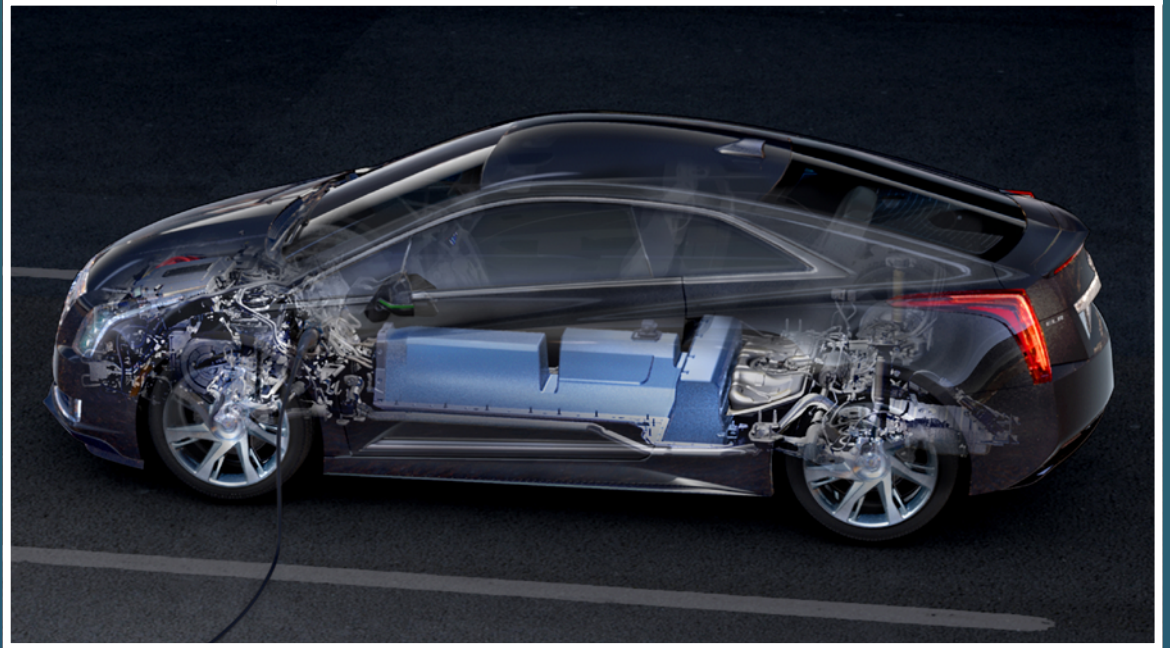
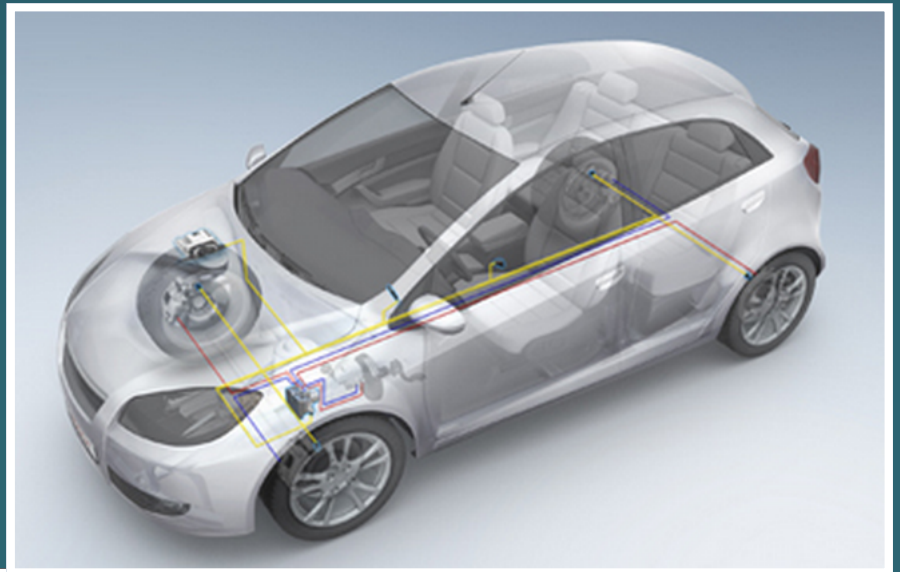


RESEARCH REPORT  
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# The Global Chassis Sector Report

AN ANALYSIS OF THE BRAKING, STEERING AND SUSPENSION MARKETS



JUNE 2015  
BY DAVID SADDINGTON



**ABOUT**  
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and performance requirements and test protocols for replacement braking components for road going motor vehicles and trailers. ECE R90 will apply to passenger vehicles from November 2016 and the regulation is likely to favour aftermarket OEM brake manufacturers who can afford the significant additional cost of testing.

## 2.2 STEERING

The growth in installation rates of electric power assisted steering (EPAS) has been rapid with a swift and decisive replacement of hydraulic power steering as the dominant technology within the past 10 years. In 2005 hydraulic steering claimed a 56.3% share of the global steering market compared to 25.8% claimed by EPAS. By 2014 those figures had almost reversed, with EPAS holding 67.8% of the global market compared to just 24.8% with hydraulic. The share held by unassisted and electro-hydraulic steering also lost out to EPAS, falling from 17.9% in 2005 to just 7.4% by 2014.

Looking forward to 2022, we will see EPAS continue to increase its market share. In the tough environment created by the tightening emissions targets manufacturers are scrambling to meet, EPAS's contribution to fuel consumption savings of up to 6% plays a large part in its popularity. Another huge contributing factor is its relative low cost, and lower costs over the life of the vehicle, which also reduce warranty claims and leads to large overall cost savings to OEMs.

Through the 2000s, EPAS's mainstream acceptance was held back by issues, including concerns around lack of steering 'feel' compared to hydraulic systems, which made EPAS unpopular with many drivers. However, improvements in software control technology have largely solved this problem, and in the last few years we have seen even manufacturers of traditional 'drivers' cars', including Audi and BMW roll out EPAS across their ranges. By 2022, we anticipate that EPAS will be fitted to around 86% of the world's new light passenger vehicles.

Full steer-by-wire systems came to market in the 2013 Infiniti Q50, which featured a 'fail-operational' redundant steering column, which is engaged automatically in the event of power failure. The acceptance and success of the Q50 will no doubt be closely monitored by other OEMs. However limited forms of autonomous vehicle control are also available from Mercedes-Benz and Audi. The 2014 Mercedes-Benz S-Class equipped with Intelligent Drive option of traffic-jam assist, allows the car to steer, brake and accelerate itself at speeds lower than 37 mph. Available first on the S-class sedan as a \$2,800 option, Intelligent Drive is also offered on the re-engineered 2014 E-class lineup. Currently the take-up rate for Intelligent Drive on the S-class sedan is 50%. It falls to 15% for the E class. Audi has said it will have a traffic-jam function on the redesigned A8 flagship, due in 2017. Mercedes-Benz, General Motors, Nissan, Google and Volvo all have said they will have a self-driving car on the road by 2020.



# 3

## KEY MARKET DRIVERS

### 3.1 CO<sub>2</sub> REGULATION DRIVING CHANGE

Today, CO<sub>2</sub> emissions targets are the single most significant factor that is driving change in all aspects of the automotive industry. It is fuelling a revolution in engine technology with internal combustion engine (ICE) downsizing and optimising, and adding urgency to increasing levels of vehicle electrification. The increased trend particularly in Europe and China for SUV ownership has brought a counter-intuitive effect in terms of CO<sub>2</sub> emissions due to their relatively larger mass. As a result there has been a strong emphasis on reducing vehicle weight with implications for all systems and their associated components.

### 3.2 CO<sub>2</sub> LEGISLATION IN THE MAJOR VEHICLE MARKETS

#### 3.2.1 Europe

TABLE 1 Current EU emission standards for passenger cars (ECE + EUDC chassis dynamometer test)

Standard	Introduced	Grams per kilometre (g/km)					
		CO	HC	HC+NOx	NOx	PM	PN
<b>PETROL</b>							
<b>Euro 1</b>	Jul-1992	2.72	–	0.97	–	–	–
<b>Euro 2</b>	Jan-1996	2.20	–	0.50	–	–	–
<b>Euro 3</b>	Jan-2000	2.30	0.2	–	0.15	–	–
<b>Euro 4</b>	Jan-2005	1.00	0.1	–	0.08	–	–
<b>Euro 5</b>	Sep-2009 (a)	1.00	0.1(b)	–	0.06	0.005(c)(d)	–
<b>Euro 6</b>	Sep-2014	1.00	0.1(b)	–	0.06	0.0045(c)(d)	6×10 <sup>11</sup> (c)
<b>DIESEL</b>							
<b>Euro 1</b>	Jul-1992	2.72	–	0.97	–	0.140	–
<b>Euro 2, IDI</b>	Jan-1996	1.00	–	0.70	–	0.080	–
<b>Euro 2, DI</b>	Jan-1996(e)	1.00	–	0.90	–	0.100	–
<b>Euro 3</b>	Jan-2000	0.64	–	0.56	0.50	0.050	–
<b>Euro 4</b>	Jan-2005	0.50	–	0.30	0.25	0.025	–
<b>Euro 5a</b>	Sep-2009(a)	0.50	–	0.23	0.18	0.005(d)	–
<b>Euro 5b</b>	Sep-2011	0.50	–	0.23	0.18	0.0045(d)	6×10 <sup>11</sup>
<b>Euro 6</b>	Sep-2014	0.50	–	0.17	0.08	0.0045(d)	6×10 <sup>11</sup>

\* Category M1 vehicles. For Euro 1 to 4 vehicles greater than 2,500kg were type approved as Category N1 vehicles

(a) Sept 2010 for all M and N vehicle weight categories

(b) NMHC limit = 0.068 g/km

(c) Applicable only to vehicles with DI engines

(d) 0.0045 g/km using the PMP measurement procedure

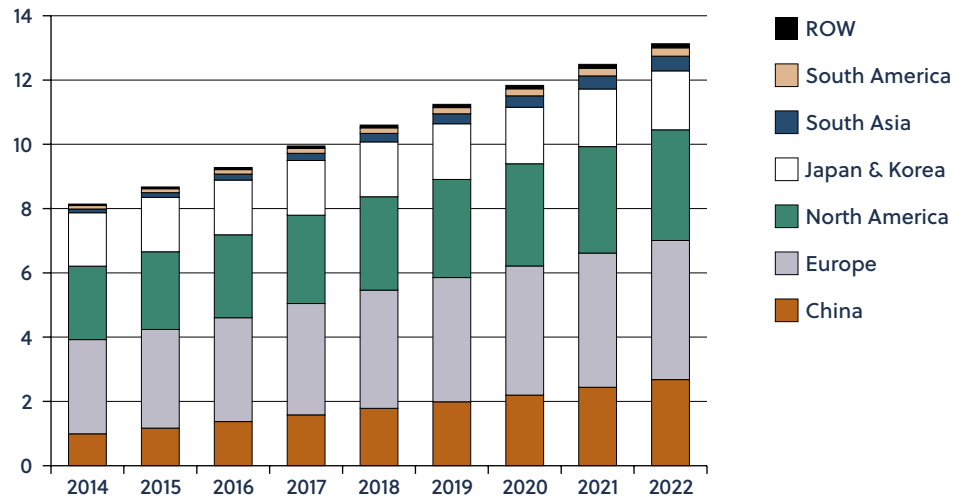
(e) After 30th Sept 1999 vehicles with DI engines had to meet the IDI limits

Source: ICCT

## 5.7 OUTLOOK AND FORECAST TO 2022

### 5.7.1 Springs and dampers

FIGURE 20 Global active suspension demand (million units), 2014–2022



Source: ABOUT Automotive

TABLE 11 Active & semi-active suspension demand (thousand units), 2014–2022

	2014	2015	2016	2017	2018	2019	2020	2021	2022
China	989	1,171	1,372	1,578	1,784	1,995	2,205	2,416	2,626
Europe	2,935	3,065	3,195	3,466	3,680	3,895	4,110	4,325	4,540
North America	2,287	2,417	2,547	2,757	2,967	3,177	3,387	3,597	3,807
Japan & Korea	1,657	1,787	1,917	1,657	1,707	1,757	1,807	1,857	1,907
South Asia	117	127	137	147	157	167	177	187	197
South America	107	117	127	137	147	157	167	177	187
ROW	87	97	107	117	127	137	147	157	167
<b>Total</b>	<b>8,170</b>	<b>8,676</b>	<b>9,276</b>	<b>9,947</b>	<b>10,599</b>	<b>11,242</b>	<b>11,835</b>	<b>12,487</b>	<b>13,131</b>

Source: ABOUT Automotive

Despite advancements in active and semi-active suspension systems over the past ten years, the fundamental challenge for manufacturers remains balancing the level of safety, comfort, and performance the customer expects, with the price they are willing to pay. While active suspension has been on the agenda of vehicle manufacturers for a long time now, complexity and costs have limited the uptake of more advanced active suspension systems beyond the luxury/performance end of the market. Likewise energy demand has proved a barrier while mainstream vehicles operate with 12V circuits.

What we are seeing at the moment is that sensors developed for other vehicle features are reducing the potential costs of introducing active suspension technologies, at the same time that simpler systems are slowly beginning to

# The Global Chassis Sector Report

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Concise profiles for each of the following chassis sector suppliers are included within the report:

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- China Automotive Systems
- Continental Automotive
- JTEKT
- KYB Corporation
- Nexteer
- Magneti Marelli
- Mando Corporation
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