



# BP UNLEADED WITH 10% ETHANOL IN OUTBOARD MOTORS

### **What about the fuel-system components on the boat?**

It is important to follow boat manufacturers' recommendations when selecting fuels. Use of an inappropriate fuel can result in damage to the engine and boat components that may require repair or replacement. Fuels with ethanol can attack some fuel-system components, such as tanks and lines if they are not made from acceptable ethanol-compatible materials. The ethanol can soften some fibre glass or rubber components or can leach resins and other materials from rubber components, these can then foul filters, carburettors or injectors.

### **Can ethanol-blended fuels affect the performance of two-stroke engines?**

Refer to the manufacturers specifications, if the manufacturer specifies that the equipment can use petrol with an Ethanol content up to 10% then the engine will operate satisfactorily. When petrol containing ethanol is used for the first time after a fuel changeover from ordinary petrol, the tank must be completely dry prior to introduction of the ethanol blend. Otherwise, phase separation could occur that could cause filter plugging or damage to the engine. If the engine is one that can use an ethanol blend but is an older model it is advisable to frequently inspect all fuel-system components to identify any signs of leakage, softening, hardening, swelling or corrosion. If any sign of leakage or deterioration is observed, replacement of the affected components is required before further operation.

### **How does ethanol affect fiberglass fuel tanks?**

Older fiberglass tanks manufactured may not be compatible with petrol containing ethanol. In the presence of ethanol, some resins may be drawn out of fiberglass and carried into the engine where they can clog filters and carburettors or injection systems.

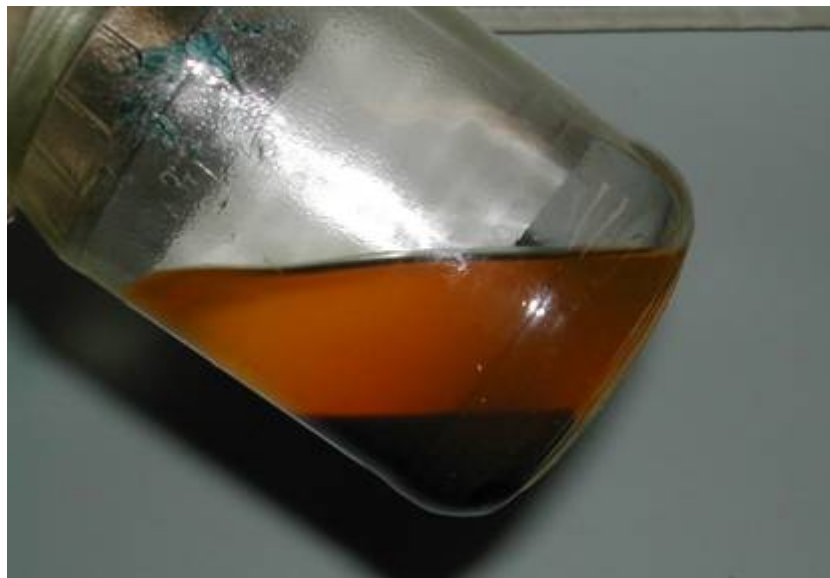
### **Are older fuel lines prone to failure? What about gaskets?**

Older fuel lines can become brittle and hard with age, when exposed to ethanol they can soften, swell and distort and this can cause leakage. If the rubber components in a fuel system look old, hard or show signs of cracking or brittleness then they should be replaced with ethanol compatible components before using fuels containing ethanol.

### **What is phase separation, and how do I deal with it?**

If significant amounts of water are present in a fuel tank with petrol that contains ethanol, the water will be drawn into the fuel until the saturation point is reached for the three-component mixture of water + gasoline + ethanol. Beyond this level of water, phase separation could cause most of the ethanol and water to separate from the bulk fuel and drop to the bottom of the tank, leaving petrol with a significantly reduced level of ethanol in the upper phase (see Figure 1 below). If the lower phase of water and ethanol is large enough to reach the fuel inlet, it could be pumped directly to the engine and cause problems. Even if the ethanol water phase at the bottom of the tank is not drawn into the fuel inlet, the reduced ethanol level of the fuel reduces the octane rating by as much as 3 octane numbers, which could result in engine problems.

The level at which phase separation can occur is determined by a number of variables, including the amount of ethanol, the composition of the fuel, the temperature of the environment and the presence of contaminants. It is very important (A) that the system is inspected for significant quantities of water in the tank before using gasoline with ethanol and (B) to limit exposure of the fuel tank to excess water. If phase separation has occurred, it is necessary to completely remove all free water from the system and replace the fuel before continuing operation. Otherwise, engine problems could occur.



*Figure 1: Sample of fuel from fuel tank in which phase separation has occurred. The upper phase is petrol with a reduced level of ethanol. The lower level is a mixture of ethanol and water.*

**Is an additive available that can prevent phase separation?**

There is no practical additive that can prevent phase separation from occurring. The only practical solution is to keep water from accumulating in the tank in the first place.

**Are there any additives that can allow the phase-separated mixture to remix when added to the fuel tank?**

No, the only way to avoid further problems is to remove the water, dispose of the depleted fuel, clean the tank and start with a fresh, dry load of fuel.

**Is there a simple solution to water condensation in the tank as a result of ethanol?**

It is best to maintain a full tank of fuel when the engine is not in use. This will reduce the void space above the fuel and will reduce the flow of air in and out of the tank with changes in temperature. This will reduce condensation on the internal walls of the tank and will limit exposure of the ethanol in the fuel to humidity and condensation.

**What should be done when storing boats with ethanol-blended fuels for extended periods?**

When preparing to store a boat for extended periods of two months or more, it is best to completely remove all fuel from the tank. If it is difficult or not possible to remove the fuel, maintaining a full tank of fuel with a fuel stabilizer added to provide fuel stability and corrosion protection is recommended. A partially full tank is not recommended because the void space above the fuel allows air movement that can bring in water through condensation as the temperature cycles up and down. This condensation potentially becomes a problem.

**For further information, please call the  
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