

Laying up your classic or historic vehicle for the winter - Fuel issues

As autumn approaches it's time to start thinking about laying up your vehicle(s) for the winter period. With respect to fuel systems there are a number of different views of how best to ensure your classic is protected and will be in fine fettle for next year's activities. This article endeavors to highlight the key issues and makes appropriate recommendations to help protect your historic vehicle.

There are a number of issues that must be considered:

1. Corrosion
2. Elastomers (pipes and seals) shrinkage/cracking
3. Fuel Oxidation
4. Loss of volatile fuel components through evaporation
5. Diesel waxing

Petrol Vehicles

Corrosion

With the blending of 5% and 10% ethanol into road fuels, ethanol induced corrosion is an added concern. Ethanol is slightly acidic and when combined with water can promote corrosion in fuel systems. It is therefore important that every effort is made to prevent water ingress and keep fuel systems dry. The ethanol in petrol will naturally mop up low levels of water continuously but this can drop out when levels become too high or temperatures fall. An aftermarket corrosion inhibitor additive in the petrol can provide additional protection to the fuel system and is a worthwhile investment.

For complete protection the fuel system should be drained, flushed and filled with a non-ethanol containing fuel such as alkylate or one of the special storage fuels provided by suppliers such as Sunoco. These fuels are quite expensive, so another option is to drain the carburettor float bowl and remove any free water and sediment. Leaving E5 in the fuel tank and the rest of the fuel system should not be an issue provided the fuel system is free from water.

Fuel Draining

Try to avoid draining large volumes of fuel and always do it in a well-ventilated area, preferably outside. Petrol vapour is heavier than air and will build up in confined spaces and can be easily ignited by open flame heaters and central heating boilers, etc. If you pump fuel out of a tank or fuel system, remember that it can easily build up a static charge and cause a spark and ignition, so make sure fuel cans are always on the ground and not in the vehicle, so the charge can dissipate to ground. Always allow a few minutes after pumping for the charge to relax. Ideally, drained fuel should not be kept over the winter period and is best disposed of by using in your daily vehicle, provided that it has not been dosed with Tetra Ethyl Lead as that will kill the oxygen sensor and the 3-way catalyst. Lead replacement additives will not cause any problems in modern cars.

Elastomers

Elastomer materials used for pipes and seals typically swell slightly when in contact with petrol and are generally best kept wet with fuel to avoid shrinking and cracking as they dry out completely. Draining the fuel system is therefore not recommended unless you plan to work on it during the lay-up. The winter lay-up is also a good time to check the condition of all the fuel system pipes for signs of ageing such as hardening and cracking, particularly now petrol contains ethanol.



Fuel oxidation and loss of volatile fuel components through evaporation

Modern petrol is very stable and BSEN228 petrol can be stored for up to 6 months without any issues provided it is stored in a cool place in a sealed can to prevent vapour loss. To minimize exposure to air and the build-up of condensation from natural vehicle fuel tank breathing with temperature changes, it is recommended that fuel tanks are kept 2/3 to 3/4 full. This helps to minimize any fuel tank wall condensation and allows for a top up with some fresh fuel after the lay-up to restore some of the lost volatility and aid starting.

Restarting after the lay-up

Check the fuel system thoroughly to ensure that all the flexible pipes are in good condition with no signs of cracking or swelling. Top up the fuel tank with fresh fuel to restore the volatility. Start the vehicle and immediately check for fuel leaks, particularly around the carburettor and engine bay. It is not unusual for flexible pipes that have not been wet with fuel to shrink and leak when exposed to fuel again.

Diesel Vehicles

Corrosion

The main cause of corrosion in diesel vehicle fuel systems is free water. The water content of diesel is controlled to a maximum of 200 mg/kg in the BS EN590 specification and typically levels rarely exceed 100 mg/kg. The diesel fuel can become hazy when levels exceed 120 mg/kg depending on the ambient temperature. It is therefore important to ensure the vehicle fuel tank is completely free of water. It is a good idea to drain the bottom of the fuel tank at least annually if there is a suitable low point drain or by means of a suction pump from the fuel filler pipe. Any water will accumulate in the bottom of the tank and provide an excellent environment for microbiological growth that can cause corrosion and fuel filter blocking.

The winter lay-up is also a good time to drain any water from fuel filter bowls and replace fuel filters.

Since the addition of up to 7% volume Fatty Acid Methyl Ester (FAME) biodiesel in BSEN590 diesel, the propensity for microbiological growth has become greater. The FAME is also hygroscopic and tends to hold dissolved water throughout the fuel and it does not drop out so readily as pure diesel. The FAME is slightly acidic and will corrode brass, copper, zinc and lead

coated components over time. Whilst copper is widely used in classic and historic vehicles for fuel lines it should be avoided and replaced with stainless steel or Kunifer pipe to avoid future corrosion problems. Trace levels of copper and zinc in the fuel from corrosion can act as a catalyst and increase fuel oxidation, deteriorate fuel storage stability and increase fuel injector deposits.

Elastomers

Elastomer materials used for pipes and seals typically swell slightly when in contact with diesel fuel and are generally best kept wet with fuel to avoid shrinking and cracking as they dry out. Completely draining the fuel system is therefore not recommended unless you plan to work on it during the lay-up. The winter lay-up is also a good time to check the condition of all the fuel system pipes for signs of ageing such as hardening and cracking, particularly now diesel and gasoil contains FAME. FAME is a strong solvent and is not compatible with some elastomer materials such as nitrile and buna rubber. A full list of compatible materials is provided on the FBHVC website, fuels section - (<https://www.fbhvc.co.uk/fuels>).

Fuel oxidation

BSEN590 diesel fuel should be stable for at least 6 months under normal ambient storage conditions. The addition of FAME to diesel fuel has directionally deteriorated diesel fuel storage stability together with the removal of the natural antioxidants in the diesel fuel during the hydrotreating process to remove sulphur. However, there are additional oxidation stability performance tests required when FAME is blended to diesel and gasoil to ensure storage stability is maintained.

Since the addition of FAME to diesel fuel, particulate levels have increased, and it is recommended that fuel filters are changed at least annually.

To minimize exposure to air and the build-up of condensation from natural vehicle fuel tank breathing with temperature changes, it is recommended that diesel fuel tanks are kept full during the winter lay-up period. This helps to minimize any fuel tank wall condensation.

Diesel waxing

Diesel quality is adjusted seasonally to ensure that vehicle operability is maintained all year round. Winter quality diesel is available from service stations from the 16th November through to the 15th March each year. Laying a vehicle up with summer quality fuel may lead to waxing and fuel filter blockage below -5°C.

If possible, refuel with winter quality before laying your vehicle up to avoid cold flow problems if you plan to use your classic or historic vehicle during the winter period. Winter quality fuel is fine for use in the summer as it just has enhanced cold flow performance which does not affect summer vehicle operability.

Restarting after the lay-up

Check the fuel system thoroughly to ensure that all the flexible pipes are in good condition with no signs of cracking or swelling. Start the vehicle and immediately check for fuel leaks, particularly around the injector pump, injector leak-off pipes and engine bay. It is not unusual for flexible pipes that have not been wet with fuel to shrink and leak when exposed to fuel again.

Esso Synergy Supreme 99 and ethanol

Members may have become aware that Esso have recently made an announcement about the availability of ethanol free petrol.

"We currently supply an ethanol-free Synergy Supreme+ 99 unleaded in some parts of the UK. From September 2023 our Synergy Supreme+ 99 will transition to contain up to a maximum of 5% ethanol at all Esso pumps irrespective of which part of the country they are located. The labelling at our pumps will remain as E5 for Synergy Supreme+ 99 unleaded".

The ethanol free Synergy Supreme 99 Petrol was available in areas where the fuel terminals are supplied by underground pipeline from Esso Fawley refinery. Esso have maintained the supply of ethanol free petrol for as long as is practicable within the requirements of the UK Renewable Transport Fuels Obligation. They have been able to meet the obligation by blending higher levels of biofuel in other grades to meet the overall obligation but are under increasing pressure to have renewable content in all road fuels. This brings Esso into line with other Super grade fuel suppliers.

The octane and volatility will not be affected although the blend will change slightly to take account of the additional octane provided by the addition of ethanol. The fuel will contain a small amount of oxygen from the ethanol and will cause some engine mixture enleanment that may require a small carburettor adjustment to maintain vehicle driveability.



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Nigel's career in engine and vehicle testing, fuels product development and quality in the oil industry culminated in his current role as a consultant and industry advisor in the UK and Europe. He is an active member of the British Standards Institute's Liquid Fuels Committee. He supports and competes at Shelsley Walsh in a modified Triumph TR7 and has many other historic car and club interests.