

## MGB Technical Tips - "Running-On":

To begin with, I'll explain the term "running-on", which is really very self-explanatory.

The term describes the condition of a petrol engine with carburettors, not fuel injection, that continues to operate when the ignition key is switched off. Even when there is no electrical ignition at the spark plugs, the engine still runs for a while in a very poor, uneven manner.

This condition can be detrimental to the condition of the engine, and can also be dangerous if the driver isn't expecting it to happen, and having turned the ignition key off thinking that the engine will stop, and then releases the clutch pedal with the car in gear. The running-on could cause the car to move and to crash into something. The condition is detrimental to the engine because without the spark plugs firing, the existing air/fuel mixture in the combustion chamber is ignited with random timing that causes shock waves inside the engine and the feeling from the driver's seat that the engine is trying to rip itself out of the car.

Running-on is also sometimes called "dieseling" because the engine operates without a spark to ignite the air/fuel mixture above the pistons. Diesel engines ignite the air/fuel mixture by having a very high compression ratio which squeezes the mixture until it heats to a temperature which is hot enough for the mixture to burn.

(The BMC, B-series engine, as fitted to MGBs, was used in a huge number of various models of cars and in other applications, such as stationary engines to operate the chiller compressors in cool-rooms for food storage or as an in-board motor in boats. In the case of the B-Series being used as a stationary engine, it was usual for the engine to be converted to be fuelled by diesel rather than petrol. The compression ratio of the diesel B-Series engine was 17:1, instead of 8.8:1 in the petrol version. This is a good indication of how strong the B-Series engine is. This strength comes mainly from an excessive use of cast iron in its design, which also makes the engine un-sportscar-like because of its excessive height and weight.)

If the ambient temperature is quite cold, the high compression ratio of a diesel engine might not compress the air/fuel mixture sufficiently to raise its temperature high enough to ignite the mixture. If the ambient temperature is too cold, a diesel engine has Glow Plugs to ignite the air/fuel mixture. The Glow Plugs act in the same way as Spark Plugs in a petrol engine, by heating the air/fuel mixture to its ignition point, not with a spark but with a glowing (heated) metal element.

So, what actually happens when an engine runs on?

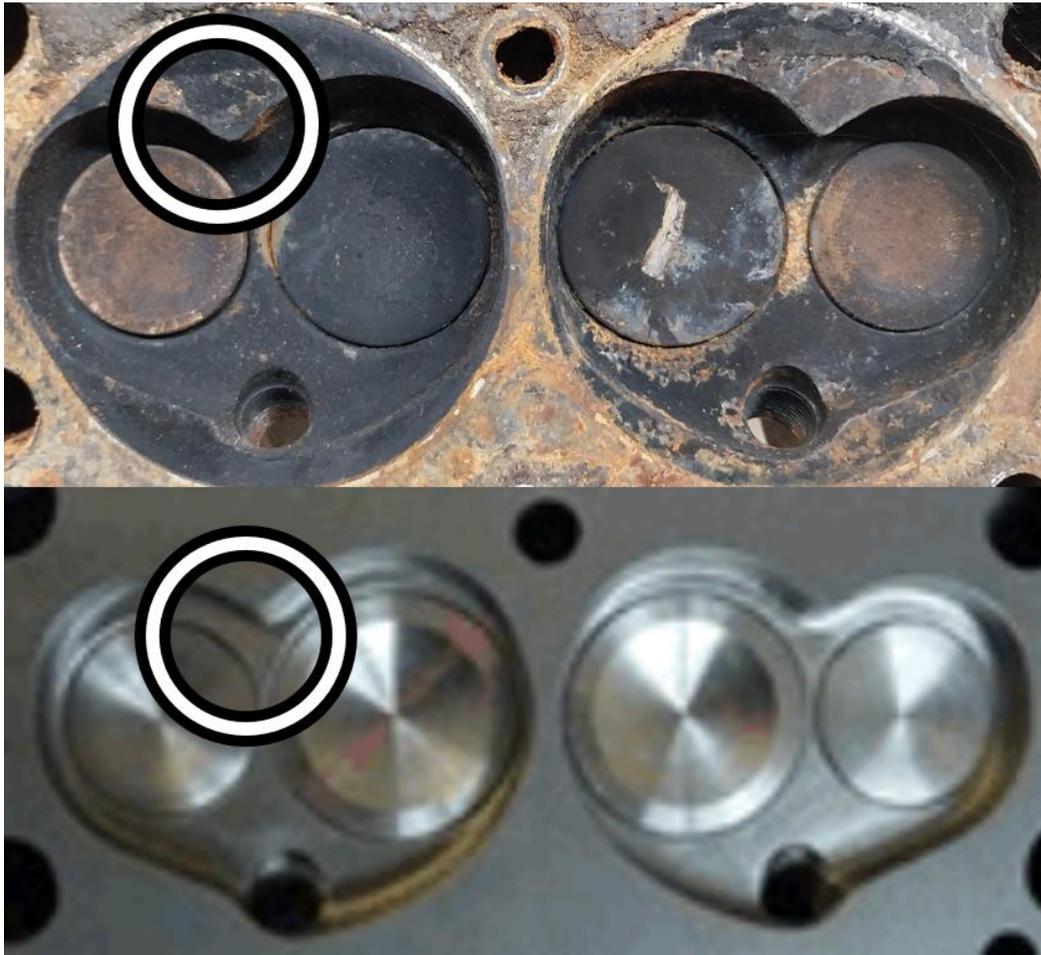
The driver parks their car and turns the ignition switch to stop the engine.

The momentum of the spinning engine means that the engine doesn't stop dead the very instant that the ignition is off. The momentum of the moving parts inside the engine means that they continue to move until compression in the combustion chamber and internal engine friction slows them down until they stop moving. However, the downwards movement of a piston on that cylinder's intake stroke still creates a vacuum which draws fresh air into the cylinder past the open intake valve. That rush of incoming air through the carburettor draws petrol from the float chamber through the jet of the carburettor and into the cylinder. When the engine is switched on, the spark plugs fire and ignite that incoming air/fuel mixture. When the ignition off and the engine has stopped, the air/fuel mixture doesn't burn and the petrol lays dormant inside the cylinder and vapourises harmlessly. If running-on conditions are in effect, the air/fuel mixture ignites from a source other than the spark plug, which causes a poor burning which produces little power but is enough to force the piston down the cylinder bore, which therefore pushes another cylinder on its intake stroke, to repeat the process. I suppose in the worst cases, it could continue to do this until all of the petrol has been emptied from both of the SU float chambers. The petrol pump isn't operating with the ignition off, so at least no more petrol is being sent to the float chambers. This is why fuel injected cars with electronic engine management don't suffer from running-on, because their fuel supply is actively cut off.

The cause of running-on is from some sort of hot element inside the engine's combustion chamber. Usually this is carbon (soot) built up inside the combustion chamber which can be heated so that it glows like an ember in a fireplace. Another "hot element", which is particularly found in A-Series and B-Series engines, is caused by the Siamesed exhaust valves in cylinders 2 & 3 being next to each other, which overheats the cylinder head metal that runs between the combustion chambers of Nos.

2&3. A thin/sharp metal surface is more likely to transfer heat than a broad surface. Another pointed metal surface which unfortunately the B-Series engine (& A-Series) has, is a very distinct “heart” shape to the combustion chamber in the cylinder head, the point of which can get excessively hot and can cause ignition of the air/fuel mixture even without the spark plugs functioning when the key is switched off.

See the photo below showing one of my old, standard MGB cylinder heads on top, with a modified cylinder head for one of my performance engines below. Two things to note in the photo are the shapes of the points in the heart, which I’ve circled, to outline how the modified head has had the point reduced and bevelled back to stop it from being a running-on hot spot. You’ll also notice in the cylinder head that I took from an old engine which I’ll rebuild, is the amount of soot coating the combustion chamber. I’ve seen lots that are worse but I hope that the reader can see it in my photo.



The heart-shaped combustion chamber in these BMC engines is not a design fault because it was created by a mechanical engineering genius called Harry Weslake. A brief summary of Weslake’s work includes; engine tuning for the Bentley Le Mans victories, developing cylinder heads for Ferrari, consulting for Coventry-Climax engines for the Cooper and Lotus Formula 1 engines, teaming up with American F1 driver Dan Gurney to produce Gurney-Weslake F1 engines, developed a four valve per cylinder V8 engine for Chevrolet and manufacturing the Ford Capri RS engines that won the European Touring Car Championship.

The Weslake-designed cylinder head with the heart-shape combustion chamber provided an excellent swirling of combustion gases to promote easier ignition and smoother burning of the air/fuel mixture. The point of the heart shape also directed the incoming petrol and fresh air away from the hot running exhaust valve to reduce the likelihood of pre-ignition in the B-Series engine.

This Weslake feature gave a significant power increase to the mundane Austin and Morris family cars of the day, but for the sporting marque of MG, the extremely pointed heart shape helped produce an ignition heat source.

Faults that the MGB owner can correct to prevent or reduce running-on are numerous.

These faults fall into three categories; the prevention of a physical internal engine "hot spot", driver behaviour adjustment, and poor engine tuning. I'll deal with poor engine tuning first, because this should be corrected even if running-on isn't a problem.

### Engine Tuning:

A poorly maintained and badly tuned engine can be more likely to make the engine run hotter in the combustion chambers, even if not necessarily on the temperature gauge. The points below are possible causes for getting the temperature inside the combustion chambers hot enough to create a running-on issue.

Make sure that you're using NGK brand BP6ES spark plugs or the equivalent in your preferred brand, but I've been running my MGBs happily on NGK for more years than I can remember. Whichever brand of spark plug that you choose, just make sure that it's from a well-known manufacturer and not chosen because they're cheap.

Only go to a colder setting spark plug, if you can't get the running-on to stop by tuning the engine. Sometimes a spark plug (usually a faulty one or an incorrect one) can get too hot inside the engine, which turns it into a running-on hot element inside the engine. A colder setting spark plug would normally only be used on extremely heavily performance modified MGB engines which produce about 50% more horsepower than a standard engine. If your spark plugs haven't been renewed for several years then maybe it's time to invest \$20-\$36 for a new set.

Retard the ignition by 1-3 degrees if you can't stop the running-on, but this is really a desperate measure because you're just making the engine less powerful than it should be instead of correcting the fault but it could be a temporary measure to help with the running-on condition of your MGB.

If your MGB is fitted with a fuel filter, when was the last time that you replaced it? If the filter is partially blocked with sediments, this could reduce the flow of petrol, making the fuel mixture to be lean and heating the engine internally, causing the running-on.

If the valve clearances on your MGB haven't been reset since the eve of the Millennium, there's a chance that an exhaust valve might not be seating properly. As I stated in a previous Technical Tips article, a great deal of engine heat is passed from the exhaust valve, to the exhaust valve seat in the cylinder head, and from there, into the engine's coolant. So, if the exhaust valve doesn't contact fully, or for long enough with the valve seat, the exhaust valve gets very hot. This heat can be a cause of the engine running-on because the exhaust valve is igniting the petrol/air vapour instead of the spark plug.

If your car is experiencing running-on, and you're not already, try using a higher octane rated fuel. Avoid using fuels that contain any Ethanol.

As I described above; running-on occurs because of the momentum of the rotating parts inside the engine continuing to spin after the ignition spark has been disconnected.

Having the MGB engine's idle speed set too high, obviously increases the momentum of the engine's internal parts when you turn off the ignition key. If your engine is prone to running-on, make sure that you aren't giving it the opportunity to occur more often, and have the idle speed set to the correct RPM for your model MGB.

Fresh air leaks into the engine will promote running-on by allowing an additional source of air to be burned in the engine, without the benefit of the air/fuel mixture receiving any additional petrol from the carburettor to stop the mixture from being too lean. A lean mixture will cause a loss of power and will increase the heat inside the combustion chamber.

Unmetered air, not passing through the mouth of the carburettor where the air filters are bolted to, doesn't allow the carburettor to contribute sufficient petrol into the engine.

This unmetered air can leak into the inlet ports of the cylinder head via;

- A damaged manifold gasket.

- A leaking inlet manifold that needs the carburettor to manifold, and/or manifold to cylinder head fasteners to be tightened.
- A perforated or badly fitting hose between the Positive Crankcase Ventilation valve (PCV) and its port on top of the inlet manifold.
- A chafed through or split brake booster vacuum pipe between the booster and the inlet manifold.
- Any hoses to the inlet manifold which are secured by cheap, poor quality hose clamps which have cut through the hose.
- Worn butterfly valve spindles in the SU carburettor bodies.

Poorly tuned carburettors that are providing a lean mixture to the engine will cause it to run hot, as can a faulty distributor or incorrect ignition timing.

All of the above items should be checked during the regular tuning and servicing of your MGB whether it experiences running-on or not, but obviously they should be checked very soon if running-on is occurring.

### Engine modification:

Firstly, I'll mention the US specification MGBs, which were deliberately detuned and modified by the Factory to force the engines to run hot in an attempt to reduce certain exhaust emission gases for the Californian market. I suspect that very few US import MGBs in Australia will have many of these emission control features still fitted or connected. Although, these US imports will probably still have the US cylinder head and maybe the distributor which suits the US engines. These are more likely to induce running-on than the UK and Australian built MGBs.

US market MGBs were fitted with an anti-run-on valve because of their inclination to have this problem. This isn't needed if the emission gear has been removed from your MGB. The anti-run-on valve diverts fresh air into the inlet manifold instead of air from the charcoal canister. The charcoal canister has the purpose of absorbing the petrol vapours from the fuel tank (instead of them escaping into the atmosphere) and storing them until they can be drawn into the engine and burned off. This supply of petrol vapour does a great job of allowing the MGB to continue running even when the ignition key is turned off and the fuel pump has stopped, because it provides an additional source of air and petrol to burn.

Turning now to all MGB engines and how to mechanically remove the carbon build-up inside the combustion chamber and on top of the piston crown. Before progressively cleaner engine oils and petrols became available, in my Grandfather's driving history, he was required to remove the cylinder head from his car, every 10-15,000 miles, to use a scraper blade and wire brush to dislodge and remove the carbon inside. This practice was known as "de-coking" the engine. His 1953 Motor Manual on "How Your Car Works And How To Service It" gives excellent instructions on this process for the average motorist of the day.

This tedious but regular task isn't required as frequently as it was in those days but many cars can still benefit from carbon removal. Even modern cars.

The cylinder head on a modern car takes considerably longer to remove than one on a Classic car, so these days, carbon removal comes in the form of an aerosol can!

The engine air inlet tube is disconnected from the Mass Air Flow (MAF) sensor on a modern car and with the engine running, the mysterious contents of the aerosol can is sprayed out to clean the MAF and to allow the engine to "burn off" the internal build-up of carbon. You can usually see that it's cleaning the engine by the clouds of smoke coming from the end of the exhaust pipe. You can also tip a bottle of petrol additive into your fuel tank next time you fill up.

I have historically considered all additives to be modern equivalent to "snake oil", especially when they claim to improve power, fuel consumption, liver function, and bed-time activities. I have used some of these engine additives on occasions and found that some of them worked and other didn't have any noticeable benefit. There are some anecdotal reports of these products actually harming an engine, so I'm not going to either recommend or denounce this treatment, but to leave it to your own decision.

Without question, the most effective way to prevent your MGB from running-on, is to remove the cylinder head and get it mildly performance modified, as seen in the earlier photograph. Getting the cylinder head's combustion chambers machined will help because the sharp point of the heart-shaped combustion chamber should be reduced and rounded out so that it won't get so hot and cause pre-ignition or running-on. You might as well get the cylinder head machine shop to spend a couple of hours working to improve the gas flow through the inlet and exhaust ports. We're not talking about a racing engine cylinder head here, just a few hours of machining labour to give your MGB a slightly better spring in its step.

While your cylinder head is off the car, it can be "hot tanked" at the machine shop to remove all of the carbon, the rust, the flaking paint, the excess silicone sealant, and the sediment that will have accumulated in the water jacket.

Then, if no hardened valve seats have ever been fitted to the cylinder head, this is the time to replace the factory valve seats.

If the original valves are in a good condition, they can be cleaned and the surfaces which contact the valve seat can be re-ground and lapped with valve grinding paste to form a good seal.

The valve guides in the cylinder head will likely be worn and will need to be replaced.

Of course this work costs money but your MGB will be performing like it just came out of the factory, or even better.

#### Driver behaviour:

Some people state that allowing the engine to idle for 10-20 seconds before turning off the ignition key will reduce the momentum of the engine's internal rotating parts, which can reduce the likelihood of the engine running-on. I don't have any firsthand experience of this possible solution but it makes sense to me to try it.

A possibly dangerous and probably not car-friendly way to discontinue a running-on episode is to engage the handbrake and to press firmly on the brake pedal, and then to stall the engine by releasing the clutch pedal with the car in gear. Stalling the engine stops the momentum laden rotating parts from continuing their path and drawing in more air and petrol. This is a drastic action to take. It works but I do not recommend taking this action, at least partly because of the strain the engine experiences. It can be a dangerous practice and is only needed if other things haven't been dealt with as they should've been.

I'll relate a story before I move on to my final anti-running-on solution which is dear to my heart. Many, many years ago, a friend of mine's father was the Service Manager at a Porsche dealer and he once told me that many of the elder owners of a Porsche 911 would frequently bring their high-powered cars into the dealership complaining that their car was running very poorly. They were told to come back at the end of the day once their 911 had been "tuned". The procedure was to fit six new spark plugs into the engine, and allow an apprentice to take it out for a thrash for an hour. Then the customer was charged a Porsche-amount of money for getting their 911 running properly again. The problem was that the drivers of these high-revving performance engines were changing gear at 2,000RPM and driving around the city in fifth gear.

Don't "drive Miss Daisy", like in the film.

My current daily-driver MGB was very sluggish to accelerate and difficult to start when I first purchased it. After just over a month of **me** driving it, driving it properly, it was transformed into a much quicker starting and accelerating car without having to take a spanner to it.

If you don't use the engine fully by sometimes giving it a good run and hold the gears until at least 4,000RPM before changing up, you're going to encourage the build-up of carbon / soot inside the combustion chambers in the cylinder head and on top of the pistons. If your MGB is in good health, try taking it on a hard drive to burn off and clear out any soot contamination from the combustion chambers.

If your MGB begins to slow down due to a steep incline on the road, press the accelerator pedal further to the floor. If your MGB can't safely maintain the legal speed limit on an inclined section of road, get someone to look at it to get it fixed.

I'm not suggesting that anyone should be driving their MGB like a maniac, and I'm not suggesting that MGB owners should regularly hold the engine for extended periods at high revs but I am suggesting that every MGB owner should be using more of their well-maintained engine's available revolutions per minute at least some of the time for the benefit of the engine, to reduce the build-up of carbon inside the engine. There is actually a reason why the Factory fitted its MGBs with a tachometer marked with a 5,500RPM orange line and a 6,000RPM redline.



There's a genuine purpose why my competition-prepared Yellow B has been using a Stack brand tachometer for the past 20 years. The factory MGB tachometer stops at 7,000RPM which isn't quite enough when I'm competing on the track. I'm not saying that a standard, "Street" MGB should, or even could spin at over 7,000RPM, what I'm saying is that it's absolutely fine to change gears at more than 3,000RPM, for most of your outings in the B, just don't be frightened to go on a run in your well-maintained MGB and change gear at 4,000RPM or even higher.

Maintain your MGB engine properly and enjoy it more fully by using it the way it was always intended to be driven.