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Problems with your Fuel?

Today we have a new generation of electronically controlled, Low emission, high speed and high horsepower diesel engines. The reason for all this new technology is the need for diesel engines to meet the clean air act of 1994 & 2004. They are accomplishing this by using electronic injectors and by changing the diesel fuel we are presently using.

With this new generation of diesel engines you need to take precautions to properly maintain the engine. This includes installing a proper fuel/water separator along with using a proper fuel additive designed to meet the challenges for today's electronic engines. If you take these precautions it will save you costly down time and money

First, a proper fuel/water separator must remove all of the dirt and water at the rated micron level of the filter element in the fuel. The reason for this is that the injector tolerances on the electronic engines are smaller than the old style injectors. The new style injector will not tolerate any water in them at all. This is why you want to use an additive that removes water from the fuel (demulsifies) to get any emulsified water out of the fuel. Do not use an additive that emulsifies the water into the fuel. The only way to remove 100% of the water in the fuel is with a chemical additives. Even a centrifuge that spins at 9,800 rpm's can not guarantee 100% water removal.

Secondly the filter has to flow more fuel with less restriction through the fuel system. The reason for this is the new style engines flow 2-3 times more fuel in order to cool and to lubricate the electronic injectors. Some engine companies are recirculating the fuel in the head which may change in the future. With this larger fuel flow you are allowed a maximum fuel pump restriction of 4.1 to 12 in.Hg. It depends upon the engine manufacturer. Most of your fuel/water separators will not meet these standards because they were never designed for today's engines & fuel flows.

We also wanted to share our observation with you on the fuels you are buying today. They are different from the fuels you were buying in the past. Diesel fuel today is so dynamic that even today, as we speak, decisions on what color to make what diesel products are still being argued over between the EPA, IS, API and the rest of us.

In order to understand the 1994 version of diesel fuel we must go back to the 1970's. As a result of a growing demand for middle distillates which include kerosene, jet fuel, #1 and #2 diesel fuel, refineries no longer simply distilled crude oil to make distillates, they resorted to catalytic cracking. The difference between light, middle, and heavier fuels is the boiling ranges. The cat-cracking process breaks up heavier fuels so they will meet the specifications for lighter products. Lighter fuels are more valuable than heavier fuels. So with the increasing demand for the more valuable lighter products, the refineries made the investment to catalytically crack more crude. Today heating oil and diesel fuel that you buy is the product of severe catalytic cracking. So what does this mean? Fuel that has been refined this way does not want to stay in its new form. It wants to change back into something heavier. The heat of an engine raises the temperature of the fuel in the return lines, thereby accelerating the formation of particulates. In fact any energy that we put into today's diesel and heating oil (regardless of sulfur content) speeds up the production of solids. These solids take many shapes and forms. They are typically sticky gums. Varnishes and sludge's that will plug filters, strainers, nozzles, and injectors. Often we blame bacteria for these solids, when in fact this is the fuel re-organizing itself into heavier products that like to stick together. In fact 93% of what clogs today's filters is not dirt or algae, but it is the re-polymerization of the fuel. The microscopic particulates that form will grow larger and eventually clog your fuel system.

And then came October 1, 1993, low sulfur fuel was born. Reducing sulfur is good for both the air we breathe and for the post combustion components of an engine. Sulfur forms a load bearing protective film that will be missed. This will result in the premature failure of injectors, injector pumps, and the balance of the fuel metering system.

One major change we missed on October 1, 1993, was the change to a calculated cetane index number of 40, rather than a minimum engine cetane number of 40. Very simply stated the refiner now provides us with a slightly lighter cut of fuel to achieve the calculated index rather than use a cetane improver. The difference is a lighter fuel that has less BTU's per gallon. Less BTU's equals lower mileage and power. Lighter fuels entrain more water and are less lubricating.

Heating oil for off road purposes is being over looked. Low sulfur diesel is certainly being scrutinized by many. The other #2 product is not. Cetane numbers on the higher sulfur off road fuel are often in the 37 or 38 range. Cetane numbers only give you ignition. There are typically more BTU's in off road fuels. However our concern here is overall fuel quality is suffering from lack of quality control because we are all so distracted by low sulfur fuel.

The good news is that for each of the deficiencies of 1994's fuel there are materials that can be added to minimize the problems while maximizing the performance of your engine.

- 1) Catalysts will improve power and miles per gallon & less Urea Usage & Exhaust filter plugging
- 2) Lubricity agents will reduce premature failure of injectors & Pumps
- 3) Stabilizers will stop gum and particulate formation
- 4) Biocides will stop bacteria and fungus
- 5) Cetane improvers (When only absolutely necessary)

So with all these changes in today's fuels you should use a fuel additive that will assist the fuel /water separator in solving 100% of today's fuel problems. We can accomplish this by using the **ONE Solution** Combustion Improver which brings your diesel fuel to a Premium Diesel. **ONE Solution** meets the Engine Manufacture Association FQP-1 which is defined as a diesel fuel that is Superior in quality than commercial fuel specification ASTM D 975.

MPW does this by adding:

- 1) Combustion Catalyst that improve the combustion efficiency
- 2) Demulsifier that removes the water from the fuel so not to harm the fuel injection systems
- 3) Biocides that control the bacterial growth in the fuel
- 4) Dispersants that eliminate the existing solids in the fuel (Macroscopic Sludge)
- 5) Polymerization Retardants that prevent the formation of solids (Microscopic Sludge)
- 6) Lubricants that keep injector jets & pumps from seizing (Low Sulfur Fuels)
- 7) Detergents that keep the fuel pumps & injectors clean
- 8) Metal Deactivators that prevent catalytic oxidation
- 9) Corrosion Inhibitors to protect the tank from corrosion
- 10) NO Alcohol to interfere with the separation of the water from the fuel
- 11) Reduces fuel consumption by at least 5%
- 12) Low treatment cost per gallon

Besides changes in the way fuels are being processed we are also seeing changes in the way the fuel is being stored. We use to store fuel underground where the fuel was always cool. Today you are seeing above ground fuel tanks. Smaller fuel tanks that are being filled more often. This causes higher storage tank temperatures and accelerates the formation of particulates produced by the fuel. This means more condensation as the tank breathes during the changes in the atmospheric pressure or temperature. With smaller tanks companies are filling the tanks more often and not allowing the fuel to settle out. This will cause premature filter clogging in the engines with greater problems with water separation.

So with all these changes in diesel engines, the processing of the fuel and the way the fuel is being stored, you need to look at new ways of testing, filtering and treating your fuel. If you do not take these precautions it could be an expensive mistake. Price a new style injector and pump. You will see why people are being pro-active to there engines

We will be adding to this for the new Tier 4 & 5 engines that will be coming out as well. We have tested the additive in the new DEF system & re generations systems. We found 50% less DEF being used and have extended the regeneration out for over 8 weeks on Caterpillar engines.



The #1 Second Source in the World



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Filtration Solutions for 2007 Fuels

We will discuss filtration problems for the 2007 fuels. In part to address filtration solutions to the challenges facing the diesel industry with the approaching EPA 2007 Highway Rule.

Side effects are a good term to use with diesel fuel changes. Beginning in 2007, NOX and PM levels must drop by 92% and 90%, respectively, with NOX emissions to drop an additional 3% by 2010. This is a considerable hurdle that can only be met through the use of exhaust after treatment systems that contain both a diesel particulate filter (DPF) and either a NOX adsorption system or Urea-based selective catalytic reduction (SCR) technology for reduction of NOX. These systems depend on catalytic and oxidative regeneration, and as a result are sensitive to the components of the exhaust. Sulfur in exhaust poisons after treatment catalysts. The 2007 Highway Rule requires sulfur levels in diesel fuel to drop 97% to minimize sulfur levels in exhaust gas and facilitate operation of after treatment systems.

Although none of the above concerns water, Ultra Low Sulfur Diesel (ULSD) fuels formulated to meet 2007 standards have dramatically different water holding capacities. Water is stabilized in ULSD by lubricity additives that refiners and fuel companies must add to ULSD. These additives are necessary because the hydrodesulfurization process used to drop sulfur to 2007 EPA targets also unexpectedly removes species that give diesel an inherent lubricity. This lubricity naturally protected fuel injector components from wear. The need for additives was discovered when ULSD was linked to field failures of fuel injectors. The presence of additives dramatically increases the stability of water in ULSD. Water that typically settled out of 500 ppm sulfur #2 Diesel fuel in a matter of a couple hours, now persists days in additized ULSD blends. This stability causes fuel-water separator failures, and once again threatens the integrity of fuel injectors.

As you know, fuel-water separation does not involve entrapment of particles. Rather, fuel-water separator media provides a surface to destabilize drops of water suspended in an oily fuel, allowing them to grow and drop out of the fuel before penetrating to the accepts side of the media. Prior to the advent of ULSD, a water repellant surface worked very well. Typical fuel-water separation media undergo some form of silicone water-proofing. In ULSD blends, however, water droplets are sufficiently stable to pass freely through this type of media.



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Our work to date has shown that the more opportunity provided to the stabilized droplets in fuel to adhere to surfaces, the greater the probability the droplets are removed from the fuel. As a result, we have developed media that provide orders of magnitude more surface to the drops, thus dramatically improving the efficiency of water removal. We effect this through combining a high surface area meltblown with a water repellent separator media. In addition, filter design elements that promote slow, even distribution of the fuel-water mixture over the filter surface are pivotally important. In recent testing in the industry standard test (SAE J1488), our 15PS-15+ FF meltblown media performed with 99+% water removal efficiency at twice the rated flow for the separator involved.

We are currently looking to develop media for more severe water separation challenges, such as those coming from Biodiesel blends. We've got a fair amount of work underway to understand the bad actors in the fuel blends, with a view toward developing media that specifically targets these components and removes them from the water stabilization process.

I hope this is of use to you. If I've missed anything, or don't have the detail you need, please don't hesitate to contact me directly.



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Magnuson-Moss Act

Many customers fear that the use of any non-recommended fuel additive will void the warranty on their equipment. This fear is often prevents the customer from experiencing the benefits that a quality fuel additive can deliver. It's truly ironic, as an engine that burns clean and has a clean fuel system will actually be less likely to need repair compared to one that is not maintained in this condition.

Fortunately for our customers, there is the Magnuson-Moss Act. This act contains a prohibition on "tie-in -sales", or the practice of requiring a consumer to service a product with another specific product in order to maintain the warranty. This relates to us in that a manufacturer recommends a specification for fuel for their engine. As long as the treated fuel meets the appropriate specification, the manufacturer cannot deny warranty coverage based on your use of the additive.

In February 2003, MPW, Inc. provided both #2 diesel fuel and additive to an independent laboratory. They treated half of the fuel with **ONE Solution** at a rate of one to ten thousand by volume, and then ran both the treated and untreated fuels for compliance with ASTM D975 specifications for #2 diesels. A total of thirteen tests were run, and both samples met all the criteria for #2 diesel. In fact, there were no negative effects from the use of **ONE Solution**.

Therefore it is illegal to void an engine warranty through the use of MPW **ONE Solution** at the normal treatment levels. If anyone says different please get it in writing.

Additionally, **ONE Solution** has been shown in our laboratory tests and in the field to help in maintaining the stability and low particulate content of treated fuels. The dispersant and biocide present can even return an "off spec" fuel to a serviceable state.

Keeping your fuel in top condition minimizes engine wear and reduces unscheduled downtime. Help your fuel, your engine, and yourself with MPW fuel additives

IMC AGRICO

To: Gene Wilkerson, MPW Distributors

From: George E Mc Quien, Senior Process Engineering

Date: July 27, 1999

Subject: **ONE Solution** Performance at South Pierce GTSP Plant

Having reviewed the environmental test results, the field carbon mass data, and the plant Performance, I feel the following conclusions may be drawn.

Greater burn efficiency was achieved during the treated test than during the untreated test. It took an additional 0.39 GPT to heat the product with the untreated oil, thus a 9.7% reduction in fuel consumption was realized during the treated test. The carbon mass test showed a 70% reduction in volatile hydrocarbons reaching the stack with the treated fuel vs. the untreated fuel. **These tests confirm the earlier findings that the treated fuel yielded more BTU/l than the untreated.**

Improved environmental conditions were achieved with the improved combustion of fuel. The reduction of unburned fuel in the gas stream improved opacity and lowered the stack temperature. This allowed for better gas stream scrubbing as shown in the environmental emissions test. The actual emissions numbers for these tests are not for publication. However, it can be stated that the treated test has a greater potential for fluoride evolution than the untreated test, but had a 20.1% lower emission under the same scrubber conditions. **This confirms the earlier observations on fuel conversion with the improved flame characteristics with the treated fuel.**

Improved potential for increasing production rates. Due to the potential to Emit (PTE) **For fuel oil, the granular plant is BTU/hr limited.** The standard practice is to assign 0.15 mm BTU/gal for the rerefined oil used at the GTSP Plant. The more realistic values are 0.143-0.148 mm BTU/gal. **This means for the allotted gal/hr fuel usage, the treated fuel will support 3% on average more product rate than the untreated oil.**

Lowered cost. The savings in the fuel cost is obvious. The hidden cost savings in the reduction of burner nozzle replacements, combustion chamber repairs, and tank cleaning are there, but yet to be defined.

ONE Solution has proven it claims and I am happy to have played a part in it introduction to IMC-Agrico, as cost savings idea.

GEM/gem
MPW1.Doc

Special report on piston no 2.

Piston no. 2 was overhauled by the crew during dry docking.

Total running hours since last overhaul was 11,253. Total running hours of piston was 17,318.

Please see photo no56 and M/E piston and piston rings calibration report and cylinder liner report.

MAN B& W were onboard with two service engineers to assist in mounting fuel pumps and roller guides.

The following were observed:

- All rings were moving freely and were in good condition.
- No carbon below first ring
- Combustion space remarkably clean and tops of piston crown dry

MAN B&W service engineer stated that he had never seen a piston and rings in such a good condition after more than 11,000 hours and suggested we should increase the maintenance interval to double provided checks are carried out in port after 12,000 hours.

Having tried out a number of products of the last years without getting the benefit from the use of these as advertised we decided to try a Combustion Catalyst, burn rate modifier & lubricant called:

ONE Solution which has shown astonishing results on RCCL ships, Power plants and large locomotives. Tests carried out by EPA have shown large reductions in COx, Sox and Nox. The product is said to lower the ignition by more than 400 degrees F for more complete combustion.

Our First observation after two days test in February 1999 was that the color of the exhaust changed from brownish/yellow to almost clear.

Later observations showed 40-50% less soot and 30% less sludge.

A side effect is of course less fuel consumption which benefits the time charterer when the vessel is on T/C but could not prevent a potential speed claim.

Another side effect is less emissions and hence a cleaner environment which is increasingly focused on today.

It was planned to clean the M/E LO sump, but it was found clean and job was cancelled. Also FO service tank was opened for cleaning but no sludge found and job was cancelled.