



## Which is Better - Storing With a Full or Empty Tank?

### Storing with a Full Tank:

There is less area to support condensation, which means fewer water problems and less risk of phase separation in E-10 gasoline. There are fewer volatile fumes that can be a source of combustion, and some marine yards insist on a full tank for this reason. If the fuel does go bad, which will not happen by using K100 properly, there is more fuel to replace.

### Storing with an Empty Tank:

Most often, the season starts with a fresh tank of fuel. This is recommended by some motor manufacturers. However, by following this recommendation there is a much greater chance of condensation building up during the off season, which means the good, new fuel is being added to any water buildup that may exist. It is difficult, if not impossible, to drain the fuel injector/carburetor system. The remaining fuel will age, forming gums and varnishes that may result in a carburetor rebuild - expensive!

### Ideally:

Store with a full tank of fuel that won't form gums and varnishes and won't go bad.

### All K100 Fuel Treatments:

- Contain a proprietary organic formulation that bonds itself to water and renders it completely burnable as fuel, so condensation is nothing to worry about. In E-10 gasoline, K100 encapsulates the water molecules before they combine with the ethanol, so phase separation cannot occur. Contain organic solvents that dissolve sludge, gums and varnish and prevent reformation of those deposits.
- Contain organic lubricants that coat the surfaces of fuel system to prevent corrosion and oxidation of metallic components. This also helps prevent cold-start scuffing on 2-cycle engines.
- Contain an octane/cetane booster (about 2 points), which will counteract the slight deterioration of those levels during storage.

Using K100, the new season starts with a clean fuel system, no gums and varnishes, no water contamination, and fuel with the same octane/cetane rating as when put up for storage.

### Recommendation:

Always fill the tank and treat the fuel with a double-dose of K100 before storage and run the engine for a few minutes to make sure the treatment gets throughout the fuel system. It also makes good sense to change the fuel filter at the start of the new season.

## What's the Best Way to Prepare for Storage?

There is an old saying, "Pay me now or pay me later". This is especially true when laying up an engine for storage. Skipping steps at lay-up will guarantee expensive repairs at start-up.

General: Each manufacturer has recommendations for oil changes, filter changes, gear case lubrication, etc. Find the manufacturers' recommendations for your engine and follow them. Change any oils (lubricants) before storage. Any moisture in the old lubricant can cause component corrosion and pitting on bearings, which should be avoided at all costs.

Petroleum based fuels are complex compounds with many additives during the refining process - more so now as fuels are reformulated to meet government mandates to lower pollution rates. Unfortunately these same agents that make for cleaner burn make the fuel less stable. Diesel is now less than a 90-day fuel and gasoline is a 30-day fuel. After that the fuel deteriorates and loses a good portion of its efficacy. As fuel ages, asphatimes form, darken the fuel and eventually settle to form sludge at the bottom of the tank. A good stabilizer slows down this darkening and sludge formation. Old fuel often also contains water contamination.

K100-MD for diesel and K100-MG for gasoline contain enhanced stabilizers that hold the petroleum compounds together stabilizing the fuel to keep it fresh during the season, and contain solvents that dissolve asphatimes and put them back into the fuel. This maintains fuel power and protects equipment with increased lubricity. The cleaning action also dissolves deposits on injector tips to restore the spray pattern. Doubling the K100 treatment will keep fuel fresh during storage or if sitting for long periods of time.

Store with a Full Tank (Rather than an Empty One). When storing with a full tank there is less area to support condensation, and there are less volatile fumes that can be a source of combustion. These benefits outweigh any advantages to storing with an empty tank.

Prepping the Carburetor: Draining a carburetor dry may sound good in theory, but a carburetor cannot be completely drained. Some residual fuel will remain, which will turn to gums if left exposed to the air during storage. Gumming will occur even more quickly if there is any moisture in the fuel. Fuel treated with K100 will not form gums or varnish.

E-10 Gasoline: The new oxygenating agents in E-10 cause it to go bad faster than the old MTBE fuel, and accumulated condensation increases the risk of phase separation. A double-dose of K100-MG will keep E-10 fuel fresh for at least 6 months and prevent phase separation from occurring.

Bio-diesel Fuels: Bio-fuels contain high amounts of dissolved water. K100-MD is an especially good treatment for the newer bio-fuels because it eliminates residual moisture.

Preparing for Storage: Store with a full tank and treat the fuel with double the normal ratio of K100. Run the engine for a few minutes to make sure the treatment gets throughout the fuel system.

Removing from Storage: At the start of a new season the engine should be ready to fire up and go. If the storage period is longer than 6 months, change the fuel filter, drain 1/2 the tank and refill it with fresh fuel, add the normal amount of K100, mix as well as possible and start the engine. If it's been a really long time, replacing all the fuel may be the easiest way to avoid starting problems, especially if using premix fuel in a 2-cycle engine. Remember that rubber components don't like long term storage, so inspect hoses and seals carefully as they may need replacing.

Generator Storage: Generators typically sit for long periods of time, but when needed they need to work! Double-treat the fuel as described above, and replace it annually with new, treated fuel (drain the old fuel and use it in some other vehicle). Run the generator for at least 15 minutes to get it up to temperature and make sure it's functioning properly, do an annual preventive maintenance check-up, and keep a new spark plug next to the generator.

## What's the Best Procedure for Changing From MTBE to E-10?

Why the Switch From MTBE to E-10?:

While MTBE has been the standard oxygenating compound in gasoline since the phase-out of tetraethyl lead, the government has determined that MTBE may get into the ground water and can cause cancer. In some areas of the country MTBE has already been replaced by a 10% ethanol (E-10) mixture. Eventually, MTBE will be phased out nationwide and replaced with E-10.

Three Main Problems When Changing From MTBE to E-10:

- Given time and daily changes in temperature, all tanks will accumulate water. When new E-10 fuel is added to a tank with old MTBE fuel and any water, a reaction occurs and a white gummy substance may form that can clog fuel filters and injectors. Water is the critical reactant.
- E-10 has a solvent effect. Old sludge and varnish in the fuel tank will be dissolved, releasing rust, dirt and hard particles into the fuel stream and clogging fuel filters. Clogged filters may strain a weak fuel pump and cause premature failure. Be prepared to replace fuel filters during the changeover.
- Ethanol dissolves some types of resins in certain older fiberglass tanks and introduces them into the fuel stream. This will ruin the carburetors and engine. Do not use E-10 fuel in fiberglass tanks without checking with the dealer first; if they are a problem the only solution with E-10 fuel is to replace the tanks.

How to Safely Change to E-10 (Once You Change, Don't Switch Back):

Make sure to ask the supplier whether they are pumping MTBE or E-10 fuel. Use up all the remaining old fuel, then use a paste test to check the tank for water contamination. If there is more than 4% water, drain the tank or have it professionally cleaned.

K100 will totally encapsulate water at a 1:1 ratio. Add enough K100-G or K100-MG to encapsulate any water remaining in the tank before adding E-10 fuel. It's critical to use enough K100 to encapsulate all the water.

In vehicles there is no way of testing for water, so start using K100 before switching to encapsulate whatever water may be present. Use up as much fuel as possible, then for the first treatment double the appropriate amount of K100 for your size fuel tank before filling with E-10 fuel.

Use K100 continuously to prevent phase separation. If phase separation has already occurred, K100 will not totally reverse the separation.

After the switch, if the engine is hard starting, has poor performance, lack of acceleration and/or lower maximum RPM, sludge is probably clogging the fuel filters, injectors or carburetors. Treat the

fuel with a double-dose of K100 and change the fuel filter. Wait about 30 minutes for K100 to encapsulate the water and dissolve the sludge. The engine should now start, though it might stumble at first. Set the engine(s) at fast idle and run until it audibly runs more smoothly.

K100 also contains an organic lubricating agent. This is not a substitute for pre-mix or auto-inject in 2-cycle engines, but will aid in fuel system component life and help prevent cold-start cylinder wall scuff.

## How Much Water Contamination is in My Bulk Tank?

Commonly Used Bulk Storage Tanks

(Contamination Depth Conversion in Inches)

### Basement Heating Oil Tanks

**275 gallon vertical 27"x44.25"x60"**

1" = 2 gallons

2" = 5 gallons

3" = 9 gallons

4" = 14 gallons

**275 gallon horizontal 44.25"x27"x60"**

1" = 7 gallons

2" = 14 gallons

3" = 23 gallons

### Exterior Tanks

**500 gallon horizontal 48" dia. x 5'5" long**

1" = 2 gallons

2" = 7 gallons

3" = 13 gallons

4" = 20 gallons

5" = 28 gallons

**1,000 gallon horizontal 48" dia. x 10'9" long**

1" = 5 gallons

2" = 14 gallons

3" = 26 gallons

4" = 40 gallons

**1,000 gallon horizontal 64" dia. x 6'0" long**

1" = 3 gallons

2" = 10 gallons

3" = 17 gallons

4" = 26 gallons

5" = 36 gallons

**2,500 gallon horizontal 64" dia. x 15'0" long**

1" = 8 gallons  
2" = 23 gallons  
3" = 43 gallons  
4" = 65 gallons

**5,000 gallon horizontal 96" dia. x 13'4" long**

1" = 9 gallons  
2" = 25 gallons  
3" = 47 gallons

**5,000 gallon horizontal 72" dia. x 23'10" long**

1" = 29 gallons  
2" = 57 gallons  
3" = 86 gallons

**10,000 gallon horizontal 120" dia. x 17'0" long**

1" = 13 gallons  
2" = 36 gallons  
3" = 66 gallons

**10,000 gallon horizontal 96" dia. x 26'8" long**

1" = 18 gallons  
2" = 50 gallons  
3" = 94 gallons

### What Mileage Increase Can Be Expected Using K100?

The mileage increase depends on your vehicle/equipment.

If your vehicle/equipment is brand new, a 2%-4% mileage improvement can be expected. New engines start out clean, and K100 keeps them clean. Mileage improvement occurs because K100 modifies the petroleum molecule, altering the burn chemistry for more complete combustion which results in more power, better mileage and a cleaner environment.

If the vehicle/equipment is older, and/or has 50,000 miles or more, and K100 has not been used, a higher initial mileage improvement of up to 12% can be expected. The first couple of tank fills using K100 can show significant results because the treatment cleans the build-up of carbon and sludge throughout the engine, as well as altering the burn chemistry. Once the system is cleaned up, additional mileage increases will not occur (you can't keep getting a 12% improvement with each new tank).

In either case, without regular treatment, the engine will get dirty. Use K100 consistently to maintain the best mileage possible for your vehicle/equipment.

### Why Did the Fuel Filter Clog After Using K100?

That clogged filter is proof that K100 is cleaning up the entire fuel system.

In older equipment, especially equipment run in dirty or dusty conditions, there may be dirt particles trapped in the gums and varnishes in the tank. When K100 dissolves those gums and varnishes those hard particles like dirt and rust are released into the fuel system.

Fuel filter changes are necessary to remove the debris K100 has cleaned out of the system. Continuous use of K100 will eliminate this necessity because the treatment keeps the fuel systems clean and free of gums and varnishes.

## Why Would I Use K100 in Hot Weather?

### Hot weather is more reason to use K100!

Hot weather may also bring high humidity, which may cause moisture to build up in the fuel tank. In E-10 gasoline, enough moisture in the tank will cause phase separation, and may make the engine difficult or impossible to start and running well.

A solid year-round fuel maintenance program uses K100 in warm weather at a reduced treatment ration to stay ahead of the moisture contamination. K100 encapsulates and burns off as fuel any moisture in the tank, eliminating free water that causes phase separation in E-10 fuel.

## Can I Mix Fuel Additives?

We don't recommend mixing fuel treatments.

Most fuel treatments are petroleum-based and are specifically designed to repel water. K100 is bio-based and specifically designed to attract water. Mixing the two together with water as a catalyst may cause unknown and undesirable reactions.

To test for compatibility of additives with water, add equal amounts of water, K100 and the other treatment to a small glass bottle. If the resulting liquid is clear, the two treatments are compatible. If it's milky, or you see any formation of solids, the treatments are not compatible.

However - Even if compatible with water, other components in the different treatments may cause unpredictable reactions when added to fuel. It's best practice not to mix them. Always use up as much of the old treated fuel as possible before changing to a different treatment to avoid problems.

## When Should I Add K100?

Because of it's chemistry, K100 will always mix completely.

It doesn't matter if K100 is added before, half-way through, after - or days after - filling the tank because K100 will always mix completely with the fuel without agitation.

## Is There a Way to Test K100?

Test for yourself and see the difference.

As a comparison, you may wish to repeat the tests below with the fuel treatment you are currently using. As most treatments are petroleum based, chances are your treatment will show separation and water presence in the first test, freeze in the second, burn with a dark sooty smoke in the third, and exhibit signs of rust in the fourth. We feel confident that the differences will become immediately apparent.

- **Test #1:** Fill a small, clear glass bottle 1/3 with water, 2/3 with K100. Note the clear solution - K100 has completely mixed with, and encapsulated, the water molecules. It will never separate. Use water detecting paste to find no water present.
- **Test #2:** Put the treated bottle into your freezer for as long as you like - water treated with K100 will not freeze. Each water molecule is separated from the adjacent one by a film of K100, so the water molecules can't coalesce to form ice crystals despite the cold.

- **Test #3:** Do not do this test using any fuel or near any combustible material. Twist a small paper towel into a wick, insert it a few inches into the treated bottle and light the wick. It will burn cleanly, with no smoke at all. Listen carefully and you will hear small popping sounds as the individual water molecules flash off as steam. K100 removes the water from the fuel by "burning" it off as the engine runs.
- **Test #4:** Put an uncoated common nail into the sample and leave for as long as you like - there is no sign of rust because the water molecule is completely surrounded by K100, leaving no oxygen available to support rusting.