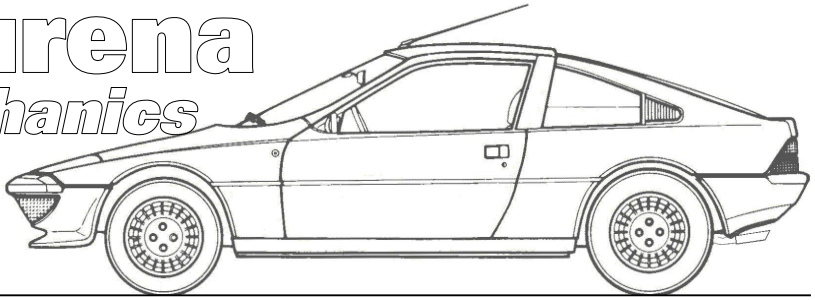
Murena mechanics



Roy Gillard

Recently I answered a question on Lennart's Matra Forum and since it is an important point which hasn't been aired in the magazine for a long time, I thought it would be good to repeat it here for those newer Matra club members and others that don't use the internet or read the forum much.

PCV or Positive Crankcase Ventilation

Any engine produces a small amount of crankcase compression owing to the pistons going down rapidly in an enclosed space, just the same as they produce compression in the cylinder head going up. Since the volume below is much larger, the compression is not great, but it is still there. Now in older engines, say back in the fifties and sixties, this compression was simply vented to atmosphere but since it contains an oil mist, they often had a wire mesh that the air/oil mist had to pass through to try to retain the oil part. However, you got a lot of oil on the roads over the years from all the engines pushing out these fumes.

Now steps were taken to stop this pollution along with all the exhaust pollution and so more modern engines are no longer allowed to vent the crankcase to atmosphere. You cannot simply close off any vents though without doing something about the crankcase compression. So they decided to 'vent' it back into the engine intake and let the engine consume it. You don't want these oily fumes passing through the carburettor, so you need an air/oil separator. On the Murena this is the green plastic item connected:

a) to the manifold below the carburettor,
b) to the intake elbow above the carb. and
c) to the cam cover.

How it works

The vacuum in the intake manifold is used to draw the air out from the crankcase via the connection to the cam cover and create a slight vacuum in the crankcase. This vacuum is important and if it is not present you will get more oil leaks from the engine as the slight pressure tries to find a way out. As the air is drawn into the green separator the perforated discs separate the oil from the air and the tiny bit of oil is drawn into the inlet manifold below the carb. and gets consumed by the engine. The majority of the crankcase air is drawn into the intake elbow above the carburettor and passes through it in the normal way.

Since the connector air hole into the inlet manifold is very small and hot oil is passing through it, it can carbon up and get blocked, and the system then fails to work properly and the carburettor will probably get very oily. So you must make sure the air hole is kept clear. This is why one of the service items is to check this crankcase breather system periodically (every major service).

You should check the air hole is clear. You can do this very simply by removing the hose whilst the engine is idling and check if you can feel the suction with your finger. If it is blocked then because the hole is so small you will probably have to unscrew and remove the connector from the manifold to clear it. If necessary you should replace the green oil separator if it has become too dirty. However, you can sometimes open it up and clean the discs and re-assemble it, but it was originally glued together so you will need to be careful separating it, and then try to re-glue it back together afterwards.

Now I know, since I have seen them, of many cars and engines (and not just Matra) where this system is no longer connected and therefore cannot work as designed. The manufacturers have been forced to spend millions on trying to clean the internal combustion engine, for the benefit of us all, so please don't undo all this work simply because you don't understand it. Also if you make an older car worse than when it was designed it gives the green activists more ammunition against classic cars on the road.

Modified engines

When many people modify their engines particularly fitting twin side-draught carbs. in place of the original down-draught, or change the air intake filter system, often they leave out this PCV oil separator or blank off the PCV system, and just vent the system to atmosphere. Please don't do this, partly as you will be causing more air pollution; partly because you are breaking regulations, and causing more oil on the roads; but also you are probably creating the right conditions for more oil leaks from your engine and crankcase.

I once saw a Murena 2.2 that continually pushed the dipstick up and unseated the rubber at the top so it could vent the crankcase pressure there, and of course this meant there was always a film of oil mist all over the engine compartment! This was entirely due to the PCV system being closed off. Another car that I saw always had a film of oil over the back of the car after a long open road run. This was the fault of the crankcase being simply vented to atmosphere. The oil fumes coming from the end of the hose were carried by the airflow under the car and would coat the back of the car (as well as those following for any length of time!).

Different carburettors

If you fit DCOE Webers, one problem is they don't have any suitable take-off connections for this PCV system (or the distributor advance mechanism) unless you have the emission version of these carbs. The DHLA Dell'Ortos by comparison are a newer design so do have suitable connection points, similar in fact to the ADDHE Solex as fitted to the Murena 'S'. So if you use a pair of DCOE carbs. you will need to drill and tap the manifold and fit a suitable connector into it.

Hopefully you now understand why that green air/oil separator is there, why it is a service item every 30,000 km, why it is important that the tiny hole in the connect is clear, and please don't vent your crankcases to atmosphere.

Distributor Advance

On a related topic, the intake vacuum is also used via the carburettor, to control the distributor vacuum advance. Many of you may not be aware of exactly why this is provided and what is does.

You first need to understand the ignition and power sequence. When the spark fires, the mixture in the combustion chamber does not just explode instantly, it burns, and it takes a small amount of time to provide the push to the piston. This admittedly very small time is the reason behind the timing point being before top dead centre. We need to fire the mixture just before the piston reaches the top so that by the time the main push of expansion happens, the piston has just past top dead centre and that expansion is fully exerted on the piston in the right direction.

Imagine firing the mixture too early or too late. Too early and the expansion would initially try to stop the piston reaching TDC and it would produce a slowing effect and lot of heat. Too late and some of the energy of the expansion would be wasted as the piston was already some way down the cylinder giving a larger volume into which the expansion was taking place. So the timing point is critical if we are to get the most out of our engine.

Mechanical advance

The distributor controls the timing point by two different means. There is mechanical advance and vacuum advance. Mechanical advance is needed because as the engine revolutions rise the time between firing and TDC gets shorter, so the timing needs to advance to still produce the greatest push at exactly the right moment. This is done by having small weights that spin in base of the distributor and it is designed that as they move out, they cause the base plate to move and alter the firing point.

The amount they move is controlled by two springs that are chosen to suit the characteristics of the tuning of the engine. These need oiling if they are not to seize up, and this is why you need to put some drops of oil in the centre of the shaft under the rotor arm at service time. This oil seeps down and lubricates the 'bob-weight' mechanism. Many forget to do this now and the result can be no advance with rising revs, restricting the engine performance.

Mixture strength

Different mixtures burn at different rates. A weak mixture takes longer to burn than the correct one, and if we have a lean mixture we need to fire it slightly earlier so that the main push of expansion still happens at the same time as before to give the piston the greatest push. In other words a lean mixture needs more timing advance.

When you are driving on the open road and you approach the speed you wish to cruise at, you back off the throttle slightly, and this naturally produces a weaker mixture, but it also creates a higher vacuum in the inlet as you are reducing the opening of the throttle and therefore restricting the air intake orifice.

Vacuum Advance

This greater vacuum can be used to advance the timing to match the weaker mixture, using a diaphragm on the distributor that can alter the timing by moving the base plate and altering the firing point. The amount of alteration has again to match the particular engine characteristics so the diaphragm return spring is also carefully chosen by the manufacturer during days of actual testing both with the engine on the bench and in the car on the road.

One effect of backing off and getting vacuum advance is that when you cruise you run slightly leaner and improve the

overall economy. Without the vacuum advance, the engine would need that little bit more throttle to maintain the cruise and the economy would not be as good since the timing and mixture strength are no longer an ideal match..

High performance engines

However, there is a downside to vacuum advance, and some cars are not fitted with it for good reason. These are very highly tuned engines such as racing engines and also those in cars like the old Mini Cooper S and Lotus Cortina as just two examples. The problem is that when a highly tuned engine in a performance car is driven spiritedly, you often change down at high revs, and use the closed throttle on the over-run to aid slowing down into corners. This closed throttle and high revs can create very high vacuum and too much advance, and with too much advance and a very weak mixture (because the throttle is fully closed) it can lead to engine damage.

The loss of economy in these cases is of no concern as the use and spirited style of driving is all about getting the maximum performance, not worrying about a little extra fuel usage! This is another reason why some of the performance carburettors such as twin side-draught Webers did not provide vacuum take-off points. They were expected to be used more for performance and racing than economy on the road.

However, for most road cars, even sporty ones like our Matra, this doesn't apply and the vacuum advance can bring slight benefits to overall consumption.

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