

Maintaining differentials



Putting new life into old drive axles. By Richard Simpson

Drive axles on modern heavy vehicles are not particularly maintenance-intensive. In fact, the drive axles on most road-going trucks will last the life of the vehicle with only occasional periodic maintenance. Drive axles on tippers and other vehicles used in harsh service may require a bit more attention, but advances in transmission technology and lubrication quality have both served to extend the life of this essential component.

It's a different story in the bus industry though, where the high capital cost of vehicles and restricted export markets tend to extend vehicle life with the first user way beyond the point where major components require overhaul or replacement.

Usually – and this is a tribute to the quality of the components used – it is general wear rather than the sudden failure of an individual component that necessitates axle repair.

Given that running a freshly replaced pinion against one that has worn is likely to cause accelerated wear to both, it is wise to take the opportunity to strip and inspect the entire assembly and replace all wearing components, and this makes refurbishment preferable to a repair (an incoming axle pictured below; a finished unit is shown on p14).

A refurbished unit is also more economical than replacement with a new assembly, given that the vehicle itself is unlikely to be in the first flush of youth. Most major bus operators look for an exchange

or replacement service, rather than attempting the work in-house.

Many of the big bus fleets use the services of Powertrain Products, of Willenhall in the West Midlands, which has a business history dating back to the 1970s. About 80-90% of the axles handled by the company are now bus components, "because buses live longer than trucks," proprietor David Etherington explains.

He started the business in the fallout of Leyland's takeover of luxury car manufacturer Jaguar as part of BMC. Jaguar owned truck and bus manufacturer Guy, and there was no room for Guy in the already crowded Leyland portfolio of commercial vehicle brands, so it was the end of the road for the factory in Fallings Park, Wolverhampton, although it was claimed to be one of the few profitable parts of the Leyland empire.

"As a former Guy man, I took the decision to leave my then job at Leyland and set up as a parts and service specialist for Guy as, with no new product to sell, the franchised dealers were all packing it in."

The business bought up inventory from retiring dealers which was used to support legacy operators, and soon diversified into providing transmission services for Leyland vehicles, too. Moving with the times, in 1981, the company became a service



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David Etherington



partner for ZF, and the German company’s axles are stocked alongside Eaton, Kirkstall, Rockwell, Meritor, Dana, Scania and Volvo units. Additionally, the company is a service partner for Allison Transmission.

ROOT CAUSE

Etherington has seen more than his fair share of failed axles over the years, but apart from general wear and tear, what’s the main cause of failure?

“Water!” he asserts. Water can enter the differential bowl if breathers are broken or mis-routed. Axle tubes sometimes suffer stress cracks under the spring saddles. “Oil won’t come out of them, but water will get in.”

Over-vigorous chassis washing can also cause problems. Axle oil seals are designed to close under internal pressure, making it possible for a high-pressure external water jet to penetrate them.

No matter the source, the symptoms are the same. Oil in the differential bowl takes on the appearance of milky coffee, indicating an emulsion of oil and water, and rust. The results are devastating. Not only are the heavily loaded pinion bearings attacked, the ability of the lubricant to protect the gear teeth themselves is seriously diminished.

“In the worst cases, there’s so much water in the oil that it pours out when a half-shaft is removed.

“You can’t just change the oil and hope the problem goes away,” Etherington warns. “If it gets to that stage, the damage has been done.”

Other causes of premature failure include letting prop shafts go out of repair. “If the UJs [universal joints] are damaged or seized, half-shafts are worn or sliding joints seize, this will damage the diff.”

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However, incorrect prop shaft positioning on replacement can also cause problems. “The prop shaft is indexed to the flange, typically with ‘1’ and ‘0’ marks stamped on to both components for accurate alignment. But these can be obscured if the flange is painted. If removed, the prop shaft must be replaced in exactly the same position that it was originally fitted.” He repeats the old instruction familiar to generations of mechanics schooled on Haynes manuals and rear-wheel-drive cars, about scribing a mark across both components to aid realignment.

Rather less traditionally, he reports that when a vehicle is run for an extended distance with the suspension set at the wrong ride height, this too can cause premature failure. An altogether more obscure source of failure can be built-in to an axle if inexperienced hands attempt to reassemble it.

“RTV [room temperature vulcanising] silicone ‘instant gasket’ can be lethal to



the axle,” he reports (see overheated surface in inset image above). “Typically, people apply it in far too generous an amount, hoping it will make a better seal. They see it squeeze out of the external surfaces of the joint when it is torqued up, and think they have done a good job. But similar amounts are forced internally, become detached, get chopped up by the gears and end up obscuring the oil feeds to the bearings. The material itself is oil resistant. It won’t go away. We use a specialist sealant for the job [pictured, p12].

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REPAIR COSTS

He cautions that the true cost of undertaking drive axle repairs and refurbishments in-house is prohibitive to most operators.

“It’s a specialist job that, if it is to be done successfully, requires specialist tools, specialist skills and a trained eye. All our products are tested before they leave here [pictured left], including an air-pressure test at 0.5bar to ensure a leak-free axle.

“We offer a three-year warranty on axles and diffs fitted by ourselves, or two years if the axle is fitted by the customer. We have a team of 12 mobile engineers in vans, who can visit customers’ premises and fit replacement axles on site. If a big fleet is experiencing a rash of failures, we can give a diagnosis of the cause, too.

“There’s a definite drive-line hierarchy in the average workshop. Engines are well-maintained, gearboxes rather less so, and drive-axles hardly at all. And that’s where we come in!” **TE**

