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Supplemental Information & Instructions

220-362 Water Probe Indicator

220-360 E-Xtend E-Fuel Treatment

220-355 E-Zorb E-Fuel Treatment

220-375 Store-n-Start E-Fuel Treatment

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Ethanol and Classic British Cars

3

Ethanol in Gasoline and What it Means to You

4 Based on comments and questions we are getting from all over the world, many of us are already using
5 gasoline that contains 5% or 10% (or more) ethanol. Ethanol is an alcohol, made from corn or grains, that
6 is added to oxygenate gasoline. It is a replacement for the MTBE which is no longer being used. Gasoline
7 with ethanol is called E10, E85, corn fuel, alcohol fuel and reformulated or renewable fuel. For the
8 purpose of this document, we will refer to a gasoline-ethanol blend as E-10 fuel. There is a great deal of
9 information out there, some good, some bad, and it is very hard to come to grips with the facts. We are
10 going to try and present the best information we have on ethanol and what effects it may have on your
11 vehicle.

12

Why Should I be Concerned?

13 There will be more problems for the owners of Classic British cars, because, unlike more modern
14 vehicles, the older gas tanks are vented to the atmosphere. Moisture from the air has always been an
15 issue for us – how many of you have had to deal with a rusty gas tank? Aside from the problems
16 reported with ethanol “attacking” fuel system components, most of the problems we are having with
17 ethanol are really problems with water.

18

Ethanol and Water

19 ➤ **Ethanol absorbs water from the atmosphere.**

20 Gasoline with 10% ethanol can absorb 50 times as much water as gasoline without alcohol. At 70° F,
21 gasoline without ethanol will hold water at a concentration of about 150 parts per million (PPM).

22 Gasoline with 10% ethanol will hold between 6,000 and 7,000 PPM. If the ethanol and the water remain
23 mixed with the gasoline, they will pass through the fuel system and they will be burned or converted to
24 steam in the engine.

25 ➤ **Phase Separation**

26 The ethanol will continue to absorb water from the atmosphere only up to a point. With 10% ethanol,
27 when the water reaches 0.5% (3.8 teaspoons per gallon), phase separation will occur. Phase
28 separation is the term used to describe the formation of distinct layers, with a thicker layer of gasoline
29 mixed with a little ethanol on top, and a thinner layer of water and more ethanol on the bottom. The
30 lower layer can have as much as 75% ethanol in it. This process is unavoidable, and it can also be
31 triggered by a drop in temperature.

32 ➤ **Phase Separation Related Problems**

33 **Shelf Life:** A gasoline-ethanol mix will absorb water until it reaches a concentration that triggers the
34 phase separation. E-10 gasoline has a 90 day shelf life when kept in a sealed tank. At about 100 days,
35 even in a sealed tank, it may have absorbed enough water to begin to separate. With a vented gas
36 tank, there will be significant amounts of water in the tank in 30 to 45 days. With 10% ethanol blends, it
37 is suggested that you replace the fuel in the tank on a 2 to 4 week cycle.

38 **Octane:** When gasoline and ethanol are mixed, the octane rating achieved is due partly to the ethanol.
39 When phase separation occurs, the octane rating of the fuel can drop by as much as 3 points, and
40 there is an increased risk of detonation, “knocking” or “pinging”.

41 **Rough Running (or stalling):** Because the water-ethanol mix is at the bottom of the tank, the fuel
42 pump may pick up a slug of this mixture, and the engine will run very poorly or perhaps die.

43 **Corrosion and Rust:** Water in contact with the bottom of the fuel tank and inside the fuel lines will
44 cause rust, and that in turn will tend to clog fuel filters and lines.

45 **Ethanol and its Effect on Normal Engine Operation**

46 **Mixture:** Ethanol blends will affect the air/fuel ratio because of the additional oxygen molecules within the
47 ethanol's chemical structure.

48 **Vapor Lock:** Probability of vapor lock or hot restart problems will be increased because the vapor
49 pressure of the gasoline with ethanol will be greater (if the base fuel is not chemically adjusted).

50 **Corrosion and Rust:** Various studies seem to indicate that fuel with up to 10% ethanol do not increase
51 rust and corrosion under **normal** conditions. However, see notes under phase separation above

52 **Specific Issues for British Car Owners**

53 Ethanol can react with materials that were impervious to gasoline.

54 ➤ **It's about age**

55 Engines and fuel systems designed after 1996 should be able to tolerate ethanol blends up to 10%, but
56 systems and components designed before that will have problems.

57 ➤ **Seals**

58 Seals may shrink, swell, or deteriorate depending on the material that are made from.

59 ➤ **Fuel Tanks**

60 Tanks (and fuel lines) in use for years will have deposits that may be loosened by ethanol, and the
61 loose debris may clog fuel filters or cause the needle and seat to stick open, causing flooding.

62 ➤ **Hoses**

63 Some rubber hoses will "dry-out" or deteriorate when exposed to gasoline/ethanol mixtures.

64 Presumably, more problems will arise as the percentage of ethanol increases.

65 ➤ **Float valves with plastic needles**

66 Lawrie Alexander reports that in some cases it has been necessary to "...shave a few thousandths off
67 the four vanes of the plastic needles, allowing them to ride smoothly inside the brass tubes."

68 Alternately, use all-brass needles & seats

69 ➤ **Viton tipped needles**

70 All the testing we have done indicates that DuPont Viton is inert when exposed to denatured alcohol.

71 We have not checked to see what happens when exposed to grain alcohol.

72 ➤ **Fuel Pumps**

73 If the diaphragm is rubber, there may be problems, but in general we are not aware of any problems
74 linked specifically to ethanol.

75 ➤ **Gaskets**

76 Ethanol may attack the rubber in rubber/cork composite gaskets. This may be more of a problem as the
77 amount of ethanol in gasoline increases. Fiber washers & gaskets are apparently not affected.

78 ➤ **Aluminum, aluminum alloys**

79 Ethanol does not seem to pose a threat to aluminum when it is 10% or less of the gas-alcohol mixture.

80 At 25%, it will attack the aluminum.

81 ➤ **Floats in carburetors**

82 The TR 4-4A Zenith-Stromberg floats that were made of foam covered with a "skin" may deteriorate
83 when exposed to ethanol. Other plastic floats (like those used by SU) may be affected.

84 **Precautions to Take to Avoid Problems**

85 If you use an ethanol blend, try to run your engine on clean, fresh fuel. Think about shelf life.

86 Keep the tank as full as practical to minimize the amount of air and moisture in the tank.

87 If you have a sealed fuel system (not vented), make sure it is truly sealed.

88 Keep engine parts well lubricated to counteract the solvent effect of ethanol.

89 Check the gasoline in your tank for water contamination/phase separation. Properly discard any fuel that
90 appears to have gone bad. Resist the temptation to use bad gas in other small gas-powered equipment.

91 Keep your engine tuned and stick to the factory recommended maintenance schedule.

92 Consider buying gasoline with a higher octane to be certain that you will always be running your engine
93 on the minimum octane necessary for good performance.

94 Consider fuel additives that will counteract the problems caused by the ethanol and water it absorbs.

95 **So What Else Can You Do?**

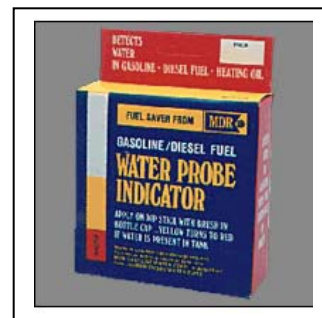
96 We will talk about normal week-to-week operation, and deal with winterizing separately.
97 First thing you need to do is to determine if you have water in the tank. Because water will collect at the
98 bottom of the tank, loosening the drain plug a little *may* allow you to capture a small sample in a metal
99 container. You may be able to detect the presence of water or a water-ethanol mixture. You can also use
100 a test kit.

101 **220-362 Water Probe Indicator**

102 The 220-362 Water Probe Indicator will detect the presence of water in your gas
103 tank. You will need to determine if you can pass a dip stick through the filler neck
104 all the way to the bottom of the gas tank. Simply apply the Water Probe detector
105 on the dip stick, which turns red to show the exact level of water in your fuel tank.

106 What you do next will depend on what you discover.

107 If you do find water in the tank, please refer to the section below.
108 If you don't have water in the gas, you can add a stabilizer.



111 **220-360 E-Xtend E-Fuel Treatment (8 oz)**

112 Most of us don't drive our British cars on a daily basis. The relatively short shelf-life of
113 30-45 days in a vented tank, or 90 days in a non-vented tank is an obvious concern.
114 With the price of a gallon of gas being what it is, the thought of draining the tank every
115 45 days (vented tank) or 90 days (non-vented tank) is not something to look forward to,
116 never mind the challenge of disposing of the fuel properly. By adding a stabilizer to the
117 fuel, we can delay the phase separation that will eventually occur. This increases the
118 shelf life to about 60 days in a vented tank, and about 180 days in a non-vented tank.
119 E-Xtend is a fuel preservative formulated specifically to do just that. It also contains
120 antioxidants and de-gumming agents to help fight sludge, and prevent resin deposits
121 and gum from forming in the fuel tank. Fuel filters will stay cleaner longer and engines
122 will run better. E-Xtend should be mixed with the fuel every time you buy gas. For fuel
123 with 10% ethanol, the ratio is 1 ounce for every 6 gallons of gas, so one 8 ounce bottle
124 will treat 48 gallons of fuel. The long-neck bottle makes it easy to pour into the filler
125 neck.



126 **If you do find water in the tank...**

127 What you do depends on how much water there is. Unfortunately we are not in a position to use terms
128 more specific than "excessive" If there is an excessive amount, you could drain the tank using standard
129 shop safety procedures and dispose of the contaminated fuel in accordance with your local hazardous
130 waste disposal regulations. Contact your local authorities before you drain the tank.

131 If the amount of water in the tank is not excessive you can add something to the fuel to re-mix the
132 gasoline, ethanol and water back together.
133

134 **220-355 E-Zorb E-Fuel Treatment (16 oz)**

135 E-Zorb will totally emulsify the water-ethanol layer that formed at the bottom of
136 your gas tank as a result of phase separation. The water and ethanol will mix back
137 into the rest of the fuel in the tank. The water will pass with the gasoline through
138 the finest filters and go through the engine, finally leaving as steam. The octane
139 (up to 3 points) lost when most of the ethanol separated from the gasoline will be
140 regained. If you have water in the gas tank, E-Zorb should be mixed in the ratio 1
141 ounce to 20 gallons of gasoline with ethanol. That means the one pint (16 oz.) bottle will
142 treat 320 gallons. It will be necessary to agitate the fuel in the tank by rocking the car from
143 side to side and bouncing it up and down.



144 **Winterizing the Fuel System**

145 Any vented fuel tank containing a gasoline-ethanol blend that stands for longer than 30-45 days should
146 be treated with the following winterizing procedures to maintain the integrity of the fuel.

- 147
- 148 1. Try to determine if there is any standing water/ethanol on the bottom of the tank. Review the
149 procedure above.
 - 150
 - 151 2. If there is an excessive amount, you could drain the tank using standard shop safety procedures
152 and dispose of the contaminated fuel in accordance with your local hazardous waste disposal
153 regulations. Contact your local authorities before you drain the tank.
 - 154
 - 155 3. If no water is indicated, add 220-355 E-Zorb at the suggested ratio of 1 ounce to 20 gallons of E-
156 10 gasoline to compensate for condensation that will occur during storage.
 - 157
 - 158 4. Now add 220-375 Store-N-Start to the tank at a ratio of 1 ounce to 5 gallons of E-10 gasoline with
159 enough Store-N-Start to treat the tank when totally full.

160 **220-375 Store-n-Start (4 oz)**

161 During storage gasoline "breaks down." Oxidation takes place creating a semi-
162 fluid gum that results in deposits of hard resin on all intake surfaces that can
163 clog carburetors.

164

165 STOR-N-START stabilizer contains a powerful anti-oxidant, de-gumming
166 agents, inhibitors and metal deactivators. Keeps gasoline refinery-fresh. Also
167 helps prevent octane loss during storage.

168 STOR-N-START is the only stabilizer to receive the "performance tested and
169 verified seal" from MARINE TESTING INSTITUTE for both gasoline and diesel
170 formulas.



- 171
- 172 5. Immediately after adding the 220-375 Stor-N-Start, fill the tank with fresh E-10 gasoline. Filling
173 the tank should be enough to agitate the E-Zorb and Stor-N-Start, thoroughly mixing them with
174 the fuel. However, if the tank is already full or only needs a small amount of new E-10 gasoline,
175 you can insert an air hose to the bottom of the tank allowing the air pressure to bubble the gas for
176 5-10 minutes. THIS MUST BE DONE IN A WELL VENTILLATED AREA! GASOLINE VAPOR IS
177 A SERIOUS HEALTH, FIRE AND/OR EXPLOSIVE DANGER! This should be sufficient to
178 complete the agitation process.
 - 179
 - 180 6. Run the engine for 5-10 minutes to circulate the treated fuel throughout the fuel system.
 - 181
 - 182 7. Winterizing the rest of the vehicle is beyond the scope of this document. There are many sources
183 for lists of things to do to prepare your British car for a winter of inactivity, many of them readily
184 available on the web.



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