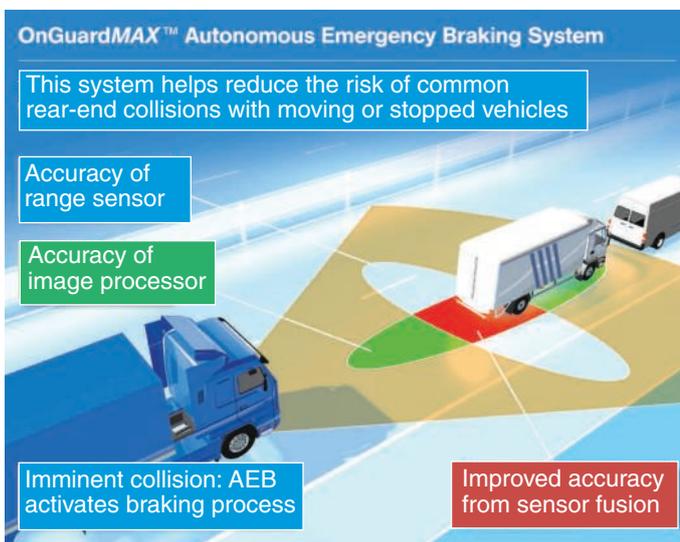


BRAKING WITH



At first glance, the big gains in heavy vehicle braking systems appear to have already been made. We saw the transition from drum to disc brakes in the 1990s, as ABS (anti-lock braking) became mandatory – introducing more control for the driver. That was followed by the transition to EBS (electronic braking systems), introducing electronically-controlled air brake valves.

ESC (electronic stability control) was the next step forward and we are now around half way through its legal implementation process, of which more later. Looking ahead, though, the next big thing will be AEB (autonomous or advanced emergency braking), which has enormous safety potential and also opens the door for further interaction with other systems – bringing further safety benefits. Just as ESC was a development of ABS, AEB draws on the possibilities that ESC will introduce.

So what's the timetable for implementation. The legislative programme for both ESC and AEB must be seen in the context of the European Union's vision of accident-free driving. Both systems can help drivers to maintain vehicle control where they might otherwise have lost it, and it is this potential to reduce very serious accidents that triggered the regulatory regime, which saw most new types of commercial vehicles (including buses and coaches), being required to fit ESC back in November 2011.

ESC is still not yet mandatory, however, on truck and bus models that were already in production at that time. That said, most new trucks will have to be fitted with ESC by 1 November this year. But there remain some exceptions for N2 category vehicles (between 3.5 and 12 tonnes gvwt). For those fitted with hydraulic brakes, ESC must be fitted to new vehicles by 11 July 2015. Those with air-over-hydraulic brakes will need to comply by 11 July 2016.

The timescale is different for buses and coaches. Most new large vehicles in category M3 will need to be fitted with ESC

TRADITION

Recent years have witnessed a transformation in braking technologies, application and associated legislation. But there is more to come, says John Kendall

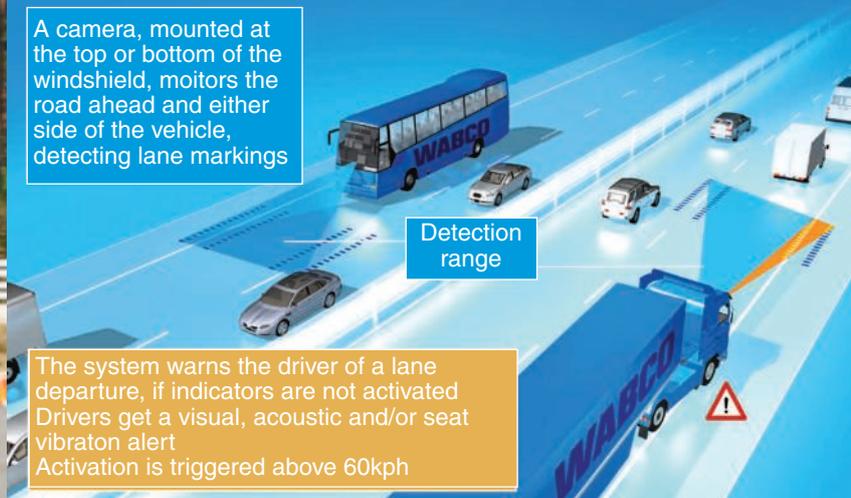


OnLane™: WABCO's Lane Departure Warning System

This technology helps prevent unintended lane changes, which are one of the most common causes of accidents

A camera, mounted at the top or bottom of the windshield, monitors the road ahead and either side of the vehicle, detecting lane markings

The system warns the driver of a lane departure, if indicators are not activated. Drivers get a visual, acoustic and/or seat vibrator alert. Activation is triggered above 60kph



by 1 November this year. But, as with trucks, there are variations for vehicles with hydraulic and air-over-hydraulic braking. M3 category vehicles with hydraulic brakes will need ESC by 11 July 2015, while those with air-over-hydraulic must comply by 11 July 2016. For lighter buses in category M2, which covers most 17-seat minibuses, ESC will be mandatory by 11 July 2015. In all cases, there is no requirement for retrofitting to older vehicles.

The legislative timetable for AEB systems is simpler – probably because AEB applied to unpressurised hydraulic systems and a mix of unpressurised hydraulic and pressurised air systems is less complex than ESC. Although the electronic development needed for AEB control systems is considerable, once developed it can be applied to existing ESC systems.

Regulatory roadmap

Neither M1 nor N1 category vehicles – passenger cars and light CVs below 3.5 tonnes gvw – are yet covered by the AEB legislation, although it is worth noting that the systems are either optional or standard on several passenger cars. Indeed, from this year, models tested by Euro-NCAP will not be eligible for a five-star rating unless AEB is included. Meanwhile, new types of M2, M3, N2 and N3 (covering most truck and bus models) had to be fitted with AEB from 1 November last year. All new vehicles must comply from 1 November next year.

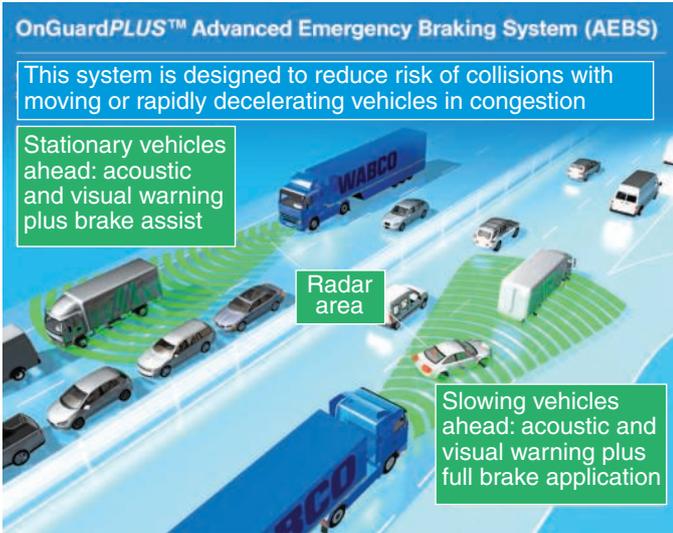
So what about the technologies? ESC is well established, having first appeared on cars in the mid 1990s. It is effectively

an extension of ABS, allowing braking force to be applied to individual wheels to help maintain control. The system also reduces engine power to remove a possible skid cause. An ECU (electronic control unit) gathers data from sensors around the vehicle to determine which wheel, or wheels, need to be braked and when power needs to be reduced. This could, for instance, be on ice or snow at relatively low speeds, or at higher speeds in normal conditions.

Arguably, it took the introduction of EBS for the full potential of ESC to be realised with air brake systems. EBS enabled faster response times for trailer brakes in particular, than was possible when the brake valves were actuated by air pressure alone. However, the system is more complicated for hydraulic systems, because braking individual wheels requires the system has to be pressurised – a state normally achieved by the driver pressing the brake pedal.

But Wabco chief technology officer Dr Christian Wiehen reckons that ESC development is far from over. "Today, we have the basic functionality and we are going to refine that. So what you can expect will be a smoother transition between normal brake control, ABS, and electronic stability control... ESC intervention will become less frequent and required to a lesser extent," he explains.

Next will come integration of additional sensors, he says, taking information from, for example, positioning systems, GPS and cameras, which will help predict the vehicle trajectory and its implications. "Today, we base [ESC activation] on the driver



input, because we only register steering angle. If you have an idea of the road ahead and the surrounding traffic, you can predict which trajectories are plausible and which are not.” However, he concedes that such enhancements are unlikely before 2020.

Wiehen also believes that when electronically controlled steering becomes available on commercial vehicles, there will be scope for communication between the two systems – further improving the effectiveness of each. “But there is still the challenge of considering the height of the centre of gravity,

when it comes to roll-over protection,” he continues. “We are all dealing with estimates and assumptions, but they are not as accurate as an algorithm based on sensor data.”

Autonomous braking

What about AEB? Its technology in some ways stems from ACC (adaptive cruise control), which senses the distance from the vehicle in front, usually using a combination of forward-seeking radar and a camera. AEB first alerts the driver, if the distance to the vehicle in its path is reducing, usually with an audible and visual warning in the cab. But whereas ACC systems were designed to slow the vehicle to match the speed of the vehicle ahead, AEB can apply full braking, if the driver fails to respond to the signals.

Why does this matter? According to a study by the International Road Transport Union (IRU) in 2007, one fifth of road accidents in Europe involving trucks resulted from a truck running into the back of another vehicle. That’s devastating when the other vehicle is a light car. While AEB systems may not eliminate all such accidents, the technology could greatly reduce their severity. “I would see the main advantage for AEB in drastically reducing the number of rear end collisions,” agrees Wiehen. Even so, it will be several years before most trucks on the road are suitably equipped.

In the meantime, he suggests doing your own thing, with GPS and cameras “as we are already implementing them as part of lane departure warning systems”. Seems there’s much that can be done while we await further developments with brake system hardware and controls. **TE**



IF ONLY YOU'D SEEN THE SIGNS

Uneven wear, reduced performance, product failure, more breakdowns, shorter vehicle service life and increased operating costs are all **signs of spurious products** being used on commercial vehicles.

For 100% safety and reliability always purchase genuine Knorr-Bremse parts. All of our products and manufacturing processes are certified and quality controlled to the highest European standards, guaranteeing complete customer satisfaction, every time.

MAKE SURE YOU SEE THE SIGNS.



For more information call
0117 984 6223 or email
sales@knorr-bremse.co.uk

KNORR-BREMSE



EFFICIENT. TECHNOLOGY. WORLDWIDE.