

DIESEL AND ETHANOL FUELS – PROBLEMS AND SOLUTIONS

How does they affect me and why should I care?



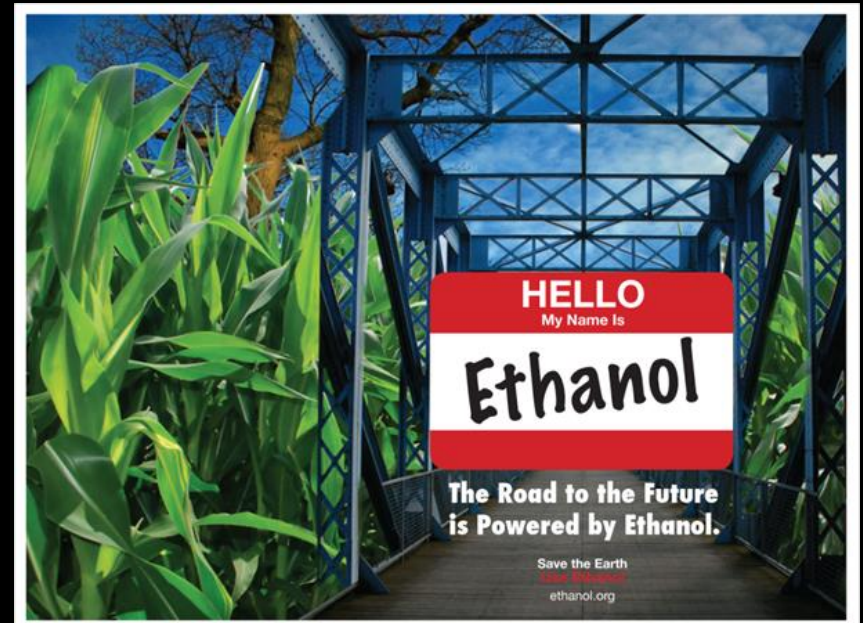
Over 40% of the US corn crop is dedicated to ethanol production

If you converted all the corn in the USA to ethanol, it would only supply 12% of our total fuel needs.

Meat prices have increased 25%



I don't think this is true

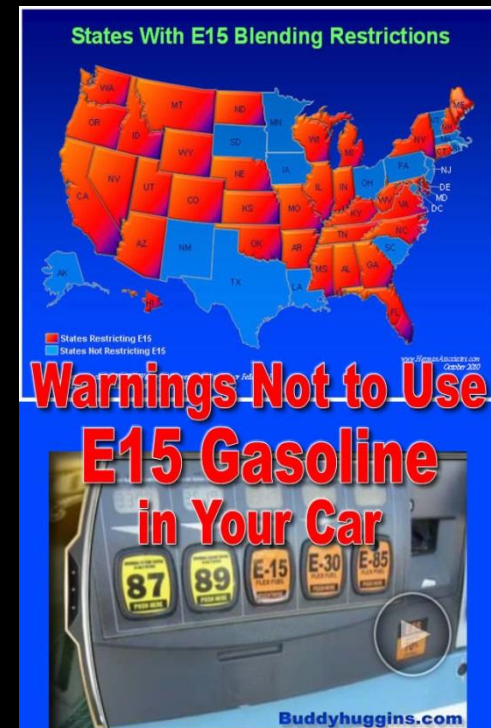


The three most common ethanol blends sold in the USA

E10 is 10% ethanol and 90% gasoline

E15 is 15% ethanol and 85% gasoline

E85 is 85% ethanol and 15% gasoline



Without government subsidies, ethanol is a loser

It takes 131,000 BTU's of energy to produce one gallon of ethanol

There is only 77,000 BTU's of energy in a gallon of ethanol

Ethanol only has 75% of the energy that gasoline has



The higher the percentage of ethanol, the lower your fuel mileage

The use of E85 will reduce your overall fuel mileage by 25%

Fuel Economy of a Chevrolet Tahoe Using Gasoline and Ethanol (miles per gallon)



* 85 percent ethanol, 15 percent gasoline.

Source: "The Ethanol Myth," *Consumer Reports*, October 2006.
Available at http://www.consumerreports.org/cro/cars/new-cars/ethanol-10-06/overview/1006_ethanol_ov1_1.htm.



Determining the percentage of ethanol in gasoline is done with water

Knowing how much ethanol is in your gasoline is important because you can prevent damage to your vehicle's engine



BEFORE



AFTER

THE REASON FOR TESTING YOUR GASOLINE ETHANOL PERCENTAGE

Supplier gain for adding 6% additional ethanol

- 10,000 Gallons of Gasoline
- X 6% Additional Ethanol
- 600 Gallons of Ethanol
- 600 gallons of Ethanol
- X \$2.70 Cost of ethanol
- \$1,620.00 Cost of additional ethanol
- \$1,896.00 Normal cost of Gasoline
- Difference = \$276.00

Fleet dollar loss for supplier adding additional 6% ethanol to 10,000 gallons of gasoline

- 10,000 Gallons of Gasoline
- Loss of 1 mile per gallon
- 10,000 miles with loss
- Average mileage 16 divided into 10,000 miles = 625 gallons of gasoline
- 625 gallons of gasoline
- X 3.16 Cost of gasoline
- \$1,975.25

Lean air fuel mixtures are very hot

- Fuel systems on non-flex fuel engines are calibrated for the energy level of gasoline
- When you have less energy in the fuel and the same amount of air, that equals a hot lean air fuel mixture
- Hot lean air/fuel mixtures can burn valves, pistons spark plugs and cause pre-ignition or detonation



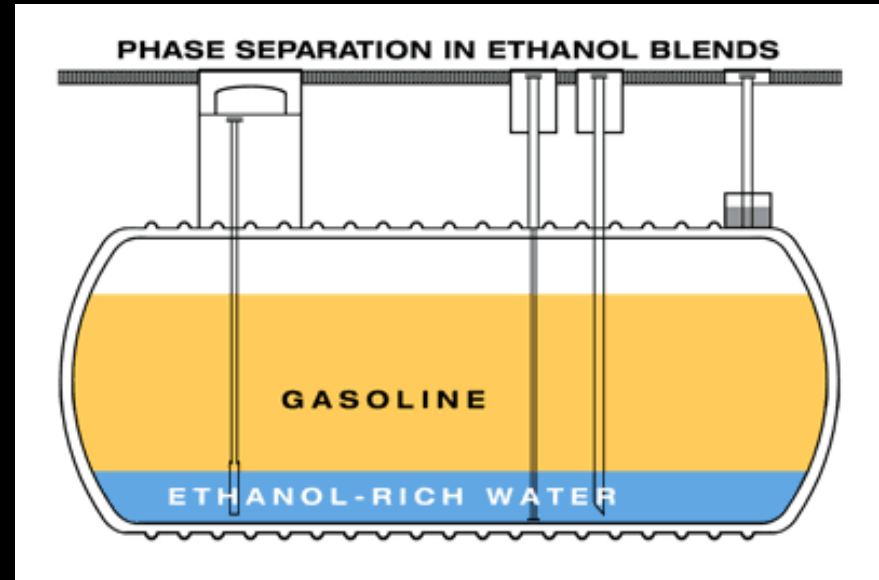
Four major problems with ethanol-blended gasoline

- Ethanol is hygroscopic and will attract water
- Once water is introduced, the shelf life is only a few weeks
- Ethanol is highly corrosive
- Ethanol is a powerful solvent



Phase separation will ruin your gasoline

E-10 gasoline will hold about two teaspoons of water in suspension before it goes through phase separation



Water separators remove free water only

This is an example of free water



Water is heavier than gasoline, so water falls to the bottom of the separator



Marine applications are at a higher risk of ethanol damage

Dissolved fiberglass resin on intake valves can result in severe engine damage and require fuel tank replacement



Watercraft work in a high moisture environment,
putting them at a higher risk of damage



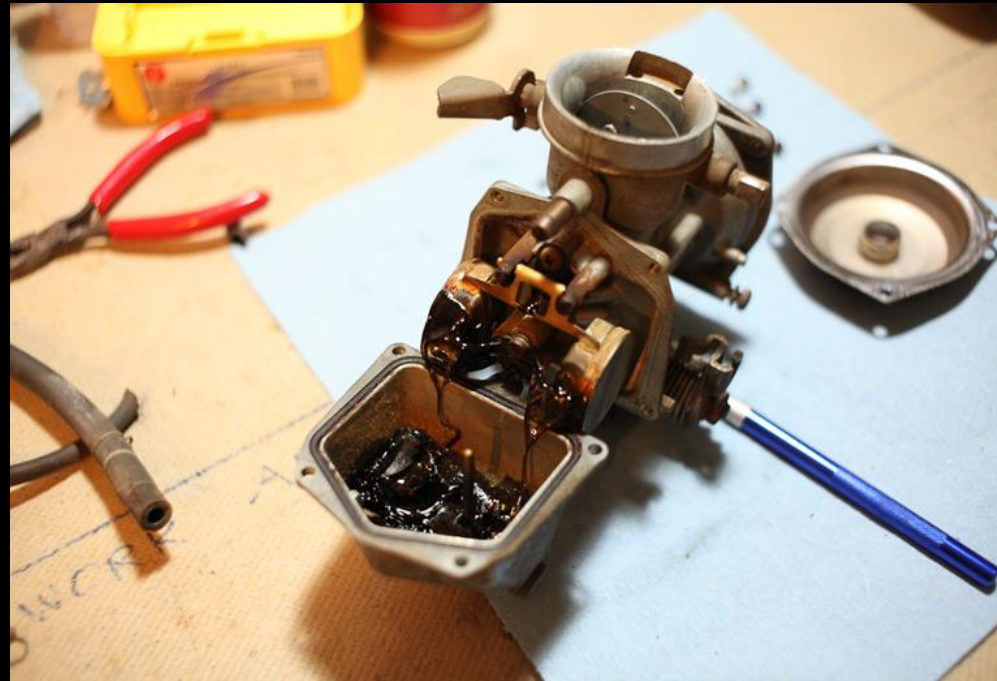
Boats tend to store fuel for longer periods of time

Fuel tanks in most boats are vented, which is a problem

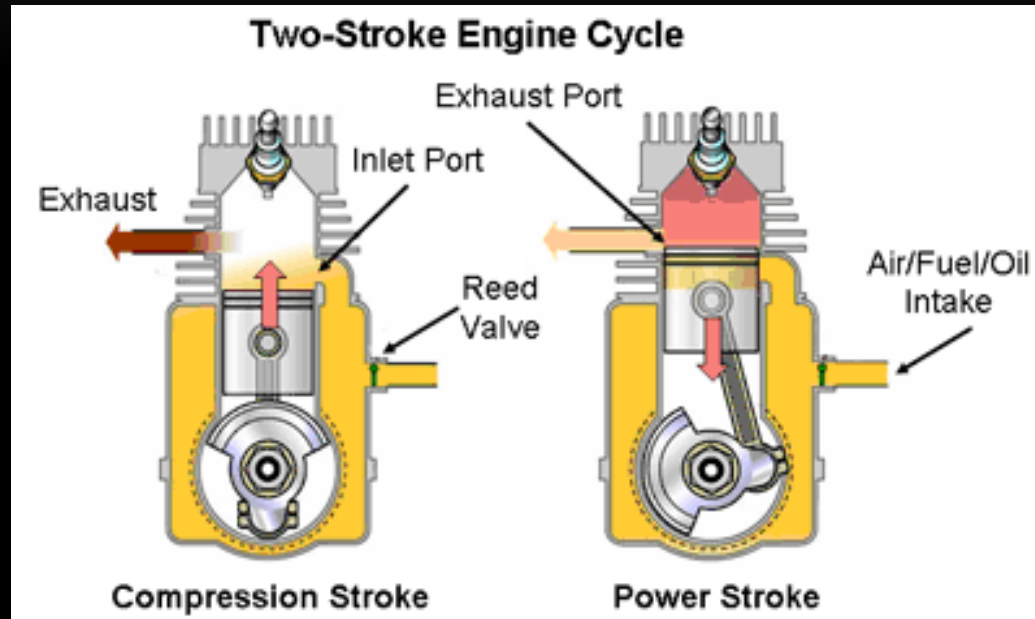
Store watercraft either completely empty or completely full of fuel

“Caution”: Never mix ethanol and ethanol-free gasoline in the same tank

MTBE (methyl tertiary-butyl ether) and ethanol are incompatible and will cause major repair issues if they are mixed in the same fuel tank



Three ways ethanol can damage two-cycle equipment



1. Ethanol can block normal lubrication, causing engine damage
2. Lack of energy in ethanol results in hot/lean fuel mixtures
3. Seasonal storage can result in corrosive damage

Corrosive ethanol damage caused by seasonal storage

Brass fuel system components are highly susceptible to the corrosive effects of ethanol

Fuel jets can be blocked by corrosion causing a no-start condition



Ethanol can be very destructive to different materials

Carburetor floats can be damaged or dissolved by ethanol-blended gasoline



Older vehicles are more susceptible to ethanol damage

The fuel systems of older classic cars were not made of materials that can withstand the highly corrosive effects of ethanol



“OCTANE”

What is it and what does it do for vehicles?

Does octane make your vehicle fly?

Do you occasionally treat your vehicle with premium gasoline thinking it is beneficial?

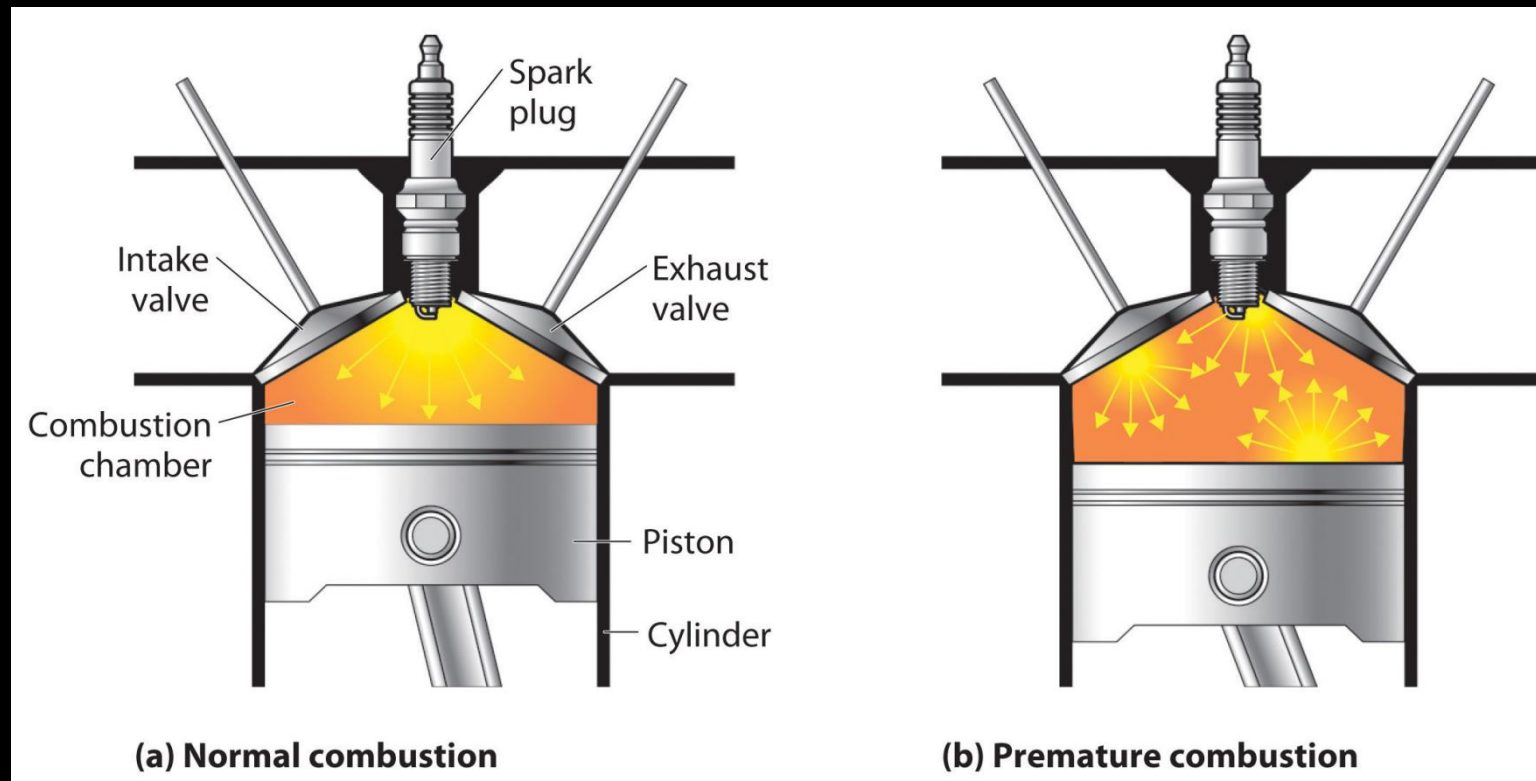
What do you think octane does for your vehicle?



“PRE-IGNITION”

What causes the knocking sound

Pre-ignition reduces fuel mileage and engine performance



Pre-ignition can damage your engine



Pre-ignition can cause a bent connecting rod

Pre-ignition can punch a hole in the top of a piston

Computer-controlled ignition can prevent this damage

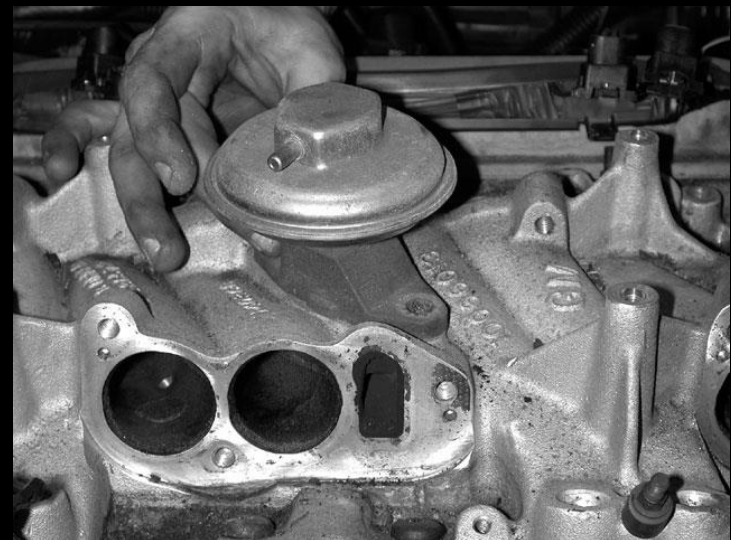
At this point you are probably wondering – why is ethanol being added to gasoline?

- They say ethanol reduces our dependency on foreign oil
- Ethanol reduces CO (carbon monoxide) emissions
- MTBE (Methyl Tert-Butyl Ether) octane booster in gasoline had to be replaced
- MTBE was replaced with ethanol which raises octane & oxygen content
- Ethanol is 119 on the octane scale



The three components that have the biggest negative effect on fuel mileage

- To achieve maximum fuel mileage, fuel injectors must be kept clean
- Exhaust Gas Recirculation Valves (EGR) and Oxygen Sensors must also be kept clean to achieve maximum mileage



Can fuel additives solve or prevent problems caused by ethanol?

- There are over 4,500 fuel additives on the market
- Only about 25 of them that perform as they claim
- No additive will eliminate ethanol in gasoline
- You can only counteract the negative effects of ethanol
- Do not use an additive that contains alcohol

Gasoline additives must be used when fuel is in good condition

There is no product on the market that can economically fix phase-separated gasoline

Phase-separated gasoline should be discarded to prevent engine damage or vehicle breakdown



Things a gasoline additive should do to have a positive impact on your vehicle

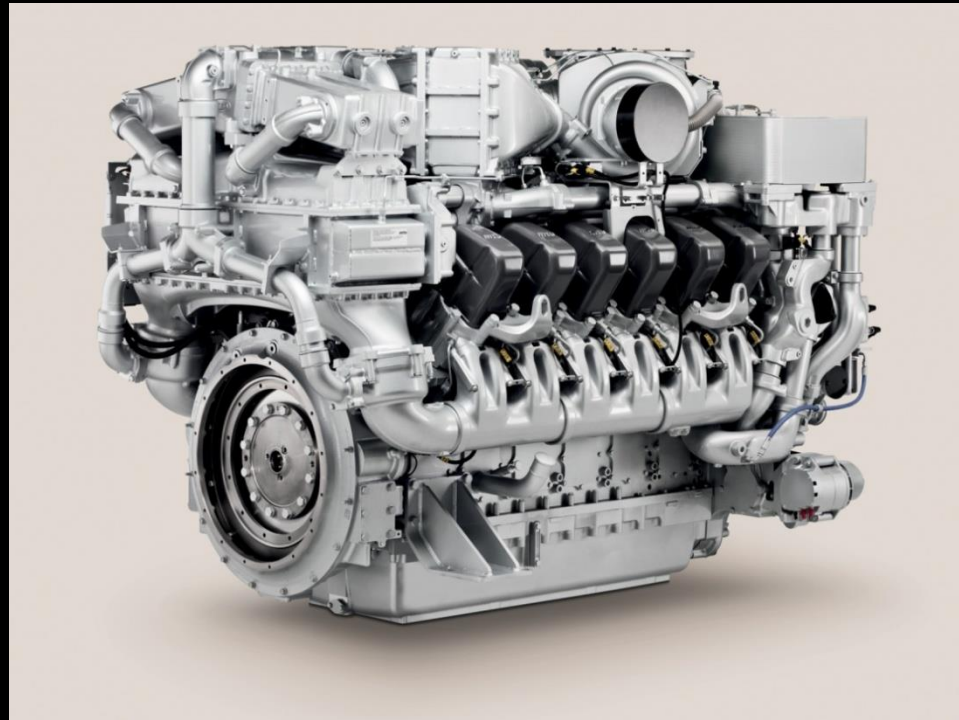
- Water removal to reduce the chances of phase separation
- Inhibit corrosion caused by ethanol-blended gasoline
- Boost power and engine performance, improving fuel mileage
- Clean internal engine components, improving mileage, reducing wear and engine octane requirements
- Extend the life of gasoline in long-term storage



QUESTIONS

Diesel fuel

What you need to know about diesel fuel to maximize performance and reduce chances of equipment failure



Diesel equipment failures

- Fuel problems are the number one cause of diesel-powered equipment failures
- Microbial growth of fungus, mold and bacteria is the number one cause of these failures
- It's not algae which requires sunlight to grow
- Asphaltenes forming from degraded fuel are the second most common cause of engine failure

Causes of fuel filter plugging

Plugged fuel filter caused by microbe excreted waste



Fuel degradation forms asphaltenes, clogging lines and filters



Monsters in your diesel tank

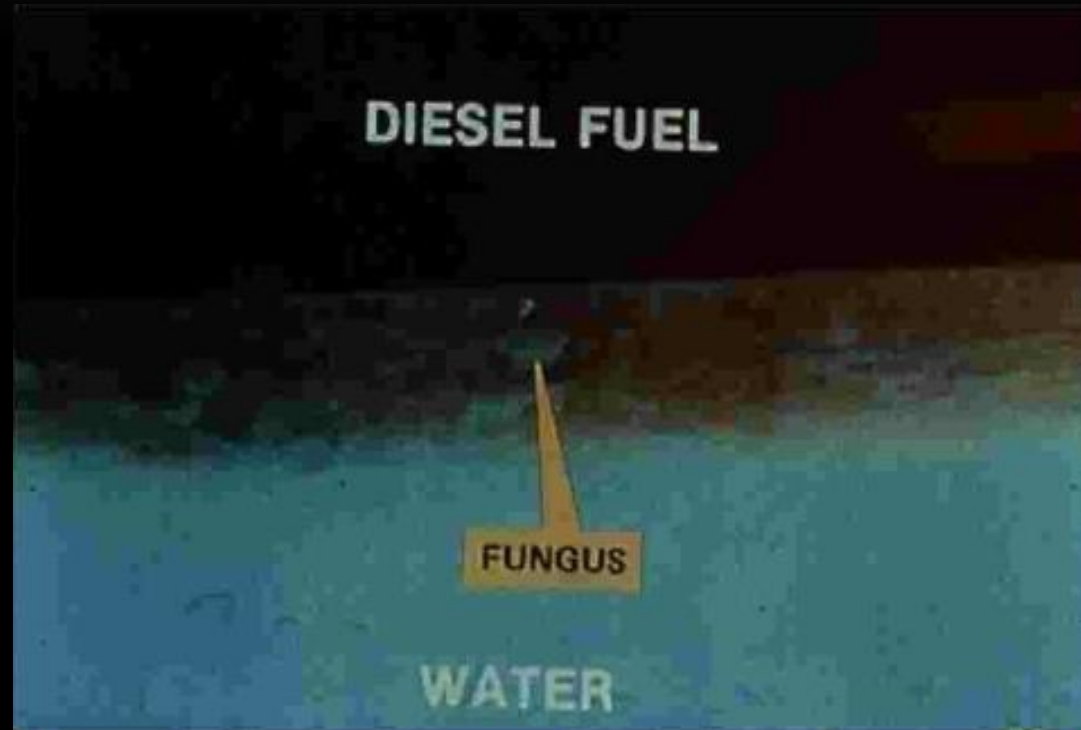
Bacteria can multiply from one cell to 246,000 in six hours

Bacteria can come from the air, moisture or during tank filling



The culprit is water in the tank

- Growth occurs when you have a water-diesel interface
- Microbes live in the water and use diesel as a food source
- A drop of water is a lake to a microbe



How to test for water in fuel



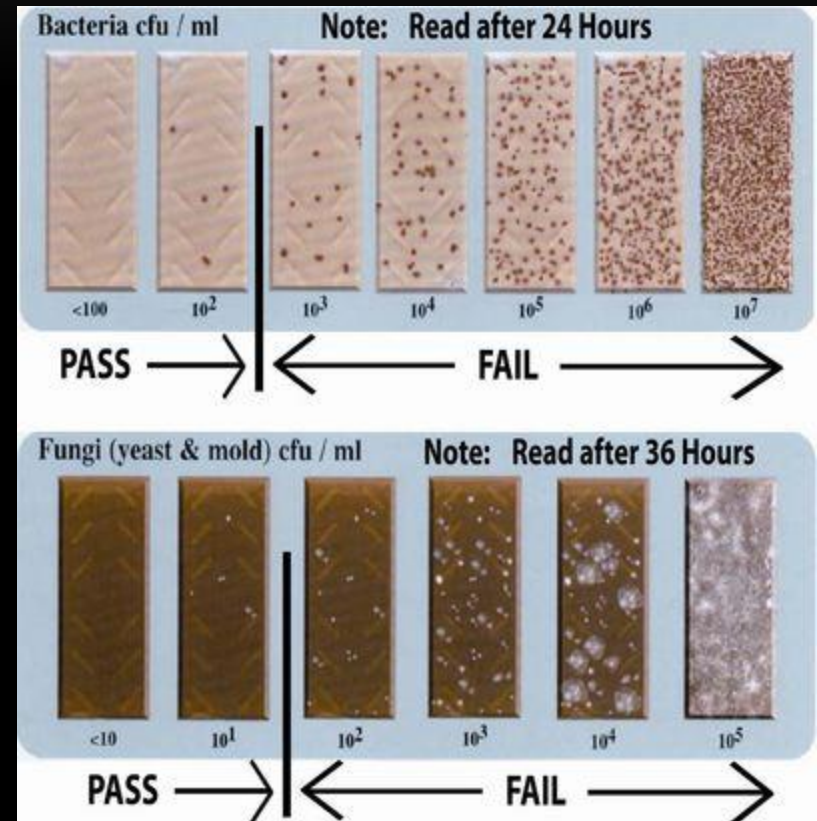
Testing begins by taking a fuel sample

- A Bacon Bomb, as seen on right, is used to collect a fuel sample
- For best results, the fuel sample should come from tank bottom of the fuel tank where microbes live



Testing for microbes in diesel fuel

- There are a number of test kits on the market
- Fungus mold tests are separate from bacteria tests
- The quicker the results the more expensive the test kit



Corrosion caused by bacteria

- Bacteria excrete acids that can corrode metal parts
- Fuel tanks, pipes, injectors, injector pumps & fuel lines can be damaged - as seen by this example



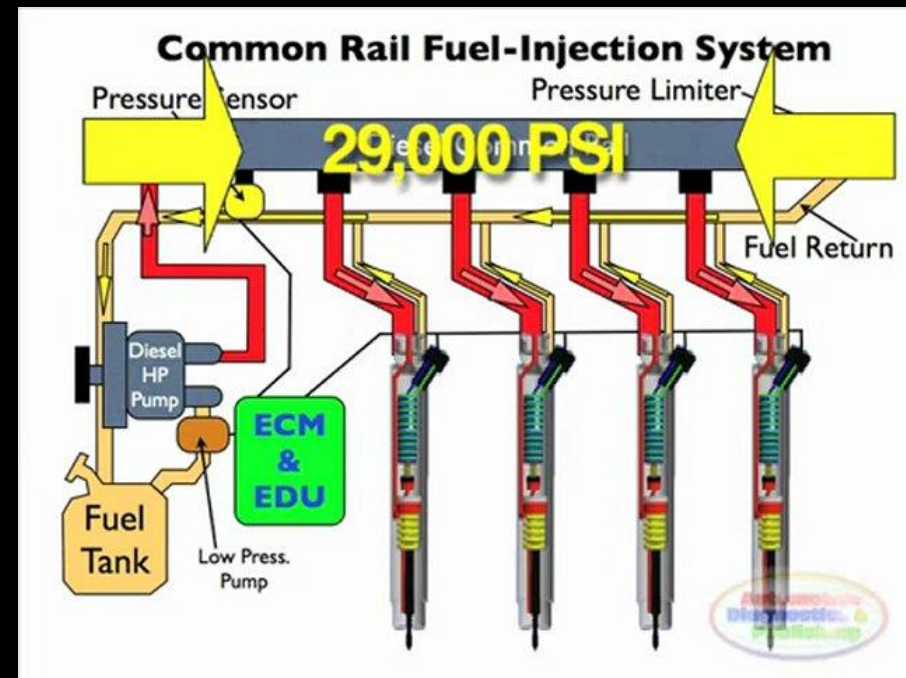
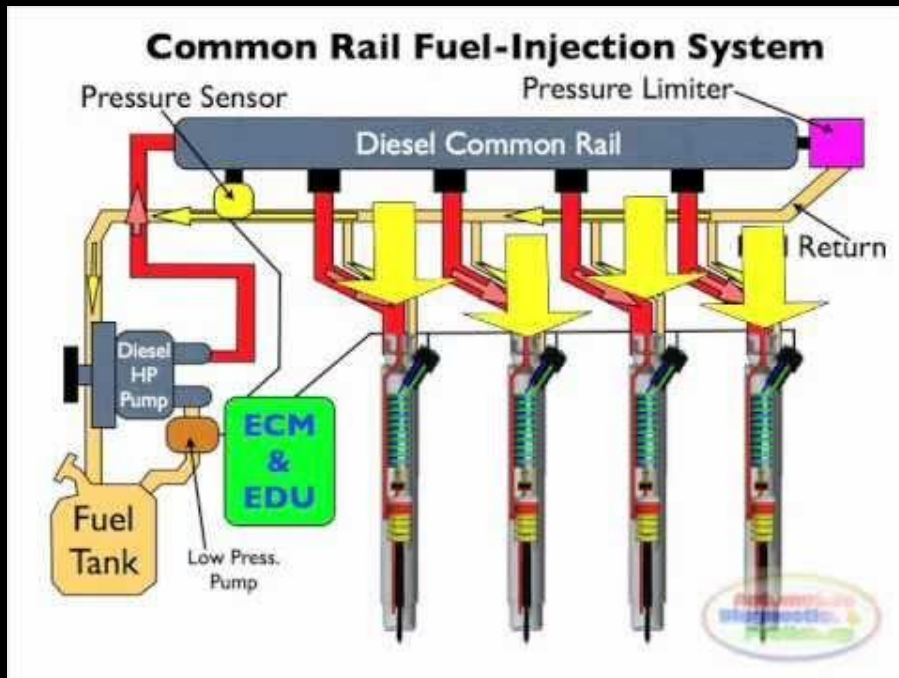
How water ends up in diesel fuel

- Condensation forming on tank walls
- Most fuel tanks are vented, exposing the fuel to humidity and water absorption
- Seven degrees difference in temperature will trigger condensation
- Water intrusion into tanks from rain and ground water
- Water brought in the tanker from the supplier



How diesel engines generate water

Hot un-used diesel fuel returns to the fuel tank, causing a temperature differential and setting the stage for condensation in the fuel tank



EPA-mandated changes to diesel fuel have caused problems

- The EPA required the reduction of sulfur in diesel fuel to reduce emissions
- Sulfur was reduced from 500 parts per million to 15
- Sulfur is a natural biocide that suppresses microbial growth in fuel
- Sulfur was a lubricant for injectors and seals



Cetane & why it matters

- Cetane is the opposite of octane
- Higher cetane means better performance, lower emissions, quicker starting, and less noise
- Higher cetane than manufacturer specifications yields no additional benefit
- Modern diesels run best on a cetane rating between 45 & 50

How cold weather affects diesel fuel

- Diesel fuel contains wax which will cause it to gel at low temperatures
- What is meant by diesel fuel cloud point and pour point?
- Winter fuel contains a mix of No#1 & No#2 diesel to lower the fuel gel point
- Anti-gels will be needed in cold climate areas
- What do you do if the fuel system is completely gelled?



Going green with biodiesel: Benefits and problems



Four things you need to know about biodiesel

- Most common biodiesel concentrations are B2, B5, & B20
- Biodiesel has a higher lubricity rating than straight diesel
- Biodiesel has one-fourth the shelf life that straight diesel has and is more susceptible to microbial growth
- Biodiesel tends to gel at higher temperatures than straight diesel



Improper storage can cause problems with diesel fuel

Dark color storage tanks damage fuel because they absorb heat from the sun

Light colors should be used to reflect the sun's rays to reduce evaporation



Preventive maintenance can minimize storage problems with diesel fuel

- Drain or pump water from your diesel tanks as soon as it is detected because microbes need water to grow. Every 30 days at a minimum.
- Keep diesel tanks as full as possible to prevent condensation
- Add biocide in maintenance dosage every 90 to 120 days
- Use fuel stabilizer to reduce fuel degradation with long term storage
- If possible, try to ensure your supplier maintains their system well

QUESTIONS

For more information on this and other useful topics, visit us at

www.BellPerformance.com and www.WeFixFuel.com

Brought to you by Bell Performance, Longwood FL

info@bellperformance.com

