

What Do the New Ultra Low Sulfur Diesel Specifications Mean to Your Business?

By Ken Kizer, CLS

It's 3 p.m. on Friday and I'm getting ready to knock off early for the Memorial Day weekend. I'm looking forward to spending time with family and friends. Then my phone rings and it's my V.P. of Sales, Steve Brewer, CLS, telling me he has a great opportunity for me. For those of you who have a vice president of sales in your company, you know that a phone call like this usually involves some sort of effort on your part. His opportunity was writing this article addressing the new Ultra Low Sulfur Diesel (ULSD) specifications. I know all of you have read articles on ULSD and probably had several conversations with people who are bound to have several different view points and opinions. I promise to do my best in giving you more information that you may find useful when such conversations arise.

First of all, beginning this month, June '06, refiners are required to start producing diesel fuel for use in highway vehicles with a sulfur content of no more than 15 parts per million (ppm). That's a 97 percent decrease over the past 500 ppm sulfur fuel. At the terminal, highway diesel fuel sold as ULSD will be required to meet the 15 ppm sulfur standard as of September 1, 2006. However, in January of '06, the EPA issued an extension which extended the deadline for terminal and retail compliance until October 15, 2006 to provide a longer period to decrease the potential for contamination of fuel in the handling and distribution of ULSD. What this means is that it's going to take some time for all of the pipes in the distribution system to get cleaned out. Just moving the ULSD fuel through the network of pipes can cause ULSD to pick up

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– Ken Kizer, CLS

enough sulfur to become non-compliant (have >15 ppm sulfur).

Due to the EPA's Clean Air Act, ULSD is necessary because 2007 vehicles cannot operate properly on anything but ULSD. The emission control systems which will be standard equipment starting in 2007 necessitates this lower sulfur fuel. Use of 500 ppm sulfur fuels in 2007 vehicles can poison the catalysts and particulate filters, causing them to be ineffective in reducing targeted emissions.

Pre-2007 vehicles can use the new ULSD and see small emissions reductions, but some of the problems we saw back in '94 when we moved from 5000 ppm sulfur to 500 ppm sulfur may have to be re-addressed. We'll discuss diesel fuel additives in the next few paragraphs.

An Explanation

We've already established that in order for a fuel to be labeled as ULSD, it can contain no more than 15 ppm sulfur. This does not mean that there won't be 500 ppm sulfur content fuel available, it just can't be labeled as ULSD. (The labels in the picture are what you'll see on the pumps). By October 15, 2006, 80 percent of the diesel fuel for on-road use produced by U.S. refineries must meet the 15 ppm ULSD sulfur limit. This leaves 20 percent of fuel that can be produced containing up to 500 ppm sulfur for use in off-road equipment. The current on-road specifications will get us ready for the year 2010, which is when off-road diesel fuel specifications also moves to a maximum of 15 ppm sulfur content. For now, the good news is that when the fuel is tested for sulfur content, “the EPA has allowed a 3 ppm testing tolerance for a period

of two years so laboratories downstream of the refinery will have greater assurance that their procedures are adequate without fear of compliance challenges. This 3 ppm temporary margin will allow time for the industry to transition to improved test procedures and instrumentation while minimizing the potential for fuel to be downgraded simply because of the test procedure.” (Ref. (1) EPA 40 CFR Part 80) After two years, the tolerance for testing will be 2 ppm.

API Suggested Diesel Pump Labels
 Compliant with EPA 40 CFR 80.570

ULTRA-LOW SULFUR HIGHWAY DIESEL FUEL
 (15 ppm Sulfur Maximum)
 Required for use in all model year 2007 and later highway diesel vehicles and engines.
 Recommended for use in all diesel vehicles and engines.

LOW SULFUR HIGHWAY DIESEL FUEL
 (500 ppm Sulfur Maximum)
WARNING
 Federal law prohibits use in model year 2007 and later highway vehicles and engines.
 Its use may damage these vehicles and engines.

NON-HIGHWAY DIESEL FUEL
 (May Exceed 500 ppm Sulfur)
WARNING
 Federal law prohibits use in highway vehicles or engines.
 Its use may damage these vehicles and engines.

- Titles of all labels (e.g., Low Sulfur Highway Diesel Fuel) are in 24-point type, Sulfur Level Cap Designations (e.g., [500 ppm Sulfur Maximum]) are in 20-point type, and all other required language is in 14-point type as approved by the EPA.
- Green is chosen as the background for the first two labels because of its strong association with diesel in the gasoline service station network.
- Labels shall be on the upper two-thirds of the pump in a location where they are clearly visible.
- Pumps must be labeled by June 1, 2006.

Guilty Until Proven Innocent

So now you've got your load of ULSD and you are asking yourself, what if this fuel tests as having > 15 ppm sulfur? Well, there's a thing called presumptive liability, which simply means you are considered guilty until proven innocent. Whoever is in possession of the non-compliant fuel and everyone upstream of where the fuel is found will have a chance to prove their innocence. For those of you handling fuel, your best defense against non-compliance is the Product Transfer Document as well as good record keeping. Non-compliance can get quite expensive as you could potentially get fined up to \$32,500 per day per incident. So it is important that you maintain good records and have your fuel supplier or blender provide you with Product Transfer Documents that show the ULSD is compliant with the 15 ppm maximum sulfur limit.

Now we need to consider diesel fuel additives. The finished product has to contain no more than 15 ppm sulfur. A diesel fuel additive that can be used at the maximum recommended treat rate without causing the ULSD to be non-compliant will be labeled like this: "This diesel fuel additive complies with the federal low sulfur content requirements for use in diesel motor vehicles." This is the responsibility of the additive supplier and means that you can use this additive without concern of making your ULSD non-compliant. I can't speak for other additives, but Schaeffer's Diesel Treat 2000 line of additives will be labeled like this and can be used in ULSD without fear of non-compliance.

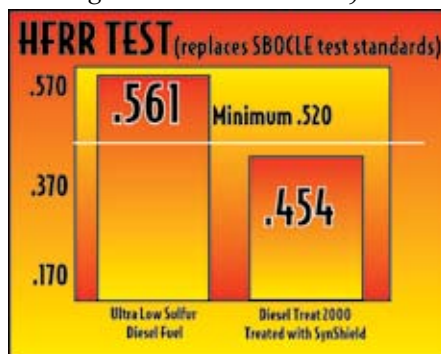
A diesel fuel additive that is non-compliant will be labeled like this: "This diesel fuel additive does not comply with federal low sulfur content requirements for use in model year 2007 and newer diesel motor vehicles." This means that this additive contains more than 15 ppm of sulfur and could possibly make an ULSD non-compliant, especially if used at more than its recommended treatment rate. However, the additive can still be used in ULSD subject to the 15 ppm cap as long as it doesn't make the finished product non-compliant.

Does anyone understand?

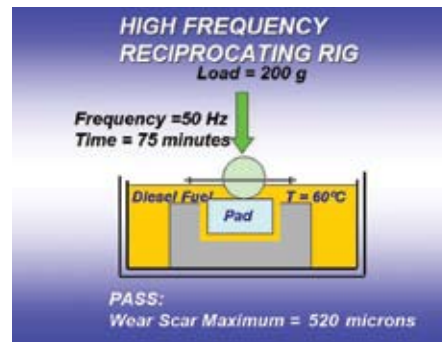
To figure this out, we need to understand ppm. Let's say we have an

additive with a treat rate of 1:2000. To figure the ppm of this additive in the fuel, we divide 1 by 2000 and multiply by 1 million to get 500 ppm of additive in that fuel. What if this gallon of additive itself contains 30 ppm of sulfur? Won't its use in ULSD be non-compliant? Well, we simply divide the 30 ppm of sulfur in the gallon of additive by the 2000 gallons of fuel the gallon will treat and we know this additive will contribute 0.015 ppm of additional sulfur to the treated ULSD. This amount of sulfur would not be detectable based upon the repeatability of the current EPA approved test methods used to detect the amount of sulfur in ULSD. As a result it would take 70 times over treatment of the additive to contribute even 1 ppm of additional sulfur to the ULSD. Remember to make sure you are staying compliant with the ULSD specifications as there are potentially 32,500 reasons per day per incident to make sure you are doing the right thing!

It's common knowledge that when we remove sulfur from fuel, we remove some of the fuel's natural lubricating qualities. The new test method for testing the lubricity in fuel is the ASTM D6079 High Frequency Reciprocating Rig (HFRR) test. This replaces the former ASTM D6078 Scuffing Bockle test. Besides taking into account that the fuel has undergone deeper hydro-desulfurization to meet the ULSD specs, the HFRR also takes into account that the fuel injection equipment will run at higher pressures to meet the new emissions standards. (Please refer to the diagram of the HFRR test)



A ball submerged in diesel fuel at 60 Deg. C (140 Deg. F) with a 200 gram load is rotated on a pad at a frequency of 50 Hz for 75 minutes. According to the Engine



Manufacturers Association (EMA), in order to pass, the resulting scar diameter on the pad must be no greater than 520 microns (1 micron = 1 millionth of a meter). Based on testing conducted on ULSD fuels, fuel injection equipment manufacturers have required that ULSD fuels have a maximum wear scar diameter of 460 microns. The EMA recommends that the lubricity specifications be consistent with the fuel injection equipment manufacturers' recommendation.

It is my opinion that never before has the use of diesel fuel additives been more important or easier to justify, especially with today's fuel prices! When looking at using a diesel fuel additive, there are many attributes to consider, but with the new ULSD, lubricity could be one of the most important.

Schaeffer's Diesel Treat 2000 line of diesel fuel additives contains a proprietary product called Synshield™, which has a wear scar diameter of 454 microns in the HFRR test. Synshield also is the only synthetic based lubricity additive available and does not contain any sulfur. The lubricity insurance an additive like Diesel Treat 2000 can provide can easily justify the cost of the additive when taking into account the potential repair bills of a fuel injection system.

Additives can also help you get better fuel economy. While researching this article, I've found two schools of thought on the energy content of the ULSD. According to a paper by the American Association of Equipment Manufacturers, the ULSD will have a reduction in fuel density resulting from the hydrotreating process. Though no one seems to know exactly how much, this translates into a slight lowering of

the energy content and subsequent increase in fuel consumption.

However, some industry experts told me their initial testing on ULSD has shown no difference between the energy content of ULSD and the previous on-road fuel. While this subject may still be under review, in either case the detergent package in an additive can improve fuel economy by helping keep the fuel system clean. This allows better spray patterns and more complete combustion of the fuel. Additives also have components for cetane improvement, emission reduction, and better cold weather operability in the winter months.



Math 101

When looking at the math, let's say you own a truck and put on 120,000 miles per year. You don't currently use a diesel additive and you are getting 5.5 mpg and are paying \$2.80 per gallon for fuel. Now you start using a premium additive that adds \$0.02 to your fuel cost. To break even and cover the additional \$0.02 cost at the \$2.82 per gallon price, your mileage has to increase 0.71 percent, or go to 5.54 miles per gallon. For your bottom line fleet savings, a 1 percent fuel economy increase will save you \$173.00 per year, a two percent increase will save you \$770.00 per year, and a three percent increase will save you \$1,356.00 per year. Remember that these numbers are for one truck. What if your fleet is larger?

Also, tests have shown fuel economy increases of five percent and higher. By the way, a five percent fuel economy increase using the numbers above would save you \$2,494.00 per year using the fuel prices listed above.

Additional costs = Increased profits

The whole point I'm trying to make is that we know the ULSD is here, and though there are several different opinions as to what that means as far as lubricity is concerned, you shouldn't look at a diesel fuel additive as just being another expense. The additional cost of the additive can actually mean increased profits

to your operation. In the end, you'll have to decide what's best for your situation.

I hope this article has given you some added information for the next ULSD discussion you're involved in.

Also, I'd like to say a special thank you to Schaeffer's Chief Chemist/Technical Director, Larry Ludwig, CLS, OMA, CMFS, and to Schaeffer's National Diesel Additives Manager, Phil Hamilton, CLS, for their help with this article.

Contact Schaeffer Manufacturing Company, 102 Barton St., St. Louis, Mo. 63104 or call 1-800-325-9962 or 1-314-865-4100 or visit the company online at www.schaefferoil.com.

Editor's Note: *Ken Kizer, CLS, is an STLE Certified Lubrication Specialist, receiving his certification in April, 1999. He lives near Dubuque, IA., where he manages a sales area for Schaeffer. He also coordinates Schaeffer's in house CLS training program.*

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Electric Standby Provides Welcome Relief for Food, Produce Businesses

Refrigerated trucking operators have a new tool to blunt the impact of diesel's steady upward price creep. Carrier Transicold's Vector 1800MT multi-temperature trailer refrigeration unit is the first transport refrigeration unit with built-in electric standby.

Using patented Deltek hybrid diesel-electric technology, the Vector 1800MT is Carrier's premier

multi-temperature unit, offering unprecedented system reliability, performance and an estimated 30 percent reduction in maintenance costs. The technology eliminates most mechanical components common to conventional trailer refrigeration units and uses an ultra-high-performance generator driven by the diesel motor to power the electrical system.

The Vector 1800MT unit's all-electric performance lends itself well to electric standby capability, which allows a parked unit to be plugged into an AC power source, eliminating the need to run the diesel motor.

Until now, the ability to run a transport refrigeration unit from an AC electrical source could be a relatively expensive add-on. But with the Vector 1800MT, 460-volt electric standby capability is built into every unit.

Electric standby conserves diesel fuel, reduces engine wear, eliminates emissions, eliminates engine noise and complies with regulations, especially in California where use of electric standby at the loading dock is one of the approved methods for compliance with diesel emissions regulations.

Electric standby also adds up to reduced operating costs and is less expensive than powering the AC from the diesel engine. The manufacturer says the savings amounts to greater than 50 percent. The reduced engine use also translates into reduced maintenance for even greater operational savings.

"The trend in fuel costs as well as emissions regulations is going in a direction that favors standby operation," says Mike Murdock, product manager, trailer products for Carrier. "The Vector 1800 MT with Deltek



technology is the right offering for the times.”

In addition to electric standby and maintenance savings, the Vector refrigeration system is the first multi-temperature trailer unit to use Carrier’s Advance Microprocessor control. It also offers the benefit of an all-electric heating system that provides constant heat capacity and tight temperature control, independently of outdoor temperature. Matched with Carrier single- and dual-discharge evaporators, the Vector offers 11 different trailer configurations.

CARRIER TRANSICOLD

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Obtaining Greater Fuel Efficiency and Reducing Harmful Exhaust Emissions

By Tom Brown

If you could save just 10 percent in fuel costs each month what would that be worth? For most trucking professionals this would not only represent a substantial cost savings, but an

opportunity to help get a handle on soaring fuel prices.

Today, managing and controlling fuel costs is a top priority, which can determine the very economic survival of many operators and truck fleets. So what can be done to better manage and control fuel costs? What new technologies exist which can be applied to this rapidly growing problem? The answer is the Hy-Drive Hydrogen Generating System.

Hy-Drive Technologies Ltd. recently launched its latest product, the G2 hydrogen generating system (HGS). The G2 HGS is designed to substantially improve fuel efficiency while being environmentally friendly by reducing exhaust emissions.

Hy-Drive units on the road are already saving customers money at the pumps. Third party testing has confirmed the benefits of the HGS, according to the manufacturer.

Glenn Windrem of Glenn Windrem trucking in Peterborough, ON, says “Since installing the Hy-Drive unit, my gravel trucks have experienced an average 10 percent improvement in fuel economy.”

Windrem is currently saving more than \$3,500 per month with five Hy-Drive units and has plans to install more.

The G2 system works by injecting small amounts of hydrogen gas on demand into the combustion chamber of a regular internal combustion engine. This creates an enriched air mixture and a more complete and faster burn of the diesel fuel, which results in reduced emissions, improved fuel efficiency and more engine torque. The product is easy to install and works with any engine, all types of fuel and in almost any climate.

The G2 makes no modifications to OEM engines, and does not interfere with the manufacturer’s warranty. The engine will continue to operate in the same way in which it was designed, according to the manufacturer, but it will be more efficient and cleaner over time. The G2 unit helps eliminate existing deposits and prevents future carbon build-up. The unit also reduces abrasion and wear of pistons, rings, valves, cylinder walls and overall degradation of the engine and its oils.

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On the road, the system needs to be refilled with distilled water on a regular basis (about every 4,000 miles/6,500 km). If there is no distilled water available, the system will warn the driver and then switch off, reverting back to the original fueling system until it is replenished with water again.

The Hy-Drive unit is designed and manufactured in accordance with SAE J1455 standards, and the system is subjected to Environmental Stress Screening (E.S.S.) which includes both extreme temperature cycling and vibration cycling.

Editor's Note: Tom Brown is the president and CEO of Hy-Drive Technologies Ltd. For more information on Hy-Drive please visit www.hy-drive.com or call 1-888-359-5697 or email Tom Brown at tom-brown@hy-drive.com.

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Consider Charge Air Coolers to Reduce Fuel Costs

By Sherri Middleton

Fleets and owner operators are considering all their options these days with rising diesel prices. One option to consider is adding a charge air cooler or a turbo cooler to your truck.

Will Garrett, co-owner of Radiator Supply House Inc., an Oregon-based company, says turbo coolers provide great performance with improved fuel mileage and can save operators thousands of dollars a year.

"Every truck runs differently, so it's difficult to say how much you might save, but we do know that a truck is allowed to leak 15 percent and that begins to happen right from the factory," he says. "Manufacturers are now coming out with charge air coolers that have zero leak and drivers are noticing a pickup in horsepower."

For example, a leaking air charge cooler running approximately 500 miles per day and getting 5.5 miles per gallon at 91 gallons of diesel a day will cost about \$223 to operate. A non-leaking air charge cooler running 500 miles per day at 6.0 miles per gallon uses 83 gallons of diesel per day at a daily cost of \$203. This amounts to a monthly savings of \$20 per day; \$420 per month and \$5,040 per year based on \$2.45 per gallon/U.S. average diesel fuel prices as of January 20, 2006. These numbers will rise or fall depending on fluctuating diesel prices.

"It costs about \$700 or \$800 to put a charge air cooler on truck so based on those numbers the cost of the turbo cooler can be recovered in a month or so," he says.

"We put a huge inventory of parts in our warehouse so trucks don't have to be down long," Garrett says. "Usually it's a two week downtime on a truck when you're waiting on radiators, cores, A/C condensers or turbo coolers. Since we have a large stock in inventory, we can usually ship out the order in a couple of days. We opened our company on the West coast knowing that a trucker on the East coast could place an order for a part with us and get the part delivered the next day.

For more information contact Radiator Supply House at 1-877-615-3002.

RADIATOR SUPPLY HOUSE INC.

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