FAST ▸▸ FORWARD

Never before have electronics, sensor and computing technologies so dominated the pace of truck development. Brian Tinham examines the future with Bosch and Wabco

Truckers of the future may no longer consider themselves drivers, but instead mobile logistics managers. Why? Because driving is likely to become increasingly automated. So the role may morph to optimising transport movements via cloud-based systems – responding to truck- and business-related events and opportunities.

Fanciful? A lot depends on how deeply into the crystal ball you're prepared to gaze. The technology is already much more than edging that way. Indeed, in a very real sense, the future depends on political, legal and cultural changes keeping up.

That was certainly the picture painted for the year 2026 by technology giant Bosch at last autumn's IAA Commercial Vehicles show, in Hanover. Its VisionX concept billed the truck of the future as a '40-tonne smart device on wheels'. Such a vehicle, predicted the firm, would feature advanced connectivity and automation, enabling it to navigate traffic and routes mostly without driver intervention. And that was just the start.

To an extent, we've heard it all before, but, given that 2026 is now less than a decade away, let's examine some detail. And not just through the eyes of Bosch, but also Wabco, which is busy blazing similar technology trails.

Bosch first, and Dr Johannes-Joerg Rueger, president of its CV business unit, confirms that for the foreseeable future the firm is focusing its R&D primarily on ADAS (advanced driver assistance systems) and autonomous trucks.

For him, that means starting by building on AEBS (autonomous emergency braking systems) and electro-hydraulic steering technology, with improved camera and radar sensors, as well as systems and software. These, he says, are the keys not only to improving incident mitigation and/or avoidance, but also to delivering platooning (where multiple trucks closely follow a lead vehicle, braking and steering in sync via wifi) and/or autonomous trucks.

"We need better technology to enable the aerodynamic and safety benefits of platooning. Not just more advanced lane-keeping support and braking automation, but also low-latency inter-truck digital connectivity," explains Rueger. And the latter is critical to synchronising virtually-linked trucks' behaviour. "Without it, vehicles can't be driven close together at motorway speeds – which is essential if we want to reduce fuel usage and congestion."

But fast connectivity is one thing: redundancy and dynamic response are others. If drivers are to be taken out of the loop, all systems must be designed to bring platoons to a safe state in the event of either system failures or unexpected events. "This is something we still need to work on," says Rueger. "For example, how do we want the systems to react if a car slots between two platoon trucks?" And hence the additional focus on AI (artificial intelligence).

Solving such issues matters – again, not only to deliver Bosch's vision of driver-centred logistics, but also to improve conventional truck safety. "Making platoons happen might be a challenge in central Europe, but the base technologies must be developed anyway to meet safety requirements on-highway and in congested city centres," he explains. "So we're looking at a step-wise approach that leads eventually to platooning as additional functionality."

To an extent, it is a similar story with connectivity and AI: both, obviously, are advancing regardless of their platooning potential. Consider telematics, which now offers everything from incident-

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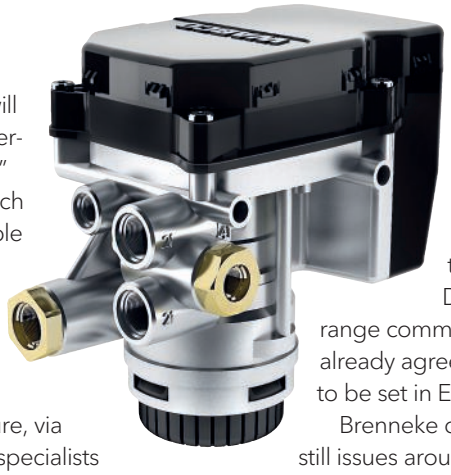
triggered video to driver behaviour monitoring and predictive maintenance.

Commenting on the latter, our Bosch man observes that future improvements are now dependent on modelling and AI. It's about turning the growing mass of truck and trailer ECU data into management information, founded on risk-based probability of component failure. "Such information would be very valuable for truck operators, given its potential to cut costs, increase efficiency and improve uptime," he argues.

So would an extension of existing freight tracking technology. "We already offer connectivity units that sit on crates and communicate through trailer control units. But in the next two or three years, transport managers will get digital logistics, enabling them to observe and manage freight electronically via a secure data exchange app. They will also be able to see the location and physical state of goods in transit [critical temperatures, vibration, etc] online in real time via cloud-based systems, such as our Bosch IoT [Internet of Things] Cloud."

Picking up on Rueger's earlier system redundancy point, Wabco vice president of engineering Dr Christian Brenneke adds that the principle applies to everything from system inputs, through computing and on to outputs. "For example, on the sensor side, we can't rely on today's camera and vision systems alone," he explains. "We believe highly automated trucks will need additional laser-based sensors, too."



Wabco's approach is one of driving triple redundancy throughout. In this case, it's not only about mitigating for any one subsystem failure, via what safety system specialists call 'graceful degradation', but also ensuring that automated truck controls respond appropriately to sensor data whatever the traffic and weather conditions.

Dr Johannes-Joerg Rueger

BIRD'S EYE VIEW

"With this approach, we can 'fuse' the sensor technology outputs to offer 360° coverage of truck surroundings regardless of the situation." Just one caveat: Brenneke warns that, for this to work predictably, all sensor subsystems must deliver top-end performance. "That's why our radar systems, for example, are based on 77GHz sensors, not the earlier industry accepted 24GHz."

That said, Brenneke argues that triple redundancy is also paramount for truck electronic and electrical architectures to ensure reliability, uptime and, again, above all, failure to safety. And precisely the same applies to the outputs – such as brakes and steering systems – particularly, but not only, where truck automation is envisaged. "With any automation, it's critical that control of the truck is maintained whatever the circumstances. That's why we are working on these fail-safe technologies."

It's also why the company is investing in vehicle-to-vehicle and truck-to-infrastructure communications. "Electronically connected vehicles are now coming into the real world, following last year's demonstrations in Europe," he asserts. "Also, platooning is a strong driver in North America. And although the industry is currently developing on wifi technologies, such as DSRC [dedicated short range communications], a standard already agreed in the US looks likely to be set in Europe in Q1 this year."

Brenneke concedes there are still issues around data security, as well as safety – for example, vehicles joining, leaving and infiltrating platoons. Nevertheless, he reckons technical barriers will be surmounted within a couple of years, making platooning a reality by, say, 2021. "Vehicle automation in combination with improvements in our technology's ability to perceive traffic and the environment will probably make autonomous trucks a realistic proposition within 10 years."

Getting there, he agrees, is about incremental steps. And, again, he points to Wabco's work on the underpinning ADAS technology – for example, its latest OnCity laser-based urban artic 'turning assist' system. Essentially an extension of Wabco's OnGuard radar-based AEBS, this is the first to offer 180° cornering pedestrian and cyclist detection.

"Fleet data from several million miles driven in the US using our OnGuard systems show they reduce accident rates by more than 80%. We believe that OnCity will deliver similar results in city centres," asserts Brenneke.

And he adds that ongoing developments with rear-facing sensors, including ultrasonic, radar and camera, will continue to improve outcomes with reversing, low-speed manoeuvring and lane-keeping support respectively. "Much depends on the OEMs' and, of course, operators' appetite for the improvements, but new systems will be available in the next two to three years." TE