Ethanol and Classics Don’t Mix! Vital Information You Need to Know… Our Must-read Final Episode of Three.

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Photo by Kim Henson.

Ethanol and the Classic Car Fuel System – Part 3, by Dave Moss.

Photos by Kim Henson and Dave Moss (as credited individually).

Since 2011, suppliers have been blending a gradually increasing ethanol content into UK fuel – reaching the level around 5% known as E5 early in 2013. Official approval already

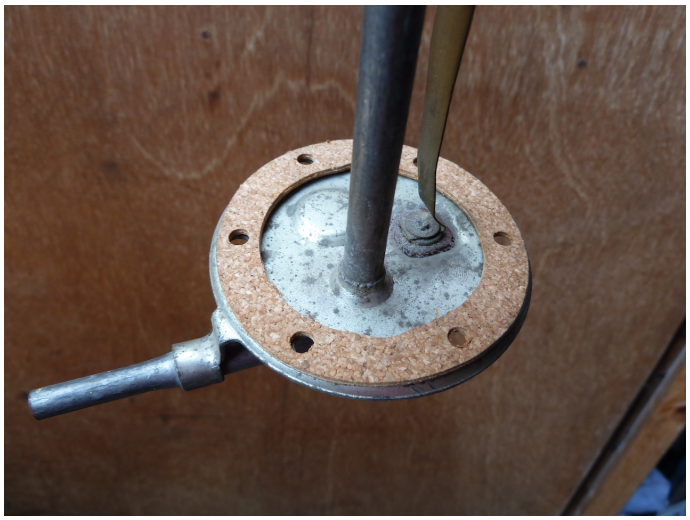
exists to continue raising the proportion to 10% – the E10 level, and quite simply, none of this is good news for classic vehicle owners, for old car fuel systems and Ethanol were never intended to meet.

Ethanol is not a pleasant substance, being acidic, somewhat corrosive, a solvent, and also hygroscopic – it absorbs water from the atmosphere. Over time, water and ethanol form a mix denser than petrol, and in a process known technically as “phase separation” this pretty aggressive cocktail sinks to the bottom of the tank. With E10, the process starts with a mere 0.5% water content in the fuel.

In modern and well-used vehicles running on E5 fuel, neither the amount of water build-up nor phase separation has proven to be a big worry, since with occasional exceptions, cars of the 21st century can accommodate it. But, if you run a classic and haven’t thoroughly checked the condition of its fuel system since 2011, now might be a good time… especially if its used infrequently, or perhaps regularly stored over winter or longer. Given time sitting still, absorbed moisture could be enough to initiate rust inside a near-empty fuel tank, building up over time to the point where rust granules might eventually block a tank outlet, fuel filter or carburettor jet. This stagnant mixture, built up in the tank over months, might be pumped into the carburettor after vehicle storage, making starting difficult if not impossible – and E10, when it does appear, will make all these things worse. Use of one of the additives available to help combat corrosion problems in long term storage could be considered here.

Longer term effects on vehicles built before 2000 can’t be ignored either. In the past, carburettor and fuel pump components were often made from alloys involving aluminium and zinc, some of which have been researched as susceptible to ethanol-induced corrosion. So, when dismantling fuel system components, look for signs of white deposits where fuel flows – or where a fuel/air mixture is present. For different reasons similar effects are possible anywhere fuel and dissimilar metals come into contact. With E5 fuel, again few problems have surfaced, but there are other risk areas: Ethanol can affect some plastics, elastomers and composite materials, as used in floats, diaphragms, needle valves, seals and

so on – making such components worth examining for deterioration. Cork seals and “O” rings are also at risk.



Cork gaskets are among components that suffer with exposure to ethanol… (Photo by Kim Henson).



In the future, petrol tank gauge floats will need to be of ethanol-proof materials… (Photo by Kim Henson).

There’s also a bigger and much more widespread worry – ethanol has a slow, definite but

unpredictable destructive effect on many types of rubber, especially fuel hoses from an earlier age – as used to interconnect tanks, fuel lines, pumps, filters and carburettors. At some stage in this terminal road downhill, leakage or seepage of fuel is a strong possibility, bringing us to a public and classic car health warning. Leakages anywhere in petrol vehicle fuel lines are an extreme safety hazard, and can quickly lead to fires, which can equally quickly destroy a valuable car. Thus any surviving original hoses – and any replacements fitted before 2000 – will be suspect and should be considered for replacement.

Industry quality standards have applied to fuel hoses for many years. The Society Of Automotive Engineers (SAE) is the body responsible, and issues a series of regularly updated standard specifications – known as J30/R x. These standards evolved from straightforward oil and ozone resistant synthetic rubber tube known as R2, reaching a landmark with R6, a single hose type specified to carry petrol, diesel, and oil or vapour – and cope with early fuel injection systems, with a 50psi pressure limit. Growing concern about petrol vehicle vapour emissions saw R6 also become the first hose for which maximum permeability (in simple terms vapour loss through the tubing) was specified.

Permeability is the key reason why older hoses are incompatible with fuel containing ethanol. The higher the permeability, the more vapour finds a way through the hose wall, and as it does so, any ethanol component gradually “dries out” the synthetic materials that keep the hose supple. Cracks then develop, and eventually the fuel finds a way through – though the time taken has proven to be quite unpredictable. But higher ethanol content speeds up the whole process – yet another reason why E10 fuel is an increasing concern to owners of older vehicles.

Newer and tighter specifications have been introduced since J30/R6 requirements were introduced, reaching the point where current R9 hose has permeability under 3% of the R6 series figure. Today’s best quality hoses improve further on that, achieving figures below 1%, but for classic vehicles, J30/R9 fuel hose has become widely accepted as an all round general replacement. It’s described as a “synthetic rubber hose, with 15 g/m^2/day permittivity, and 100psi pressure capability. The inner will be resistant to chemical attack,

swelling, and permeation by gasoline, oxidized gasoline, ethanol extended gasoline, diesel fuel, and oil or lubricants and vapours. The outer tube will be oil, ozone and heat resistant."



This very recent 'J30/R6' hose, suitable for unleaded petrol, is not ethanol-tolerant. (Photo by Kim Henson).



Always note the designation printed on the hose; this is an 'R6' type, but what you need is 'J30/R9' hose (please see text), which incorporates superior qualities to predecessors, including resistance to ethanol. (Photo by Dave Moss).

R9 is readily available through motor factors, and suppliers can also be found by internet search. It's worth pointing out here that concerns have been raised in classic car circles and elsewhere in the specialist motoring world over hose quality. Unmarked fuel hose, of unknown specification, is readily available at relatively low prices, and from time to time reports surface of unmarked product, believed to originate in the far east and sold as J30/R9 hose, but of doubtful quality.

For peace of mind use genuine, branded hose of the correct internal diameter – from makers with familiar and respected names. Clear indication of manufacturer, tube diameter and the relevant J30/R9 specification should be marked along its entire length. Expect prices of at least £10.00 per metre for quality hose: Not cheap, but a small price to pay for safety and longevity in coping with ethanol-blended fuels of the future.

If you have missed earlier episodes in Dave's story, and wish to read them, please go to:

Part 1: Ethanol in fuel – the background (please click HERE to take you to this article).

Part 2: Ethanol and the classic car petrol engine – an overview (please click HERE to take you to this article).

Further information sources and principal references:

Background and advice on ethanol in fuel from the AA:

http://www.theaa.com/motoring_advice/news/biofuels.html

Motor Fuel Composition and Content Regulations – an impact assessment on the petrol protection grade extension requirement:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232126/petrol-protection-extention-ia.pdf

A report by the QinetiQ consultancy for the Department for Transport "Assessing the compatibility of fuel systems with bio-ethanol" is at:

http://www.realclassic.co.uk/techfiles/bioethanol_fuel_study.pdf

The Federation of British Historic Vehicle Clubs' website contains information on a wide variety of topics of interest to classic vehicle owners. This page provides considerable detail and advice on biofuel use:

http://www.fbhvc.co.uk/legislation-and-fuels/fuel-information/

A detailed technical assessment of the issues of ethanol fuel blends in older vehicles is here:

http://www.groups.tr-register.co.uk/wessex/ethanol-update.html

One supplier of additives intended to guard against ethanol induced fuel system corrosion: (Note – there are several others.)

www.millersoils.co.uk/automotive/classic-fuel-additives.asp

The full Society of Automotive Engineers J30 series fuel hose specification list

is available here, along with much other useful information relating to automotive standards overseen by the SAE.

http://standards.sae.org/j30_201202/

The SAE J30 series fuel hose specification can be purchased from the above site, but at the time of writing (Jan 2016) can be viewed on this link without charge.

http://www.volksbolts.com/faq/SAEJ30.pdf

Note from Kim: This article was written before the UK's decision to depart from the EU, and

any possible implications of this exit, with respect to future legislation relating to fuel matters, are, of course, as yet impossible to determine!