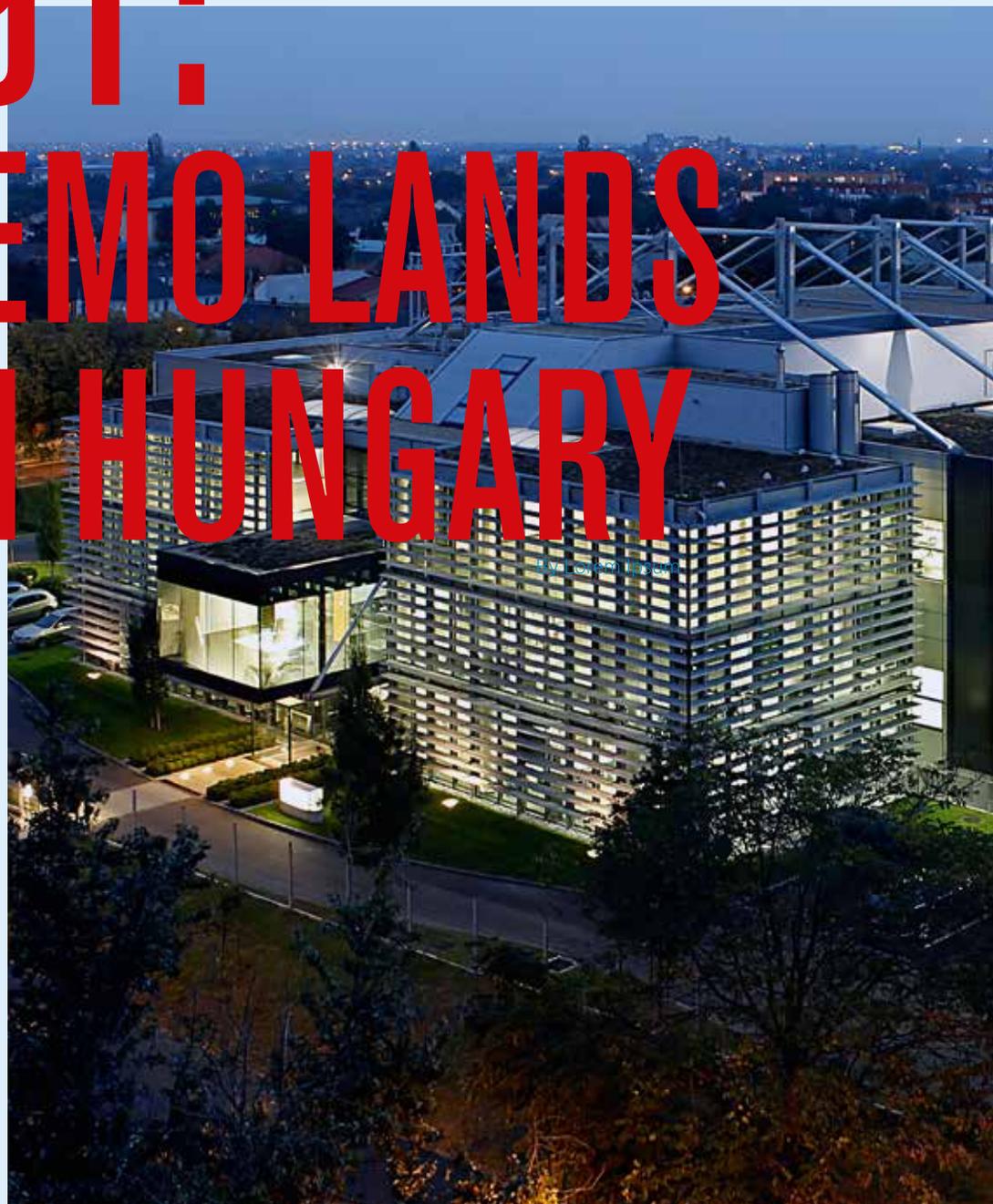


© Aqualabo

*they can then connect to their IT system."* Aqualabo provides the necessary information for connecting the device. *"This flexible approach opens further development opportunities, notably with major electronic box manufacturers in Asia."* An undeniable competitive advantage without overshadowing the primary mission of Aqualabo, which is guaranteeing outstanding water quality for the well-being of all. |

\*The sensor's watertightness and reliability are ensured by LEMO connectors.

# 1991: LEMO LANDS IN HUNGARY



25 years ago, LEMO decided to strengthen its Eastern European presence. Having sensed an enormous potential in a Hungarian company, LEMO acquired part of it, trained its staff and developed the plant. What became REDEL Elektronika Kft, fulfilled LEMO's expectations and has continued to develop.



One of LEMO's most modern factories is in Hungary ▲



It was on 1st April 1991, only a year and a half after the fall of the Berlin Wall. Eastern Europe had started opening up and LEMO was keen to be there. REDEL Elektronika Kft was founded in Budapest, after having acquired part of the electrical connector production unit of the previous State-owned company KONTAKTA. Until then, it was the German LEMO subsidiary that delivered LEMO products to customers in Hungary and the neighboring countries.

Just like other former Eastern bloc countries, Hungary had to adapt its production capabilities, its economy and society. LEMO was well received in these circumstances. *"The staff welcomed this acquisition, remembers Gábor Vancsisin, former managing director, now retired and a member of the Board. Large State companies were dismantled, causing unemployment, whereas we were able to keep our jobs."*

Employees were carefully selected and trained. *"In the beginning, LEMO tested us a lot — explains Gábor Vancsisin. Training courses were organized in Switzerland. We had to learn about production documentation, adopt technological and quality requirements — in short, learn LEMO's philosophy!"* At the same time, Swiss experts would visit REDEL Kft. *"These exchanges were extremely beneficial, adds the former MD. We greatly appreciated the attention and interest that LEMO management showed us, as well as all the help and positive attitude of our Swiss colleagues."*

From many aspects, the first two years reflected the period "before the fall of the Berlin Wall." For instance, administration was fully manual. *"Technical documents were stored in filing cabinets. When manufacturing orders were placed, we used to copy documents by hand and transmit the sheets to production."* The purchase of a photocopier quickly changed this laborious task. Another example was that salaries were paid in cash by the company cashier. The Hungarian banking system was rapidly modernized and by 1994 bank account transfers became possible.

Just like the whole country, REDEL Kft was progressing fast. The offices and the production workshops were brought together in the building located at Vágóhid street. In 1996 an office block was built including a laboratory. The machine park was regularly modernized. Much progress was also brought about in the field of environmental protection, one of LEMO's central concerns. Quality and production volumes have continued to increase.

By the end of 2007, REDEL Kft had developed so successfully that expansion became necessary. The construction of a new plant was decided on an 8,000 m<sup>2</sup>-land that LEMO had purchased back in 1991. The inauguration took place in 2010. It is one of LEMO's most modern factories. The plating department is among Central Europe's most high-tech installations. Thanks to an automatic water treatment system, waste water is treated before reaching the public sewage network, in compliance with LEMO's strict environmental regulations.

During the last five years, the Hungarian factory's production has increased by 5 to 10%. It continues to play the key role that LEMO had envisaged. This is where the REDEL P medical connectors are being assembled. *"The assembly processes have been transferred from REDEL SA in Ste-Croix, Switzerland, explains Sándor Szűcs, current Hungarian MD. We perform the complete assembly, complying obviously with the Swiss quality standards!"* LEMO has never stopped developing the Hungarian subsidiary's potential. REDEL Kft is ready for much more: only about 50% of the new building's capacity is currently being used.

*"Amongst all the modern equipment, there is an old Bruderer stamping machine that is still highly productive, considering her age!"* adds Sándor Szűcs. She is the last relic from the soviet era, symbolizing our amazing progress. |



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