

# Remobilisation of a 1937 Morris 8 Sports

## Episode 8: Starting and Misfire Issues

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*The author in a relaxed moment.*

### Topics

I now turn to some of the frustration I have experienced with engine starting and misfires. After fleshing out what I could cover I realised that there is far too much material for just one article.

So I have decided to split this topic into two instalments. In Part 1 below I will outline the problems and the (scattergun) approach I took to get to the fix.

In the future Part 2 I will offer a few hindsight reflections and discuss in a little more detail some of the subtleties of how the Kettering ignition system actually works. I will close by describing the approach I now use to check the ignition system performance on my older cars. This may offer another ignition fault finding option for those with some technical capability.

I will leave it to the discretion of our very capable and long suffering Editor to decide on how she wishes to deal with the two parts (bin them both?).

*(ED: No way will they be binned - we are grateful for all the technical knowledge, experiences and effort you have put in to sharing all of this with us.)*

I then have just one future article to go: my car battery – a custom solution using the ubiquitous 18650 lithium ion cell

See earlier newsletter issues for other topics I have covered. If you have no interest in ignition systems, stop reading this article now!

## **Part 1: The Problem and the Fix**

Chasing starting and misfire issues could fill a book, but in this first part I will try to restrict myself to describing the problems I experienced, and what I hope is a resolution.

### **Initial Work on the Engine**

With the body nearly finished, I started to look more closely at the engine. I had managed to get it running very early on, before commencing on the body and electrical systems. Operation was very intermittent, and it produced clouds of smoke. I did not investigate further at that time.

Not surprisingly, when I got around to getting it started again, it still had the same problems. For periods at a time it would not start all, which prompted the usual response to remove and examine the non-firing plugs. Depending on their condition when removed, I would either suspect the fuel system, or the ignition system, or even the engine timing, or all three, because nothing was consistent. Sometimes they were oiled up, or sooted up, or dry, or wet. There was no clear pattern, the conditions varied across the plugs and different plugs were worse than the others at different times.

To get the engine started, the plugs had to be thoroughly cleaned and dried. I use a 1000V 100Mohms insulation tester (Megger) for testing spark plug insulation levels. When measured prior to cleaning, the non-firing plugs always exhibited a low insulation resistance (generally much less than 1Mohm). I found that the plugs had to check out at > 10MOhm for reliable firing in the engine. Once I achieved this level of insulation by cleaning and drying, away the problems would go, - for a while.

I checked the compressions, which were very even and in my experience seemed OK for an old low compression engine (around 135psi at the cranking speed achieved). It was clear from the blue exhaust smoke that the engine was burning oil, but there seemed to be more issues causing the intermittency and misfiring. I replaced all the plugs with new ones, and for a while (half an hour or so of running) it ran perfectly. Then it was back to “normal”. The sage old hands reading this will now be saying “ah-ha you should have .....

## Confusing Symptoms

Because the plugs were sometimes wet, I thought the carburettor was flooding. Because they were sometimes dry, I thought the fuel pump was intermittently failing. Because they were sometimes sooty, I thought the mixture was too rich. Because the spark was sometimes weak, and the engine misfired on depressing the throttle I thought the coil or the capacitor (condenser) was sick, or the points were not opening properly, or there was too much series resistance in the primary (i.e. points dirty or badly corroded), or too much leakage current in the secondary (distributor, HT leads, plugs etc.) and so on. So I went through everything in the fuel system and the ignition system, replacing the obvious and thoroughly testing the rest. I found lots of possible contributors, but nothing definitive.

So in desperation I decided to remove the engine and gearbox, and have a look at the status of the valves, guides, bores, pistons, rings, and bearings, but leaving the crankshaft in position unless a major repair required its removal. I split the engine and gearbox, and replaced the seals at both ends of the gearbox, as they showed significant leakage.

I found that the valve guides needed replacement so I undertook this, purchasing new guides from the club. The bores and rings were worn, but in quite good condition. I was advised to remove the ridge at the tops of the bores and give the cylinders a light hone, which I did. I contemplated also popping in a replacement set of rings, but could not locate a 60 thou oversize set for the 918cc engine, so had to pass that up. While the engine was out, I replaced the timing chain. I couldn't get the crankshaft pulley off (it seemed to be cold welded on!), and I didn't actually remove the crankshaft. Fitting a new timing chain without having the crankshaft sprocket moveable on the shaft was a major challenge.

I took a set of figures for all relevant clearances and found the engine bearings to be in good condition. I put it all back together, and dropped it into the car. I reset the timing. The starting and misfiring problems did not improve - in fact they got steadily worse.

After some time, I was convinced that the fuel system was now operating correctly and consistently, and so I looked more closely at the ignition system.

## **All Roads Lead to ...the Ignition**

On hindsight, I think there were several contributing factors to my problems, but while I was fixing the minor ones the major one became more prominent, and eventually dominated. I now think that the main culprit was slow and intermittent degradation of the ignition condenser (capacitor) connected across the distributor contact breaker points. When subsequently re-examining the points, they had become quite pitted in the short time since refurbishing them. The failing condenser appeared to cause accelerated erosion of the contact points, such that they then then contributed to the worsening situation.

I spent a lot of time on the internet, looking for hints, advice and reports of similar issues. It wasn't until after I had come to the above conclusion regarding the condenser that I came across a revealing piece of advice: that ignition faults, and in particular a "weak" condenser can insidiously induce all of the above spark plug symptoms and even masquerade as intermittent fuel system faults.

While I had a general understanding of the Kettering ignition system, I had never really investigated it closely to understand what the normal operating parameters and conditions should be, and therefore be able to identify the faulty components. When I went on line, I found that not many others had much idea either. In most cases the mantra was "replace everything". This approach may in most cases solve the problem, but as a solution for me, it offends both my innate curiosity and my wallet. So I resolved to find out more.

## **Back to My Findings.**

As mentioned earlier, the misfiring and fouled plugs did not stay on any one cylinder. This suggested that the problems were related to common parts of the system, i.e. in the ignition system everything up to the distributor cap and plug leads. Or maybe something in the entire fuel system ....or maybe timing issues .....

## HT Spark Tests

A subjective test often applied to check the state of an ignition system is to remove a HT lead (from the distributor centre or a spark plug) and crank the engine to draw an arc from this lead to a grounded metal part. An 8 mm or more arc is considered adequate for an older engine. The amount of energy in the spark is also very important, but with this simple test the assessment of spark energy is only subjective. It should be “fat blue”, and not “weak yellow”, or similar wording. It is almost impossible to perform this test without causing the ignition system to at times run open circuit, stressing the insulation with quite high over voltages (maybe two to three times normal).

Therefore I now avoid doing these arcing tests. As will be described in the future second part of this article, I have adopted a test that avoids unnecessary voltage stress on the ignition system, while also confirming that sufficient energy is available to ignite the mixture.

However, at the time I carried out HT lead arc tests many times. In the initial testing the arc length and colour appeared fine, both at the coil HT lead, and at the individual plug leads. The arc length and colour only became consistently erratic and weak in the later stages, by which time it was almost impossible to start the engine.

Another test I have regularly used when a plug appeared to misfire intermittently was to take it out and lay it on the head to check its spark while cranking. When out, the plug would appear to spark ok, but when back in, it might initially fire the cylinder and run at idle, but soon play up again. I now think that this test is also a pretty ineffective measure of ignition system/plug performance.

This is because the breakdown voltage in air for a 0.8mm (~0.030”) gap is about 2.4kV. For the Morris 8, at 0.5mm gap it is only 1.5kV. Under combustion conditions inside the cylinder, a much higher ignition system voltage is required, maybe up to 10-15kV. So testing an ignition circuit and plug by taking it out and laying it on the head to check that it is firing is nigh on useless.

It took me a while to work this out!

## My Conclusions

I now think that a weak spark caused by the original ignition problems was not adequate to ignite the mixture under all conditions. After a few intermittent misfires a wet (moisture/petrol/oil) film coated the plug reducing the insulation resistance and effectively killing any further spark on that cylinder (at compression pressures). A good ignition system should be able to fire a spark plug with insulation resistance well below 10Mohm, but this was not happening.

The apparently “fouled” plugs were masking the real issue – weak and intermittent ignition energy caused by a faulty condenser-contact pair. I never determined the exact fault, but I suspect that the condenser was failing intermittently in a way not picked up by the multimeter “kick” test (often recommended in fault finding advice on ignition system condensers). So, while the condenser had checked out to be good again and again using this test, I finally decided on impulse to replace both it and the contact points together. Since I didn’t have an original capacitor to hand, I selected and wired in a 1200Vdc polystyrene component from my spares box.

When testing by flicking open the contact points the spark appeared no different to the earlier observations when the initial misfiring was present. However, the plugs would now fire in air with 100kohm connected across them. This appeared to be an encouraging improvement, as during earlier testing that the ignition system would not fire a plug in air with anything lower than 300kohm connected across it.

## The Start-up Test

I was rather apprehensive, but nothing ventured nothing gained so I cranked it over. The engine immediately started up and ran at a good idle. The rough idle and misfiring appear to have completely disappeared. Also, I could now adjust the carb mixture to a stable point with the jet in the expected range. Too good to be true! It still starts and runs when I try it, and accelerates down the street without spluttering and missing. I can’t be positive that it was only one component playing up, having replaced both the coil and the contact points as well, but at this point the condenser appears to have been the main cause of it all.

## The Lesson

So there we have it. Every test I carried out on the individual ignition components came up rosy. Because of this, I just could not work out a logical cause. I never ever used to replace the condenser because in 60 years of maintaining cars I don't ever recall having had a failure – until now. One is always learning ....

With some egg on my face, the advice I would now give is that if you have poor starting and an intermittent misfire problem, don't spend too much time delving into the many possible causes outlined above, without first replacing both the condenser and contact breaker points!