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Truck development over 40 years

Reading an industry magazine of the recent retirement of an industry identity took my mind back to meeting him early in the 1980s and the state of the industry back then. It was certainly a different world for me as a new member of the engineering department at Kenworth Trucks and the trucks were very different to those with which we are familiar now.

In the early '80s the 'standard' fleet linehaul truck was a COE that had an engine rated at around 300hp, a nine-speed transmission, bias ply tyres, was restricted to a regulated maximum overall length of 16.5m and could not gross more than 38.5 tonnes. The common front suspension had a stiff 52″ multi-leaf spring, and the tandem drive axles rode on a walking beam suspension. Not conducive to a good ride for the driver, particularly as cab suspension was nonexistent at the time.

Brake systems were dual circuit, but the third Edition ADRs 35/00 and 38/00 had not been promulgated and did not come fully into force until 1988. Meanwhile, anti-lock brakes had not been released and were not mentioned in those ADRs.

Another problem confronting operators was fitting enough fuel capacity on these short wheelbase prime movers. There was simply not much space within the wheelbase for more than a pair of 550 litre tanks which were constrained by the ADR tests in force at the time to be cylindrical. These tanks had to withstand being dropped from 9m onto its corner without leakage afterwards! The offending ADR17/00 was withdrawn in 2005 and since then the use of rectangular tanks which were not able to pass the drop test has become the norm, even on conventional bonneted model prime movers.

In 1985 NAASRA, (now Austroads) released their report "Review of Road Vehicle Limits" (RORVL) which changed the world as we knew it. The review was far reaching and investigated road damage caused by repeated passes of heavy truck traffic, related costs and surveyed weights of the vehicles using roadside weighing equipment. While today's trucks are generally compliant with axle load limits, back then, overloading by significant amounts was not uncommon, so any review of load limits had to include these roadside checks. The recommendations (later adopted by the States' road authorities) increased axle load limits to those used today under General Mass Limits conditions. Additionally, the bridge formulas were changed and included axle spacing tables for B-double combinations. This set the scene for adoption of B-doubles across the country and setting up systems for CML and HML operation and the PBS system.

In the late '80s truck development continued with suppliers and manufacturers responding to a competitive market with the first electronically controlled diesel fuel injection systems being offered. While they were in some cases relatively crude electromagnetic actuators controlling fuel racks of the injection pump, the market quickly moved to camshaft driven electronically controlled diesel injectors.

The major challenge for these systems for the truck manufacturers was incorporating the electronic control components and harnesses into the architecture of the wiring systems. Control modules of the time had limited computing and memory capacity, so some systems had ECMs mounted in the cab as well on the engine. There was also perhaps some caution on the durability of these early ECMs if mounted to the harsh hot vibrating environment of a diesel engine. Initial customer wariness and caution quickly was overcome by the performance of these engines both from output and reliability aspects. And we are now familiar with ECMs mounted to the engine block as common practice. New engines designed from the ground up around electronic fuel systems emerged, such as the Detroit Series 60, Cummins' Signature range and more from both the US and European suppliers all of which offered improved performance and fuel economy. But what was driving all this development? Operators were looking for a business advantage, but the engine manufacturers were being forced to change by global modifications to engine emissions regulation. Up until 1996, when ADR70 (Euro 1) came into force, engine emissions were only controlled by the ADR30 smoke control rule, but by then more stringent rules were in force overseas and engines meeting those rules made their way here. While emission regulations became more stringent it would have been expected that fuel economy would be impacted, but in practice the opposite was the case and fuel economy has continued to improve. Competition between suppliers has driven them to offer their most recent emission level engines, ahead of the ADR in force, to meet customer demand for cleaner or the 'cleanest' engines. One manufacturer even ran advertising using a white cloth held at the end of the exhaust pipe to demonstrate the absence of soot in the "clean" exhaust.

But of course, engines were not the only things changing. Trucks and trailers soon adopted air suspensions to take advantage of their improved roll stiffness, and better ride in all load conditions. And innovative operators collaborated with trailer builders to take advantage of the changed regulations to maximise payload capacity both in increased mass and deck length. Further innovations have been adopted ahead of regulations to improve safety and reliability that include automated manual transmissions, wider adoption of fully automatic transmissions in light and medium segments for distribution applications, and trailer EBS (TEBS) with roll stability systems. Truck electronic stability systems also crept into the market, surprisingly initially in the bottom end light duty market segment. And electronic stability control became widely available in all segments before regulators acted to mandate it. In fact, in my view, most developments in the industry were driven by customer demand for reduced costs and improved efficiency of operation, not regulations or ADRs.

So the road transport industry now operates sophisticated vehicles with complex electronic systems, and diesel powertrains which provide reliable high productivity services to the country. And that productivity is growing continually with the growth of specialised combinations operating under Performance-Based Standards approvals.

And what of the future? With the world and eventually Australia decarbonising, the transport industry is going to face enormous changes and the trucks of the future will likely have a variety of drivetrains powering them. Will a decarbonised industry be able to operate trucks at the high gross masses we accept now as the norm? Or will rail become more important part of the interstate transport mix? Looking at overseas trends, not only are EV solutions being proposed, but carbon neutral systems using renewable methane gas and biodiesel are becoming common. But I believe these are transitional solutions.

In all likelihood, there will be a variety of solutions for the different transport tasks. Already full battery EV solutions are being introduced for light and medium duty trucks that operate in pickup and delivery operations in our cities. There, the usual daily distance before return to base is around 200km, an achievable range for those EVs. But what about longer distance trips? The concept of fast charging stations may be workable for passenger cars, but recharging trucks would be a time-consuming process. Australia is heading towards a hydrogen economy, and heavy transport may well have an electric motor drivetrain powered by hydrogen driven fuel cells. There are still a lot of questions and problems to work through, and the transport industry will have to face massive changes in equipment, training and operations on the way to a non-diesel powered future.

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B-double with Xperion CNG containers.