

Global market review of electronic braking systems – forecasts to 2013

2008 edition



Just-auto

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2008 edition

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Glossary

Baffling terms such as APB, AYC, BAS, EBD, EMD, EBA and TCS bounce back and forth in brake engineering circles. But it is a foreign language to many. This section translates those terms into plain English. Further definitions are provided later in the report.

| | |
|------|--------------------------------------|
| ABS: | Anti-Lock Braking System |
| APB: | Active Parking Brake |
| ARP: | Active Rollover Protection |
| ASC: | Anti-Slip Control |
| ASR: | Anti-Skid control |
| AYC: | Active Yaw Moment Compensation |
| BAS: | Brake Assist System |
| CA: | Collision Avoidance |
| CBC: | Cornering Brake Control |
| DBC: | Delphi Brake Control |
| EBA: | Electronic Brake Apportioning |
| EBD: | Electronic Brake Force Distribution |
| EBS: | Electronic Braking System |
| ECU: | Electronic Control Unit |
| EDC: | Engine Drag Torque Control |
| EHB: | Electro-Hydraulic Brake |
| EMB: | Electro-Mechanic Brake |
| EPB: | Electric Parking Brake |
| ESC: | Electronic Stability Control |
| ESP: | Electronic Stability Programme |
| HA: | Hill Assist |
| HDC: | Hill Descent Control |
| MSR: | Engine Drag-Torque Control |
| SBC: | Sensotronic Brake Control |
| SCS: | Stop Control System |
| TCS: | Traction Control System |
| TC: | Engine and/or Brake Traction Control |
| VDC: | Vehicle Dynamics Control |
| VSA: | Vehicle Stability Assist |
| YRC: | Yaw Ratio Controller |

Preface

Research methodology

This report is intended to provide an overview of electronic braking systems, providing top-level market fitment, volume and value forecasts through 2013. Our forecasts are not extrapolative but dependent on the underlying drivers of supply and demand. Our forecasts are largely based on interviews with the author's extensive international network of industry contacts. This allows us to consider and explain the meaning and implications of industry events, rather than offer simple description based on incomplete data.

Our approach is divided into two distinct methodologies:

- qualitative interviews – these are generally opinion-based, which aim to build knowledge about future braking system market trends and company strategies; and
- quantitative interviews – typically fact-based, focused on establishing market values, shares, and volumes.

Report coverage

In this, the fourth edition of this report, just-auto reviews the key market drivers for electronic braking systems, and updates the market analysis. Following our market overview in Chapter 1, just-auto's product fitment forecasts in Chapter 2 predict the market (by volume and value) worldwide (and by major car-producing region) for electronic braking systems. Chapter 3 sets out a review of recent innovations in this arena while Chapter 4 provides brief profiles of the major manufacturers, namely Advics, Bosch, Continental Automotive Systems, Delphi and TRW.

The author

Since 2000, Matthew Beecham has served as an associate editor for just-auto. He authors a range of global auto components' market research reviews, including batteries, braking systems, coatings, clutches, cockpits, driver assistance systems, door modules, electric motors, engine cooling systems, exhaust systems, front-end modules, fuel injection, fuel tanks, glass, ignitions, interiors, lighting, mirrors, roof systems, shock absorbers, spark plugs, rotating

electrics, tyre pressure monitoring systems, tyres, wheels and wipers. Matthew has also written a number of features for magazines including *Car Graphic* (Japan), *JAMA* (Japan) and *Automotive Engineer* (UK). He earned his PhD in automotive technology transfer at Cranfield University.

Chapter 1 Introduction

Brake control systems offer assistance to the driver by controlling the brake pressure on each individual wheel in critical situations. The vehicle remains controllable and follows the steering intentions of the driver. Anti-lock braking systems (ABS) prevent the wheels from locking during braking. As a result, the car can be steered even with the brake pedal fully depressed, allowing the driver to avoid obstacles. The traction control system (TCS) prevents the wheels from losing traction when starting off accelerating on snow, ice and wet roads. The electronic stability programme (ESP) combines the ABS and TCS functions and also works to prevent the vehicle from skidding. If the system detects that the vehicle is about to skid, it reduces the engine output and specifically brakes individual wheels resulting in the vehicle remaining on the desired course. Anti-lock brakes are already compulsory in the EU and, in contrast, the US government has already introduced legislation that will require all vehicles with a weight of under x tonnes to be offered with ESP. From September 2011, it should be fitted as standard in the European Union member countries. ESP uses ABS as its technical base, with yaw rate and steering angle sensors also fitted to the vehicle.

Chapter 2 The market

Market trends

While ABS prevents the wheels from locking during braking, and traction control stops the wheels from spinning on acceleration, ESP goes one step beyond the functions of both these systems. In addition, it reduces the risk of skidding in all traffic situations.

Ever since the first ESP system appeared on a Mercedes-Benz model in 1995, braking system manufacturers have been predicting significant demand, as appreciation of ESP among drivers of the middle and lower segments of the car market grows. Although ESP is already standard equipment on many luxury cars, an increasing number of mid-range and small cars are being fitted with the unit as an optional fitment.

“When ABS was introduced, it was only fitted as optional equipment on high-end luxury models,” said Herbert Hemming, executive vice president of the Bosch Chassis Systems Control division. *“Now it is standard across all new vehicles within the EU and in many parts of the world. ABS has made braking safer, and has therefore made a major contribution to reducing accidents.”* When Bosch produced the first ever ABS in 1978, it weighed in at just over xkg per wheel. Today, Bosch offers ABS units weighing xxxkg. The latest ABS technology also operates considerably faster and offers greater levels of safety.

In September 2006, the US National Highway Traffic Safety Administration (NHTSA) released a proposal that will require electronic stability control (ESC¹) to be standard equipment on all light vehicles sold in the US. The NHTSA has apparently been keen to legislate in favour of ESC for some time, particularly on SUVs. There was some discussion about ESC following the Ford Explorer tyre failure and rollover problems at the beginning of the decade. According to a Notice of Proposed Rulemaking published on 14 September 2006, all light vehicles in the US with a gross weight of up to xxx metric tonnes are to be equipped with this active safety system, a requirement that will be phased in gradually from the 2009 model year up to the 2012 model year. This would

¹ ESP (electronic stability programme) is referred to as ESC (electronic stability control) in the US.

Chapter 3 Technical review

Defining the elements

Demands for more performance with minimal cost or weight penalties are pressurising brake system designers to come up with new ideas. Although advances in friction materials and calliper designs have helped improve braking performance, the main improvements in braking in recent years have come from electronic control: firstly ABS (anti-lock braking system) and then EBA (emergency braking assistance). According to the VDA, the best technology for reducing braking distances is EBA. It identifies hazardous situations through the driver's reactions and generates full braking pressure in a fraction of a second. The system uses electronic sensors that detect the need for full brake application from the speed at which the brake pedal is pressed down. The VDA says that tests have established that xx% of all accidents involving pedestrians – accidents in which the driver applied the brakes – could have been avoided if the vehicle had been equipped with a brake assistant.

The key international regulations for the testing and approval of brake systems on road vehicles are ECE (Economic Commission for Europe) Regulations (ECE-R) xx and xxH. Regulation xxH was prepared during the 1980s based on opinions from industry experts based in Europe, US and Japan. According to the VDA, although it incorporated the previously-valid US FMVSS (Federal Motor Vehicle Safety Standards) 105 and ECE-R xx into a harmonised regulation for passenger car brakes, the measuring procedures were largely brought into line. In line with this, the US introduced FMVSS xxx, which enabled the manufacture of brake systems complying with both sets of Regulations. Japan signed the UN/ECE Agreement of 1958 and thus signed up to Regulation xxH, says the VDA. Today, only ECE-R xxH is used for approval of passenger car brake systems.

Recent innovations

Anti-lock braking system developments

ABS was the first slip control technology. The aim of ABS is to limit the pressure to any wheel which decelerates too rapidly, allowing maximum

Chapter 4 Manufacturers

Advics

Advics Co was formed in July 2001 by combining the brake operations of Denso, Aisin Seiki and Sumitomo Electric Industries in Japan to develop new brake technologies and modules. Each partner holds an equity stake; Aisin Seiki has xx%, Denso and Sumitomo each have xx% and Toyota holds the remaining xx%.

Based in Aisin's headquarters in Kariya in Aichi prefecture, Advics operates four technical centres in Japan (two in Kariya and one each in Hyogo and Fujioka-cho). In addition, the company operates a number of subsidiaries overseas, as follows:

- Advics North America Inc, Michigan, US: research and development and sale of automotive brake systems and components;
- Advics Manufacturing Ohio Inc: manufacture of automotive brake components;
- SAFA LLC, Georgia, US: manufacture of automotive brake components;
- Advics Asia Pacific Co Ltd, Thailand: sale of automotive brake systems and components, and also oversees Advics business operations in the Asia-Pacific region;
- PT Advics Indonesia: sale of automotive brake systems and components;
- Advics Tianjin Automobile Parts Co Ltd, Tianjin, China: manufacture and sale of automotive brake systems and components;
- Advics Guangzhou Automobile Parts Co Ltd, Guangzhou, China: manufacture and sale of automotive brake components, and sale of automotive brake systems;
- Advics Taiwan Automotive Parts Co Ltd, Taichung, Taiwan: research and development and sale of automotive brake systems and components.

Advics designs and produces ABS, stability control systems, brake boosters, master cylinders, disc brakes, drum brakes and other related components. Its brake customers in Japan include Toyota, Nissan, Mazda, Suzuki, Honda, Mitsubishi and Daihatsu.