Spotlight on... ENGINES

The motor is the heart of your motorhome. It should be understood and cared for. This month, Phil Curry focuses on engine facts

We all treat our motorhomes as one of the family. And, as well as having their own character, they've also got a heart – the engine (even though it is made of cold metal!). It pumps vital fluids around the essential systems to allow your 'van to move, stay lubricated and work as it should.

In fact, an engine is more complicated than the heart, which deals with only one fluid, because it has three liquids to pump around: fuel, water and oil. It also has to expel exhaust fumes, and convert its chemical reactions into movement. There is no more complex part of your vehicle.

There are two common types of fuelled engine: petrol and diesel. The vast majority of motorhomes use the latter, as this provides better torque under low engine revs, which means it is more efficient than petrol at providing enough momentum to move the weight of your 'van.

The history of the diesel engine goes back to 1892, when Rupert Diesel applied for the patent, for industrial use. It was not used in automotive fields until 1930, when the first diesel-powered journey was made

One other benefit of diesel-fuelled engines is economy: an average motorhome, powered by diesel, will return about 25mpg; petrol engines struggle with the heavy loads of a motorhome and return lower fuel consumption figures.

As diesels are complex, they should be looked after by competent technicians. Make sure you have your engine regularly serviced. Should an engine fail, it is extremely expensive to put right.

Although there is some simple work you can do yourself, modern engines are becoming more compact as manufacturers try to make their vehicles' engine compartments as small as possible – and this makes home maintenance almost impossible. Take a modern Fiat Ducato, for instance: even the filters are squeezed into a tight space, under the bulkhead. And, there is no room for the engine battery under the bonnet – it sits beneath your feet, in the cab.

TOP TIP

Mark 1cm points on your coolant bottle so you can check the level more accurately.

phil's TIPS

I have worked on a number of older vehicles and lost count of the times I've had to **replace a fuel pipe** or flush a system because of a foreign body blocking the transfer of fluid. When I've checked them, I've noticed the carburettors have been dry, and no fuel is getting through to the float chamber and, therefore, into the pistons. Some older vehicles don't have fuel filters, so after fixing the problem I've always fitted an inline filter to prevent any further blockages.

The air filter is vital. The air that travels into your cylinders will come through this. Break a cylinder and it is pretty much 'game over'. Likewise, the oil runs through a filter and into the engine, lubricating the cylinders, crankshaft and cams – if something gets into these and breaks them, your engine is finished.

Keeping an eye on your fluid levels is essential, too. Coolant and oil both do an important job in cooling and lubricating your engine. Therefore, it is essential to keep them in top condition.

However, just filling up your coolant bottle with water every now and again is not enough. If left in cold weather with plain water in the engine, it can freeze. As water turns to ice it expands, which can cause serious damage. Antifreeze lowers the freezing point of water when it is mixed into it, and keeps it in liquid form.

THINGS YOU CAN DO

- Replace air filter
- Check and top-up oil level
- Check and top-up coolant
- Check and top-up brake fluid
- Check and top-up screenwash
- Check engine battery voltage
- Check timing belt for wear or perishing
- Check Alternator is charging engine battery

How does a diesel engine work?

Diesel and petrol engines are similar in layout. Both can be accurately described as 'internal combustion engines' because they drive the powertrain in similar ways. However, the process used to ignite the fuel is where the main differences lie.

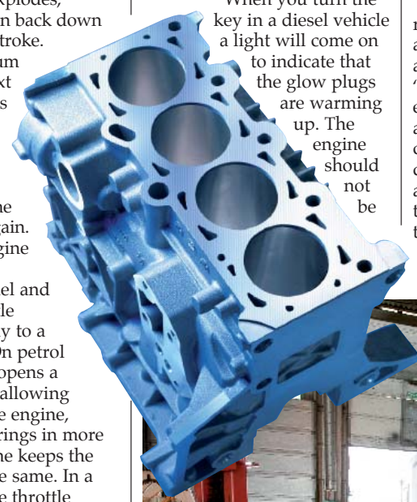
The way in which a standard diesel engine works is simple. As a piston moves down its cylinder, it draws air into the chamber. As it begins to rise, the intake is shut off and the air is trapped inside. As the air is compressed, the temperature inside the chamber rises to around 800°C. At this point, when the piston is at the top of the cylinder, the injector sprays the diesel fuel into the chamber. This explodes, forcing the piston back down to complete its stroke. As the momentum carries it, the next up-stroke pushes the fumes caused by the explosion out through the manifold, and the process starts again.

In a diesel engine there is no pre-mixing of the fuel and air, so the throttle works differently to a petrol engine. On petrol units the pedal opens a butterfly valve, allowing more air into the engine, which in turn brings in more fuel as the engine keeps the fuel/air ratio the same. In a diesel engine the throttle simply pumps more fuel into the cylinder, increasing the explosion and providing a faster cycle.

It is a common misconception that when used, the glow plug in a diesel engine causes the fuel to combust just like a spark plug does in a petrol engine. This is not the case. In a petrol engine the spark plug causes the combustion of the air-and-fuel mixture by igniting the fuel and driving the piston down, whereas a diesel engine relies solely on heated air to manage the combustion.

The glow plug, although mounted in a similar place to the spark plug, serves no purpose in normal combustion – it does a different job. In a diesel engine, it is the fuel being injected into the cylinder, when the air inside has been compressed, that causes combustion. This compressed air is extremely hot and explodes as the diesel hits it. Neither a spark nor any outside assistance is required.

Nevertheless, help is needed when the engine is first started. When cold, the engine block acts as a heat sink, absorbing any heat around it. This means that as soon as the air in the cylinder is compressed, the heat is drawn out to the block so the injected fuel does not ignite. The glow plug is used to help the air heat up, until the block is warm enough *not* to draw warm air away from the process.



When you turn the key in a diesel vehicle a light will come on to indicate that the glow plugs are warming up. The engine should not be started until this light has gone out. Starting the engine beforehand could damage the glow plugs and the engine.

Diesel engines with a common-rail injection system do not need to be warmed up as the engine's control unit monitors the fuel being injected and keeps the combustion consistent.

Does size matter?

Engine size is often measured in litres. But how exactly does this relate to an engine's size and performance? And, what does this measurement mean?

A 2.3-litre engine is not as powerful as a 3.0-litre version but it is more economical. The larger engine will have more power to pull heavier vehicles such as motorhomes.

The capacity (in litres) relates to the total volume of all the cylinders in an engine, and is known as the engine's 'displacement'. A 2.3-litre engine will hold 2.3-litres of air-and-fuel mixture in its cylinders. The higher the displacement, the more fuel and air can be accommodated, the bigger the explosion, and the faster the piston cycle –all of which produces more power. However, bigger engines will also draw more fuel into their cylinders, and will suffer in terms of higher fuel consumption.

Another area that can cause confusion is the difference in figures quoted for an engine when it is measured in litres, or cubic centimetres (cc). The cc is the exact figure for the size of the engine, while the size in litres is the rounded-up figure. For example, a 1.6-litre may actually have a capacity of only 1597cc.

DID YOU KNOW?

Diesel used in automotive engines is a thicker substance than unleaded petrol. Its extra density means that it also weighs more.

A litre of diesel will weigh 0.85kg, while a litre of regular petrol weighs only 0.72kg.

So, in a 90-litre tank, you will be carrying 76.5kg of diesel, or 64.8kg of petrol. So if you want to work out your Mass in Running Order (MiRO), multiply the weight per litre above by your tanks capacity, add 75kg for the driver, and add this figure to your motorhome unladen weight. If you then subtract this figure from the MTPLM, you'll have your maximum payload.

Marc Ball, of Barnes LDV, working on our Argos ***Inset*** **Larger engines produce more power but use more fuel**

Our step-by-step report... on a professional vehicle check and minor service

We recently took our Bürstner Argos 747-2 long-term test 'van to Barnes LDV, in Theale, Berkshire for some essential work. While there, we also asked them to carry out a quick engine check, as it has racked up a considerable number of miles in a relatively short time. The mechanics were happy to oblige...

1 Engineer Marc Ball first consulted a checklist which relates to specific servicing requirements, according to certain mileage bands.

2 The first step was to check the fluid levels. The obvious one was the coolant, as this was the source of an engine leak we had recently noticed (*June issue, p169*).

3 Once our problem leak was fixed (a loose connector pipe), the coolant was topped up to the correct level – halfway between the max and min marks.

4 Next on the checklist was an inspection of the brake fluid. This is a routine check as it usually doesn't need to be replaced until after two years, or 36,000 miles.

5 Next, it was time to replace the filters. The fuel filter on the Ducato is in an awkward corner of the engine bay, and can take some time to replace.

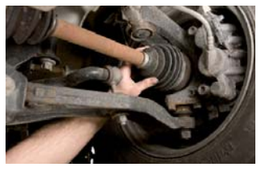
6 Next on the checklist was the oil filter. Marc went underneath our Bürstner and unscrewed the sump plug, allowing the oil to drain out of the system.

7 Once all the oil had drained out of the system, the oil filter was removed. An oil-filter band wrench was used to get the old filter out. Then a new one was fitted in its place.

8 The system was topped up with the correct grade of oil. Marc used 5W/30 for our Bürstner, which should prevent cold-weather start-up troubles. (*For more on oil viscosity see p84, May issue.*)

9 When topping the engine up with oil, Marc kept a constant check on the level, using the dipstick. Too little will not protect the engine. Too much will burn or seep into places it shouldn't.

10 Marc then went back under the Bürstner to check the exhaust system for any mounting problems or possible leaks and corrosion. Thankfully, the 'van was given the all clear.



11 Marc then checked the ball joints and driveshaft boots, to ensure that the running gear is in good condition and that there are no cracks, leaks or other problems.

12 The handbrake cable was greased and inspected for any signs of fraying or breaks – as the consequences could be dire if this cable were to snap.

13 The tyres also received a thorough inspection. First, Marc read the tread depth of each tyre to make sure that each was within the legal limit...

14 ...then, the tyre pressures were checked. For our Bürstner they should be 59.5psi for the front tyres and 43.5psi for the rear set.

15 Next, the wheel was removed so that the rim could be inspected for defects. The brake discs and pads were also checked for excessive wear.

16 The service was completed with a couple of courtesy checks. First, the headlights were inspected to make sure that they comply with UK traffic law...

18 ...and finally, the windscreen wipers were checked before the 'van was taken on a road test to ensure that everything was performing as it should.

Our thanks to engineer Marc Ball of Barnes LDV, in Theale. The firm can be contacted by phone on 01189 300900 or via its website www.barnes-group.co.uk.