INTRODUCING HIGH PERFORMANCE CLEAN DIESEL

BECAUSE BETTER FUEL BURNS CLEANER

EcoChem
Alternative Fuels

PUBLIC FORUM By Mike Antich

UNANTICIPATED TRADE-OFFS TO ULSD?

The EPA mandated the introduction of ultra low sulfur diesel (ULSD), effective June 1, 2006. Since then, there has been an uptick in reports of fuel-related problems. Recurring complaints are corrosion in storage tanks and dispensing systems containing ULSD, onboard vehicle fuel tank corrosion, clogged filters, and seal and gasket deterioration. "I've been around diesel equipment most of my life and clearly we have seen a significant spike in fuel-related issues within the past three to four years, including the identification of particles that appear to be pieces of rust in fuel samples, in addition to increased bacteria, microbes, and water," said one fleet manager.

Similarly, some OEMs report field issues with corrosion of steel fuel tanks on vehicles. "We don't know if it is related to ultra low sulfur diesel or not, but it has correlated with its introduction," said one OEM engineer, who wished to remain anonymous. "Since ULSD came out, we have seen more of an issue with fuel tank corrosion and fuel filter clogging, but we don't know definitively if it is being caused by ULSD or by poor quality biodiesel. The fuel tank corrosion seems to occur more in the Southeast. We're not sure what's causing these issues, but we've definitely seen more in the last couple of years than before."

POSSIBLE SOURCES

EPA standards require ultra low sulfur diesel to contain no more than 15 parts per million of sulfur. One consequence to the reduction of sulfur, according to some in the industry, is that it creates a more favorable environment for microbes and bacteria to develop and thrive. Some fleet managers are concerned ULSD may increase the incident of microbial contamination. These fleets report a higher degree of water contamination in storage tanks and vehicle tanks. Microbes depend on this water to live and the "food hydrocarbons" found in diesel fuel to proliferate. Few microbes actually proliferate in the fuel itself, but do depend on the hydrocarbons in diesel fuel for nutrition. Once the contamination process begins, it will quickly accelerate while the fuel is stored. Microbes will immediately start to grow in water, which will ultimately expand into a growing colony. The colony produces acids that corrode metal parts in the fuel tank and fuel systems. Another contributing factor to contaminated diesel has been the introduction of biodiesel. Some organic blends of biodiesel have been found to accelerate bacteria and microbe growth.

As bacteria and fungi reproduce, they form biomass, which accumulates at the fuel-water interface, on tank surfaces, and on filters. The development of biomass is a direct consequence of microbial growth, but its effect on fuel systems is mostly indirect. As the metabolic waste from the biomass and dead cells accumulate, they settle out as sludge at the bottom of a fuel tank. If not treated, the colony will grow very rapidly in a fuel storage tank and produce as much as several pounds of sludge per week. The sludge not only gums up storage and dispensing tanks, it can also be transferred to the vehicle's fuel tank. As a result, vehicle fuel filters may become clogged. The first symptom of this is reduced filter-life. Occasionally, catastrophic failures may occur, such as engine shutdown due to fuel starvation.

In most cases, contaminants are "imported" into a vehicle's fuel system. For instance, before ULSD fuel reaches the dispensing pump, it may be transferred from three to six storage tanks and/or trucks. At every point along the way, the fuel usually absorbs small amounts of water and contamination. Also, some companies do not "top off" their storage tanks and keep a minimum amount of fuel on hand. The reduced fuel volume maximizes the surface area of the tanks to produce condensation. Another factor that contributes to both microbe growth and water accumulation is how fast fuel is run through storage and dispensing tanks. Generally, problems decrease with higher volume.

Once condensation and microbes become an issue, fleet managers must remediate (pump out tanks) and filter the fuel. Once you have microbes, it is almost impossible to completely eliminate them. You must treat your storage tanks.

FUEL TRADE-OFFS

ULSD is designed to decrease emissions and prevent sulfur damage to diesel particulate filters (DPF), which need to be cleaned of ash every 150,000 to 300,000 miles, depending on application. In pre-2007 engines, the ash was primarily created by oil additives needed to protect engine components from sulfuric acid. Since ULSD has only 15 parts per million of sulfur, it allows the use of CJ-4 engine oil, which doesn't contain these additives to protect against sulfuric acid, and, as a result, generates less ash and maximizes DPF cleaning intervals.

However, there are trade-offs. ULSD costs a few cents more per gallon and contains 1-2 percent less energy. The refining process that removes the sulfur also removes high-energy aromatics, which corresponds to a 1-2 percent increase in fuel consumption.

What has the industry scratching its "collective head" is the chronological correlation between the uptick in fuel-related problems in diesel trucks and the introduction of ULSD. Is there a connection between the two? Although highly controversial, some are asking: Are the increased incidents of microbial contamination and fuel tank corrosion unanticipated trade-offs for the use and storage of ULSD?

Let me know what you think.

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THE FUEL QUALITY PROBLEM OF #2 ULSD

Since the 2006, mandate for low sulfur diesel fuel, multiple studies performed by organizations such as John Deere, Cummins and Dow Industries have found #2 ULSD to be of poorer quality than its predecessors. More troubling was the discovery in these studies that #2 ULSD potentially increases the chances for fuel tank corrosion and filter clogging.

Fuel consistency is a significant challenge for #2 ULSD

Problems With #2 ULSD Include:

- Lower grade product due to rising demand being refined from more marginal portions
- Inherently thicker and contains more contamination
- Lower BTU or energy content decreasing performance and fuel economy
- Increased wax content known to gel faster causing filter plugging
- Lower solvency decreasing ability to dissolve injector and other deposits
- Lower cetane and is known to increase engine knock and cold start damage
- Less lubrication damaging fuel system and increase operating temperatures

#2 ULSD MAY POSE CONTAMINATION PROBLEMS

Recent studies show that the North American fuel supply is contaminated. The supply line consisting of pipelines, transport tanks, and vehicle tanks has become a volatile environment of microbial and other contaminants. It is estimated that eight out of every ten diesel engine failures have been directly related to poor quality and contaminated fuel. Poor combustion and increased pollution are sited as the primary reasons. Some indirect effects of mircobial contamination of diesel fuels include:

- Microbial influenced corrosion
- Sludge formation of Microbial
- Organic acid accumulation
- Hydrogenase - caused depolarization of metallic surfaces Diesel Fuels
- Transfer-line flow restrictions
- Filter plugging - Engine wear
- Corrosive deposits on engine parts (injectors, cylinder linings, etc.)
- Reduced heat of combustion

“WITH MULTIPLE POINTS OF CONTAMINATION IN THE FUEL DISTRIBUTION SYSTEM, IT SHOULD BE NO SURPRISE THAT #2 ULSD CAUSES PROBLEMS AND DOES NOT BURN AS CLEAN AS INTENDED.”

Fred Pister,
Quality Assurance Manager
EcoChem Alternative Fuels

MULTIPLE CONTAMINATION POINTS IN DELIVERY SYSTEM FOR #2 ULSD FUEL

Below is a graphic that shows the fuel system delivery process from the refinery to the consumer. You can see the multiple points of fuel contamination during the process.

#2 HPCD FUEL LIFE CYCLE

HIGH PERFORMANCE CLEAN DIESEL

“THE PROBLEMS WITH #2 ULSD FUEL HAVE CREATED THE NEED FOR A CLEAN-BURNING, NON-CORROSIVE DIESEL. HIGH PERFORMANCE CLEAN DIESEL IS THE ANSWER TO THOSE PROBLEMS.”

Dave Richards,
CEO
EcoChem Alternative Fuels

INTRODUCING
#2 HPCD CLEAN DIESEL FUEL

#2 High Performance Clean Diesel (HPCD) is a unique, pure, petroleum enriched fuel with superior properties over regular Ultra Low Sulfur Diesel. It meets ASTM specifications and EPA regulatory guidelines.

The purity and stability of #2 HPCD eliminates the need for any winter blends, additives, retrofits, additional purification or filtering with zero change in equipment or fueling infrastructure. #2 HPCD helps keep fuel systems, engines and exhaust system components in peak condition.

- Increased BTU Content resulting in Documented Fleet Average MPG improvements above 16%
- Documented 13% reduction in NOX and 12% reduction in hydrocarbon emissions
- 20% reduction in black smoke
- Zero to trace amounts of water
- Significantly lower operating temperatures
- Enhanced stability for combustion completion
- Sludge inhibiting for extended periods of time
- Significantly improved lubricant properties for better engine performance and longevity

For An On-Site Presentation
Contact EcoChem 614-764-3835
email: sales@ecochem.us

#2 HPCD BENEFITS OHIO

Teachers
If all Ohio school buses were burning #2 HPCD fuel annual savings would be approximately $66 million, which translates into salaries for about 1320 teachers.

Manufacturing
#2 HPCD will impact the creation of hundreds of fuel systems manufactured in Ohio.

Job Creation
EcoChem Alternative Fuels expects to create 32 jobs its first year and lead to the creation of additional service tech and site manager jobs across the fuel industry in Ohio.

Transportation
The Dublin Fuel Study is showing a 16.1% MPG improvement. Because transportation of goods is ubiquitous, it will have positive ripple effects across every economic segement in Ohio .

Clean Air
#2 HPCD reduces NOX emissions by 13% according to the recent Dublin, Ohio Fuel Study. With 45% of the state's emissions coming from vehicles, that can make a big impact on air quality.

#2 HPCD SUPPORTS ECONOMIC AND ENVIRONMENTAL HEALTH IN OHIO

On May 11, 2011 The City of Dublin unveiled preliminary test results showing EcoChem's #2 HPCD Fuel showing 16% mpg savings and 13% NOX savings. Photo shows Ohio EPA Director Scott Nally, EcoChem CEO Josh Koch, City of Dublin Officials and a tailpipe emission test.

			Gallons Used	$0.36 Savings	Gallons Saved
Dublin City and School District annual diesel fuel consumption (estimates based on fuel study)			330,000	$118,800	33,000
Projected Savings for Ohio Schools (613 Districts)					
Assumptions -->			300,000	$108,000	30,000
613 -->			183,900,000	**$66,204,000**	18,390,000
Impact on Ohio					
Cost Savings for School Districts		$66,204,000			
Gallons of diesel fuel saved		18,390,000			
CO2 = 22.2 pd CO2 per gallon of diesel		408,258,000	*CO2 pounds reduction*		
NOX = .42 gram per gallon of diesel		7,723,800	*NOX grams reduction*		
NOX reduction 14% with HPCD		25,746,000	*NOX grams reduction*		
Total Revenue Created in Ohio		$27,585,000			
Gross Profit for EcoChem Alternative Fuels		$12,500,000			
Sales Commissions Paid in Ohio		$4,320,000			
Distributor Commissions Paid in Ohio		$6,900,000			
Jobs Created					
Executive/Sales	12	$1,440,000			
Technicians	12	$840,000			
Administration	10	$500,000			
Total	**34**	**$2,780,000**			
Please note: Assumes only public sector sales.					

"INDEPENDENT STUDIES HAVE SHOWN A MPG IMPROVEMENT OF 16.1%. AT $3.50 PER GALLON, THAT TRANSLATES TO A 9% NET COST SAVINGS, OR 29 CENTS PER GALLON."

Rob Hamer,
CFO
EcoChem Alternative Fuels

THE ECONOMICS OF HIGH PERFORMANCE CLEAN DIESEL FUEL

#2 HPCD's documented 16.1% MPG performance improvement translates into an actual 14% fuel consumption savings. At $3.50 per gallon fuel cost, this is a gross fuel savings of 49 cents per gallon. After HPCD value-added cost of 20 center/per gallon, the net savings is a remarkable 29 cents per gallon, or 9 %! Because #2 HPCD literally cleans the engine over the first 30 days, users also receive the benefits of reduced emissions, less engine-wear and extended engine life cycles.

The purity and stability of #2 HPCD eliminates the need for any winter blends, additives, retrofits, additional purification or filtering with zero change in equipment or fueling infrastructure. #2 HPCD helps keep fuel systems, engines and exhaust system components in peak condition.

Consumer Example of Fuel Savings with HPCD Fuel

ABC Trucking Company using 1 million gallons per year of #2 ULSD Fuel @ $3.50 per gallon = $3,500,000
At 14% less fuel consumption with #2 HPCD, ABC Trucking will use 860,000 gallons at $3.70 per gallon = $3,182,000
Annual Net Savings of $318,000 (9%)

“WITH 45% OF OUR EMISSIONS IN THE STATE OF OHIO BEING VEHICLE EMISSIONS, ECOCHEM’S ABILITY TO IMPACT IT BY 13% IS TREMENDOUS. THIS IS A PRIME EXAMPLE OF ENVIRONMENTAL PROTECTION AND BUSINESS NOT HAVING TO BE MUTUALLY EXCLUSIVE.”

Scott Nally,
Director,
Ohio EPA

THE SUPERIOR PROPERTIES OF #2 HPCD MAKE IT THE CLEANEST DIESEL FUEL AVAILABLE

In 2005 the government mandated the use of #2 Ultra Low Sulfur Diesel Fuel, and it was a big step forward for green, environmental concerns on our nation's highways.

In 2011, an innovative fuel company, EcoChem Alternative Fuels, has raised the bar in clean burning diesel fuel with the introduction of #2 High Performance Clean Diesel (HPCD). In independent tests conducted in the City of Dublin, Ohio, from March-May of 2011, #2 HPCD has taken clean diesel fuel to new levels by reducing NOX by 13% and Hydrocarbons by 12% over the current Ultra Low Sulfur Diesel levels.

An Environmental Solution that is Economically Viable Too!

Unfortunately, many environmentally-friendly measures are not self-sustaining and require either government subsidy support or a premium cost. #2 HPCD is Not one of those products. In fact, the same independent study in Dublin, OH shows a 16.1% MPG improvement over #2 ULSD. This means that cities or organizations swiiching to this fuel will see significant economic benefits too.

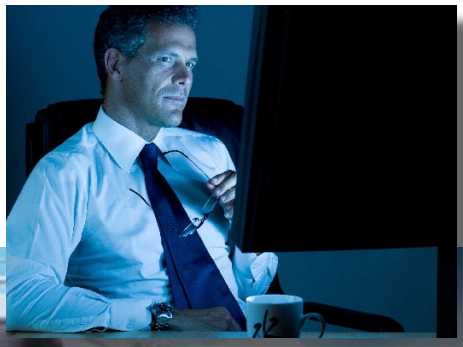
Environmentalist view 6-8% reductions as significant, but #2 HPCD's 13% reductions in NOX represents a true breakthrough in clean-burning fuel. EAF developers credit their ability to remove sediments and impurities as the reason for the significant gains.

“THIS INNOVATIVE PARTNERSHIP WITH ECOCHEM SUPPORTS SEVERAL OF THE CITY OF DUBLIN’S GOALS FOR THE DEVELOPMENT OF LOCAL SMALL BUSINESSES AND SUSTAINABILITY INITIATIVES.”

Michelle Crandall,
Director of Administrative Services
City of Dublin, Ohio

DUBLIN FUEL TESTING PLATFORM PARTNERSHIP

- 12 City of Dublin School System buses participating in program.
- Strict adherence to program protocol with respect to fueling procedures, emissions testing, and documentation.
- In order to create baseline conditions, all buses had been operating on #2 ULSD and evaluation began on March 8, 2011.
- On April 12, 2011, nine of the buses were switched to use exclusively HPCD.
- The remaining 3 buses remained on ULSD for seasonal trend comparison.
- The period from April 12 until May 9 had been previously identified by EcoChem as a "cleansing period" when little or no change in performance was possible as the HPCD removes contamination from the fuel system.
- Statistical testing was done using a "paired t-test" analysis. Over 300 data points are in the database as of this date.



Partners For 2011 Dublin Fuel Study

"Final test results showed #2 HPCD to improve MPG by 16.1% while reducing NOX emissions by 13% and hydrocarbons by 12%."
Mike Long, CEO and Test Supervisor
Resource 100 LLC

CITY OF DUBLIN

DUBLIN CITY SCHOOLS

WASHINGTON TOWNSHIP FIRE DUBLIN - OHIO

RESOURCE 100 LTD

Ohio Small Business Development Centers

FC

EcoChem Alternative Fuels

DUBLIN OHIO CITY SCHOOLS
FUEL STUDY MARCH-MAY 2011

Experimental Design

The goal of this HPCD validation project is to compare various attributes of two diesel fuels, conventional #2 Ultra Low Sulfur Diesel (ULSD) and High Performance Clean Diesel (HPCD) as produced by EcoChem Alternative Fuels (EAF). The subjects of the two fuels are school buses owned and operated by the City of Dublin School District.
The attributes compared were:

- Fuel economy (MPG)
- NOX emissions (PPM)
- HC emissions (PPM)

The experiment to compare the two fuels could have been designed in two ways. One way would be to recruit 12 buses and operate 6 buses on the ULSD and the other 6 buses on HPCD. Then, after a suitable length of time measure the various attributes of interest for each bus. This would lead to independent samples for which it is expected to find certain variability among the buses --- they all have different baseline fuel economy and emission profile depending on age, maintenance history and other factors. It was observed that a problem arises if this variability is large in that it could completely hide an important difference in the fuel economy and emissions between the two fuels.

The other method, a paired design, attempts to remove some of this variability from the analysis so it is possible to more clearly see any difference in fuel economy and emissions of the fuels studied. In this case we would start with the same 12 buses, but this time each bus was required to test both fuels.

It was then decided to reduce the number of buses in the experiment to 9 for the purposes of the paired analysis and keep the other 3 buses running on the ULSD to the earlier of the conclusion of the experiment or at a point where any season variation in the fuels could be accounted for and corrected. This is described in the section following.

Subject Vehicles

There were 12 buses owned and operated by the Dublin Ohio School District (DOSD) that were utilized in this evaluation project. The same buses were used throughout. The buses were selected to be representative of the DOSD fleet including low mileage, medium mileage and large mileage buses. The buses all were used to transport students in everyday activities of the DOSD.

Data Management

All data was collected utilizing a strict protocol designed and agreed to in a formal Validation Project Plan (VPP) before the evaluation process began. Important features of the data collection include:

1. All buses were fueled on previously determined days of the week; in most cases Monday, Thursday and Friday.

2. By mutual consent, the buses were fueled by a representative of the City of Dublin, Ohio (Dublin) and not the DOSD.

3. All data was recorded on log sheets by Dublin and forwarded by email to Resource100 LTD for input to database and statistical analysis. A sample log sheet is shown in Appendix A.

4. A similar procedure was followed for the emissions testing. On certain pre-arranged days of the week, early in the morning the buses were first placed into service emissions testing was performed by Dublin utilizing a 5-gas analyzer.

5. Photographs were taken of each fueling showing the bus and odometer reading so that data could be verified. A sample photograph is shown in Appendix B.

6. All data entry was double checked and verified for accuracy.

The Periods of the Experiment

As indicated previously, with the paired design the evaluation started with 9 buses operating on both fuels. EFA disclosed that in their opinion it was likely that buses would show an increase in vehicle emissions of HC and NOx and reduced fuel economy for a period of time following the introduction of the HPCD. The theory behind this is that the HPCD does a "scrubbing" of engine parts and during that time frame it is possible that many particles will be released through the fuel, combustion and exhaust system thereby actually reducing performance. The length of this Cleansing phase was estimated to be about 3-4 weeks.

Therefore, the project was broken into 3 distinct periods: Baseline, Cleansing and Validation.

DUBLIN OHIO CITY SCHOOLS
FUEL STUDY MARCH-MAY 2011

From March thru May 2011, the Dublin Ohio City Schools hired Resource 100 LTD to conduct an independent study of fuel consumption and emissions. Below is the executive summary of their findings.

Executive Summary

Parameter	HPCD Percent Change over ULSD	Units measured
Fuel Economy	+16.1%	MPG
HC Emissions	- 12%	PPM
NOX Emissions	- 13%	PPM

- When corrected for seasonal variations of .167 MPG, the HPCD fueled buses showed an average 1.2 - .167 or 1.033 MPG net improvement in fuel economy. On a percentage basis, this equates to 1.033/6.4 or 16.1%. The expected average increase in MPG by using HPCD rather than conventional ULSD is 16.1%. These results are shown graphically in Chart 2 below. The bottom section of each bar is the average MPG for each bus operating with ULSD. The top section is the incremental boost in MPG on average by the change to using exclusively HPCD.

  Although individual buses varied, in every case, the HPCD showed an improvement in fuel economy.

- When corrected for seasonal variations, the HPCD fueled buses produced on average 12% less HC emissions than while operating on the ULSD.

- When corrected for seasonal variations, the HPCD fueled buses produced on average 13% less NOX emissions than while operating on the ULSD.

- It is the opinion of Resource100 LTD that the for the subject vehicles HPCD fuel produced statistically significant results of improved vehicle fuel economy and reduced vehicle emissions over conventional #2 ULSD fuel.

“FOR ALL 9 BUSES IN THE DUBLIN FUEL STUDY, IN EVERY CASE, THERE WAS IMPROVED PERFORMANCE WITH HPCD FUEL.”

Mike Long,
President
Resource 100, LTD

ECOCHEM ALTERNATIVE FUELS, LLC
FREQUENTLY ASKED QUESTIONS AND ANSWERS

Q How does #2HPCD perform in the winter?

A Great! HPCD is good in cold starts to minus 18 degrees C while typical ULSD will start clogging and jelling at 0.

Q Will this affect the warranty on my vehicle?

A No, we meet all ASTM testing specifications and EPA regulatory guidelines.

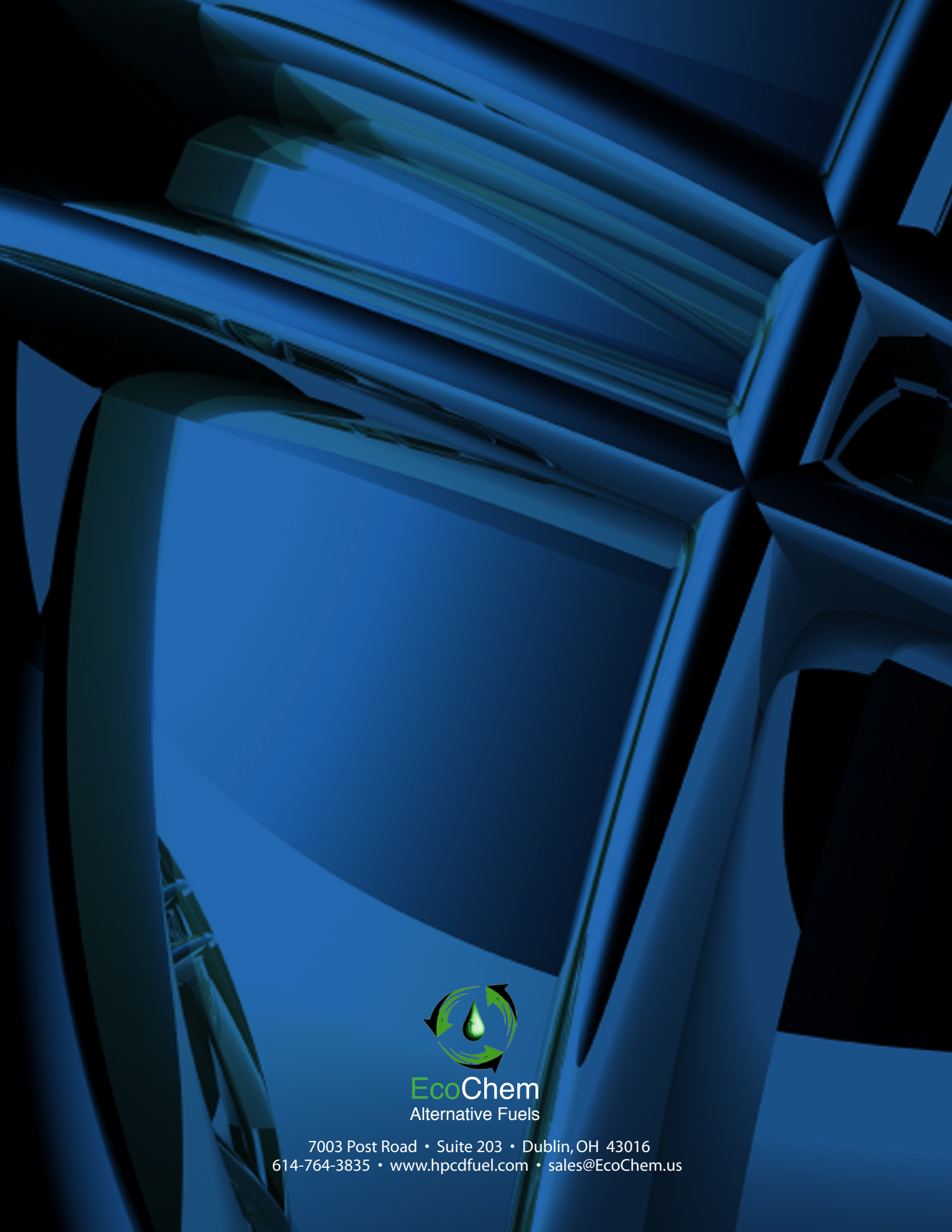
Q What is the shelf life of the fuel?

A #2HPCD is stable for up to 6 times longer than #2ULSD.

Q How does HPCD increase MPG?

A Our fuel also cleanses the entire fuel system (especially the fuel injectors), and adds lubricity for less resistance. Our process manipulates the diesel molecule in two ways: 1) exciting the hydrogen atom to accept more oxygen, 2) increase the surface area of the molecules. It's like taking a log and splitting it up, both the increased oxygen levels and the increased surface area contribute to a hotter and more complete burn in the combustion chamber with greater energy release.

SUMMARY The EcoChem process creates a next generation of diesel fuel that contributes to: low emission numbers, less wear metals, lower operating temperatures, increased BTU content, increased horse power, increased torque, increased MPG, and fewer gallons used. Bottom line: better fuel burns cleaner.



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