

# The Essential Fuel Tests You Need To Know About

## To Save Yourself Time, Money & Headaches

Regular fuel inspections are an important part of good housekeeping and essential to staying ahead of any shifts in stored fuel condition. But which ones to do? Sensory (sight and smell) fuel inspections are better than nothing. However, analytical fuel testing by an accredited lab is the only way to really know how your fuel is doing in storage, and the best way to track it over time.

**These are the most important fuel tests you need to consider for your stored fuel.** We'll summarize what each test does, what problems they can detect, and what you should do if your stored fuel comes up short.

<b>Water and Sediment (ASTM D-2709)</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>Measures both water and sludge sediment in samples of stored fuel.</p> <p>A sample of diesel fuel is centrifuged to force any water and sediment in the sample to the bottom of a tube. The volume of water and sediment is then measured.</p> <p>Healthy fuel that meets legal specifications is expected to have a water/sediment content below a certain % level.</p>	<p>Water is necessary to support microbe growth in fuel and storage tanks. Water can contribute to tank corrosion.</p> <p>Presence of sediment contributes to injector fouling and engine deposits and is an indicator of possible fuel instability.</p> <p>Presence of both can predict operational problems in emergency or critical-use equipment.</p>	<p>Fuel cleaning, utilizing both chemicals and mechanical filtration, will remove the water and sediment and should enable the fuel to meet water and sediment test standards.</p>

<b>Microbial Presence/Count</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>Two test methods, one more rigorous than the other. Microbial presence testing utilizes cultured test strips to give a qualitative indication of the presence of microbes in a sample.</p> <p>Microbial Count testing uses phase contrast microscopy and a machine like a Coulter Counter to mechanically count the number of microbial bodies within that pass through a scanner.</p>	<p>Microbial presence in fuel is important to monitor on a regular basis to ensure microbial colonies do not grow to problematic levels.</p> <p>Microbiological growth in fuel is responsible for a myriad of expensive problems – fuel degradation, corrosion, filter plugging and biomass formation</p>	<p>Application of biocide is the only way to effectively reduce microbial counts in fuel.</p> <p>Periodic dosing of stored fuel with biocides will help keep microbial counts below problematic levels.</p>

<b>Water Presence &amp; Content (Stick Test   Karl Fischer)</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>There are multiple methods for determining water content in fuel, with Karl Fischer Titration (KF) being the dominant common.</p> <p>Karl Fischer tests give a qualitative measurement of water content as a percentage.</p> <p>Presence of free water (i.e. a tank water bottom layer) can be confirmed and measured through the use of water finding paste (“tank sticking”).</p>	<p>Water content contributes to tank corrosion and provides an essential medium for microbe growth in fuel.</p> <p>Increases the risk of phase separation in stored ethanol-blended gasoline, which can quickly destroy the fuel’s viability.</p> <p>Excessive water content may also damage fuel injectors and cause problems with common rail diesel engines</p>	<p>Excessive free water may be mechanically removed (pumped out), followed by treatment with a water scavenger to remove trace remnants.</p> <p>Excessive dissolved or entrained water can be treated with a demulsifier chemical to make the water drop out of the fuel, enabling it to be removed.</p>

<b>pH Level</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>Measurement of the pH level of a fuel sample by a pH meter.</p> <p>On the pH scale of 0 – 14.0, 7.0 is neutral, while healthy fuel will almost always fall between 5.6 and 8.</p>	<p>Low pH (acidic) readings below 5.6 may indicate accelerated microbial growth in the fuel, as microbes produce acidic byproducts that lower fuel pH.</p> <p>High acid levels in stored fuel are responsible for accelerating the rate of degradation of the fuel. They also contribute to tank corrosion and damage.</p>	<p>Excessive pH level is a primary indicator of microbial presence, which must be remediated by the removal of water bottoms and the judicious application of biocide treatment. Highly acidic fuel itself may need to be disposed of, unless it is diluted with fresh fuel before use.</p>

<b>Cetane Index</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>Estimation of the cetane rating of diesel fuel.</p> <p>Involves calculations based on the measurement of the fuel's density and distillation temperatures.</p>	<p>Poor cetane index/rating of diesel fuel contributes to a host of combustion problems in the engine – poor starting rough running, black smoke production from incomplete combustion.</p>	<p>Cetane deficiency is easy to remedy through application of chemical cetane improvers to raise the fuel's cetane rating from 2-6 points.</p>

<b>Sulfur Content (ASTM D-2622)</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>There are multiple methods for determining sulfur content in fuels. D-2622 utilizes X-ray fluorescence to give an accurate measurement of sulfur content.</p> <p>This is an essential test for confirming that stored ultra-low sulfur diesel (ULSD) fuels do not maximum sulfur content allowable by law.</p>	<p>Sulfur content in excess of 15 ppm may be the fuel at risk for violating applicable sulfur content laws, depending on what the fuel is used for.</p> <p>High sulfur content in diesel fuel also shortens the life of DPF systems, increasing maintenance costs.</p>	<p>There are no viable chemical or mechanical solutions for lowering sulfur content. Dilution of the fuel may be possible but depends upon starting sulfur content.</p> <p>If this is not possible, the fuel may need to be disposed of.</p>

<b>Fuel Stability (ASTM D-2274)</b>		
<b>What is this test? How do you run it?</b>	<b>What problems can it predict or detect?</b>	<b>What to do if your fuel fails?</b>
<p>Also known as Oxidative or Accelerated Stability.</p> <p>Measures the storage stability of fuel.</p> <p>Fuel sample is heated and exposed to oxygen to simulate fuel oxidation in storage. Insolubles like sludge are produced in the process and measured at the end of the test.</p>	<p>Test predicts fuel instability because unstable fuel will produce higher quantities of these insolubles measured on the test.</p> <p>Such fuels will darken and stratify in storage at a faster rate, producing sludge and reducing combustion viability. Also will be more likely to produce injector and engine deposits.</p>	<p>Fuel should be polished or cleaned to remove existing insoluble and sludge.</p> <p>Fuel should then be chemically treated with a stabilizer to halt further degradation and extend its effective storage life.</p>

Running these essential tests a la carte can cost upwards of \$2000 at an accredited lab. That's sticker shock for some, but may not be all that much when compared to the cost of large volumes of fuel you could be in the charge of. Factor in the costs incurred if the fuel doesn't perform in a critical emergency, and the perspective on the cost of testing shifts.

Partnering with someone who has existing relationships with accredited testing labs is also a great way to get these done, but at a fraction of the cost. Customers of the Bell FTS Program for preventive fuel maintenance can have these tests run for a fraction of the cost.

**If any of this resonates with you, talk to us!**

