

SAFER LORRIES

With the truly horrific consequences of accidents involving heavy trucks so fresh in our minds, Brian Tingham looks at technologies set to make a difference

It goes without saying that truck safety is critical for everyone involved in transport. Hence the heavily-regulated PMI (preventive maintenance inspections) regime to which all operators are subject. Hence also OEMs' significant investments in R&D, aimed at continuously improving the technologies that underpin braking and stability systems – and, more recently, developing equipment to further protect vulnerable road users.

In general, the carrot and stick approach – of maintaining public confidence on the one hand and respecting prescriptive legislation on the other – is working well, and the industry can be proud of its record. However, when incidents do happen, they tend to be lethal, tragic and catastrophic – proving that while a good safety record is one thing, a sound reputation may be quite another. Clearly, changing perceptions and making a difference has to be about transport going the extra mile and delivering genuine step changes in performance.

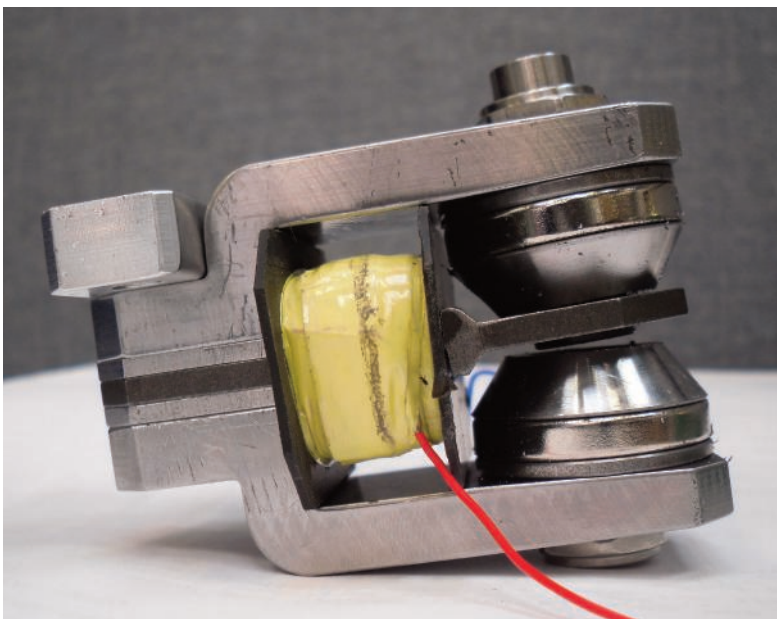
Slip control on steroids

That brings us to CVDC, the Cambridge Vehicle Dynamics Consortium, which comprises academics at Cambridge University supported by truck industry

heavyweights, including AB Dynamics, Camcon, Denby Transport, Firestone, Goodyear, Haldex, MIRA, Poclairn Hydraulics, SDC Trailers, Tridex, Volvo Trucks and Wincanton. Fully two years ago now, this not-for-profit heavy truck R&D organisation was trumpeting its development of a replacement for EBS (electronic brake system) capable of delivering up to 25% better stopping distances.

Its big news was a 'slip control' system that would revolutionise braking efficiency. Instead of the current rapid stop-go-stop cycle to which truck

Right: CVDC's axle-mounted, fast-braking valve block system
Below: the shape of air valves to come



wheels are subject under heavy EBS-controlled braking, the new system would "continuously optimise tyre skidding during braking, so maximising deceleration while also maintaining manoeuvrability". It was a grand claim then – so where are we now?

David Cebon, professor of mechanical engineering at Cambridge University and director of CVDC, says it has taken time to move up from laboratory simulations, but that recent full-scale trailer testing at MIRA delivered average stopping distance improvements of 18%. "We are still hoping for a 20–25% improvement, following further development of our prototype, but this is already a substantial achievement," he insists.

Why the two-year timeframe? Cebon makes the point that before testing the new system on CVDC's semi-trailer, there was a lot of work to do. "We needed to complete development of our fast-action, electromagnetic brake valves. That was challenging. The original design used a flexure and binary

actuation technology to open and close the air port. It worked 10-times faster than conventional solenoid-operated valves, but drew impractically high current. So we had to learn how to convert our design for much lower power. That meant researching magnetics and materials, and designing components capable of carrying a lot of magnetic flux, yet flexible and robust enough to work reliably.”

That process alone took around 18 months, working with Haldex, but CVDC now holds a patent. “Now we understand it, we can do better, in terms of optimising our design,” he says. And in fact, Cebon reckons the team could reduce the valve size by a further 30–50%. However, the team also had to architect its new braking system hardware for the trial trailer – partly to ensure fail-safe behaviour in line with the existing braking regulations (around secondary braking), but also to enable back-to-back comparisons during trials with existing EBS technology on the same vehicle.

With the test results from that development under its belt, Cebon reveals that CVDC is now working with an unnamed truck manufacturer (widely believed to be Volvo) implementing its novel braking hardware on a tractor unit. Indeed, as we go to press, he expects to be testing a full combination with the technology.

Next up, the team will be looking for commercial partners to take the technology to the next level. That will be about shrinking the brake valves, as described, but also making decisions about where to site them – either on the vehicle chassis adjacent to the brakes, or on the axles themselves, for direct brake chamber actuation.

“Either way, there’ll be a lot of smart processing close to each wheel, as per our original concept. However, the closer the units are to the brake chamber, the shorter the air pipe – which means faster actuation, but also greater vibration. Ultimately, this will need an integrated design, but we’ve done the proof of concept and now it’s up to the manufacturers to decide how they want to take it forward.”

Vulnerable road users

So far, so good, and Cebon indicates that two OEMs have already declared an interest. However, CVDC has also been quietly working on another, quite separate truck safety system – this aimed at protecting vulnerable road users, especially cyclists. And the result is technology that not only detects the presence of cyclists in the danger zone, but also automatically brings the truck to a standstill before it can inflict the low-speed crush injuries so tragically common with undertaking incidents.

Cebon says studies of reconstructed fatal accidents prove that common causes concern errors of judgement on both parts – cyclists and truck drivers – but also the problem for drivers with



The system detects the cyclist in the danger zone (pic 1) and automatically stops the truck if it is on a collision course (pic 2), allowing the cyclist to pass unharmed

seven mirrors to assess before turning left. "If it takes half a second to look at each one, that's three and a half seconds to get round all the mirrors, yet the cyclist is on the move. It's an impossible situation for a driver."

That conviction, he says, prompted the project, which four years ago started with a goal of developing technology capable not only of detecting cyclists, but also reliably predicting an imminent impact and autonomously applying vehicle brakes fast enough to prevent serious injury. "There is time to stop a truck, but only if action is taken very quickly, so we believe an active intervention system is essential," explains Cebon.

Sensing cyclists

In brief detail, CVDC's new system harnesses ultrasonic sensors positioned around one metre apart along the truck's nearside and providing data to an ECU. That assesses relative motion, consistently rejecting spurious objects, such as street furniture, and only responding to bodies it predicts are on a collision course with the truck.

"It's critical that any system minimises false

positives and our technology has been proven on test tracks to be a very accurate predictor," states Cebon, adding that Lang O'Rourke and AB Dynamics have been active participants.

Interestingly, he also says that the system was checked against computer reconstructions of 19 fatal accidents for which there is detailed witness, tachograph and photographic evidence. "Our accident simulations indicate that the system could have prevented 18 of those fatalities. In three cases, there would still have been a collision, but the truck would have stopped in time to prevent the cyclist from being run over – and that's key."

Cebon concedes there is still work to do in terms of getting the system to handle multiple cyclists and making it ready for commercialisation, but says proof of concept is "well and truly done". He also reckons it could be developed for easier tasks, such as interventions when people walk in front of trucks. The big challenge, though, will be encouraging OEMs to integrate the technology with their braking systems, he believes. "For that we need OEM or tier one manufacturer support, and we are looking for commercial partners now." ^{TE}



Delivering value for you and your business

- ✓ World-class OEM approved lubricants
- ✓ Full UK telephone technical support
- ✓ Daily nationwide deliveries

MORRIS LUBRICANTS
ESTABLISHED 1869

Trusted for Generations

Paul, like his father before him, understands that quality oil is the lifeblood of his fleet. That is why his family business only uses the latest Morris Lubricants' OEM approved products in every service.

For our latest commercial vehicle product range brochure, please call 01743 232 200

MADE IN THE UK

www.morrislubricants.co.uk




PCS
PAUL CLARK SERVICES

Road Transport Industry Engineering Support

- Mechanical Assistance
- Electrical Assistance
- Coach Building Assistance
- Managerial Assistance
- Workshop Facilities

ISOQAR
REGISTERED
Cert No 10903
ISO 9001

FTA
Member

Tel: 0845 6060 474
info@paulclarkservices.co.uk
www.paulclarkservices.co.uk

"A very high level of technical skill... the engineer was highly professional on site and worked well under his own initiative as well as part of our team"