

Careless torque

When a wheel assembly detaches from a moving truck or bus, it can reach 150km/h and bounce 50m high, threatening anything in its path. Brian Tingham examines developments

Just two short months ago, Joan Aitken, the traffic commissioner for Scotland, issued formal warnings to three Stagecoach Group subsidiaries, and imposed a condition on a fourth's licence, preventing it from expanding beyond its 160-vehicle fleet. Her ruling, at a public inquiry, followed a series of wheel loss incidents and adverse reports from VOSA vehicle examiners.

What's interesting about this inquiry is twofold. First, it demonstrates to unbelievers that wheel security, even in 2011, remains a worrying issue. And secondly, the inquiry accepted that the incidents happened despite the Stagecoach operators – particularly Perth, Fife, and Glasgow – being well run ships, all the way from maintenance to drivers and engineering management. Stagecoach Strathclyde fared less well, because it took one of the firm's drivers to blow the whistle.

That said, the Incident Investigation and Reconstruction Group at TRL, which prepared a report on all the Stagecoach incidents, generally approved of the group's procedures, which it said "were in line with manufacturers' and professional institute standards". Indeed, principal consultant James Brooking, citing Stagecoach's self-imposed inspection frequency of 21 days, commented that some of its standards were "higher than those generally adopted".

In her summing up, Aitken noted that TRL also praised Stagecoach's auditing and separate wheel fitting and re-torque recording procedures, and she accepted that systems in place were "ahead of what VOSA [suggests] in the 'Careless Torque Costs Lives' leaflet". She also commented that all four of the operators had very high annual test pass rates.

Nevertheless, wheel losses did happen and,

importantly, the inquiry found a range of causes, which shed useful light on what can go wrong, even in the best run operations. For example, Stagecoach Glasgow's incident involved an Optare Solo that had just negotiated a roundabout.

Engineering examination revealed that an impact had occurred, causing the wheel to become loose. Interestingly, this vehicle had a 'wheels removed' note, alerting the driver to a wheel change, but he still failed to carry out a first use check. In that case, the engineering director decided that all Optare Solos and Versas would have their wheel studs and nuts renewed immediately and also bi-annually.

Multiple causes

Meanwhile, Perth's incidents involved Volvo, Optare and Alexander Dennis Enviro 300 buses. The Volvo detachment was due to corrosion between the clamping surfaces, but also wheel nuts that had been left slackened after a repair and gone unnoticed by the driver. Then the Optare had "advanced wear between nuts and washers", as well as "substantial corrosion on the mating surface and the heads of the cap screws, which could have prevented full clamping" (the fixing nuts had been re-fitted, not replaced).

As for the AD bus, examination found that the nearside rear wheels had not been fitted in accordance with procedures. Indications included no lubrication at the nuts and studs, while CCTV footage of a tyre fitter revealed a torque check omitted and use of the wrong air wrench.

Stagecoach Fife is interesting, in that one of its incidents involved a two-wheel loss on a Volvo bus. Engineering noted that the vehicle had a brake reline and was retorqued 30 minutes later, then again after 67 miles, but the cause remains unknown.

Right: some problems with wheels, nuts and studs should be immediately apparent to transport engineers – and locking nuts are only a partial solution



costs lives



And finally we come to Strathtay's incidents, both of which concerned Optares. On one, examination revealed that the driver should have noticed loose wheels, but also that the outer tyre had impact markings, a torque wrench had clearly been abused and the third re-torque had probably not happened.

Taking a lead on torque

On the other incident, records indicated that a broken wheel stud had been replaced, but examination also found surface corrosion and some elongation of the stud holes. However, since 80% of this operator's wheel losses were on Optare Solos, Strathtay contacted the manufacturer and axle designer Albion. The latter recommended that torque be increased from Optare's 350Nm to 400Nm, to handle cross sectional wheel loadings imposed by hitting traffic calming measures and drains.

So far, so interesting, and certainly useful additions to anecdotal evidence often proffered by older transport engineers – primarily that none of this happened when left hand threads were used on near side wheels. Whatever the mounting arrangement,

they say, nuts in the old days tended to tighten in response to the centrifugal force, not work loose. Rose tinted spectacles or not, standards are standards and we are where we are: in short, we need to think and act more constructively.

With that in mind – and accepting the need for appropriate management procedures, given that it's all too easy for fitters and drivers to start taking shortcuts and ignore procedures – what should you be checking to prevent a loose wheel turning into a court appearance? ATS Euromaster is good value here, the organisation having developed highly regarded wheel security guidance for its own fitters. Operations director David Murray, who heads up ATS's truck division, says the most important point is to view wheel security in the round – not as an issue with one cause and one set of people to blame.

"Everyone needs to start with component cleanliness, particularly around the mating surfaces at the hub and wheel, but also the studs – making sure everything is in good order," states Murray. "Without that, you're never going to get the consistent clamping force you need. But the second

When it comes to wheel security, there is no room for anything other than best engineering practice



So what about safety add-ons?

“Our locking nut is approved by all the commercial vehicle manufacturers, so, if you want disc locks fitted from new, you can get them. But you’ll never see them as standard, because new vehicles don’t have a problem with wheel security.” So says Bob Hope, chairman of Disc-Lock Europe, pointing out that problems start when vehicles are more than two years old and operators take over maintenance.

Some might contest that assertion, but, given the fact of life of detachments and near misses, his company has done very well out of selling locking nuts, either for peace of mind, where there is any doubt about procedures being followed, or where they want belt and braces.

Costs aren’t huge – a set of nuts will set you back £40 per wheel – and Disc-Lock now claims that you’ll never lose a wheel, if they’re fitted correctly. Given the results of testing at MIRA a few years ago, following a dispute involving Ford and Fruehauf, that’s a pretty safe bet.

Disc-Lock is not alone: others, such as Business Lines, also offer solutions intended to keep nuts in place and/or indicate dangerous movement or overheating – the latter due, for example, to bearing or braking problems. Oliver Shorter, sales manager at Business Lines, believes that his Checkpoint indicators are not only the best selling wheel safety devices, but also the simplest and most cost effective.

Then there’s Safetytrimworldwide, whose British engineered wheel nut management system was recently adopted by cement manufacturer Lafarge throughout the UK. The firm’s Philip Aerts explains that the system – which is based on moulded Nylon 6,6 fibre that is highly resistant to heat and friction – not only visibly indicates loose wheel nuts, but, more importantly, holds them in place until they can be re-torqued.

But there may well be another solution within the next 18 months, if work by Tamworth-based J2E Consultancy and Gary Thomas of Lloyd Morgan Group, plus their joint venture Wheely Safe, gets off the ground. J2E managing director Gary Broadfield explains their proposal as a simple wireless electronic system that detects imminent separation of a wheel from its hub and then warns the driver in real time.

Currently patented and in pre-production, the clever bit will sit on the inside face of each wheel rim, located between two stud holes. Mounted on a spring-loaded backplate, it will have a tiny battery, electronic detector switch and antenna – rather like new tyre pressure monitoring systems. Anticipated costs are around £160, including dash-mounted alarm, to protect all wheels on a 6x2 tractor and trailer combination.

No one is saying any of these options is a substitute for good maintenance practice, but it is difficult to argue that they don’t contribute to potentially life-saving wheel security and road safety.

important point is the condition of your components: you must ensure that you refit wheels that are still fit for purpose and that means reviewing the studs for signs of wastage where the thread ends.”

For him, ensuring good wheel security is also about using oil to free off, but also then to tighten, the wheel nuts. “Sometimes, the perception is that nuts will only work loose if they’re lubricated, but that’s just plain wrong. Lubricant must be used to ensure that the nuts can run up and deliver the correct clamping force,” insists Murray, pointing out that torque becomes a worthless indicator of force when corrosion and debris get in the way.

Finally, he urges technicians to follow correct torquing procedures, noting that these do vary across manufacturers, vehicles and bolt sizes. “Because of our position on safety, our standard ATS retorquing procedures are accepted by the vast majority of OEMs, although we do follow Scania’s, Mercedes-Benz’s and Volvo’s own recommendations. However, other technicians need to go to their OEMs’ websites and check for the recommended torque and torquing procedures for their vehicles.”

What about the wheels?

But there is one other aspect to worry about and that is the integrity of the wheels themselves. John Ellis, managing director of commercial vehicle wheels and tyres distributor Motor Wheel Service, is currently concerned that – following the recession – operators might turn to the thousands of second hand wheels that are circulating or simply turn a blind eye and re-use accident-damaged units.

“I have seen disgraceful wheels in the back of sheds, supposedly ready to be sold as replacements on coaches and trucks. And, without standards or markings, some of these will get through,” says Ellis. “Then again, think of what happens when a 44-tonne truck has a blowout and a new type is put on the same wheel. Wheels are well engineered, so it might work, even in a damaged state, but nobody checks. They look at the studs and nuts, but not the wheels, because nobody understands that they’re a potential source of faults.”

Ellis makes the point that, in Germany, wheels have to be approved to the original homologated vehicle via TÜV and replacements certified as having been tested to the same standard when vehicles are presented for MOT. “In other countries, that doesn’t happen. We have a free and open market, so there are no E markings, as on tyres, and no standards, apart from manufacturers.”

His point: sub standard and/or damaged wheels may be among the causes of detachment, and the fact that incident statistics don’t bear this out may be due to the Catch 22 of oversight, rather than any lack of a causal link.

“If in doubt, transport engineers should throw dubious wheels out. If you put a new tyre on a wheel that’s suffered trauma, liability falls on you, the operator, not the tyre company. And if you’re looking at replacement wheels, keep traceability as clear as possible. Don’t allow back door contamination by just trusting that a chain of supply goes back to a reputable manufacturer.”

As ATS’s Murray puts it: “Technicians have to understand that these are big issues.” For best practice with wheel security, see the FTA/IRTE, ATS and SITA UK publication on wheel security, launched last year. 