



### What are the concerns with biofuel for MG enthusiasts?

Earlier this year a report on the compatibility of vehicle fuel systems with bioethanol from the consultancy QuinetiQ for the Department of Transport recognised the problems for older cars running on blends of ethanol and petrol. The report recommended a delay in the introduction of higher levels of ethanol in the UK. The questions on many MG enthusiasts' minds are what are those problems, what damage has been seen with SU fuel system components and what alternative materials have been used for replacement parts? So we visited Burlen in Wiltshire, the only maker of genuine SU carburettors, fuel pumps and spares, to see what damage they have seen to SU fuel system components from ethanol and what alternative materials they have used to produce replacement parts.

Since the introduction of ethanol in motor fuels in the UK and overseas there have been three main areas of concern – corrosion of fuel tanks, compatibility issues over the effects of biofuels on rubber components and sealants, and combustion issues. The FBHVC (Federation of British Historic Vehicle Clubs) has recognised the seriousness of the problems with the present E5 (motor fuel with 5% ethanol) and has been very actively working on them, not least lobbying Government to delay the planned introduction of E10 in the UK.

The **corrosion concerns** are that biofuels in petrol attract water which can then lead to corrosion in fuel storage tanks and supply systems, particularly when fuel is stored for lengthy periods in a classic

car laid up over the winter months. A number of corrosion inhibitor additives have been produced, some of which are already available from suppliers and classic car specialists. Earlier this year the FBHVC commissioned independent tests of commercially available additives and the results are expected by the end of 2011. Then the Federation hopes to be able to launch an endorsement scheme to assist classic car enthusiasts selecting an additive.

The **compatibility concerns** are that some types of elastomers and polymers used for moulded and flexible rubber components may swell, shrink, begin breaking down or leak and seals may not perform well. The most common complaints are that fuel tank sealants have failed and the consequential effects are leaks, blocked carburettors, fuel starvation, weak mixtures and engine damage. Biofuels also have adverse effects on some metal components in fuel

systems, for example brass and copper. Unfortunately there is no quick fix or additive solution for these material compatibility problems, only replacing non-compatible materials with parts which can perform better in the ethanol/petrol blends used in commercially available motor fuel.

The **combustion and driveability concerns** with the biofuel blends currently available pumps in the UK are technically complex and in some respects controversial. They are being examined by FBHVC experts so clarification is expected in due course.

### What problems have Burlen seen?

Generally Burlen has not seen many problems or complaints with SU carburettors – in fact only two in the last few years. In those cases the problem was jelly like deposits in the carburettor bowl but Burlen feels it is likely the problem is caused by other factors, for example from drivers in other countries using various additives in their fuel which lead to SU carburettor and fuel system problems.

Damage has been seen to plastic motorcycle fuel tanks and the cause has been identified as the adverse action of biofuel on the original plastic tanks fitted to those machines. So replacement tanks, made from a biofuel resistant plastic material, have been a necessary preventative replacement.

Burlen's tests on the rubber fuel hoses previously supplied for SU fuel systems showed some disintegration on the inside surface of the hose from E5, so Burlen now supplies an ethanol resistant rubber fuel hose. Another replacement fuel hose option, Gates 3225 hose from Car Builder Solutions, is good for 7% ethanol.





SU carburettor bodies were made from Mazak (zinc and alloying elements of aluminium, magnesium and copper) but most recently are pressure die cast aluminium items which they hope to roll out across the SU range. The latest aluminium bodies are for MG P and J types and H4 carburettors for MG TFs and MGAs. Whilst Mazak is not recommended as compatible with biofuel in the table below produced by CONCAWE, Burlen has not seen any adverse effects or damage except the deposit of a light varnish or gum which has not become a problem. Nevertheless they continue to monitor the situation.

#### What replacement materials and parts has Burlen introduced?

Burlen has changed all its rubber fuel hoses to fully ethanol proof string reinforced components made from Viton sourced from a UK supplier. Viton is a brand of synthetic rubber, a fluoropolymer elastomer commonly used in O-rings and other moulded or extruded goods like fuel hoses. The hoses are rated to 225 psi – not a fuel pressure SU carburettors would experience!

Burlen has seen that thin rubber membranes in fuel pumps do not rot or split from contact with biofuel but they do become either too supple or in many cases very hard so they no longer perform well as efficient membranes. So Burlen uses their latest Viton diaphragms in both new and restored fuel pumps.

Some years ago SU introduced a rubber tip on the float needle valves in their H type carbs to achieve both a better seal than current brass and steel versions and improved wear characteristics to prolong the life of the valve. Burlen replaced the

rubber tip with Viton to improve performance with ethanol fuel mixes. The main metering needle had always been made of brass but as a further improvement Burlen recently changed this to nickel silver (brass with 20% nickel). This retains the necessary good machining properties to make accurate needle valve seatings, needles and jets while improving corrosion resistance for ethanol fuel use and lowering the cost.

Burlen's original plastic/nylon float was produced as two halves which were then sealed together. The experience with this pattern of hollow white plastic float has been good, but after use for some time they are usually seen stained brown and the more so in the last few years. Burlen had previously supplied a robust plastic carburettor float for military fuel systems which had a honeycomb structure and was not hollow so that if the float is pierced for any reason, then it will continue to float and perform well. Burlen has since developed a range of plastic floats called StayUp® Floats for its SU carburettors which it has tested in E85 with no problems. So they are they are now available for H and HS type carburettors fitted to Midgets, Sprites, MGBs and MGs. They are looking at the viability of this float for older versions.

Burlen continues to sell its traditional SU brass floats alongside the newer StayUp® Floats for enthusiasts who wish to maintain the originality of their vehicle. No damage has been seen with the traditional

brass floats and there have been no signs of biofuel attack on the solder used to join the upper and lower sections of a brass float. Brass is an alloy of copper and zinc. A horseshoe shaped StayUp® Float for the HIF carburettor used on the MGBGTV8 model is being developed and will be available soon.

#### Where next in the UK?

It is likely E10 will come in during 2012, a blend the DfT acknowledges is not suitable for most pre-1993 cars and many newer models too, so classic car users may then have to buy the more expensive premium E5 fuel like Shell V Power. An EU Directive requires Member States to ensure that supplies of 5% ethanol petrol are maintained until 2013.

#### Burlen Services

Burlen owns the intellectual property rights and SU trademark and has expanded its manufacturing and development facilities in order to maintain a good spares and refurbishment service for SU carburettor equipment and fuel pumps. They employ some 60 people with four experts on the restoration side and business is booming. You can contact Burlen at Salisbury on 01722 412500. For more information see [www.v8register.net/ethanol.htm](http://www.v8register.net/ethanol.htm)

Table is from CONCAWE, the Oil Companies' European Association for Environment, Health and Safety in Refining and Distribution which has carried out extensive work on the uses of petroleum substances.

Recommendations for Materials Considered for Use in Ethanol and Ethanol/Gasoline Blend Applications

Material	Recommended	Not Recommended
<b>Metals</b>	Carbon steel with post-weld heat treatment of carbon steel piping and internal lining of carbon steel tanks Stainless steel Bronze Aluminium	Zinc and galvanised materials Brass Copper Lead/tin coated steel Aluminium (may be an issue for E100)
<b>Elastomers</b>	Buna-N (hoses & gaskets) Fluorel Fluorosilicone Neoprene (hoses & gaskets) Polysulfide rubber Viton	Buna-N (seals only) Neoprene (seals only) Urethane rubber Acrylonitrile-butadiene hoses Polybutene terephthalate
<b>Polymers</b>	Acetal Polypropylene Polyethylene Teflon Fibreglass-reinforced plastic	Polyurethane Polymers containing alcohol groups (such as alcohol based pipe dope) Nylon 66 Fibreglass-reinforced polyester and epoxy resins Shellac
<b>Others</b>	Paper Leather	Cork



Editor

Please crop and resize the photos to fit the copy to the pages as set out in the PDF copy. Good quality original and cropped jpegs from Bob Owen are supplied with the copy – details below.

## Page 1

Set of the new plastic floats

[Burlen article floats cropped FS.jpg](#)

File size = 1.69MB

Twin column width

Rubber tipped needle valve

[Burlen article viton tipped valve 5](#)

[FS.jpg](#)

File size = 1.28MB

Twin column width

## Page 2

Section of new ethanol resistant fuel rubber hose – two images provided, the raw image and a cropped image

[Burlen article hose FS.jpg](#)

File size = 743Kb

Single column width

[Burlen article rubber hose cropped](#)

[FS.jpg](#)

File size = 643Kb

Single column width

CONCAWE table

[Burlen article CONCAWE chart.jpg](#)

File size = 1.93MB

Twin column width