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## Boat Engines - Dangers and Precautions Necessary with E10 Ethanol-Blend Gasoline.

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To Protect Your Marine Engine from E10 Fuels...](#)

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**Many Boat Owners**, in recent years, have unknowingly used gas, blended with too high (unsafe) levels of ethanol alcohol. Running on gas with over 10 % alcohol in a marine engine will cause performance problems, and can also cause permanent damage to your marine motor.

Understanding the dangers and effects of alcohol gas, in addition to following all the necessary marine fuel system precautions, is now necessary to avoid any problems with E10 gasoline.

There has been much controversy, misinformation and confusion since the recent (2006) increased distribution of ethanol gasoline in the United States.

Recent marketing gimmicks by some fuel additive product companies, have confused boaters even more. These ads falsely claim their new products can "fix" or repair ethanol water-contaminated fuel...Phase-separated fuel can not be fixed, and it must be discarded.

Even high level, reputable government authorities, have recently published information that conflicts with previous articles and bulletins written years ago on ethanol.

Marine manufacturer fuel recommendations (eg. owners manuals), which in the past, often warned against using alcohol fuels, now document that up to 10 % ethanol in gas is acceptable.

As more people are using E10, the necessary precautions and dangers are becoming more apparent and better documented.

Boaters looking for instant answers and solutions will not find them- But, increased knowledge and following all the necessary precautions can spare you from most of the inconvenience and problems with alcohol gas.

**All reputable authorities agree, that running on ethanol alcohol above 10 % will cause motor damage and/or performance issues with gas-powered engines, and it is always unsafe to run on contaminated fuel.**

**Prevention is your best weapon against ethanol gas.**

### Ethanol Fuel Background:

E10, Is a gasoline blended with up to 10 % ethanol alcohol and is now in widespread use in the U.S. Ethanol, ethyl alcohol, is made from corn, sugar and other grains.



Alcohol is an excellent cleaner, solvent, anti-freeze and most important, ethanol is hygroscopic, meaning it will absorb large amounts of water.

Government regulations and laws for ethanol fuel use and labeling differ from state-to-state, and are constantly changing. [View Ethanol Handbook 2006 State-By-State Laws.](#)

The most serious boat engine problems, resulting from ethanol E10 use, have mainly occurred due to illegal amounts of ethanol (over 10 %) being incorrectly added at the gas station pumps, by the delivery truck drivers..

Since using over 10 % alcohol gas is dangerous, it will invalidate all marine company engine warranties.

Many ethanol problems, reported by boaters appears to be due to their lack of knowledge/information on how to properly manage alcohol fuels.

Many boat engine breakdowns in recent months are directly related to the mismanagement of E10 gas.

Your marine mechanic may not even suspect or test the fuel as a possible cause of breakdowns. Many marine engine repair businesses have flourished as a result of ethanol gas engine damage.

Several *older* engines can not use any fuels that contains alcohol. Eg. Certain fiberglass tanks, mostly manufactured prior to 1992, will decompose from alcohol.

Fortunately newer outboard engines (past 5 years) have been designed to be more compatible with alcohol fuels.

### **Reasons Boat Engines Have More Problems with Ethanol Gas:**

#### **Boaters, often store gas in tanks longer than recommended for E10 (90 days).**

Cars, unlike boats, usually replace fuel every week or two, which will successfully prevent the possibility of water-contamination/phase separation.

#### **Boat engines live in a water environment - Alcohol gas loves to absorb water.**

Ethanol E10 gas can absorb large amounts of water into the fuel tank, MTBE in conventional gasoline did not.

Plus, boat engines usually last longer than cars. Still owning and using a marine engine from the 1970's or 1980's is not uncommon. \* These older engine parts and tanks were not usually designed or tested to withstand the damaging effects of alcohol gas.

\* Several older marine engines (made prior to 1992) have plastic and rubber parts, and fiberglass tanks that are NOT compatible with E10 alcohol fuel.

## **Dangers, Engine Problems and Damage From Ethanol Gasoline in Marine Engines:**

Ethanol's adverse effects to boat motors involves all types of performance issues and disintegration and deterioration, drying and clogging of engine parts.

### **Signs and symptoms of ethanol problems and damage include:**

Stalling, prematurely worn engine parts, rusting, clogging of fuel filters and carburetor jets, release of gunk and sludge throughout the engine, frequent water-contamination/phase separation of fuel, and eventually engine breakdowns and death.

Ethanol can cause a motor to run lean on fuel, due to water will not burn, which will take the place of fuel. Vapor lock (fuel starvation) is common when using ethanol fuels.

Alcohol fuels are very prone to **phase separation**, when the weight of the ethanol and water will sink to the bottom of the fuel tank and get picked up by the motors fuel system. (Even small amounts of water can harm the fuel system).

The **initial symptoms**, (of using a higher than acceptable concentration of alcohol in fuel, is usually engine stalling when you demand acceleration (WOT).

You'll notice other performance issues, such as increased stalling, misfire, hesitation and difficulty maintaining boat speed during trolling.

The **long term dangers** of ethanol (and other alcohol-blended fuels) are many, including deterioration of parts (rubber, aluminum, fiberglass etc.), rusting, fuel system clogging, and other varied damage to engine parts and components. Older engines are more prone to ethanol alcohol damage.

The most reported and troublesome issue with marine engines and ethanol fuel has been regarding the decomposition of certain fiberglass gas tanks. There really is no solution to this issue, other than to replace the tank (very costly, time-consuming project); Lining or sealing the tank, for added protection, is sometimes possible.

### **1. It is dangerous to use greater than 10 % ethanol in marine engines.**

Some gas supplies are *illegally* much higher. Check gas with an alcohol fuel test kit to make sure ethanol present is less than 10%.

A recent post on a Long Island, NY message board states, "Believe it or not, some of the fuel samples tested 48 % ethanol and most were above the 10 % 'maximum allowable by law'."

All marine engines sold in the United States are designed to operate on fuel containing no more than 10 percent ethanol. Engines built before ethanol became popular for environmental reasons, (past 10 years) have minimal safeguards from the damage alcohol fuels will cause.

**2. Ethanol absorbs water** - Water molecules combine with petroleum (gas) in your gas fuel tank and lines... Ethanol has an increased risk of fuel water-contamination due to ability to absorb H<sub>2</sub>O. (Ethanol attracts and absorbs moisture from the air). Vapor lock and fuel starvation can occur.

The gasoline you pump in your tank may be dry, but due to condensation (from humidity, temperature, etc.) water does exist in your tank. Since water is insoluble in gasoline, it sinks to the bottom of your tank - As long as it remains below the level of your fuel pickup tube it will not affect your engine. The problem is water is soluble in ethanol and will travel thru your engine fuel system.

A water/ethanol mixture, being heavier than gas, will sink to the bottom of the gas tank, leaving a lower octane gas on top. This low octane gas (lean fuel) can cause performance issues with 4-stroke engines, and can cause damage to 2-stroke engines.

Excess water in engines will also cause premature rusting.

### **3. Ethanol is an amazing solvent and cleansing agent.**

High levels of ethanol can dissolve, deteriorate and breakdown solid material, including rubber, plastic, fiberglass and even aluminum and steel.

Ethanol will also cleanse and release corrosive matter (gunk), varnish and rust, which will travel through the engine and clog fuel filters, carburetor jets and injectors. In many outboard engines it will also contaminate the fuel present in your fuel tank.

Ethanol tends to dissolve certain resins, which can travel through the engine intake and coat intake valves, causing sticking and bent pushrods or worse. This has been well documented for boats equipped with certain fiberglass gas tanks, made before the early 1990's.

The more gunk (rust, sediment, dirt, etc.) collected in your outboard engine over the years, the more noticeable the cleansing effects of alcohol will be noticed.

Ethanol's solvent and cleansing abilities can lead to engine failure and expensive (avoidable) repairs.

#### **4. Ethanol can wear-down and dry-out the plastic and rubber parts in your engine.**

Rubber seals and plastic material used in older boats are often not compatible with alcohol. Ethanol will make engine parts dry and brittle. Since ethanol is a cleansing and drying solution, it will clean the oil right off the internal components of a 2 stroke, Extra lubrication is necessary.

#### **5. Ethanol blends can cause additional contamination by reacting chemically with MTBE fuel blends.**

Do not mix gas that contains MTBE with ethanol E10.

Mixing MTBE fuel with ethanol blend fuel can create a gel-like substance that clogs passages in carburetors. Stalled engines and engine damage are the result. Fuel injected engines have shown less damage, than carbureted engines, from this gel-like substance.

#### **6. Engines with older fiberglass gas tanks have the greatest risks when using fuel with ethanol.**

Fiberglass gas tanks can "deteriorate" from ethanol, causing this degraded resin stuff, (you'll see "black sludge") to circulate through your engine, coating intake manifolds and building up on intake valves - which basically destroys your engine.

### **How to Prevent Damage From Ethanol in Your Outboard Motor:**

#### **1. If possible, try to avoid using ethanol fuel blends in your outboard and marine engines.**

If you are unable to obtain alcohol-free fuel in your area, you SHOULD TEST THE FUEL YOU BUY to assure the ethanol content is at or below 10 %.

**2. Follow engine manufacturer gas recommendations.** Check with your marine motor manufacturer and/or check your [owners manual](#).

#### **3. Always use fresh, high-quality gasoline and replace it every 2-4 weeks.**

Always avoid storing gas in tank for greater than 90 days. Remember that gas with ethanol has a shorter shelf life - use it up and replace it quickly.

Buy gas from busy gas stations - Fuel turnover is faster, gas will be fresher.

**4. Check your gas tank for the presence of water** and remove all water before adding an ethanol blend.

**5. Avoid running on bottom of gas tank** (where most water will sink).

#### **6. Do not mix MTBE and ethanol-blended fuels.**

Run out or remove your old (MTBE) fuel before putting the new ethanol fuel in your tank.

#### **7. Make sure your motor is equipped with a water separating fuel filter.**

Evinrude E-Tec's, and other newer engine models have them, other engines may or may not. The installation of a water separator in the fuel line will help with small amounts of water. Some marine engines are also equipped with water sensors.

#### **8. Check fuel system for contaminants and clogging and replace your fuel filter often.**

Fuel filters should be replaced at least every 50 -100 hours.

**9. Evinrude - Johnson 2 + 4 fuel conditioner** will stabilize fuel, inhibit corrosion and absorb moisture (water) without

adding alcohol to the fuel. Add fuel conditioner at every gas fill-up.

**10 .** Evinrude (OMC BRP) also recommends **carbon guard** be added to the fuel tank each time you add gasoline, (Reduces possibility of rusting, piston ring sticking and carbon build-up, better overall engine performance, increases engine life), but it will not remove water.

**11.** Keep your engine well-tuned and lubricated.

**12.** If your engine has an older fiberglass gas tank, replace it. (Check with manufacturer if your tank was designed to tolerate alcohol fuels). Newer fiberglass tanks are double-lined and made of special material that holds up to ethanol.

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- **Stricter monitoring and compliance of Gas Stations and Gas Companies needs to occur, to ensure the fuel at the pumps never contains more than 10% alcohol.**
- **Labeling of Gas Pumps, when ethanol is added, should be mandatory in ALL STATES.**
- **Older marine engines should be exempt from using alcohol fuels...**

**Now Available:**  
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**Contact The Outboard Wizard for more ethanol information and engine troubleshooting advice.**

(631) 991-4491 or 631-514-1525

Email: outboardwizard@yahoo.com

**Visit Fuel-Testers website for more detailed information on ethanol renewable fuels.**

**Please notify Fuel-Testers of Abnormal test Results and Gas Stations found selling illegal amounts of ethanol in gas.**

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#### **Suggested Reading and Websites:**

EPA, 1995 Bulletin lists several measures "you should do" to protect your marine engine from ethanol, read:

[www.epa.gov/otaq/rfgboats.htm](http://www.epa.gov/otaq/rfgboats.htm)

Fuel-Testers, a division of Earthly Solutions.

EPA - Environmental Protection Agency.

RFA - Renewable Fuels Association.

NMMA - National Marine Manufacturers Association.

ACE - American Coalition for Ethanol.

EAA - The Leader in Recreational Aircraft Aviation; FAA Federal Aviation Administration.

"Ethanol as Fuel for Recreational Boats", Dartmouth College, March 2004.

"New Regulations for Gasoline Marine Engines", California Environmental Protection Agency, Air Resources Board, (800) END-SMOG.

November 2006, FAA - EAA Warning against using fuels containing ethanol.

NREL - National Renewable Energy Laboratory; Golden, Colorado; "Issues Associated with the use of higher ethanol blends".

EPA - U.S. Environmental Protection Agency; National Vehicle and Fuel Emissions Laboratory, Ann Arbor, Michigan.

Evinrude Outboard Manufacturer Service, Owner, Repair and Shop Manuals.



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