

Known unknowns

Despite 100 years of use in every type of commercial vehicle, we know little about how exactly tyres age and wear in service. That appears to be the principal finding of research published in May, finds Will Dalrymple

The publication of a report on tyre research has coincided with the start of a consultation (www.is.gd/wupujo) to ban tyres more than ten years old in the UK. That has been industry best practice guidance for most of the past decade, and in November 2018 limitations to the use of old tyres were included for the first time in the DVSA's Guide to Maintaining Roadworthiness.

Tyre age has been implicated in at least two fatal incidents in the past decade, and the awareness generated by Frances Molloy's Tyred campaign, among others, contributed to the government's actions.

In announcing the consultation, which finishes on 1 September, road safety minister Michael Ellis said: "There is increasing evidence that age affects the safety of tyres, which is why I think older tyres should not be used on large vehicles."

However, clear-cut conclusions were hard to find in Transport Research Laboratory's research paper (www.is.gd/apelaz). In fact, perhaps the most remarkable finding seems to have been how little is actually known about the subject, at least based on what is in the public domain.

Part of the research was a review

of published studies. It found that, generally, any research on the effects of ageing on tyre performance has been on light-duty or passenger car vehicles, rather than HGVs. And it could not find any specific evidence from elsewhere linking ageing effects with 'tyre disablement or collision risk'.

Moreover, there was little data found about commercial vehicle accidents involving tyre defects. Sources differed about the importance of service conditions in the performance of the tyre: some argued that a history of underinflation and damage will hurt

performance; others argued that time is the only factor that matters.

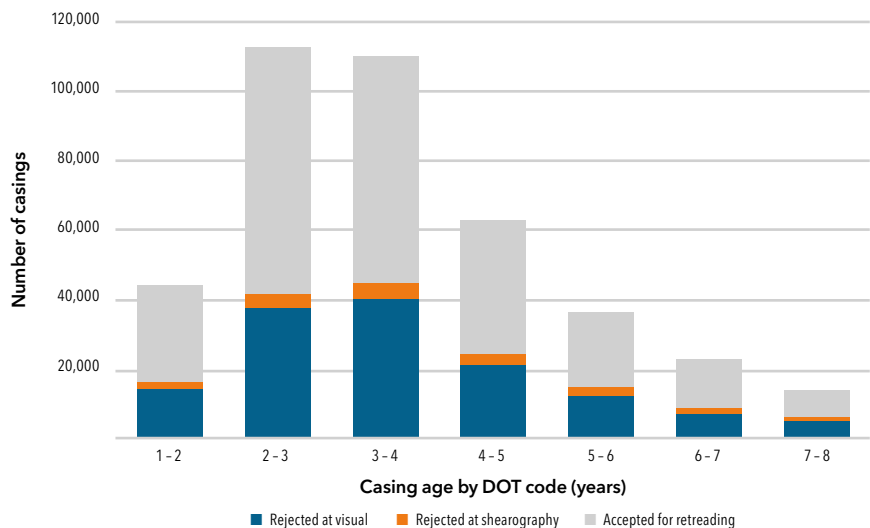
The research bears on the topic of the safety of tyre retreading, which is big business in the UK. The carcasses of CV tyres can be reused two or three times. In 2017, 42% of tyre sales were retreads, amounting to 760,000 units.

The study polled BTMA (British Tyre Manufacturers' Association) members about a variety of issues. They stated that many casings are rejected at different stages of the process - and generally reject older tyres for economic reasons. Rejection rates are highest in



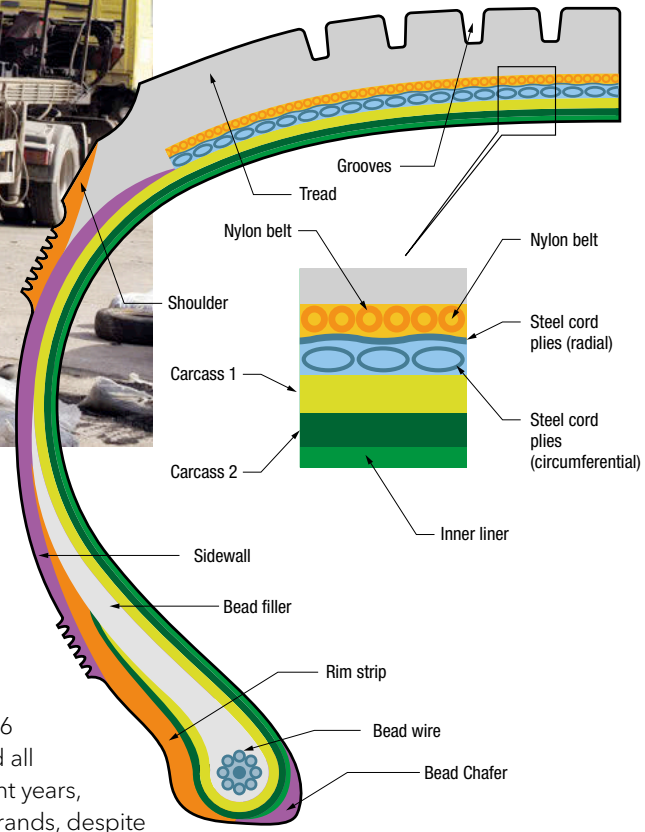
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OUTCOMES OF CASING INSPECTION (SAMPLE SIZE 404,254 UNITS; SOURCE BTMA)





TYRE FEATURES



initial visual assessment (20-50%); then during shearography testing, which is an internal visual inspection (5-10%); even less during the pre-retread preparatory 'buffing' process (4-10%); and finally least of all during remanufacture (1-3%); see also chart, pictured.

The study went on to examine a sample of 26 used 295/80 R22.5 truck and bus radial tyres (none retreaded), and compared them to five new tyres, four of which were artificially aged. They consisted of three models, from three to 19 years old. It tried, but failed, to track the operational history of the used tyres supplied. Then it tried to estimate the total number of miles travelled of each tyre by estimating tyre life based on wear rates. That, too, was unsuccessful, as variance on a typical tyre between high and low estimates was 80%.

Researchers went on to tear apart the tyres for a variety of tests, and came up with some interesting results.

Most importantly, in the researchers' 'peel strength' tests, where they measured the tyre's resistance to being mechanically pulled apart, they found evidence that older tyres did delaminate more easily in some places than a new tyre. But in the tyres surveyed, that effect tended to slow down after about four years. Artificially aged tyres were also easier to peel than new, although not

by as much as the real service tyres. They did find that older tyres tended to have stiffer rubber, perhaps due to a reaction with oxygen compounds in the air.

One surprise was that 16 of the 26 service tyres, and all of the ones older than eight years, had corroded steel belt strands, despite the lack of obvious holes or gaps where water could get in. The authors speculate that water from the road seeped into the tyre through shallow cuts; also because most of the corrosion was found in belts nearest the exterior of the tyre. Corrosion should weaken the internal bonds between the radial strands and the sheets of rubber that make up the inner part of the tyre, but the authors couldn't find any evidence that it had done in these tests.

In conclusion, the authors found that old tyres were generally in worse shape than newer ones. But they couldn't conclude whether that was due to age, or due to service history (miles travelled, overloading, overheating), and/or poor maintenance (such as underinflation), since they simply didn't know. The authors point out that the sample was too small to produce results that were generally significant, statistically

speaking. They also add: "Additional insight from tyre manufacturers would be needed to relate material property changes to a safety-critical limit for risk of disablement."

Finally, even disregarding the cause(s) of tyre degradation, the study did not offer much support for a ten-year ban. The authors say: "The project has not identified any fundamental change or a threshold in material properties that would provide evidence either supporting or contradicting a final cut-off age approach." As an alternative, the authors propose that industry sets an age limit, beyond which tyres over a certain age should be included in periodic technical examinations. That fits with existing Michelin guidance recommending that tyres over five years old should be inspected at least annually by a tyre specialist. **TE**