

Dipstick eye-view

As vans are used for a variety of duties, Toby Clark looks at the techniques and technologies that could be used to set variable (and optimal) service schedules

When, in January, the DfT decided not to extend the MOT-free period of new vehicles, including vans, to four years, it signalled its desire to ensure that vans and LCVs receive proper care and maintenance.

Ultimately, an operator's inspection and maintenance regime should reflect not just the usage patterns of the vehicle and its equipment, but also the effects of a failure or unscheduled downtime - what are the consequences, in terms of customer service, reputation and other KPIs?

This sort of thinking is well established in process engineering, such as food manufacture, where a combination of preventive maintenance, ongoing inspection and continuous reporting is sometimes known as reliability-centred maintenance (RCM).

Flexible maintenance schedules for vans have been around for a while now and these have typically followed the pattern of cars. For example, the service interval on Vauxhall's diesel-powered small Combo van is either two years, 21,000 miles or oil quality monitor warning, whichever is sooner. The IVECO Daily Blue Power (pictured) has oil change intervals of up to 31,000 miles, while Ford's Transit Custom goes even further, with variable service intervals of

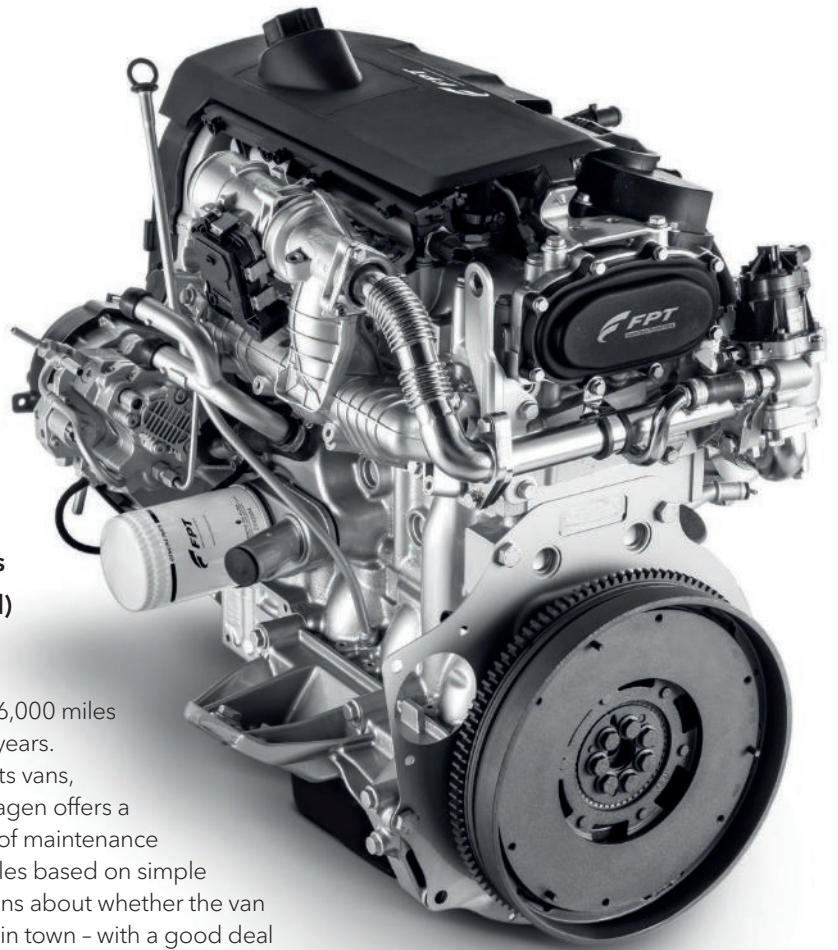
up to 36,000 miles or two years.

For its vans, Volkswagen offers a choice of maintenance schedules based on simple questions about whether the van is used in town - with a good deal of stop-start driving - or on the open road. And stop-start driving takes its toll on other components, Martin Flach, IVECO product director, points out: "You do get a fair amount of brake wear and you might change the discs every other time you change pads. Clutches are still something you have to replace, although the trend towards automatics takes that away".

Vehicle leasing firm Free2Move Lease is incorporating flexible maintenance schedules into its offering. The firm is part of PSA Peugeot Citroen's global mobility brand. Like other manufacturers, PSA is looking towards the idea that transport moves away from vehicle ownership and towards mobility as a service. Robert Handyside, the firm's head of digital and connected services, says: "The vision is to be multi-marque, and also to be a connected company."

A "significant percentage" of the firm's 60,000 fleet is LCV and, Handyside adds, "more and more of our vehicles are coming with connected boxes fitted as standard". The information starts

with accurate mileage monitoring, progressing to diagnostic CAN-Bus information. Managing director Duncan Chumley says: "We're looking at a data-centric solution - a big data solution," but warns, "data is only useful if it delivers the customer a service that they want and provides a benefit to them". The Free2Move Lease offering models the way that maintenance scheduling is progressing. Its 'Command Level 1' offers reminders of upcoming service and MOT dates; Level 2 (at a small extra cost on connected vehicles) books services and picks up fault codes, "so there's an element of preventive maintenance". The next obvious step would be more like a full fleet management service, "absolutely engaged", as Handyside puts it. "You'd book in and follow through, so services and recalls are not missed, so drivers are compliant and vehicles are back on the road quickly." A web-based variant of this service, called Connect, launched at the CV Show (see pp15-16).



"We still find that text is one of the most efficient ways of communicating with the driver"

Duncan Chumley



While direct information from sensors about factors like oil quality is desirable (see box, below), much can be inferred from the existing data output of every engine's ECU. Martin Flach reports: "Engine hours is quite a good indicator of what's been going on in the vehicle," and adds that the latest Daily does not incorporate an oil condition monitor. "By looking at how often the oil's been particularly hot, and how hard the engine has worked, you can create an algorithm to determine when to change the oil." Another telltale is the diesel particulate filter (DPF): "You know how many times a DPF has regenerated, and that's another indicator for oil condition."

But while such information can be used as a proxy for vehicle condition, contends Flach, "it's nowhere near the next evolution, when we start looking at the potential for predictive maintenance". So what's holding this back? "The fact that we don't yet put all of the telematics on every vehicle -

because really to do it properly, what you want is to be monitoring a lot of factors from telematics."

An example is air and fuel filters, he points out. "They tend to be over-maintained, to be on the safe side. But you only need to put a pressure sensor on either side, measure the delta, then you can determine the rate of degradation of the filter."

More sensors are just the start. "The whole aim is not to have just the data from one vehicle - what you need is the data from every vehicle. You start to put that together and you can get much smarter on preventive maintenance, predictive maintenance and costs," states the product director.

Perhaps this is the key difference between vans and heavy commercials: the number of connected vehicles will mean that meaningful and reliable predictive information will arise out of the sheer scale of aggregated data. "Progressively, it becomes more

intelligent, more adept, more agile, both in the way we interpret faults and in the way we respond to them - that becomes an exponential growth curve," Robert Handyside puts it.

Any predictive maintenance system needs a platform with which to communicate with the driver, fleet operator and workshop. Chumley says: "We still find that text is one of the most efficient ways of communicating with the driver." Still, an in-cab alert is also useful - but may be located on a smartphone app, rather than on the dashboard.

Warns Martin Flach: "What we have seen over the years from operating large fleets is that, if you put red lights on the dash, the drivers ignore them."

He says that the problem is much worse with vehicles that have multiple drivers. "Just messaging the driver is only a partial solution - it's much better to be able to advise the driver, the operator and the workshop with the prediction of when the service is." **TE**

OIL DEGRADATION AND OIL CONDITION SENSORS

The effective life of lubricants depends on contamination and changes to the oil itself. Short, cold trips let water and unburnt fuel enter the crankcase and contaminate the oil, while dusty conditions can cause particles to accumulate. High temperatures accelerate base oil oxidation and can deplete additives.

Oil oxidation is typically measured using Acid Number (AN). This does not indicate the corrosive effect of the oil; rather, it measures the proportion of organic acids, which are a consequence of oxidation, and other acids such as sulphuric acid, which can result from fuel and water contaminants. But these are not absolute values and trends in the measurements are more important.

There is nothing new about systems that use operating parameters to determine service intervals: GM's 1998 Oil-Life system

monitored engine speed and temperature, combining this information with a simple classification of driving conditions. Mercedes' ASSYST system added a dielectric sensor to measure the relative permittivity or dielectric



constant of the oil, which increases in line with oil degradation and contamination. Some oil condition monitors can be retrofitted.

Bosch and others have multifunction sensors which use acoustic techniques to directly measure the oil's viscosity (Sengenuity sensor shown). A Vienna University of Technology study (<https://is.gd/foqupo>) showed that microacoustic sensors can measure viscosity of mineral base oils, without being influenced by polymer additives in the lubricant. Although this does not equate to a conventional 'macroscopic' measurement of viscosity, it does correlate with the deterioration caused by oxidation.

Another method employed is impedance spectroscopy, which can measure several fluid properties at once.