

Ethanol, E10, E15

The Facts, The Myths, and The Politics

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The Myths of Ethanol and Fuel Care

Introductions

General topic overview

Educate, clarify, reduce misinformation

E10 refresher and E15 update

General fuel care and technical overview of issues

Major myths

Summary, Q&A



Fuel Care Take-aways

Segment the issues first

- E10 vs. E15 issue vs. General fuel care
- Ethanol E10 may be unfairly blamed for issues not related to ethanol use

Identified need for a source of truth in the market

- Certain companies are rather far-reaching in claims being made; creating consumer confusion/frustration
- Some additive products may actually be doing more harm than good

Core technical issues

- Control fuel quality for a certain period of time
- Deposit and varnish control within fuel system
- Automotive fuel is not designed for infrequent engine use (degradation issue)
- E0 to E10 transition; real concerns, simple solutions

A bottle of X will never solve 100% of the issues

- Keep tanks clean, check filters, buy from trusted fuel sources
- Be sure to keep up-to-date with OEM service intervals and protocol

Buyer beware – resist the myths

- #1 priority of all OEM's is to ensure engine integrity, not sell a bottle of fluid
- With so many cure-alls, voices, and opinions, consumers don't know what to believe

Ethanol **E10**

Ethanol is an alcohol used as an oxygenate in gasoline

EPA mandates the use of oxygenated fuels

- Helps reduce hydrocarbon emissions (air pollution, smog, etc.)
- Ethanol is now the only oxygenate readily available

Marine engines produced today are compatible with E10

- Use simple prevention, just like with E0

Pump labeling requirements vary by state

- You may not even know you are dispensing E10

Ethanol can help reduce our need to import foreign oil

Mercury Marine is NOT against Ethanol

Mercury Marine does support the need for a well designed and implemented national strategy to reduce our dependence on foreign oil

E10 is an acceptable fuel for use in the marine industry

Ethanol E15

The Renewable Fuels Standard requires increasing the amount of Ethanol in Gasoline due to the way the legislation was written

EPA approved up to 15 percent (E15) to be sold and used only in 2001 and newer cars and trucks under some fairly strict rules

E15 is **NOT** approved for marine, small engines, motorcycles, cars and trucks 2000 model year and older, etc

Many OEM's, including the auto industry, are opposed to E15 due to the potential of engine damage and the possibility of increased emissions

Considerable mis-fueling concerns

–EPA's label solution inadequate



Ethanol **E15** Future

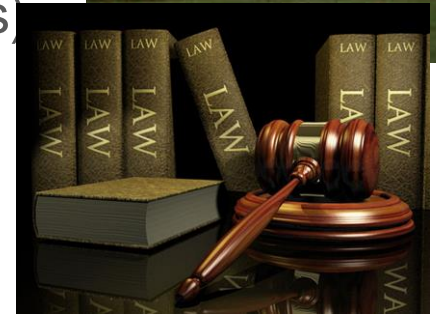
Multiple lawsuits filed against EPA to repeal E15 by the auto, oil, marine, and small engine industries

- Insufficient authority to approve E15, insufficient testing, insufficient plan to avoid misfueling, insufficient strategy in place to assure availability of E0 - E10
- Concerns also by fuel distributors and grocery association
 - Equipment damage, liability issues

Lawsuits went nowhere

Members of Congress were not able to repeal the RFS

Renewed interest in other fuel alternatives, like isobutanol (derived from biomass and other sources)



Many hurdles to overcome before **E15 becomes mainstream**

General Fuel Care

SQUASH THE MYTHS

MYTH #1

Fuel additives can cure or prevent all issues associated with ethanol-blended fuel

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OEM developed. OEM trusted.



The truth is – In addition to using high-quality fuel additives like Quikare, most OEMs recommend the following for further protection:

- ✓ Purchase quality fuel from trusted sources
- ✓ Ensure fuel filters and fuel tanks are checked periodically for sediment and water
- ✓ Keep up-to-date with OEM preventative maintenance schedules

FOR PRODUCT INFORMATION VISIT:
<http://www.mercurymarine.com/quicksilver/fuel-care/7BI>

or scan the code to the right with your SmartPhone



DROWN THE MYTHS

MYTH #2

Fuel additives can make stale or phase-separated fuel usable

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The truth is – “Bad” fuel should be completely removed and replaced with fresh fuel. Nothing can rejuvenate old fuel. To prevent fuel from going bad, most OEMs recommend high-quality fuel additives, like Quikare, to:

- ✓ Prevent sediment, gum and varnish build-up that forms when fuel goes bad
- ✓ Control moisture and help prevent phase separation
- ✓ Prevent fuel system corrosion

FOR PRODUCT INFORMATION VISIT:
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PROBE THE MYTHS

MYTH #3

Ethanol-blended fuels are bad and should be avoided

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The truth is – For over a decade, marine engines have been engineered to handle E10 gasoline. However, all types of fuels should be treated if it won't be used within a few weeks. In addition to using high-quality fuel additives, like Quikare, most OEMs recommend the following:

- ✓ Purchase fuel from trusted sources.
- ✓ Keep up-to-date with OEM preventative maintenance schedules.
- ✓ Visually inspect the fuel system for deterioration or leaks.

FOR PRODUCT INFORMATION VISIT:
<http://www.mercurymarine.com/quicksilver/fuel-care/7BI>

or scan the code to the right with your SmartPhone



Proper fuel care involves BOTH ethanol and non-ethanol fuels

General Fuel Care – All Gasoline Types

Cleaners

- Solvents that are added to fuel to clean out deposits in the fuel or combustion system. They may be concentrated for short term cleanup or intended for long term maintenance of fuel system

Stabilizers

- Anti-Oxidants that reduce the rate that the fuel oxidizes (sours) over time. To be used when the fuel is going to be stored for long periods of time (several months).
- Corrosion inhibitors that reduce the rate of fuel system corrosion

Freeze Preventers

- Alcohol (methanol or isopropyl alcohol) that combines with water present in a fuel tank to depress the freeze point of the water
- Not required with E10 gasoline**

Claims other than above should be viewed with suspicion

All Gasoline Degrades Over Time from...

Evaporation

- Lighter chemicals in gasoline evaporate in vented tanks, leaving behind a heavier fuel that will not harm an engine but may cause cold starting issues

Contamination

- Water, which may cause gas-line freezing and corrosion is the main contaminate in gasoline. An engine can ingest small amounts of water in the fuel without harm.
- Water usually enters fuel systems via condensation. This water runs under the fuel and collects in the bottom of the tank.

Oxidation

- Fuel reacts with oxygen to produce new compounds. Oxidation can lead to gums, sludge and acidic deposits. When oxidation becomes a problem, gasoline has a sour odor, becomes discolored, and may have small particles of gum suspended in it.
- Using oxidized gasoline can clog fuel filters, create deposits in the fuel system (especially the injectors), and generally hurt performance
- Oxidation can be reduced by using fuel stabilizers but once oxidation has occurred there is no chemical additive that can return the fuel to usable condition

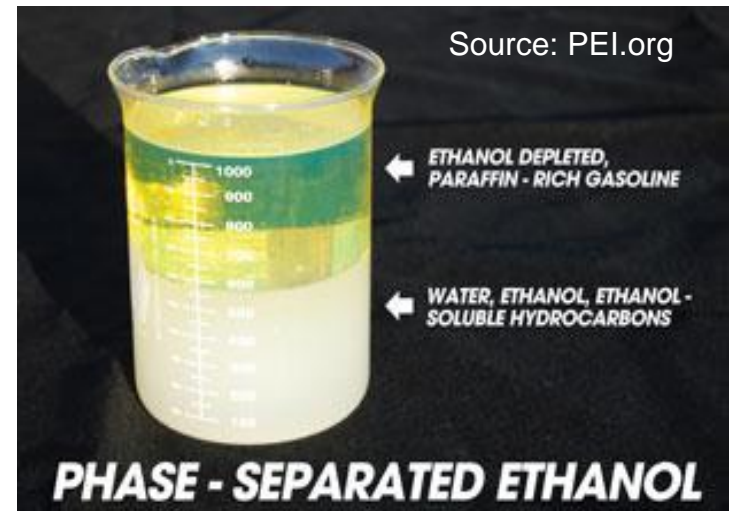
Phase Separation with E10 Fuel

When E10 gasoline comes into contact with water, ethanol will allow fuel to absorb some or all of that water

- This is actually somewhat beneficial, but fuel can reach a saturation point and water can phase separate to form a distinct layer in the bottom of the tank
- The upper “gasoline” layer will be depleted of ethanol and have a reduced octane level
- The lower “phase separation” layer will be a corrosive mix of water and ethanol

No chemical agent can be added to E10 gasoline, in a reasonable quantity, that will fully prevent phase separation

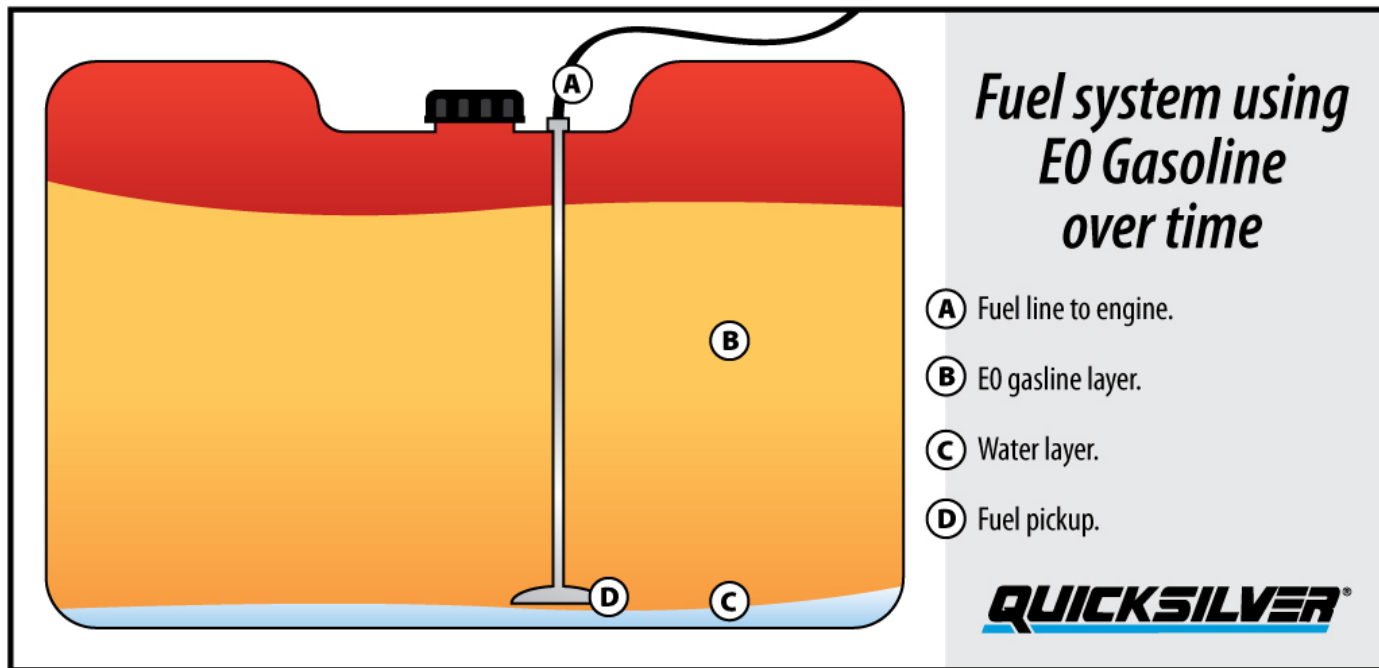
There is no chemical agent that can be added to E10 gasoline, in a reasonable quantity, that will recombine a phase separated layer



Transition E0 to E10 Fuel Issues

E0 to E10 transition is the most likely time for fuel system problems

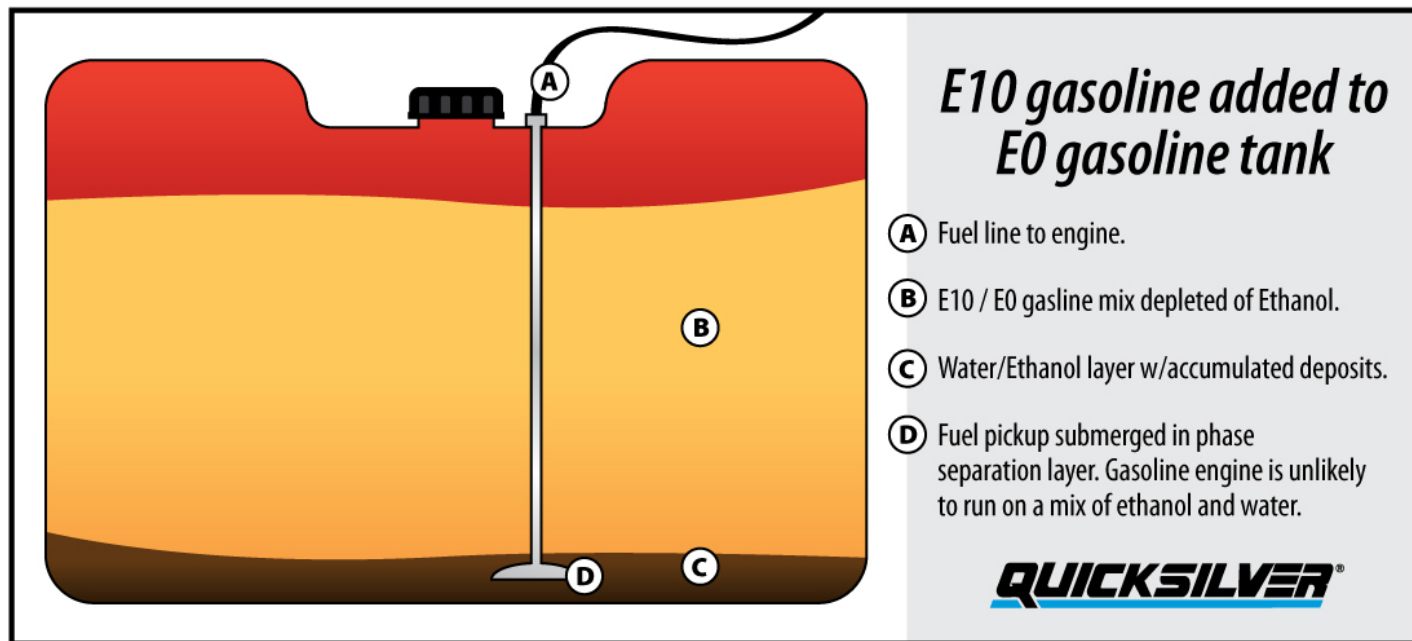
- A fuel system solely using E0 over time will accumulate,
 - deposits from fuel oxidation and contamination
 - water in a layer under the gasoline up to a level maintained by the fuel pickup



Transition E0 to E10 Fuel Issues

E0 to E10 transition is the most likely time for fuel system problems

- When E10 is added to a fuel system that has been using E0 over time:
 - As a new solvent, ethanol will tend to dissolve and loosen deposits that are present in the tank and fuel system
 - Phase separation may occur resulting in an approximately 50/50 ethanol and water layer that doubles in volume



Transition to E10 Fuel – Best Practices

To limit problems with E0 to E10 gasoline changeover:

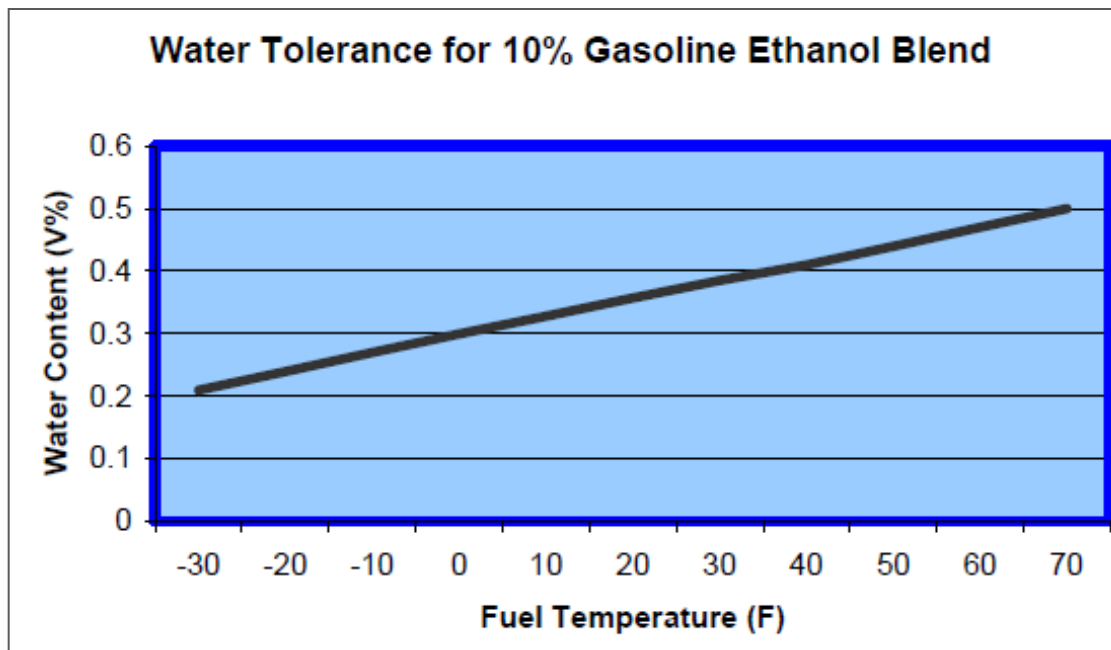
- Check for the presence of water in the fuel tank:
- Inspect water separating filter on larger engines. If water is found, pump the tank dry from the fuel line or siphon the tank dry. If the fuel is not clear or has a sour odor, the tank should be cleaned
- Add a quality cleaner like Quikleen to help clean deposits in engine
- Completely fill the tank with E10 fuel to maximize the amount of ethanol in the tank to absorb any water present
- Monitor filters and carry extra fuel filters due to filter plugging concerns
- KEEP UP WITH GENERAL MAINTENANCE INTERVALS

Simple steps and diligence can reduce problems

Seasonal Storage Concerns

Seasonal storage with E0-E10 fuel is a likely time for issues

- During storage, fuel will oxidize and may absorb water from condensation
- Water holding capacity of E10 fuel is reduced with lower temperatures, so phase separation is more likely with winter temperatures
 - E-10 can hold approximately 0.5% water at 60°F (.64 ounces in a gallon)
 - E-10 can hold approximately 0.35% water at 20°F (.45 ounces in a gallon)



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Seasonal Storage Concerns

Follow the instructions for normal storage preparation found in the Operation, Maintenance & Warranty manual

If possible, store with full fuel tank

- Add a fuel stabilizer like Quickstor to the fuel at the recommended dosage
- Run the engine for 10 minutes to distribute stabilized fuel into the engine and fuel lines
- Top off the tank to reduce the amount of exchange with the air that may bring in condensation
- Note – Some storage facilities require that fuel tanks be empty for storage



Full tanks - similar recommendation as aviation industry

Other Sources of Water Intrusion

Low quality or uncontrolled sources in the supply chain

- Unintentional or intentional contamination before purchased
- Storage tanks, seals, fill-lines, manholes, etc
- There is no industry-wide consistency or control with additives used in automotive gasoline



On the vessel

- Fuel caps not closed
- Vents not working properly
- Filter not checked



Many possible variables, don't assume E10 is the problem

Fuel Care Myths



No fuel additive can prevent ethanol from acting as a solvent

No product will prevent all issues from occurring, no matter how revolutionary they claim to be

The problem may not be ethanol-related

Fuel Care Myths



Gasoline oxidation (stale fuel) or phase-separated fuel are chemical changes that can not be reversed

Oxidation creates gums, sludge and acidic chemicals

No fuel additive can reverse these chemical reactions and make the products acceptable to an engine

No chemical agent can be added to E0-E10 gasoline, in a reasonable quantity, that will recombine a phase separated layer

Fuel cannot be rejuvenated

Fuel Care Myths



Ethanol blended fuels (E10) are common throughout much of the United States

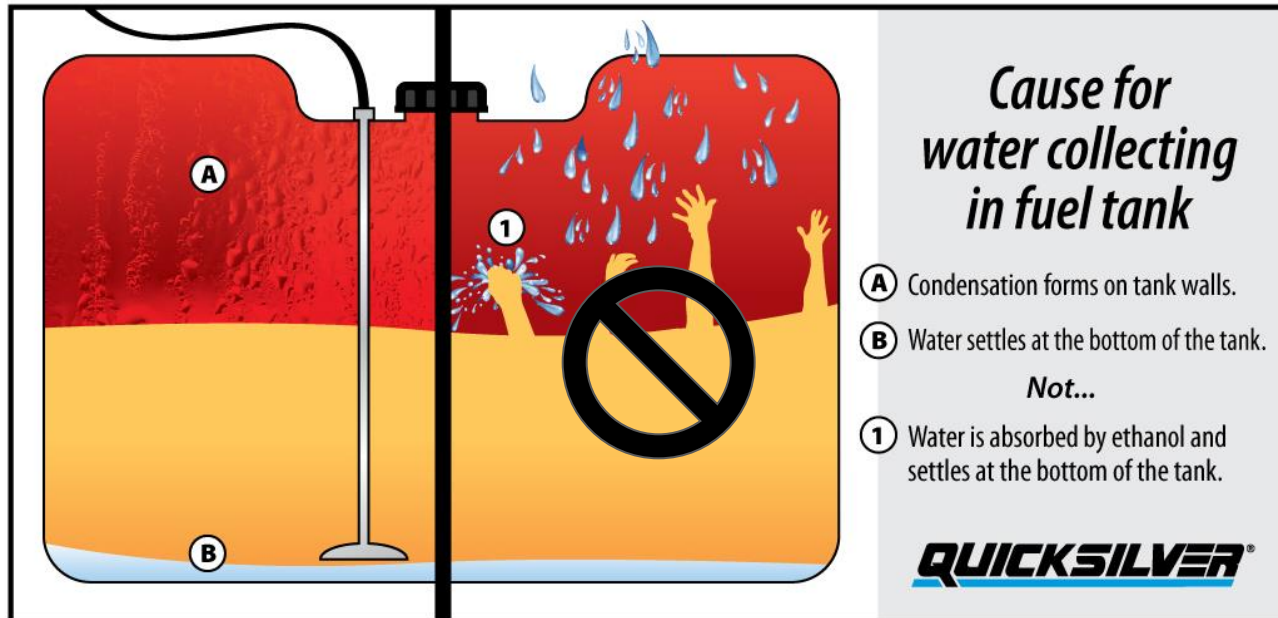
Although E0 is generally preferred, modern engines are developed to meet performance and durability targets with E10 gasoline

After the transition period from E0, E10 will tend to keep low levels of water moving through the fuel system, keeping the system “dry”

Fuel Care Myths - continued

E10 Gasoline pulls water directly out of the air:

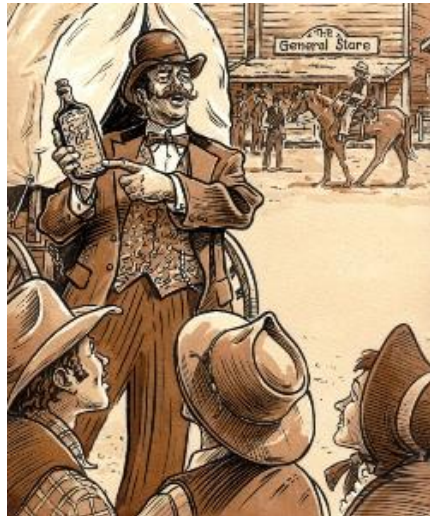
- There is no active transfer mechanism for ethanol molecules to reach out and “grab” water molecules out of the air. Under normal storage conditions, even in a vented fuel tank it just does not happen at a level or rate that is relevant
- The primary cause of water collecting in fuel tanks is condensation from humid air. This water runs under the fuel and collects in the bottom of the tank. The volume of air that can move into the tank is reduced when the tank is kept full



Fuel Care Myths - continued

Modern chemical breakthroughs have changed the way fuel treatments work:

- Gasoline as a fuel has been used in internal combustion engines for over 100 years
- Major multi-billion dollar companies with enormous resources have improved gasoline additives but there have been no recent breakthroughs involving “magical technology”
- Claims made by companies about “space-age”, “revolutionary”, or special proprietary technology should be looked at with a high degree of suspicion



Fuel Care Best Practice – E0 and E10

- To **maintain** fuel system **cleanliness** and provide adequate level of fuel **stabilization** during in-season use, regularly use a combo product like *Quickare* or other OEM equivalent
- To **deep-clean** fuel systems and combustion systems that have been neglected for a period of time, use a concentrated cleaner like *Quickleen* or other OEM equivalent
- To **stabilize** fuel from oxidation and provide corrosion protection for an extended period like seasonal storage, use a product like *Quickstor* or other quality equivalent



Simple care and prevention

Blender Pumps

- Blender pumps are designed to blend different octane or ethanol blends at one dispenser
- Blender pumps can have one hose and nozzle for each blend or one hose and nozzle for all blends
- Wisconsin law currently requires one hose and nozzle for each blend



20% ETHANOL

30% ETHANOL

E85
85% Ethanol

UNLEADED

UNLEADED PLUS

FLEX-FUEL
VEHICLES ONLY

FLEX-FUEL
VEHICLES ONLY

FLEX-FUEL
VEHICLES ONLY

10% ETHANOL
ADDED

3.379

3.279

2.779

3.599

3.479

\$ Price per gallon (including tax)

\$ Price per gallon (including tax)

\$ Price per gallon (including tax)

\$ Price per gallon (including tax)

\$ Price per gallon (including tax)



E-85
MINIMUM
70%
ETHANOL
www.E85Fuel.com



Blender Pumps



Blender Pumps

If your vehicle has one of these...



...you can save money on one of these.

Vehicle Type	FlexFuel Label	Fuel Type
Small Engine	20% FLEXFUEL	E20
Medium Engine	30% FLEXFUEL	E30
Large Engine	85% FLEXFUEL	E85

all brands participate

Blender Pumps



Sources of information

FAQ Section of most OEM Sites, including *mercurymarine.com*

The screenshot shows the Mercury Marine website's navigation and content. The top navigation bar includes links for 'Find a Dealer', 'Contact Us', 'About Mercury', 'News & Events', 'Gear & Apparel', 'Brochures', 'Promotions', and 'Share'. Below this is a secondary navigation bar with categories: 'Engines', 'Gauges & Controls', 'Propellers', 'Inflatable Boats', 'Parts & Accessories', and 'Service & Support'. A search bar is located to the right of these categories. The main content area is titled 'Storage & Maintenance' and has sub-tabs for 'Engines', 'Propellers', 'Inflatable Boats', and 'FAQs'. The 'FAQs' tab is selected, showing a list of questions under the heading 'Ethanol Fuels FAQs'. On the left side of the main content area, there is a sidebar with a list of categories: 'Outboards', 'MerCruiser', 'Controls & Gauges', 'Propellers', 'Parts & Accessories', 'Remanufacturing', and 'SmartCraft'. Under 'Outboards', there is a sub-list of topics, with 'Ethanol Fuels' highlighted.

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Storage & Maintenance Engines Propellers Inflatable Boats **FAQs**

Ethanol Fuels FAQs

- ▶ What are ethanol and ethanol-blended fuels?
- ▶ How is ethanol made?
- ▶ What are the characteristics of ethanol?
- ▶ What is MTBE and why is it being replaced?
- ▶ Does ethanol affect horsepower or fuel-efficiency?
- ▶ Are Mercury engines compatible with ethanol fuels?
- ▶ Will the use of fuels containing ethanol void my engine warranty?
- ▶ What about the fuel-system components on the boat?
- ▶ Can ethanol-blended fuels affect the performance of traditional carbureted two-stroke outboards?
- ▶ How does ethanol affect my fiberglass fuel tank?
- ▶ Are older fuel lines prone to failure from ethanol-based fuels? What about gaskets?
- ▶ Ethanol is replacing MTBE in my region - what should I do?

Outboards

- ▶ Outboard Maintenance
- ▶ Outboard Electrical
- ▶ Outboard FourStrokes
- ▶ Outboard Fuel & Fuel Systems
- ▶ OptiMax
- ▶ Outboard Model Year
- ▶ Outboard Winterization & Storage
- ▶ CARB
- ▶ **Ethanol Fuels**

MerCruiser

Controls & Gauges

Propellers

Parts & Accessories

Remanufacturing

SmartCraft

Select proper 'sources of truth'

Summary

1. E10 Ethanol absolutely IS an acceptable fuel for everyday use
2. E15 Ethanol absolutely IS NOT an acceptable fuel
3. Certain companies are rather far-reaching in claims being made; knowingly or unknowingly creating consumer confusion
4. A bottle of X will never solve 100% of the issues
 - Check filters, consistently use quality/trusted fuels, check tanks periodically, maintain engine regularly
5. Take extra care when converting from E0
6. Don't immediately assume E10 is the problem
7. All gasoline types need the same type of simple prevention if not immediately consuming fuel

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Precision Parts

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