

OIL & GREASE

with rick freeman

Do we ever stop doing things with our cars? Servicing, modifying, repairing wear and tear, maybe fixing some minor (or major) track or touring induced damage or just plain tinkering, something always seems to need to be done.

Or maybe it's because I drive a Land Rover... Ha!

I have a service due; the old girl has clocked nearly 10,000km since I last changed fluids and filters. Land Rover originally

specified 20,000km oil change intervals for the TD5 when filled with a full synthetic oil and when used under normal conditions in a temperate climate with high-quality fuel.

This was considered extraordinary at the time as diesels were considered 'dirty', partly as diesel fuel contained around 500parts per million of sulphur in Australia. Current Australian diesel is considered Ultra Low Sulphur fuel and

contains below 10ppm of the dirty stuff. Petrol has improved too, although it hasn't undergone quite as dramatic a change as it wasn't that bad to start with, although there are potential issues running ethanol blends, with the supposed 'environmental' credentials of E10 being hotly debated, but that's a discussion for another time.

Specifying a full synthetic oil was part of the secret and the TD5 engine was designed

with one of the best oil filtration systems available, alongside the normal full flow filter is a Mann-Hummel centrifugal bypass filter, one usually only seen in large diesels, although a similar arrangement was fitted to Toyota's old 2H diesel from the 80's! By-pass style filters are extremely good at removing particles including soot as small as 1 micron, but 20,000km was a fair way by any measure, and there are a



couple of disclaimers hidden in 'normal driving conditions and a temperate climate.' I live in a pretty humid place not far from the coast, definitely sub-tropical, not temperate but not as extreme as a lot of Australia and other than the move here at the beginning of the year most of my trips have been relatively short. Besides a few 20-80km jaunts, and some day trips on the dusty tracks in the local National Parks, the Disco has been 'a local', visiting the nearby beach and shopping centre. As such, I've brought the oil drain interval right back to something a little more reasonable. Why?

Well, 'normal' is a fairly nebulous thing and 'normal driving conditions' excludes things like towing, ambient temperatures above 30 degrees, off-road use, dusty environments, and short trips, usually defined as under 30km.

Fuel quality was significantly better in Europe (the Disco hails from the UK of course) at the time too, Europe implementing ULSD 50ppm diesel in 1999. ULSD reduces soot contamination in the oil

significantly, although the engine oil still saw significant soot levels thanks to exhaust gas recirculation introduced to meet EU oxides of Nitrogen (NOx) emissions standards.

So, considering the relatively short trips and infrequent use I've used some discretion and I'm tailoring the oil change interval to suit. If I was driving even shorter trips, say, only driving 2km each way each day I wouldn't want to go past something like 5,000km or exceed 12 months between an oil drain and change. Why?

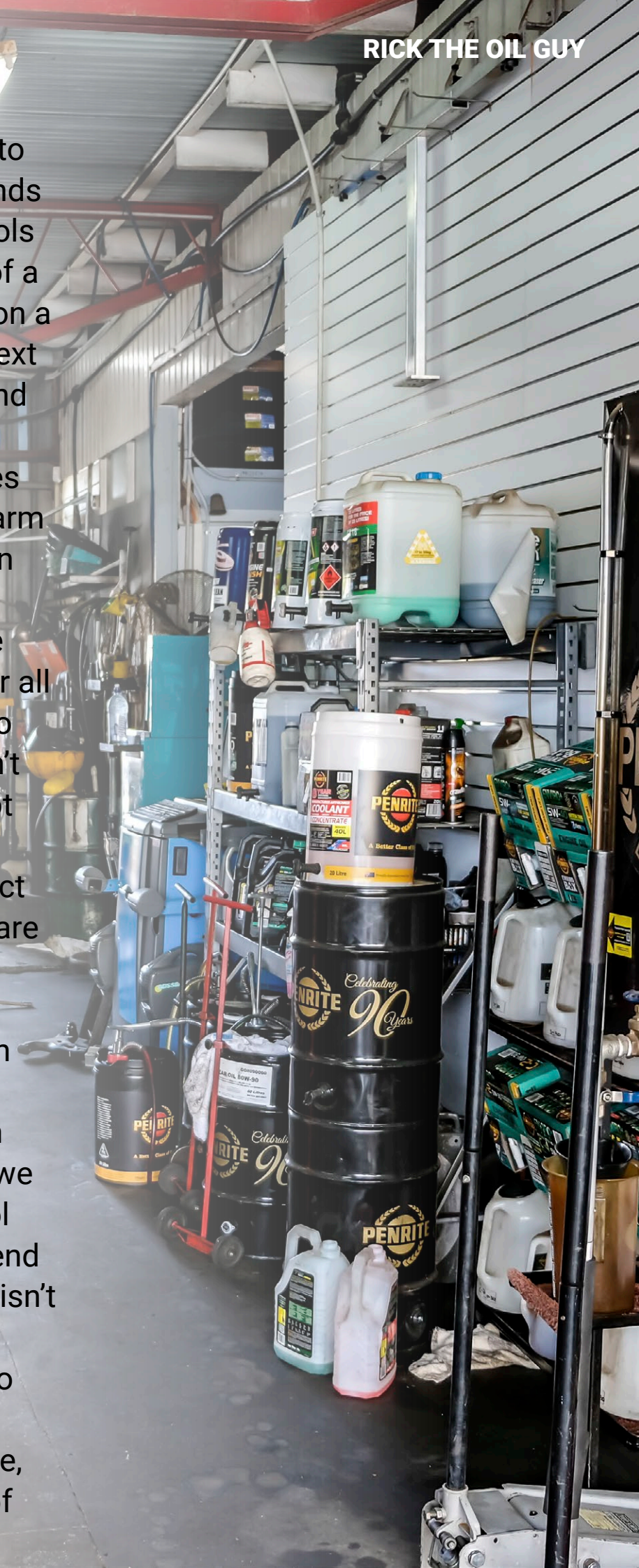
Most things mechanical have a temperature range they tend to work most efficiently at. An engine that is in good condition with minimal wear needs a coolant temperature somewhere around 80-95 degrees Celsius and an oil temperature roughly 10 degrees above that. It also needs to be operating for close to half an hour before the mass of everything has stabilised (remembering things expand with increasing temperature) so clearances are at their design optimum, and combustion is at its most efficient.

Most cars are parked up

overnight or longer. I only get to drive the Landy on the weekends and as that mass of metal cools in the relative moist, cool air of a night condensation will form on a lot of the surfaces so at the next start that moisture tends to end up in the oil.

No biggie, this all vaporises as the engine and driveline warm up, but it can take up to half an hour of running for the entire engine, gearbox, transfer case and diffs to get hot enough for all those tiny amounts of water to disappear. If the engine doesn't get to run long enough and hot enough those moisture levels will build and then start to react with other contaminants. We are burning a fossil fuel that isn't totally clean, so there are by-products of combustion which as they accumulate, reduce the life of the oil. This mix can start to become acidic and if we remember back to high school chemistry metals and acids tend to react and in an engine that isn't for the best.

Engine oils are designed to have a degree of acid-fighting ability, they are slightly alkaline, and there is a measurement of





this for diesel oils, expressed as the Total Base Number (TBN), but this reserve alkalinity can be used up relatively quickly with continual short, cold running trips. Dual purpose petrol/diesel oils TBN is nearly always available on a Data Sheet as the oils acid fighting ability is critical to long service life. The higher an oils TBN, the longer the service life, all things being equal.

Fuel dilution can also be an issue; combustion isn't at peak efficiency until everything is close to operating temps and during that time small amounts of unburnt fuel and combustion by-products make their way past the piston ring end gaps and in the oil film sealing the rings against the cylinder wall.

I mentioned that part of the reason a manufacturer can specify long service intervals is by using synthetic oil.

Without getting into the different types of base oils at this stage and how they are derived the short answer is that synthetic oils don't break down as readily under arduous use as their drilled and pumped from the earth counterparts.

Regarding lubrication and protection, in this day and age, there is little difference between mineral, semi-synthetic and full synthetic lubricants in *normal use*, but most synthetic base oils resist oxidation better than their mineral brothers.

Eventually, all oil becomes too contaminated, and the additives too depleted to ensure adequate protection, contrary to some

“Regarding lubrication and protection, in this day and age, there is little difference between mineral, semi-synthetic and full synthetic lubricants in *normal use*...”

funky claims by a couple of fringe by-pass filter manufacturers but the synthetic oils can eke out a longer life a little easier.

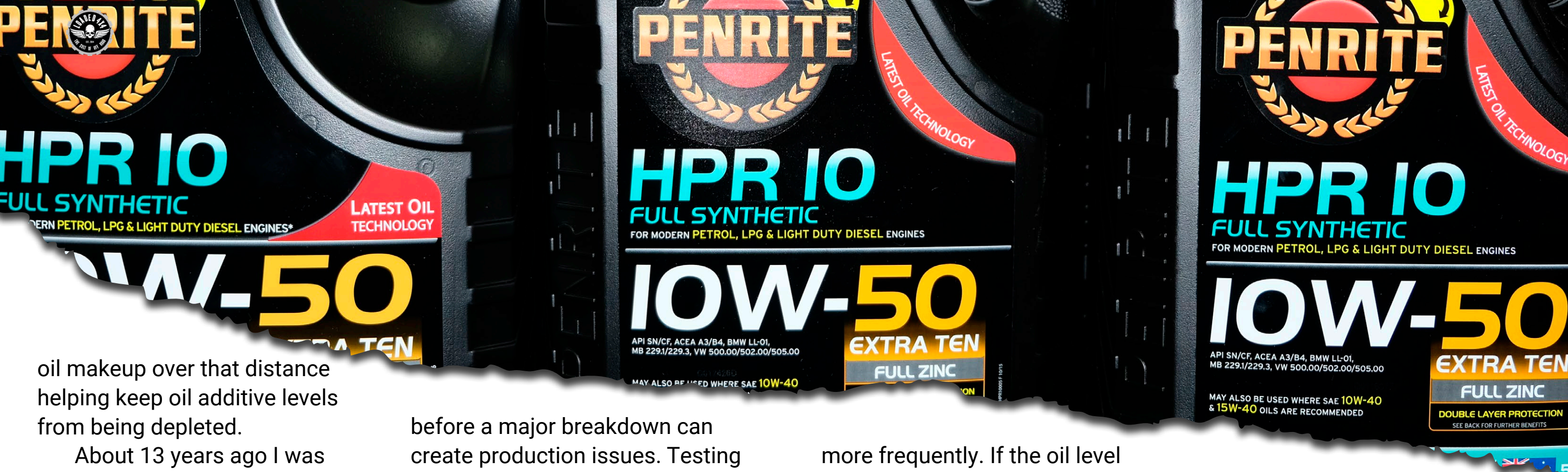
Rather than guessing as I am at the moment, there is a more scientific approach to ascertaining individual lubrication service intervals. It's called Used Oil Analysis.



Interstate trucking fleets, mining operations, marine, industry, basically anywhere running and servicing costs are critical to either continued production or the operations bottom line, used oil analysis is commonplace. And it isn't limited to engines. Any compartment that holds bits that rotate, plunge and move and are lubricated can utilise it. Oil samples are taken, sent to an analytical lab, tested and the results checked against known limits and past samples. I've taken probably fifteen samples in the last few months

from large air conditioning and refrigeration compressors and have to take a few more over the next week.

This way a trend can be established, and a pretty exact servicing interval can be established. Large trucks may be able to pass 100,000km on one oil change. That isn't a typo; I do have the correct number of zeros there! But there are several caveats. Oil type is critical. As is filtering with our air filter being most critical. No oiled cotton gauze filters here! And trucks have huge sump capacities with



oil makeup over that distance helping keep oil additive levels from being depleted.

About 13 years ago I was able to extend engine oil service intervals to 20,000km on a Nissan Patrol with the venerable TD42T using used oil analysis. I also had access to a very good oil analyst. Wear metal numbers were reduced from the oils used and changed at 5,000km, something that was happening every 2.5 weeks!

The Patrol spent less time off the road, and although the oil we were using was incredibly expensive, overall running costs were reduced, and everyone was happy. This testing isn't free, but the cost/benefit ratio for large fleets is well worth it. Potential wear and lubricant issues can be addressed; equipment can be taken offline and substituted

before a major breakdown can create production issues. Testing doesn't prevent total disaster, it won't always catch a catastrophic failure, but wear and tear can be reduced. Things that aren't always obvious such as internal coolant leaks, or fuel dilution issues that impact equipment life can be picked up and acted upon.

You probably need to be a little anal to take this approach to your car servicing, it is aimed at big operators and industry, but by taking an aware approach to what we do with our vehicles and where they've been, we can head off issues before they start.

If you're doing lots of stop-start city driving for only fifteen minutes morning and night, or a significant amount of dusty off-road driving, service your vehicle

more frequently. If the oil level starts to climb on the dipstick and you park in the same spot every day we may have a fuel dilution issue, give it a sniff, if it smells anything at all like diesel alarm bells should ring. There is a really simple test for this we can do with a business card; I'll describe it in a later issue. Petrol is a little more volatile, and we may not notice it, but direct injected petrol engines can have this problem, too.

You can also over service a vehicle. Changing oils and filters too frequently doesn't magically extend the life of equipment. If it did, commercial operators would be changing fluids weekly!

Every time we open the oil filler cap or remove an air filter we

can potentially introduce dust and other contaminants, so care must be exercised when servicing your vehicle. Ag and heavy off-road equipment have safety air filters inside the main filter to prevent contamination, and filters are only changed when their inbuilt pressure drop indicator says they should be, and not before.

Four-wheel-drive servicing isn't hard and with a little awareness and common sense it doesn't cost us more than it needs to, doesn't take too much time out of busy lives and lets us spend more time using our cars. 