Feels like the first time

When replacing braking materials, the obvious choice is to go for original equipment (OE) products. But a number of 'premium' aftermarket suppliers reckon they can save you money without compromising safety or performance – and there's a quality standard which could back them up. By Toby Clark

Braking materials – pads, shoes, discs and drums – are superficially simple, but fundamental to truck safety. Original equipment (OE) replacements are undoubtedly good, but also usually the most expensive option. Aftermarket manufacturers such as Bremskerl, Juratek, Lumag, PFC Brakes and TMD Friction (through brands Textar and Don) aim to match OE performance at a lower price.

"Pence-per-mile is one of the arguments that we would try to get over," adds Andrew Kibler, Juratek design engineer. "We have tried to develop products that last as long as the OE counterparts, but the unit cost is lower."

Even within the aftermarket brands there are different types of products. Juratek sells a 'budget' product under its own name, while its premium products use the Synergy brand: Synergy Red is a multi-purpose formulation, while Synergy Yellow is for stop-start applications such as city buses.

And product ranges evolve. Lumag, for example, recently extended its range of CV braking materials to include materials for Renault (Midlum; D13) and Volvo (FL II and III) trucks. Its CV catalogue now has more than 120 parts references.

Aftermarket braking materials – discs, pads, drums and shoes – must comply with standard R90 (see also box). R90 is an ECE standard – so it will not be affected by any Brexit changes – and it is also accepted by countries in the Middle East, South Africa and others.

"Fleet engineers certainly should be aware of it," Kibler says. "We would see it as a minimum standard." It compares aftermarket product friction levels under cold and hot conditions with the OE parts. The friction performance of the replacement part must be within +/-15% of OE specification, and there is a thermal fatigue test. "It does not cover anything like the durability of the product, or any NVH [noise, vibration and harshness] characteristics, but it filters out those materials which are not fit for purpose," adds Kibler. There are also requirements for mechanical strength – a structural overload test verifies the shear strength of the pad assembly – as well as compressibility.

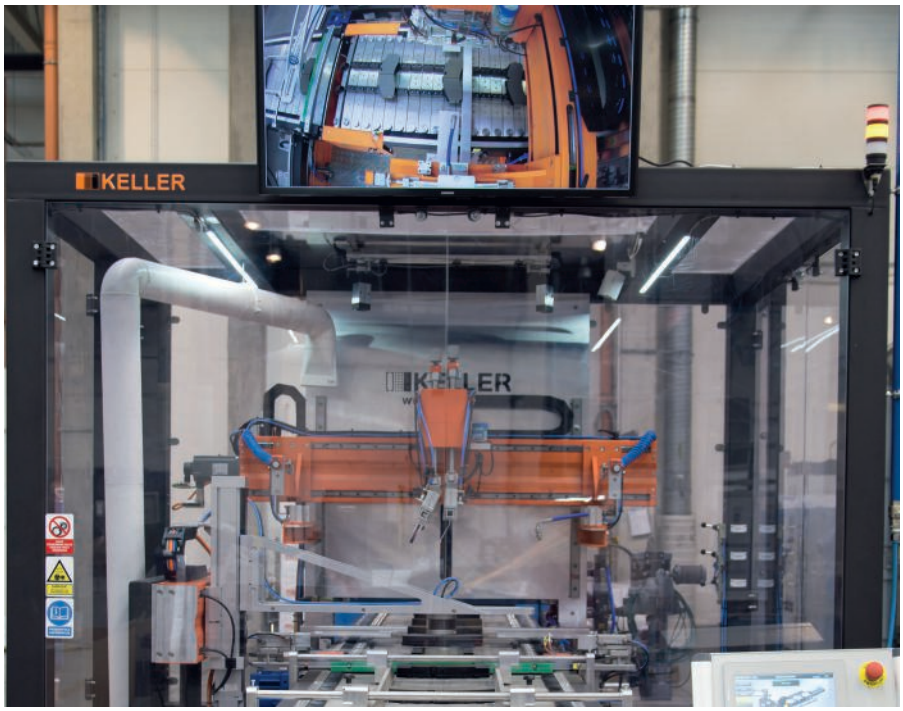
Kibler explains that R90 is application-specific: "It's not one of these approvals where you test one part and then that approval is applicable to the whole catalogue. Each part number needs to be tested and approved individually.

"The real heart of the regulation is

ECE MARKING

Aftermarket brake materials should be marked to show ECE R90 compliance. The circle with E and a number indicates where the component's conformance testing took place – E1 for Germany, E11 for the UK and so on. The number refers to a UN code of countries participating in the organiser of UNECE (United Nations Economic Commission for Europe) standards, the World Forum for Harmonization of Vehicle Regulations. See *https://is.gd/anicav* for a full list.

There is no direct policing of the standard at the level of the supplier; customers should look for the R90 mark on the product itself



the conformance of production. The manufacturer is required to measure every batch that is produced for the friction parameters and the physical properties. Those are kept on record and can be audited at any time." In the UK, the Vehicle Certification Agency is the authority responsible for overseeing R90; it undertakes regular factory audits, generally on a one- to three-year cycle. (Pictured above: Lumag's Green Coat production line in Poland.)

However, there is no direct policing of the standard at the level of the supplier; customers should look for the R90 mark on the product itself.

GOOD ENOUGH?

The stringency of the R90 requirements are questioned by Ray Massey, Bremskerl CV account manager. He says: "R90 is a fairly easy standard to achieve; 15%, when you're looking at braking force or brake service life, is a hell of a lot." He suggests that when choosing brakes, customers should consider other factors, too. "You're looking at heat transfer, service life, disc wear… and materials have got to work in conjunction with Jake brakes and retarders." One of Bremskerl's product features, for example, is a bed-in coating: for the first 150 miles or so, a high-friction material very lightly machines the braking surface to ease new pads into duty. There are still more issues to consider: brake squeal, for instance, and Massey says "brakes that smell can be an issue for coach passengers".

Quality control can be an issue in aftermarket brake parts. Lumag's UK managing director Colin Smit adds: "We regularly see counterfeit parts with the friction material crumbling and coming away from the back plate due to poor adhesion of the underlayer/mechanical anchoring mechanism. We've even seen substandard brake pads exploding into flames in the brake calliper while under fully-loaded conditions."

For those who have suffered brake problems, Textar has published a technical guide to brake pad and disc fault assessment: *https://is.gd/ozejer.*

CUTTING OUT COPPER

Brake components face substantial engineering challenges: they must dissipate large quantities of kinetic energy as heat and undergo significant mechanical stresses, while controlling NVH over a wide range of speeds and conditions. Meeting these requirements takes some pretty sophisticated materials science, and brake manufacturers have used a wide variety of ingredients. The most notorious of these was asbestos, banned now for almost three decades. As one industry expert says: "The friction material industry was badly damaged by the asbestos issue." Manufacturers that could not adapt to different materials fell by the wayside.

The next big fight is likely to centre around copper, a common ingredient in friction materials due to its ability to conduct heat and to reduce the 'groan, judder and squeal' aspects of NVH. But every time brakes are applied, a little of the friction material is lost, and in the 1990s excessive amounts of copper – judged to be 'a threat to water systems and aquatic life' – were found in run-off water flowing into San Francisco Bay. Around 35-60% of this came from braking materials, which led to California and Washington State passing legislation in 2010 to restrict and ultimately eliminate copper use in braking materials. The limits are 5% (by weight) of copper (Cu) by 2021, dropping to 0.5% by 2025 (or 2023 in Washington).

There is no similar legislation in Europe yet, but an industry expert says: "Europe is starting to look at emissions from a whole variety of areas – tyre degradation, brake particles and so on." There is particular concern about 'asbestiform' materials – those with microscopic fibre structures similar to those of asbestos. "Industry has generally tried to stay away from any sort of fibre that might give rise to problems.

"As for copper, yes there is a [similar movement in Europe] but it's not yet mandated… and realistically, we are not going to see any more environmental regulations until 2025."

While eliminating copper from truck and bus brakes is harder than it is for cars – the duty levels are much higher – some manufacturers are getting there. "Certainly Juratek already complies with the 2021 standard," states Andrew Kibler.