

Dear Reader,

Electromobility is gaining ground. More and more vehicle manufacturers are launching fully electric or hybrid vehicles. Now it's up to buyers to accept them, and two factors will determine whether this will happen. The first is the development of an electromobility infrastructure. Here in the newsletter we introduce the ladenetz.de association, in which municipal suppliers have come together to create a simple and cost-effective network for charging eVehicles. The second key hurdle for tomorrow's mobility is the operating range of electric cars. The new Energy Storage expertise center of the MobiliTec trade show at HANNOVER MESSE 2012 will spotlight this topic even more powerfully. We tell you about it on page 4. We hope you find much to interest you in these pages.

Your MobiliTec Team

Mobility sector benefits from intelligent lightweight solutions

When it comes to lowering energy consumption and minimizing material expenses in the fast-growing field of electromobility, all roads lead to lightweight materials and construction. Ever since it premiered at HANNOVER MESSE in 2010, the Lightweight Construction showcase has been growing from strength to strength, and in 2012 will boast a truly winning lineup of big-name exhibitors along with a dedicated forum and a Solutions Area – all grouped together in Hall 6. Among the highlights to be featured in 2012 are refined honeycombs and various sandwich materials made from them for the freight industry (BeeComp Sandwich Technologie) and metal composite brake discs for use in wheel hub motors (Sheet Cast Technologies GmbH). These innovations and many more will be highlighted in the Lightweight Construction showcase as proof positive of the huge potential lightweight solutions have to offer for different applications.

www.hannovermesse.de/en/lightweight

Plug in, charge and go

An electric vehicle charging post network launched by German public utilities is growing steadily, with more and more municipal companies joining in.

For electromobility to take off, users need to be able to charge their batteries as easily as possible at public charging stations. Consumers in Hamburg need to be able to use their payment cards or smartphones at charging posts in Stuttgart, Berlin or Kiel at their usual rates, and pay a single bill from their own supplier. This is comparable to mobile phone companies' roaming systems that provide nearly global coverage for their subscribers. Operators in the ladenetz.de association are looking to create just such a coordinated charging network across a wide geographic area. In Germany, 150 charging points are already connected to the network of Smartlab Innovationsgesellschaft. This subsidiary of the Aachen, Duisburg and Osnabrück public utilities has already won 13 municipal companies over to its project. In addition to those in Trier, Springe and Jülich, the project's most prominent partner is the Munich public utility company. The association is also collaborating with their Dutch counterpart e-laad.nl and the Vlotte charging station federation in Austria. The latest addition to the ladenetz.de network is also the most striking: the Sylt power company recently joined the charging post network. "Our goal is to expand cooperation to 50 partner utilities by the end of 2012," says Smartlab CEO Andreas Pfeiffer. That might just happen. Partnering is crucial, because building a roaming system is a complex and resource-intensive effort. Ladenetz.de has the leading network today in terms of cost and underlying expertise.

Plenty of IT research and development are required to create a roaming system, and the efforts of ladenetz.de benefit from public funding of research projects. Andreas Pfeiffer is convinced that there is still plenty to do in terms of electromobility research. Seven public utilities – in Aachen, Allgäu, Duisburg, Leipzig, Osnabrück, Sylt and Trier – have therefore formed a research association under the direction of Smartlab. They are participating in the German Economy and Technology Ministry's "ICT for electromobility II" technology competition with their "econnect Germany" research project, in which the seven utilities, together with Siemens and RWTH Aachen, are exploring challenges to effective electromobility in the future and developing sustainable mobility concepts. "Municipal energy supply companies, with their local roots and regional expertise, are perfectly situated to work together with cities and municipalities in shaping electromobility," points out Pfeiffer. An "intelligent parking garage of the future" in Trier, for example, is being developed with a standalone green energy supply. The focus of research in Aachen is on charging eVehicles at home within a smart home system, and in Duisburg researchers are examining charging options at the workplace. An electromobility-focused travel planning system for bus, train, car sharing and bicycles is being developed in Osnabrück and will be adopted by the Leipzig public utilities. And on the North Sea island of Sylt the focus is on linking electromobility to tourism – a fitting idea.



Siemens expands the ladenetz.de system: A Siemens charging station is connected to ladenetz.de and supplies a STAWAG (Stadtwerke Aachen AG) electric car with power. Source: smartlab

All electromobility under one roof

Electric motors and batteries are often the focus of attention in eMobility, but it's important to remember that the rest of the vehicle also has to be compatible. Automobile industry supplier Schaeffler is meeting this technical challenge with a range of innovative products and creating new, specialized structures to meet rising demand.

Automobile supply company Schaeffler has been working with components for electromobility for some time, for both the mobility and the industrial sectors. Up to now individual components have been produced in various segments at many manufacturing sites, but Schaeffler now wants to bundle these activities. Under the moniker "eMobility System House," some 300 employees in Herzogenaurach, Bühl and Suhl will drive the development of electromobility initiatives in the first phase. In addition, business in the promising electrical drive market in China and North America will be expanded.

The company is restructuring to meet "sustainably growing interest" in nearly every market. "We as suppliers play an active role as a development partner in shaping electromobility. Our innovations and forward-looking products make a significant contribution to progress and securing the future, and this always requires extensive investments," says Prof. Peter Gutzmer, VP for Technical Product Development at Schaeffler. Setting up eMobility System House is a highly strategic move for the automobile supplier, creating an international structure that forms a basis for its leadership in the complex technological field of electromobility. Schaeffler already offers its industrial and mobility customers a broad range of products for electric drives, including include key components for both hybrid and fully electric vehicles. Mechatronics, the interplay of electronic and mechanical engineering, plays an ever greater role, requiring interdisciplinary

THE SERIAL HYBRID

The Schaeffler hybrid is a car full of ideas for electric mobility. This mobile development laboratory demonstrates different drive concepts. This hybrid arranged in series can be driven, for example, all electrically and is therefore very similar to an all-electric car. The serial hybrid obtains the energy required from the battery. The internal combustion engine does not have any mechanical connection to the wheels and acts as a power generator for the battery.

KNOW-HOW: WHAT IS A RANGE EXTENDER?

An engine fitted in a hybrid vehicle to extend its range is called a range extender. An internal combustion engine usually generates electrical current using a generator for operating the electric motor.

SERIAL HYBRID: SCHEMATIC DIAGRAM OF SETUP

- Internal combustion engine:** The engine is used in combination with the generator solely to supply electrical current.
- Electric generator:** is driven by the internal combustion engine and generates electrical current for the electric drive motor.
- The battery stores energy** for all-electric operation.
- The electric drive motor operates** as a motor during electric operation, but can also act as a generator and recover energy during braking (recuperation).

thinking, broad systems understanding and comprehensive solutions. Lateral thinking more than just desirable; it is urgently needed. This approach can clearly be seen in Schaeffler's range of electromobility products, including eBike pedal force sensors, start-stop solutions, hybrid couplings, electrical wheel hub drives and full electric drives. Schaeffler's latest innovation in the latter area is its ACTiVeDRIVE concept car with an integrated

electronic differential that has garnered international attention. This component combines an electric drive with the capability for selective control of wheel drive power. "An active electronic differential improves power transfer on surfaces with varying friction coefficients," explains Prof. Gutzmer. Applications for this pioneering technology include sports cars and family vehicles as well as tractors. Besides the electronic differential, ACTiVeDRIVE includes an electromagnetic parking lockout, forced lubrication of the drive mechanism without an oil pump, planetary gearing made from sheet metal and low-friction bearings, all of which contribute to even better efficiency. These innovations give electromobility further momentum.

Schaeffler is currently notching up promising innovations in a number of other areas, but every new development takes time. In the next few years they plan to develop technological improvements in parallel for conventional drive trains, hybrid systems and electric vehicles. The vehicle of the future will sit somewhere "between gas and electricity," which has it facing the greatest challenge since cars were first invented, according to Gutzmer. All of these drive approaches aim to combine better performance with lower consumption, and the company has its work cut out for it to make this happen across the board. Gutzmer strongly believes that the potential of internal combustion engines is not yet exhausted, even after 125 years of development. "But the potential of electric drives is higher than ever," he adds.

THE PARALLEL HYBRID

The Schaeffler hybrid is a car full of ideas for electric mobility. This mobile development laboratory demonstrates different drive concepts. In a parallel hybrid, an electric drive operates in parallel with a classic internal combustion engine. This means that both units can have smaller dimensions, lower consumption and are more cost-effective. The parallel hybrid can move off solely under electric power and a manually selectable four wheel drive is also possible. The power of the electric motor can also be connected temporarily, practically as a booster, to provide more rapid acceleration.

KNOW-HOW: WHAT IS A MICRO HYBRID?

A micro hybrid is a vehicle with a start-stop system that forms the first step towards hybridization. A small electric motor (starter generator) replaces the conventional starter and generator. Recuperation (energy recovery during braking) can also be part of this concept.

PARALLEL HYBRID: SCHEMATIC DIAGRAM OF SETUP

- The battery is used as an energy store for the electric motor.
- The electric motor assists the internal combustion engine (to a lesser extent in the mild hybrid).
- The internal combustion engine performs – as in a conventional vehicle – the "lion's share" of the work to drive the parallel hybrid.
- The transmission controls the transmission of forces from the internal combustion engine and electric motor to the wheels.

Biomethane as fuel

One-fifth of vehicles operating on natural gas could run on biofuel by the end of 2011

Buyers are showing growing acceptance of natural gas as a fuel, and vehicle manufacturers are launching increasing numbers of natural gas vehicles. "What few people realize is that more and more gas stations are also offering biomethane, the renewable alternative to fossil natural gas," says Dr. Claudius da Costa Gomez, CEO of the Biogas professional

association. Of the currently 897 natural gas fueling stations operating in Germany, 174 add 5 to 50 percent biomethane to their natural gas, while 20 natural gas stations also offer pure biomethane.

As a processed biogas with the same properties as natural gas, biomethane can integrate seamlessly with the natural gas grid. There

are almost 50 biogas storage facilities in Germany. By the end of the year, they could supply 20 percent of gaseous fuel, which means around 300 million cubic meters of biomethane. According to the Biogas association, using biomethane in natural gas vehicles is an excellent way for vehicle manufacturers to reduce their fleets' CO₂ emissions.

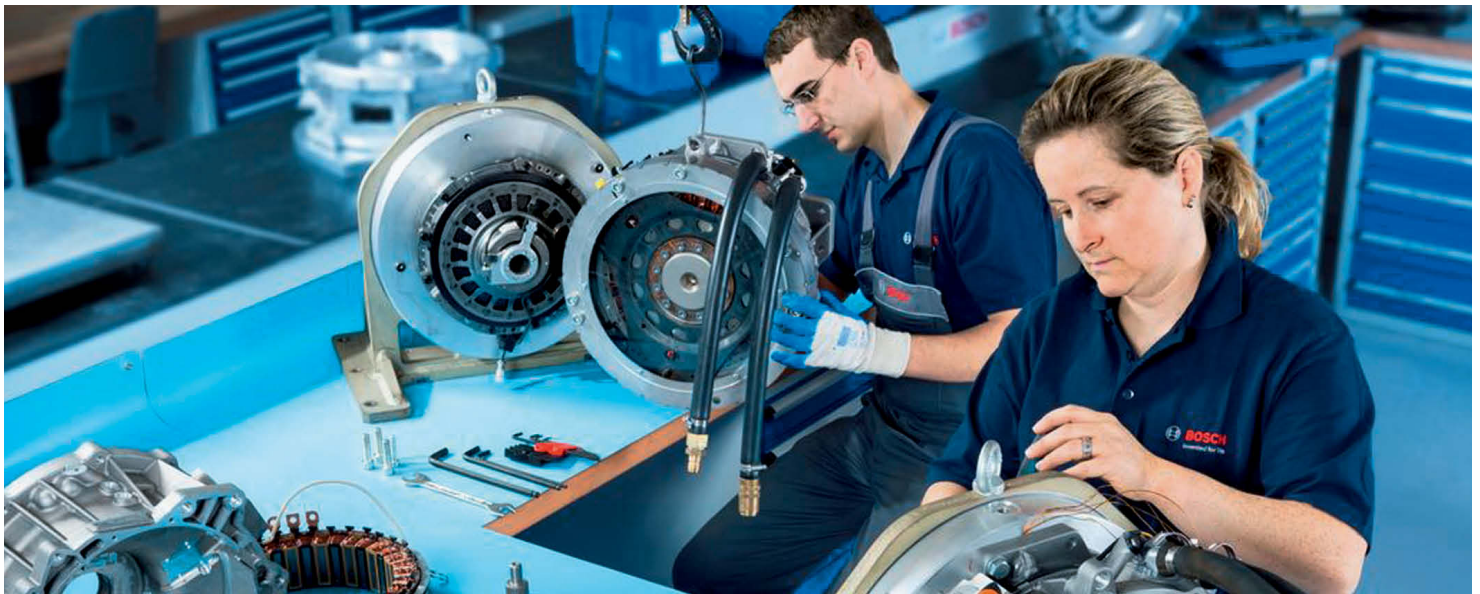
Jumbo merger

Bosch and Daimler join forces to make electric motors

Two automobile giants are joining forces. EMotive, a 50/50 joint venture of Daimler and Robert Bosch, will start producing electric motors in early 2012, and they will be installed in Mercedes Benz and Smart electric vehicles the same year. The motors will premiere in the new-generation Smart fortwo electric drive

model scheduled to roll out next spring. "Electric motors are a key component of our electric vehicles, just as important as the lithium-ion batteries," explains Herbert Kohler, Director of eDrive & Future Mobility R&D and Environment Manager at Daimler. "This makes it that much more important to keep this expertise

inside Germany." Robert Bosch is the perfect partner for Daimler in this endeavor. The joint venture's electric motors are particularly noteworthy for their modularity, which allows them to be used in a broad range of vehicles.



A joint venture with Daimler AG will produce electric motors in the future.

Source: Bosch

ePower on the move

Fraunhofer IISB develops a highly integrated electric drive train

The global race to conquer future electromobility markets creates plenty of work for car makers and their suppliers. Innovative drive systems and battery development are decisive factors in this area. The list of requirements for electric drives is long: they must be efficient, compact, robust, reliable, and ideally they should be highly integrated. Their manufacture should also use a minimum of raw materials and be cost effective.

The Fraunhofer Institute for Integrated Systems and Component Technology (IISB) has been carrying out pioneering work and setting benchmarks in systems integration development for nearly a decade.

Now, as part of their Applied Electromobility project, Fraunhofer researchers have developed an electric individual-wheel drive axle that can be installed in buses, utility vehicles, passenger cars and sports cars. In this integrated drive axle, two mechanically independent electric motors and transmissions are mounted on a single axle. "Torque can be adjusted separately for each wheel," says Fraunhofer IISB engineer Maximilian Hofmann, "which allows additional dynamic functions that leave traditional electronic stability programs (ESPs) in the dust."

Both motors and the power electronics are cooled by a shared cooling system. "This saves

on components, space and costs," says Hofmann.

The fully integrated drive electronics also allow considerable improvement of electromagnetic compatibility (EMC), which minimizes potential interference to other electronic systems from the drive system.

Another advantage of the highly integrated system is that the components are better protected against impact, vibration and spray.

All this could help German manufacturers compete in the global race for a share of the future electromobility market.

NEW: Energy Storage expertise center

Concentrated battery power at MobiliTec 2012

A mass market for electric vehicles is not possible without further improvements in battery technology. Nearly all experts share this view, which is why players in nearly every discipline agree that new, more powerful and more efficient batteries are needed to make electric vehicles a viable future option.

The MobiliTec trade show puts battery technology center-stage in tribute to its central importance for electromobility. The Energy Storage expertise center at MobiliTec draws attention to the high-tech output of researchers, developers and manufacturers in the broad field of energy storage technologies, starting in 2012 in Hall 25. The new expertise center will occupy a total of 800 square meters for its premiere in April 2012.

“Exhibiting battery technology across the production cycle is an important contribution for MobiliTec because energy storage is a key parameter for electromobility,” says Basilio Triantafillos, project manager of the new exper-

tise center. “MobiliTec has always presented itself as a flagship show for everything related to electromobility, so the Energy Storage expertise center represents a key thematic addition.” HANNOVER MESSE aims to show the production processes involved in storage, in order to give visitors an overview of the entire electromobility system.

The Energy Storage expertise center focuses attention on batteries, including their raw materials, manufacturing of cells and modules, and battery pack installation. Another important facet is how batteries are integrated into vehicles.

MobiliTec therefore seeks to tighten the connection between battery engineering players and electric vehicle manufacturers, whether for two- or four-wheelers, small or large models. For many insiders, linking these two industry segments is crucial to progressing rapidly towards cost-effective, affordable, market-ready electric vehicles.



The Energy Storage Competence Center will be added to the MobiliTec portfolio starting with HANNOVER MESSE 2012.

New chemical mobilizes hydrogen

Chemists in Erlangen are researching a new storage medium for hydrogen, and raising hopes for a future new type of fuel cell

Carbazole? “What’s that?” would be the most common reaction from the average person. And yet, this is the term that’s sparking mobility fantasies these days. This liquid with the full name n-ethyl carbazole was patented in 2004, awakening hopes of hydrogen drive systems that could become a safe and affordable mobility alternative.

Dr. Peter Wasserscheid, a professor of chemical engineering in Erlangen and a leading carbazole expert, explains the concept: hydrogen can be stored with relative ease in a tank containing this highly volatile chemical and

released to the fuel cell during operation. The trick here is that, unlike diesel or gasoline, the carbazole is not consumed but instead can be recharged repeatedly with new hydrogen. “A tank with around 100 liters of carbazole can hold enough hydrogen to run for 500 kilometers,” says Wasserscheid. Recharging the liquid is not a problem because it involves a hydrogenation reaction that takes place at relatively low pressure and a temperature of 200 to 250 degrees Celsius. Another positive feature of the hydrogen drive system is that filling the tank will hardly change at all from the driver’s perspective. The existing filling station infrastructure could continue to be used, supplied with hydrogen generated using green electricity. Only the shape of the pump handle would need to change.

While some people, including German State Secretary for Transportation Rainer Bomba, are already raving about the “miracle fuel,” research and engineering implementation are still in the early stages. However, the details that remain to be sorted out don’t deter Wasserscheid from his carbazole dream, in which he also sees long-term potential for optimizing storage. Vehicle manufacturers are taking a wait-and-see attitude for the time being, afraid of running into major problems in practice, which might include disposal of the waste chemicals. For now, interested parties should keep an eye on future carbazole developments from Prof. Wasserscheid’s research team to see what the next wave of excitement will be riding on.



Carbazole: A new type of fuel could make batteries obsolete as an energy source – and help the fuel cell leverage.

Your Contact

Basilios Triantafillos
Project Manager
Tel. +49 511 89-31156
Fax +49 511 89-31148
basilios.triantafillos@messe.de



Deutsche Messe

Hannover · Germany

**Deutsche Messe
Messegelände
30521 Hannover
Germany**

Tel. +49 511 89-0
Fax +49 511 89-32626
info@messe.de
www.messe.de

IMPRINT:

Published by Deutsche Messe
30521 Hannover, Germany
Photos: Deutsche Messe
Design: Gebertshan Satz und Repro GmbH
Text reproduction authorized on condition that the source is indicated; courtesy copies requested.