Press Information

DETROIT 2016

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SCHAEFFLER

CONTENTS

03 **Schaeffler in Detroit**
Mobility for tomorrow
Global mobility needs are changing
Detroit Highlight: Glass Car

10 **System expertise**
Total system solutions
Electrification of the drivetrain
Motorsports: Formula E
Actuators: Power on demand

22 **About Schaeffler**

SCHAEFFLER AT THE NORTH AMERICAN INTERNATIONAL AUTO SHOW 2016

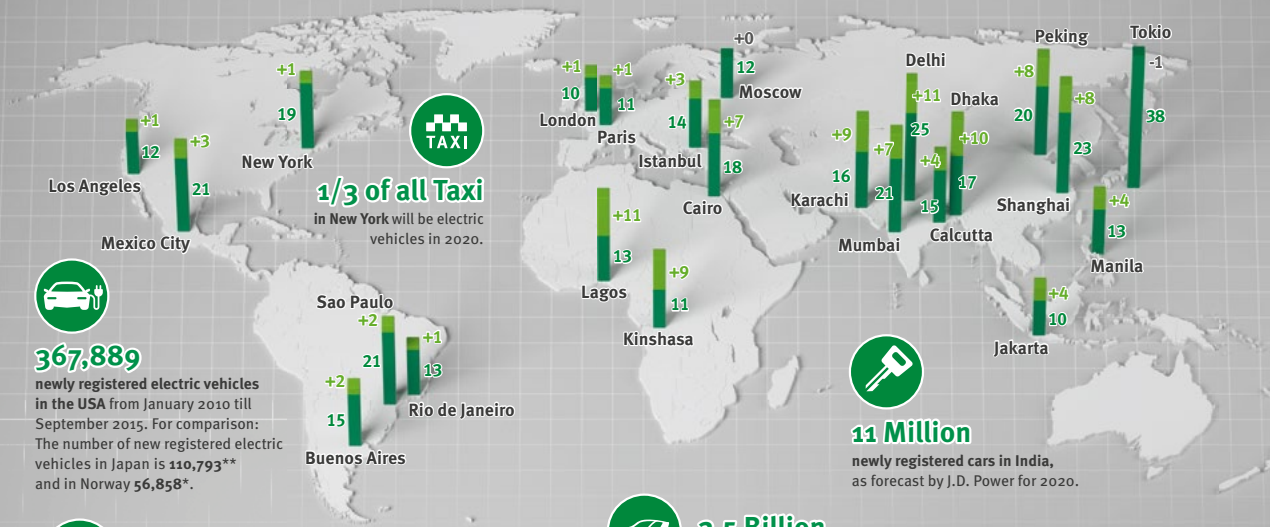
Systems expertise down to the last detail

Detroit, January 11, 2016

THE FUTURE OF THE AUTOMOBILE will be determined by increases in efficiency and progressive electrification of the drivetrain, as well as changing patterns of mobility and continuous digitalization. This paradigm shift in automotive engineering is increasing both the complexity and demands of a holistic, systemic way of thinking. As an internationally renowned supplier and development partner, Schaeffler understands these global challenges and is presenting products and solutions for **"MOBILITY FOR TOMORROW"** at the North American International Auto Show (NAIAS).

Global mobility needs are changing

Development of megacities from 2014 until 2030.



7 Million

charging stations for electric vehicles in europe 2030.
Total count 2013: **12,000**.

367,889

newly registered electric vehicles in the USA from January 2010 till September 2015. For comparison: The number of new registered electric vehicles in Japan is **110,793**** and in Norway **56,858***.

11 Million

newly registered cars in India, as forecast by J.D. Power for 2020.

228,513 km

stretches the USA rail network and is therefore the world's longest. The three countries following in the rankings – Russia, China and India have a combined length of 215,505 km.

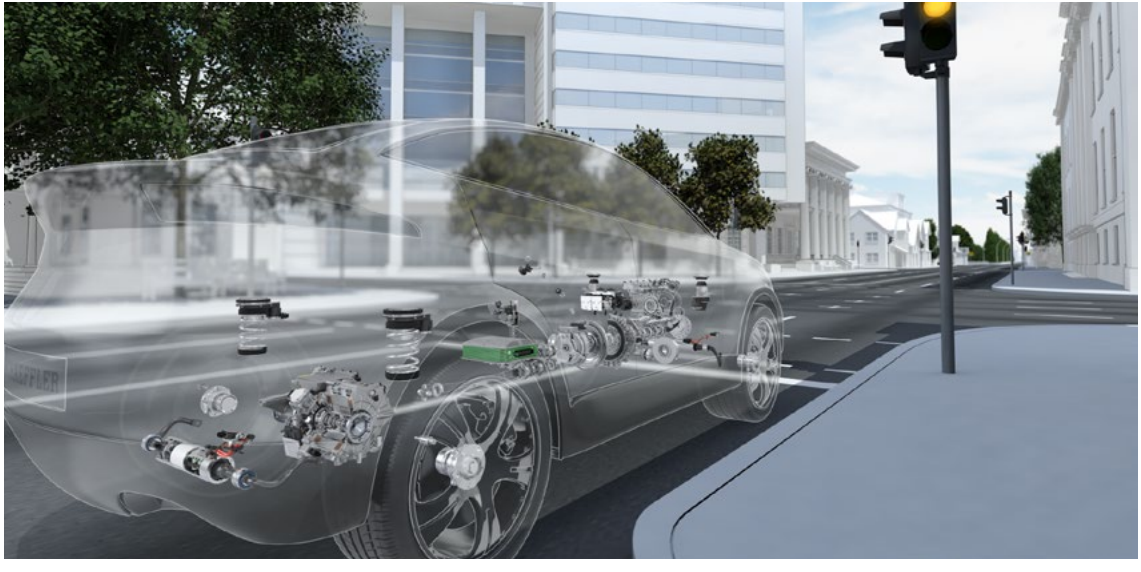
2.5 Billion

cars worldwide in 2050, as forecast by Shell – there are currently around 900 million cars.

Inhabitants 2014 (in millions) **Forecast of inhabitants 2030 (in millions)**

* till August 2015, ** till June 2015

Source: United Nations Department of Economic and Social Affairs, World Urbanization Prospects: The 2014 Revision



SCHAEFFLER'S SYSTEMS EXPERTISE is based on a comprehensive product portfolio that comprises precision components and systems for engine, transmission, chassis and electric mobility applications. The main focus is, as ever, the increasing worldwide demand for reductions in CO_2 emissions and fuel consumption, whilst not losing sight of the diverse global demands for customized drive solutions. To help meet these challenges the company is increasing its research and development capacity.

The highlight at Schaeffler's NAIAS exhibit is the **"GLASS CAR"**, a scale model packed full of around 40 Schaeffler products and technological developments. The model is brought to life by a movable screen which acts as an x-ray scanner and explains all the drivetrain components throughout the vehicle.



On the road to optimum total system solutions



Electromechanical camshaft phasing unit



Uni Air

Transmissions will have an important part to play in the future of the engine and the overall efficiency of the drivetrain. Continuous increases in efficiency and high levels of electrification will define the technological path of the drive architecture. A key to success is the **INTERDISCIPLINARY DEVELOPMENTAL WORK** at Schaeffler, where expertise from different specialist areas is brought together. The internal combustion engine, the electrical components and the transmission are considered as a single item in order to develop solutions together. This is one of Schaeffler's major strengths on the road to optimum total system solutions for the automotive industry.

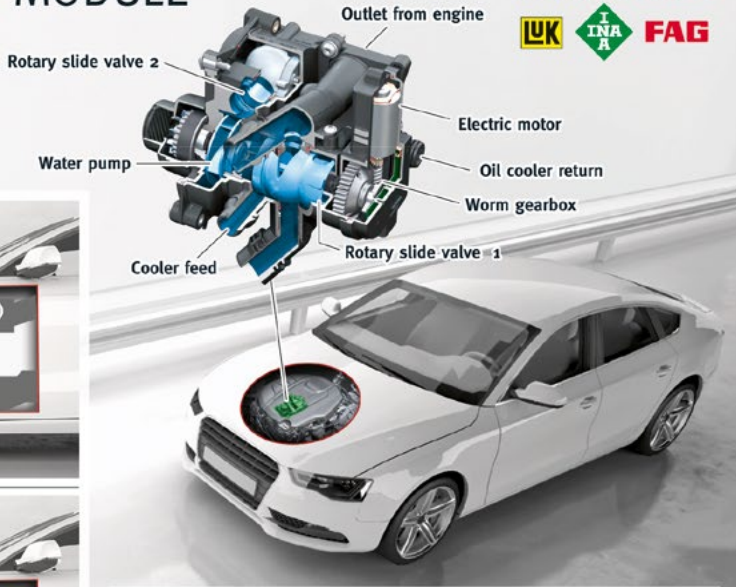
Optimizing the internal combustion engine is a particular point of focus. A key element here is the thermal management module. It controls the temperature balance and allows the ideal temperature window for the engine and the transmission to be reached rapidly. This innovative and individually adaptable module is key to reducing both fuel consumption and CO_2 emissions, and will be an important topic for the North American market in the coming years. Another approach is replacing hydraulic systems with electromechanical systems. Schaeffler's **ELECTROMECHANICAL CAMSHAFT PHASING UNITS** adjust valve drives more quickly and accurately to the engine's current operating conditions. This innovative technology reduces consumption and emissions, and increases comfort during start-stop operation. The fully variable electro-hydraulic valve train system **UNI AIR** from Schaeffler selectively controls the intake valves on each cylinder as required. This system has already achieved sales of over one million units in the United States and over two million will be sold globally in 2016.

THERMAL MANAGEMENT MODULE

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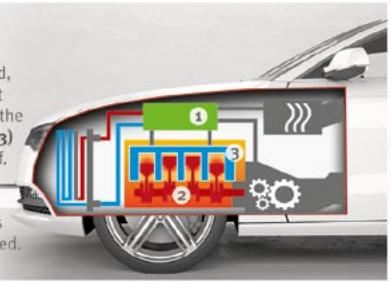
Schaeffler's thermal management module uses sensor-controlled rotary slide valves to precisely regulate the temperature balance in the vehicle's drive train and allows the ideal temperature window for the engine and the transmission to be reached rapidly. This has an effect on both the energy efficiency and the life of the drive train's components.



What is regulated?

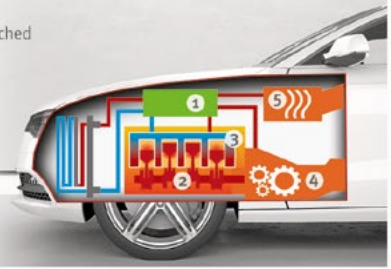
The cold running phase

After the engine is started, the thermal management module **(1)** ensures that the engine's cooling jacket **(3)** is completely blocked off. The engine **(2)** heats up substantially faster and the cold running phase is thus significantly shortened.



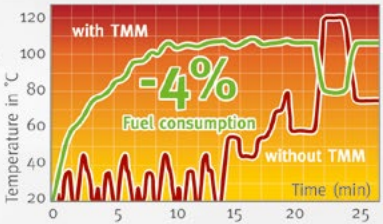
The warm-up phase

When the engine has reached its optimum operating temperature, the thermal management module **(1)** opens the water circuit and uses the available heat to regulate the temperature of the engine, transmission **(4)**, heating system **(5)**, and other system components.



Engine temperature

The thermal management module allows the optimum operating temperature of internal combustion engines to be reached in the shortest possible time. Fuel consumption and CO_2 emissions are reduced by up to four percent.



Graphic: www.josekdesign.de

One thing is obvious – transmissions are key in reducing consumption and emissions. Modern transmissions allow an engine's operation to be maintained at an optimum point by means of an increasing number of up to 10 gears. Innovative damping concepts reduce vibrations and lower speeds to a point of optimum consumption. A number of new transmissions have been developed in recent years and brought into volume production. Through its innovative components and systems, Schaeffler is pushing forward the development of all designs and concepts towards more driving comfort, lower consumption and more space.

Schaeffler's modern transmission technologies have a decisive role to play on the road to optimum total systems solutions.



Torque converter with centrifugal pendulum-type absorbers

Solutions for electrification of the drivetrain

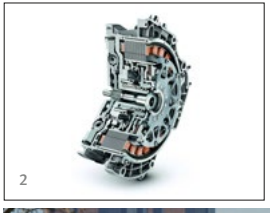
An increase in the number of hybrid and electric vehicles on the road is absolutely essential if stated emissions targets are to be achieved. The need for drivetrain electrification solutions will also increase in North America. Schaeffler offers a range of products and technologies for every aspect of efficient **ELECTRIFICATION OF THE DRIVETRAIN**. Schaeffler, with its expertise and experience in electric mobility and a correspondingly broad product portfolio, is the perfect partner for these future challenges. From hybrid modules and the electric axle through to wheel hub drives, Schaeffler's products can be integrated into hybrid or fully electric vehicles.

Schaeffler's **48-VOLT HYBRID MODULE** provides the step up to hybridization, offering financially attractive potential in CO_2 reductions. Schaeffler's P2 high-voltage hybrid module provides a drivetrain electrification solution that can be matched to a large number of drive concepts on a modular basis. With its high versatility and wide torque range, the P2 hybrid module can be used in both medium and

high performance transmission concepts, and can make a considerable contribution to reductions in consumption and emissions in fleet vehicles. Schaeffler has developed a variation of the P2 hybrid module for the North American market with an integrated torque converter. The mobility supplier is combining its expertise in the fields of torque converters and hybrid modules. The two-speed E-axle combines a completely electric drive with the option of wheel-selective drive power control. A single-speed variant is also possible due to Schaeffler's modular design. It's compact design frees up important space for other hybrid components and also has an integral light-weight differential with face spline.



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1 **Two-speed E-axle**
2 **P2 hybrid module**
3 **E-Wheel-Drive**
4 **Efficient Future Mobility North America**

Schaeffler provides electric drivetrain for the German Formula E team

As the exclusive technology partner to the ABT Schaeffler Audi Sport team, Schaeffler has designed the engine and transmission for the racing car's drivetrain. The new car started season two of the FIA Formula E Championship on October 24, 2015 with the specially designed solution. Drivers Daniel Abt (22) and Lucas di Grassi (31) are up against international competition in the fight for the world championship title. The ABT Schaeffler team's goal is victory and a leading role in the title race. The first three races were in China, Malaysia and Uruguay and the next two are in Argentina and Mexico. Formula E will come to the United States on April 2 in Los Angeles.



Power on demand: Actuators for the mobility of the future

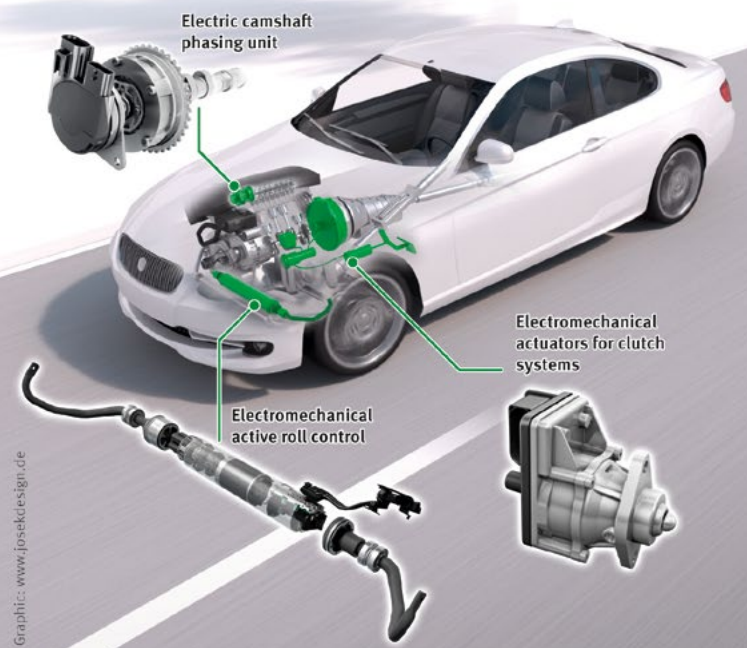
Schaeffler's expertise as a supplier of actuators to the automotive market is impressively demonstrated in the company's electromechanical camshaft phasing unit, its "E-Clutch" automated clutch and electromechanical active roll control. Power on demand is a key phrase; and electromechanical systems in the drivetrain and chassis contribute to reductions in consumption and emissions. They allow new automated functions to be implemented, such as a quicker and more accurate adjustment of the camshaft to the prevailing engine operating conditions. The E-Clutch also allows fuel-saving driving strategies, such as "sailing" and electrically supported driving, to be integrated into vehicles with manual transmissions. Compared to hydraulic systems, electromechanical solutions use less energy and use power only when needed. The first electromechanical active roll control from Schaeffler, which represents a new phase in chassis technology, demonstrates this well.

SIMPLY MORE EFFICIENT – POWER ON DEMAND

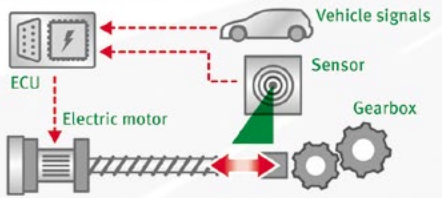
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In the drive trains and chassis of vehicles, mechatronic systems are increasingly performing the functions, which were previously implemented by purely mechanical or hydraulic means. Electromechanical components can reduce fuel consumption and emissions because they only require energy when they carry out their functions. In addition, they enable the implementation of new functions and can contribute to a significant increase in dynamics.

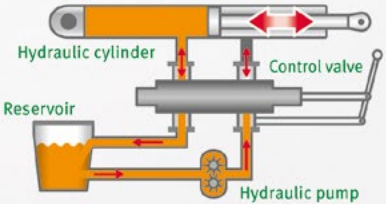


Function of electric systems



In electromechanical systems, an electric motor operating as an actuator is responsible for controlling the functions. Electric power is only consumed if the required function is performed.

Function of hydraulic systems



In hydraulic systems, pressure regulating valves are responsible for controlling the functions. This not only results in control losses, the hydraulic pump must also provide the required working pressure at all times.

Graphic: www.josekdesign.de

About Schaeffler

The Schaeffler Group is a leading global integrated automotive and industrial supplier. The company stands for the highest quality, outstanding technology, and strong innovative ability. The Schaeffler Group makes a key contribution to **"MOBILITY FOR TOMORROW"** with high-precision components and systems in engine, transmission, and chassis applications as well as rolling and plain bearing solutions for a large number of industrial applications. The technology company generated sales of approximately EUR 12.1 billion in 2014. With around 84,000 employees, Schaeffler is one of the world's largest family companies and, with approximately 170 locations in 50 countries, has a worldwide network of manufacturing locations, research and development facilities, and sales companies.


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