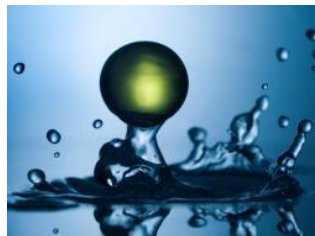




PLATINUM
FUEL TECHNOLOGY

Premium Diesel Additives are the Silver Bullet for: Increasing fuel economy Reducing repair and maintenance costs Lowering emissions

How small and large operations are
winning with automated fuel additives



In our interest, to reduce our impact on green house gasses, diesel fuel has had enormous changes in its chemical composition; these changes have increased many of the challenges addressed in this document. They have adversely affected both engine and fuel systems to a point where the introduction of additional chemicals (fuel additives) could be beneficial. Who is recommending that fuel additives can be a good

solution? Major engine manufactures, fuel refiners, and fuel wholesalers. After our researchers found that major engine manufactures, fuel refineries, and fuel wholesalers were not only recommending fuel additives they were manufacturing their own, we agreed this matter deserved additional investigation. Our research also found that automotive manufacturers around the globe, recognized that the current government minimum requirements didn't go far enough. They had spent millions of dollars to identify which fuel companies provide the quality of additive in their fuel to meet their specifications. Warning unknown results, if buying from other than the providers they announced as TOP TIER providers. Recognizing how critical the quality of the fuel is in diesel applications, one can assume this is an area worth paying attention too.

MARKET TRENDS

Companies are researching now more than ever how they can tackle these fuel challenges. Diesel fuel may be evolving into a more efficient and cleaner fuel, however most agree now is the time for companies to look at the effects that fuel will have on their diesel applications: Ultra low sulfur diesel (ULSD) fuel, problems inherent in any storage of fuel, and issues found with the fuel system itself can negatively impact fuel economy, engine life, maintenance and repair costs and emissions. We believe success will come through paying attention to the little things, this is where the savings will be found. Many companies have opted to take on the challenge of paying attention to these small details, which are enabling them to save in small increments from many areas of their operation, all of which can lead to a real advantage to the bottom line.

“Changing regulations that have led to the use of biodiesel blends and ULSD fuels have created unique maintenance needs across the globe. The addition of high quality fuel additives is now an important element in every good diesel engine maintenance program.”
- Cummins

“Currently, many fuel retailers provide fuels with lower-quality additive packages, these lower levels of additives can have negative impacts on engine performance and vehicle responsiveness.”
- Top Tier Gasoline



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The Challenge with ULSD

Ultra Low Sulfur Diesel significantly reduces greenhouse emissions however lacks important fuel properties

The refining process of ULSD is believed to be the cause of many of today's fuel problems



Today most ULSD is derived using the process of catalytic cracking. This form of refining uses very high temperatures, high pressures, and chemicals known as catalysts to refine crude oils into various fractions including ULSD. The fuels derived using these processes suffer from a wide range of problems including a lack of oxidative and thermal stability. This lack of stability manifests itself in several ways, including an increased ability to hold

dissolved water, an increased negative reaction with oxygen, and a far greater inability to handle high temperatures over time. A fuel's anti-oxidation properties are particularly important in modern fuel systems, where the fuel is exposed to higher operating temperatures. Higher fuel temperatures with increased engine operating temperatures impact oxidation rates, leading to asphaltene plugging, which can lead to premature filter and injector failure. Different refining processes and catalysts can make these problems better or worse. It appears that certain refineries produce fuels which are far less stable than do others.

The removal of sulfur, the natural lubrication in diesel fuel, has most certainly decreased the lubricity of the fuel. This decrease in lubricity can lead to greater friction and heat, causing excessive engine wear and the premature failure of engine components.

Today's tighter tolerance motors designed to work with ULSD need to be kept cleaner than ever before, in order to provide the performance intended. Lower aromatic content of fuel may make it a poorer solvent, possibly leading to additional internal buildup of carbon and other deposits. High pressure fuel systems have tighter tolerances as well, increasing wear potential with smaller inorganic contaminants.

The higher wax content in ULSD contributes to increased winter wax, gelling, which can cause many problems including stalling the motor and even catastrophic engine failure.

"The introduction of ULSD fuel to older vehicles may adversely affect fuel system components (mainly seals) and/or loosen deposits in fuel tanks. As part of a good maintenance program, owners and operators of existing diesel equipment are encouraged to monitor their diesel-powered vehicles closely for potential fuel system leaks or premature fuel filter plugging during the change-over to ULSD fuel."

- John Deere



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The storage and handling of fuel is also believed to be the source of many fuel problems



MICROBIAL GROWTH

Diesel fuel from the refinery is clean, but the more it is handled and transferred from one container to another, the greater the chances that it will become contaminated with water, dirt or other inorganic materials, or with biological agents. Water and foreign matter, such as dirt, are familiar problems best handled by the “best practices” procedures known to most fleet operators. Biological contamination, however, often goes unrecognized in its early states and is only recognized after causing some type of costly problem.

SHELF LIFE

Most diesel fuel, including the ULSD version, has a shelf life from 3-to-6 months. Again, this varies widely. Recently, diesel fuel produced at a refinery in Texas was tracked to its final destination in

Florida. When tested at the refinery the same day it was produced, the fuel barely met the specification for stability. After being stored, pumped into a coastal tanker, offloaded at Port Everglades, stored again, delivered to the fuel jobber, and finally to the customer, 23 days had passed. Again the fuel was tested, this “fresh” fuel now tested out of “spec.”

WATER CONTAMINATION

Contamination of fuel by water and dirt entering the fuel as a result of careless fuel handling may cause poor diesel engine performance. Extreme care must be exercised. Fuel-tank caps, dispensing nozzles and hoses should be kept clean to eliminate potential sources of contamination. Regularly removing water from storage tanks, vehicle fuel tanks, and filter bowls is important. A quality fuel additive will reduce fuel emulsion problems, injection system corrosion and microbial growth.

Today's low sulfur diesel fuels are more likely to leave varnish and gum deposits on injectors. Today's diesel injectors operate at much higher pressures. Over time, their opening pressure can drop. Up to 300 psi is considered acceptable but more than 300 psi means the injectors should be replaced or reset back to their original operating specs. You'll need some type of pop tester to check the opening pressure of the injectors if you suspect this kind of problem.

Many Original Equipment Manufacturers have discovered a phenomenon known as Black Filter Syndrome. This phenomenon commonly occurs when ULSD fuel is used in modern engines with common-rail and electronic unit injection systems. The combination of ULSD and the heat generated by the high pressure injection system causes the fuel to “cook” in the injection system.

“Diesel fuel-soluble biocides actually become a part of the fuel and provide continuous protection from initial storage to entry into the engine fuel system. If a regular fuel supplier is used, fuel buyers may want to determine the type of treatment used before initiating a treatment program at the fleet level.”
- Utah State University

Fuel and Storage Tanks:
“Treat with an antimicrobial additive -- a shock treatment is recommended when microbial growth is suspected, and a maintenance treatment is recommended with each fill-up.”
- John Deere



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Because of the high volume of fuel which is returned to the tank to cool the fuel system, the carbon deposits are quickly trapped in fuel filters. As the fuel filters become restricted, the operator will use more throttle to maintain power, which results in increased fuel consumption. In addition, filter life is shortened. These, as well as other types of deposits, can collect in the injectors. Dirty injectors can lean out the air/fuel mixture, causing a loss of power, rough idle and sometimes white smoke in the exhaust. Leaky injectors will richen the air/fuel mixture and cause black smoke.

“Depending on the severity of winter operating conditions, many operators may choose to protect their equipment through the use of fuel additives, fuel heaters, and fuel water separators.”
- Filter Manufacturers Council



Water can cause injector nozzle and pump corrosion, microorganism growth and fuel filter plugging, resulting from the corrosion or microbial growth. Vehicle tanks should be checked frequently for water and drained or pumped out as necessary. In extreme cases, biocides may be required to control microorganism growth. In cold northern winters, ice formation in fuels containing water creates severe fuel line and filter plugging problems. A quality fuel additive is the most effective means of preventing this problem.

The Cloud Point is the temperature at which paraffin, which is naturally present in #2 diesel fuel, begins to form cloudy wax crystals. When the fuel temperature reaches the cloud point, these wax crystals flowing with the fuel coat the filter element and quickly reduce the fuel flow, starving the engine. Many lower the cloud point temperature by diluting #2 diesel with #1 diesel or kerosene. However, this lowers the fuel heat value and can be an expensive solution. Alternately, widely available cold flow improvement additives may help delay filter plugging. They lower the pour point of diesel fuel several degrees, but do not change the cloud point temperature. Instead, cold flow improvers work by altering the paraffin crystal shapes to needle-like forms.

Another difference with diesel fuel is that it tastes good to certain microbes, especially if there's water in the tank. Certain bacteria can actually thrive inside a diesel fuel tank, forming slime, acids and other creepy stuff that can gum up fuel lines, filters, injection pumps and injectors. Infected fuel often has a "rotten egg" odor, and leaves a black or green coating on the inside of fuel system components. The growth rate of most organisms' increases with warmer temperatures, but some can thrive down to freezing temperatures.

To get rid of a bug infestation, the fuel tank needs to be drained and cleaned. An additive approved for this type of use should also be used to kill the organisms and to prevent their reappearance. The cleaning process should be followed by a fresh tank of fuel treated with a preventative dose of additive. If the fuel lines and injection pump have also been contaminated, they will also have to be cleaned. You may want to consider an ounce of prevention. A good approved fuel additive with a quality biocide may be well worth its cost as compared to the problems that can occur if an infestation takes place.



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The Solution: Automated Fuel Additives

“Since 2005 the use of lubricity additives has become common and all Exxon diesel fuels intended for over the road use contain them.”
- Exxon

“The minimum cetane engine number in the United States is 40. Original Equipment Manufacturers (OEM's) recommend a minimum 50 cetane number. German standards require a minimum 49 cetane engine number while the European Standard cetane engine number is a 51 minimum.”
- Amalgamated Inc.



The findings of our research have confirmed there are no silver bullets. Rather those responsible for best practices working to increase fuel economy, reduce repair and maintenance costs and lower emissions must look for small incremental improvements in many areas of their operation. Things like retraining driver behavior, maintaining optimal tire pressure, use of synthetic lubricants and yes fuel additives. Although some fuel additives may have a reputation for not delivering as promised, today with companies like Cummins, John Deere, BP and Chevron all producing fuel additives, one would have to agree they are no snake-oil salesman.

Let's be clear, virtually all fuels use additives in order to meet minimum government standards, with each one touting their formulation as an advantage over the others. Its important that you are aware that today's fuel from the refineries contains as much as 50% lower levels of additives than was used in the past, remember they only have to meet minimum government standards. This appears to have an exceptional level of importance to automotive manufacturers causing six of them, BMW, General Motors, Honda, Toyota, Volkswagen and Audi to band together and spend millions of dollars in research. As they recognized that the current EPA minimum requirements do not go far enough to ensure optimal engine performance, these auto makers have raised the bar. TOP TIER Detergent Gasoline's help drivers avoid lower quality gasoline which can leave deposits on critical engine parts and reduce engine performance. So I guess the question has been answered, are quality additives important in your fuel, these automotive experts certainly appear to believe so.

Expecting that you the reader are knowledgeable in these areas, it goes without saying that the chemical makeup of diesel fuel and the demands for its commercial and industrial applications require an even more stringent focus on the quality of the additives used. When authorities disagree what level of performance should be required as a minimum from diesel fuel, cetane levels, etc., who do you want to trust your equipment to? Perhaps best practices would suggest taking control of your own formulation proven by your own results.

As you look for those small incremental advantages to improve your bottom line this study would show that a quality additive should be one of them. With the ability to successfully impact your fuel economy, reduce repair and maintenance costs and lower your emissions a quality additive can offer a one stop solution. There are hundreds of formulations and performance validations from respected third party labs. The ability to identify the fuel additive to best meet your needs should be no further away than a few strokes on your keypad.



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“With improvements in MPG, reduced emissions, increased engine performance and component longevity, the answer is clear; the implementation of a premium fuel additive should be part of your fleet protocol.”

- Platinum Fuel Technology

As with all additives the critical aspect is that they are used in their intended mixing ratio. Use too little and you'll receive less than optimal results, use too much and your throwing money away. The answer then becomes clear; in order to receive the value intended the accurate dispensing of the additive is critical. Knowing that human error will likely be the weak point in accomplishing this goal, the answer to best practices, as it relates to fuel additives, is to provide automation to dispense the additives in their appropriate ratios.

Utilizing a pump with the same chemical handling capabilities is a must. The pump should have minimal moving parts and not require any type of maintenance. The pump should not utilize springs or the expansion of any pliable components such as tubing for the return/suction side of its pumping as this may cause it to be subject to inaccuracies with more viscous additives. Additionally these types of components have the potential for failure that could lead to leaking of the undiluted additives.

With many additives promising to provide from 2 to 10 percent improvements in MPG, improvements in engine performance, extended life of engine components, including fuel filters and fuel injectors and reductions in emissions, the answer is clear; using an additive with automated dispensing should be a part of your best practices implementation.

As you are moving forward with your best practices, looking to incorporate these and other small incremental improvements, you may find it difficult to find competitive information regarding automated fuel additive injection. To assist in your effort toward improving your bottom line we would like to share information regarding an automation option for you.

Platinum Fuel Technology's proprietary flow control technology minimizes messy calibrations and ensures accurate diesel fuel additive dispensing every time. It accurately dispenses diesel fuel additive to the diesel fuel system at each fueling with no operator input. The diesel fuel additive injection systems are designed to require no maintenance beyond the filling of diesel fuel additives. They are designed to accept diesel fuel level data from a wide range of sensors including digital/analog diesel fuel tank level senders, and electronic flow meters. This virtually eliminates handling of the fuel additives and creates an accurate and affordable solution for both small and large operations.

The key to quality results with any fuel additive is its accurate and consistent use:

Cummins knows this could save you real money, “The addition of high quality fuel additives is now an important element in every good diesel engine maintenance program” – Cummins



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PFT Additive Injection Systems

Three Unique Models to Meet Your Application Needs

Common installations are accomplished in under two hours. All necessary components for common installations are included

VEHICLE MOUNT PLUS—VM200

The Vehicle Mount Plus system is the upgraded version of the Vehicle Mount with a stainless steel tank, heating options and additive level sensing.

FUELING TANKER—FT100

This is the perfect option for any diesel fueling environment whether tanker truck or stationary. Our real time monitoring of diesel fuel and diesel fuel additive flows ensure accuracy and simplicity.

BULK TANK—BT100

These units are for use with bulk storage of diesel fuel and where the diesel fuel additive is commonly supplied using larger diesel fuel additive tanks



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RESOURCES

Top Tier Gasoline

<http://www.toptiergas.com/why.html>

John Deere

http://www.deere.com/en_US/ag/servicesupport/tips/tractors/common_stories/ultra_low_sulfur_diesel_fuel.html#

Cummins

http://www.fleetguard.com/pdfs/product_lit/americas_brochures/LT36049.pdf

Utah State University

<http://extension.usu.edu/files/publications/factsheet/FM-16.pdf>

Well Worth Products

<http://www.wellworthproducts.com/articles/blackfilters.asp>

Power Research Inc.

<http://www.theepicenter.com/tow021799.html>

Exxon

http://www.exxon.com/USA-English/GFM/Products_Services/Fuels/Diesel_Fuels_FAQ.as

Amalgamated Inc.

<http://www.amalgamatedinc.com/refineries-terminals-marketers.aspx>

Filter Manufacturers Council

<http://www.filtercouncil.org/techdata/tsbs/91->