Brake by Wire (Part 1) – by: Greg Byrnes

In the first instalment of a three-part ARTSA series, Greg Byrnes, Engineering Manager at Air Brake Corporation of Australia, explains the history of electronic braking systems (EBS) and trailer electronic braking systems (TEBS) and how both systems function.

A brief history of EBS & TEBS

We live in an age where electronics permeate every aspect of our lives and braking is no different.

German brake specialists Wabco introduced the first viable commercial vehicle antilock brake system (ABS) using digital microprocessor control in the early 1980s and continued to develop ABS into the fifth generation incarnation now used by major truck and trailer manufacturers around the world.

Wabco also pioneered the world's first commercial vehicle electronic brake system (EBS), introduced on the Mercedes-Benz 'Actros' in 1996, followed in 1998 by the complementary trailer electronic braking system (TEBS) for trailers.

Uptake of this revolutionary technology in Europe was nothing short of phenomenal. Most new European heavy trucks and buses now feature EBS, while about half of all new trailers manufactured in EC countries are equipped with TEBS.

Legislation making ABS mandatory in the EC in the early 1990s helped the shift from ABS to EBS, as did air disc brakes coming of age at around the same time. As European trucks are so well represented in the Australian market, such a change in European vehicle technology would inevitably impact on the Australian vehicle environment.

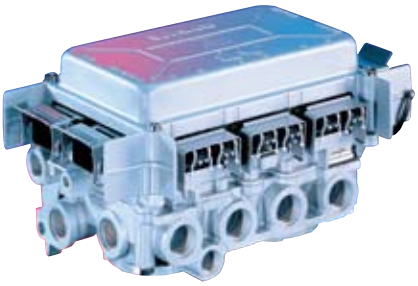
With disc brakes and EBS now almost standard on the biggest selling European truck in Australia, and many other makes following suit, Australian operators need to consider their trailing equipment specification very carefully.

What is EBS?

The energy for actuating EBS brakes is still provided by compressed air, but air pressure is controlled to deliver far more responsive, accurate and stable braking.

When the driver depresses the brake pedal of an EBS-equipped truck, stroke sensors in the treadle valve assembly (now called a 'brake signal transmitter') send a signal to a central electronic control unit (ECU). If the desired deceleration rate corresponding to the pedal travel can be achieved with engine brake or retarder alone, it engages the retarder via a communication link with the ECU. If not, it also triggers solenoid valve assemblies near the axles to admit air pressure into the brake actuators.

The familiar ABS wheel speed sensors in selected axles allow the ECU to continuously calculate the resulting deceleration rate and adjust the retarder and/or service brake air pressure until the desired deceleration is attained. Because the circuitous plumbing of the usual air control signal is displaced by an instantaneous electrical signal, brakes apply and release much faster.



In addition, because EBS reduces the hysteresis inherent in conventional pneumatic systems and foundation brake mechanisms, any change in pedal position produces a more accurate and immediate change in vehicle deceleration.

Combined, these improvements reduce the tendency for over-correction and make driver control easier and smoother. What's more, the vehicle manufacturer can easily alter the modulation characteristics of the treadle via ECU programming to provide the best possible brake 'feel'.

Ideally, the trailer will be equipped with TEBS, so the truck's EBS can then send an electronic signal to the trailer TEBS to initiate braking in almost perfect synchronisation with the truck.

Next issue: Advantages of EBS and TEBS.

The ARTSA column is written by guest writers who are members of the Australian Road Transport Suppliers Association. ARTSA is an industry association with a focus on technical issues around road transport equipment. For more information, go to www.artsa.com.au or contact the Association's Executive Officer, Rob Perkins, on email: exec@artsa.com.au, or mobile: 0411 402 832.

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