

Technical Bulletin



DP02	TB0026-2008	Elan Motorsports Technologies	
From:	Brian Frankum		
Subject:	<i>Fuel System Compatibility with Ethanol</i>	Date:	May 14th, 2008

Attention all Elan DP02 teams

The IMSA Lites series has changed fuels for 2008 to 100 octane gasoline with the addition of 8% Ethanol. The entire DP02 fuel system is designed to cope with Ethanol content as high as 10%. All parts of the fuel system should function well, as delivered, unless the Ethanol / gasoline solution separates. Separation can occur simply due to gravity, over time. However, most commonly, separation occurs due to moisture absorption. If the solution separates, the Ethanol content will be higher than intended in some parts of the fuel system (particularly the bottom of the fuel cell), allowing degradation of some fuel system components.

Elan Motorsports recommends that teams drain the fuel system immediately following every race weekend or testing event. This will minimize the opportunity for the fuel system to be exposed to unusually high Ethanol concentrations and prolong the life of the fuel system.

There are several key components of the fuel system whose useful service life will be reduced when exposed to Ethanol concentrations of more than 10%. These components are listed below and should be inspected regularly:

02-L-M002 Fuel Cell
N/A Fuel Cell Foam
PF-0109 Gasket – Top Plate (2 per car)
05-E-2100 Fuel Pump
90-L-1002 O-ring - Filler Cap
H1082 Fuel Line – Pump to Top of Cell
PF-0111 Dry Break – Female
PF-0112 Dry Break - Male

An optional replacement for fuel line H1082 is available and has a higher tolerance to Ethanol exposure. That fuel line is DP02-50-006.

Further protection against fuel separation can be achieved by installing a dryer inline with the fuel cell vent line. This will minimize moisture content in the fuel cell. ATL manufactures a product called "DRYCELL" to perform this function. The information sheets for that product are also attached to this bulletin.

Please notify Elan Motorsports immediately if any fuel system components are showing signs of Ethanol degradation. This would include swelling, brittleness, or general deterioration.

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FUEL

ATL DRYCELL™

Desiccant Venting To Stabilize Ethanol "Oxygenated" Racing Fuels



The new ATL **DRYCELL™** is a remarkable racing accessory which protects modern "oxygenated" race fuels (E10, E50, E85) from "phase separating" into an ethanol (alcohol) layer and a gasoline (hydrocarbon) layer. Although cold temperatures, gravity and other conditions can cause so-called "E-Fuels" to separate, water is still the prime enemy of these gasoline/ethanol blends.

Since ethanol has replaced "lead", MMT, MTBE and benzene as anti-knock (octane) agents, it is critical that the fuel's gasoline portion and its ethanol additive be uniformly blended.

In the ideal refinery environment, gasoline (hydrocarbons) and ethanol (alcohol) dissolve well together and form a uniform, homogenous, E-Fuel mixture. Add only a few drops of water though, and the ethanol component immediately begins attaching itself to water molecules and precipitating to the bottom of your tank or fuel cell bladder.

This "phase separation" effect is irreversible, and no amount of agitation will re-blend the gasoline and ethanol fractions. This "separation" or "layering" of gasoline over ethanol can wreak havoc in race cars and boats.

First, high ethanol concentrations at the bottom of your tank or fuel cell can create corrosion, swelling and deterioration of fuel fittings, bladders, seals, safety foam, hoses, fuel pumps, carburetors, fuel injectors, aluminum tanks and even metal fuel lines.

Second, a "stratified" fuel load initially supplies nearly pure ethanol and water to the engine, which is great for octane (anti-knock), but poor for power.

Electronic air/fuel ratio adjusters can help, but basically your engine, which is tuned for a .740 specific gravity fuel blend, is now trying to run on .790 specific gravity ethanol (ethyl alcohol).

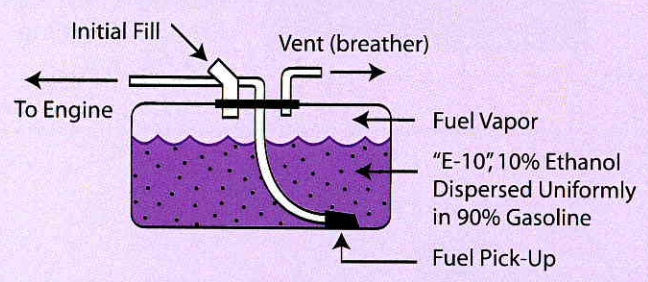
Also, the optimum air/fuel ratio for E-10 blended fuel is about 13:1, but for pure ethanol is around 5:1. So you can see how difficult it may be for your engine to adjust to "stratified" layers of fuel.

Third, once the high octane ethanol at the bottom of your fuel cell or tank is consumed, the engine is then fed relatively low octane gasoline.

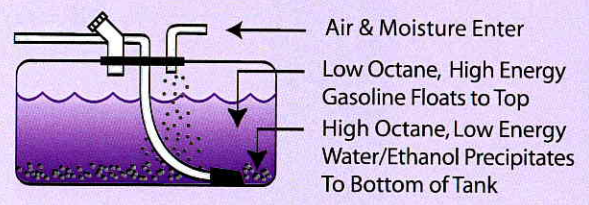
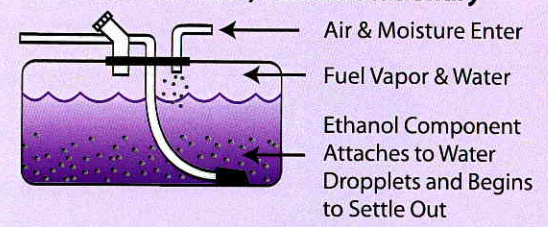
Again, the engine's optimal air/fuel ratio is violated, but worse, pre-ignition and/or detonation (knock) will likely occur in combustion chambers. Especially under load, engine "knock" can destroy valves, seats, pistons and even cylinder heads. These effects can spoil your day!

THE PROBLEM EXPLAINED

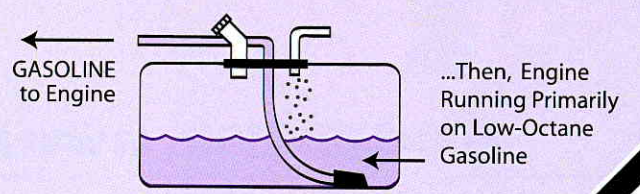
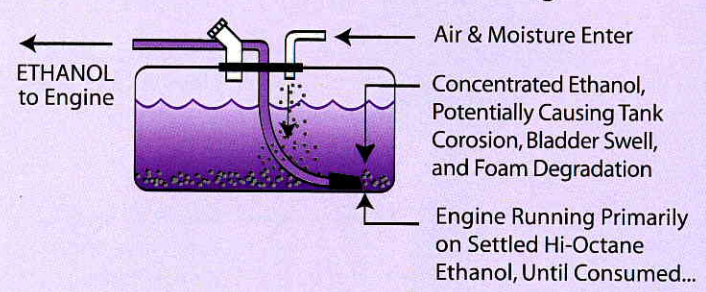
**Tank Filled with Fresh "E-10"; "Oxygenated" Fuel
10% Ethanol, 90% Gasoline**



FUEL SEPERATION PROBLEM, Vehicle Stationary



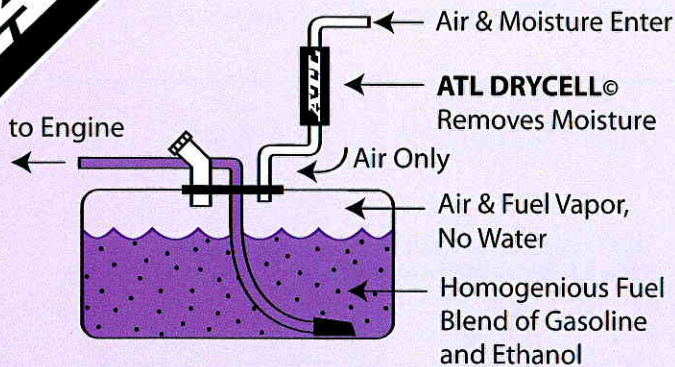
FUEL SEPERATION PROBLEM, Vehicle Moving



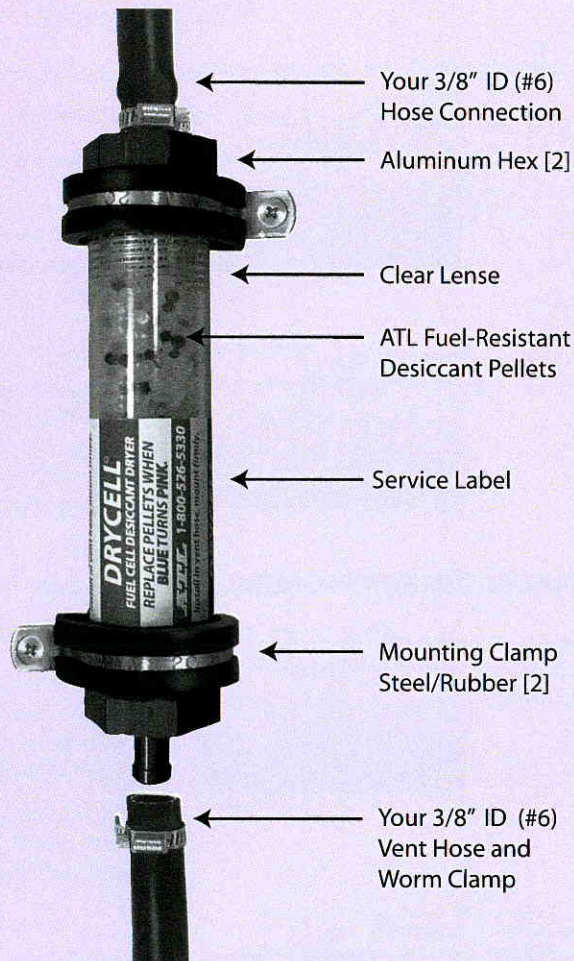
FUEL
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ATL

The ATL DRYCELL™ Solution in Action



Detail of The ATL DRYCELL™



So how does water get into the fresh fuel you buy at the track or in drums? Frequently, it doesn't, but many tanks and drums do experience condensation in the ullage (vapor) space above fuel level. Water, in the form of droplets, vapor or humidity may also creep into fuel containers through less-than-perfect caps, vents, fittings and perhaps through carelessness too. Mostly though, racing fuel tanks, bladders, dump cans and jerry jugs are vented to atmosphere. The constant "breathing" of these fuel vessels expels vapor and ingests moisture-laden air, even when the container is stationary. Only small amounts of water, in contact with ethanol /gasoline blends, are needed to kick off the "stratification" or layering of gasoline (being lighter) to the top and ethanol (being heavier) to the bottom.

How do we then exclude water from the fuel supply chain? There's not much we can do from refiner-to-tank, except purchase the freshest fuels from reputable firms. And once the fuel is in your race car or race boat, excluding air and humidity gets even tougher.

DO NOT seal off the tank vent of your race car, boat, truck or buggy! Closing this breather will pressurize the tank, perhaps dangerously, on hot days and during low barometric (pre-storm) periods. Also, a sealed tank vent will not allow fuel to be withdrawn without creating a serious vacuum which may then collapse bladder cells or implode plastic and aluminum tanks.

Instead, follow ATL's simple instructions, and install a **DRYCELL™** desiccant vapor trap in the vent line of your fuel tank or fuel cell bladder. This device allows the tank or bladder to "breathe" normally, but traps moisture before it can reach your race fuel. Monitor the **DRYCELL™** religiously, and when its blue pellets turn pink, replace all of the pellets promptly. The old pellets can be reused, but they must be allowed to expel all flammable vapors for 1 week before being "baked" in a dry oven at 250°F (120°C) for 3 hours and cooled for 1 hour.

The ATL **DRYCELL™** cylinder is only 5.5" (14cm) long, 1.25" (3.2cm) in diameter, and weighs only 5.6 ounces (150g.), so it can be easily spliced into your tank's vent line. **DRYCELL™** dryers feature removable ends for easy service, 2 sturdy brackets for permanent vertical mounting and a 3/8" diameter (10mm) barbed push-on connection at either end. There are no moving parts, no special tools needed and no maintenance contract! A 2-year no-charge warranty comes standard as well.

If you are serious about competition, and are running any of today's oxygenated (ethanol/gasoline) fuels, E10, E50, E85, you should make the investment in an economical ATL **DRYCELL™**!

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