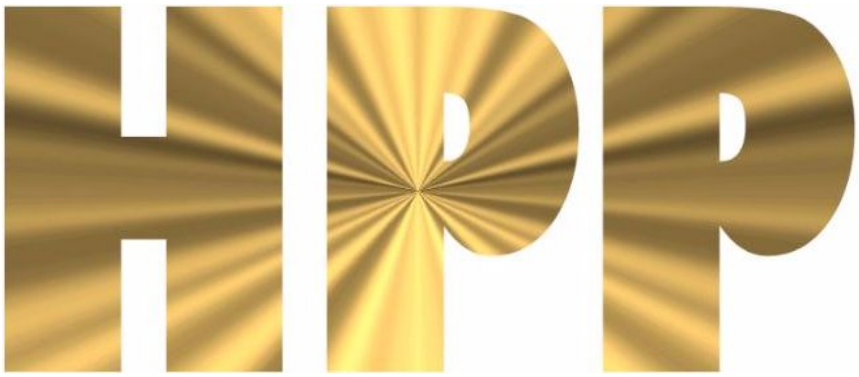

High Performance Plus Diesel-Booster
Advanced Diesel Deposit Control Additive

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INTRODUCTION

HPP Diesel Booster is a new family of premium diesel fuel additives containing technology, which offers a wide array of performance benefits at low treat cost. The additive package has been extensively tested with impressive results. Fuels containing High Performance Plus diesel fuel additives:

- Provide exceptional injector cleanliness in heavy duty direct injected diesel engines as shown by the Cummins L10 Injector Depositing Test performance.
- Provide excellent light duty diesel injector cleanliness as demonstrated by the Peugeot XUD9 Injector Deposit Test.
- Reduce exhaust emissions compared to base fuel.
- Improve fuel economy.
- Provide corrosion protection.
- Enhance fuel thermal and storage stability.
- Offer enhanced lubricity for reduced wear on fuel systems.
- Reduce water entrainment and prevent stable emulsion formation.
- Meet the requirements for National Council of Weights and Measures (NCWM) Premium Diesel based on detergency and stability.
- Improve the quality of diesel fuel to meet fuel requirements specified by the Engine Manufacturer's Association (EMA) and the Technology and Maintenance Council (TMC).
- Provide chlorine free chemistry.

There are clear and measurable advantages to incorporating a multifunctional diesel fuel additive into diesel fuel. The end user of HPP Diesel Booster Series treated fuel will appreciate the differences in terms of improved drivability, reduced combustion noise, longer component life, and reduced operating costs. High Performance Plus has added performance components such as cetane improvers and cold flow improvers to High Performance Plus products to create customized products to meet specialized needs.

The test data presented in this report utilized HPP Diesel Booster at 94.5 to 151 ppm w/w (27.5 to 44 ptb).

SUMMARY AND CONCLUSIONS

PERFORMANCE CLAIMS

Top Tier

Multiple Peugeot XUD9 Nozzle Coking Passes
Peugeot XUD9 Nozzle Coking Injector Clean Up
Multiple Cummins L10 Injector Depositing Test (L10-IDT) Passes
Cummins L10 Injector Depositing Test (L10-IDT) Clean Up
Steady State On-Highway Clean Up
Fuel Economy Improvement
Emissions Reductions
Heavy Duty Truck Fleet Test
Improved Corrosion Protection per NACE Test
Improved Lubricity per SLBOCLE (D6078) and HFRR (D6079) Tests
>80% Reflectance per Thermal Stability Test (D6468)
Reduced Formation of Gums per Oxidation Storage Stability Test (D2274)
Improved Fuel Clarity, Interface, Water Separation per Demusibility Test (D1094)

Middle Tier

Multiple Peugeot XUD9 Nozzle Coking Passes
Peugeot XUD9 Nozzle Coking Injector Clean Up
Dual Cummins L10 Injector Depositing Test (I10-IDT) Passes
Improved Corrosion Protection per NACE Test
Improved Lubricity per SLBOCLE (D6078) and HFRR (D6079) Tests
>80% Reflectance per Thermal Stability Test (D6468)
Reduced Formation of Gums per Oxidation Storage Stability Test (D2274)
Improved Fuel Clarity, Interface, Water Separation per Demusibility Test (D1094)

Low Tier

Multiple Peugeot XUD9 Nozzle Coking Passes
Single Cummins L10 Injector Depositing Test (L10-IDT) Pass
Improved Corrosion Protection per NACE Test
Improved Lubricity per SLBOCLE (D6078) and HFRR (D6079) Tests
>80% Reflectance per Thermal Stability Test (D6468)
Improved Fuel Clarity, Interface, Water Separation per Demusibility Test (D1094)

SUMMARY AND CONCLUSIONS

RECOMMENDED TREAT RATES

Base Product

Top Tier	151 ppm w/w (44 ptb)
Middle Tier	114 ppm w/w (33 ptb)
Low Tier	94.5 ppm w/w (27.5 ptb)

Base Product Concentrated

Top Tier	105.5 ppm w/w (31 ptb)
Middle Tier	79 ppm w/w (23 ptb)
Low Tier	66 ppm w/w (19 ptb)

Base Product with Lubricity Improver

Top Tier	240 ppm w/w (70 ptb)
Middle Tier	180 ppm w/w (52.5 ptb)
Low Tier	150 ppm w/w (43.5 ptb)

Additional Claims - Top and Middle Tier Treat Rates

- Improves lubricity of on-highway low sulfur fuels per the SLBOCLE and HFRR requirements in the ASTM D975 lubricity statement.
- In severe fuel, passes NACE Corrosion Test with an 'A' Rating

Base Product with Cetane Improver

Top Tier	687 ppm w/w (200 ptb)
Middle Tier	515 ppm w/w (150 ptb)
Low Tier	429.5 ppm w/w (125 ptb)

Additional Claims - Top and Middle Tier Treat Rates

- Boosts low cetane fuels approximately two (2) numbers.

Base Product with Lubricity and Cetane Improvers

Top Tier	740 ppm w/w (215.5 ptb)
Middle Tier	555 ppm w/w (162 ptb)
Low Tier	463 ppm w/w (135 ptb)

Additional Claims - Top and Middle Tier Treat Rates

- Improves lubricity of on-highway low sulfur fuels per the SLBOCLE and HFRR requirements in the ASTM D975 lubricity statement.
- Boosts low cetane fuels approximately two (2) numbers.
- In severe fuel, passes NACE Corrosion Test with an 'A' Rating

SUMMARY AND CONCLUSIONS

Based on the results of the test program, the summary of results for HPP diesel additive is as follows:

Performance	Results
ENGINE TESTING - Detergency	
Injector Keep Clean Indirect Injection - Peugeot XUD9 10 Hours RF-93-T-95 Reference Fuel Direct Injection - Cummins L10-IDT 125 Hours Cat 1K Reference Fuel	 Test Pass - >15% Flow Remaining @ 0.1 mm Pintle Lift RF-93-T-95 Reference Fuel - 11.8% Flow @ 0.1 mm Lift HPP DXL (38 ppm w/w) - 31.0 % Flow @ 0.1 mm Lift Test Pass - </= 10 Plunger Rating Cat 1K Reference Fuel - 22.4, 21.8, 26.3, 23.0 Rating HPP DXL (151 ppm w/w) - Multiple Pass - 8.6, 8.4, 9.9 Rating (114 ppm w/w) - Multiple Pass - 8.3, 5.9 Rating (94.5 ppm w/w) - Single Pass - 8.4 Rating
Injector Clean Up Indirect Injection - Peugeot XUD9 Cycle Direct Injection - Cummins L10-IDT Cycle	 HPP DXL (60 ppm w/w) - 57.8% Increased Flow @ 0.1mm Lift HPP DXL (151 ppm w/w) - L10-IDT Cycle - 37.8% Clean Up HPP DXL (151 ppm w/w) - On Highway Cycle - 61.3% Clean Up
Transient FTP Testing Fuel Economy (BSFC) Improvement Emissions Reductions	 HPP DXL (151 ppm w/w) - 2.6% Improvement HPP DXL(151 ppm w/w) - Up to 14.6% Reduction
Fleet Testing SAE Type II Fuel Economy Test	 HPP DXL (151 ppm w/w) - Up to 2.97% Improvement
BENCH TESTING	
Corrosion NACE Rust Test in Isooctane Fuel	 Visual Rating 'E' to 'B' using HPP DXL (94 ppm w/w) Visual Rating 'E' to 'A' using HPP DXL (180 ppm w/w)
Lubricity Scuffing Load BOCLE (ASTM D6078) HFRR (ASTM D6079)	 900 Grams Load Increase Can Improve Commercial On-Highway Diesel from Failing to Passing - </= 460 micron Wear Scar Diameter
Fuel Oil Stability 180 Minute @ 150°C (ASTM D6468)	 Meets NCWM Specifications of >/= 80% Reflectance
Oxidation Storage Stability ASTM D2274	 Maintains Color. Protects against Formation of Gums
Water Tolerance/Demulsibility ASTM D1094	 Passes Fuel Clarity, Interface & Water
Cummins Fuel Filter Compatibility	No Increase in Filter Pressure Drop, Clean Filter Media, No Degradation of Plastic
Cummins Elastomer Compatibility	Passes Seal and Elastomer Compatibility

PEFORMANCE RESULTS

PEUGEOT XUD9 NOZZLE COKING TEST

This test is a recognized industry evaluation of deposits in an indirect injected passenger car diesel engine. Group PF26 of the CEC developed the test in Europe.

TEST PARAMETERS

- Engine: Peugeot XUD9
- Cylinders, Displacement: 4 Cylinders, 1.9L Displacement
- Speed: 3000 RPM
- Load: 58 Nm
- Duration: 10 hours

TEST/CRITERIA SUMMARY

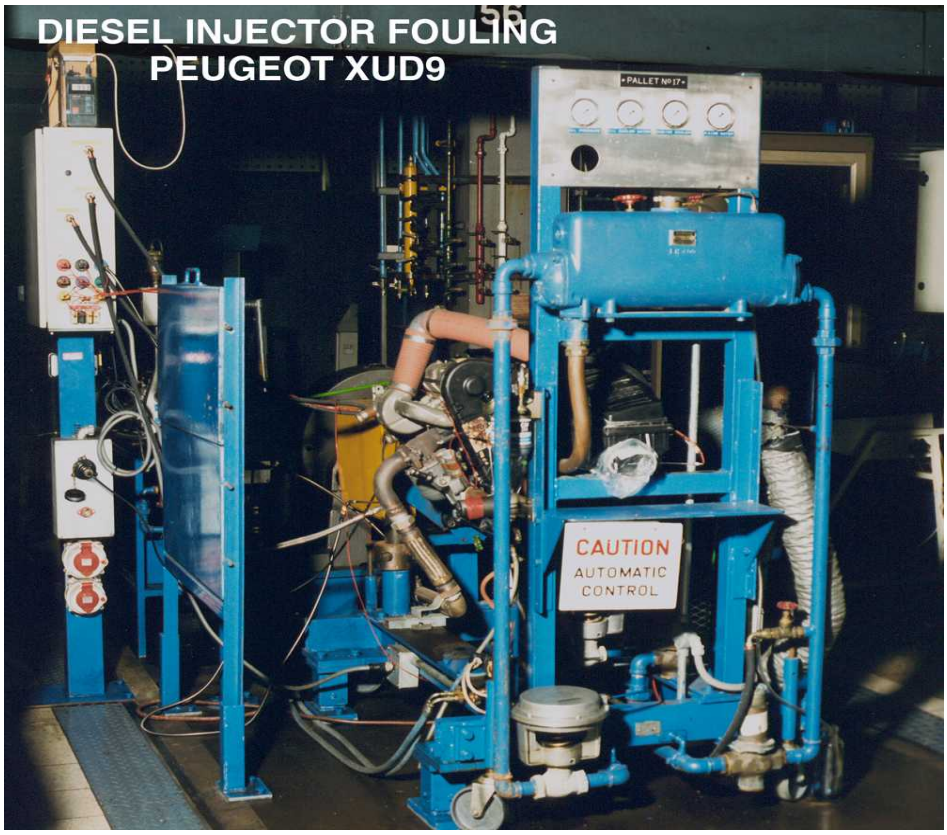
Pre-test measurements are recorded by flowing air through the injector nozzles at lift points of 0.1, 0.2, 0.3, and 0.4 mm. The nozzles are reassembled and installed in the engine. The engine is warmed to test conditions and run for 10 hours. Nozzles are then re-flowed and compared to the initial flow rate.

Group PF26 developed the original procedure, but no pass/fail limits were specified. A French OEM group, CFCA, has developed a passing criteria of greater than 15% remaining injector flow at 0.1mm of pintle lift.

RESULTS

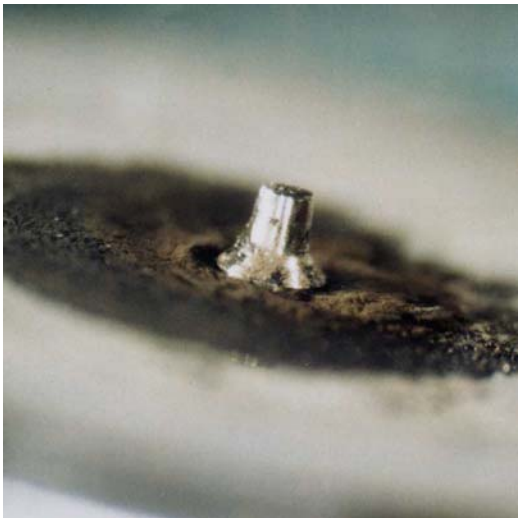
The attached graph details the excellent results obtained by using HPP DXL Series diesel fuel additives. HPP DXL Series treated fuel gave an 87% improvement in percent flow remaining and passed CFCA requirements. Combined with the excellent Cummins L10-IDT results, this demonstrates HPP DXL Series performance versatility for DI and IDI engines.

PEUGEOT XUD9 NOZZLE COKING TEST



PEUGEOT XUD9 TEST STAND

FAIL



PASS

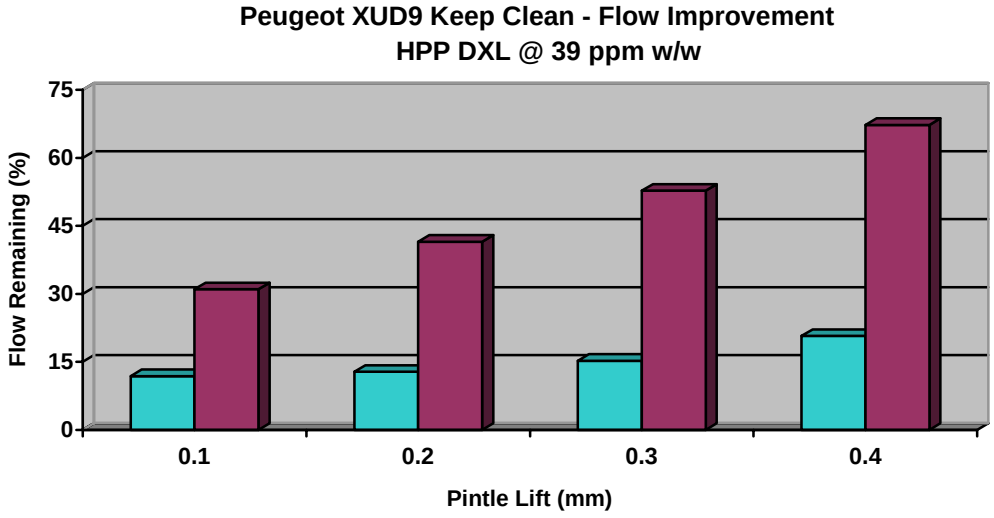
INJECTORS RUN IN THE PEUGEOT XUD9 NOZZLE COKING TEST

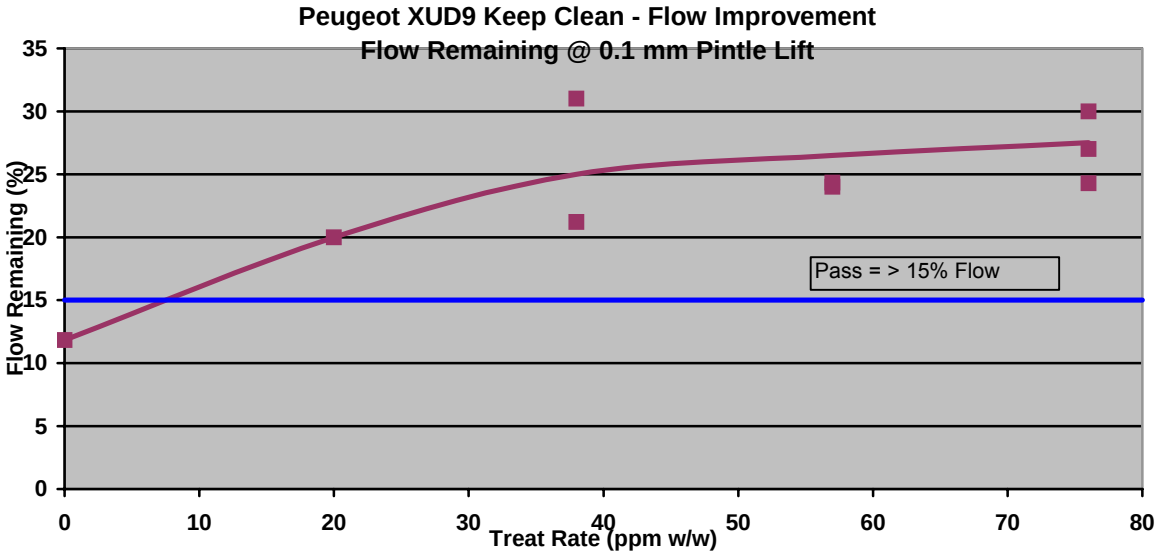
PEUGEOT XUD9 NOZZLE COKING TEST

KEEP CLEAN DATA

Duplicate testing with and without HPP DXL Series additive demonstrates improved injector keep clean performance in this European IDI engine test protocol. The testing was conducted at the Hazelwood laboratory and at Prodrive Tickford, an independent lab located in Milton Keyes, England. The base fuel is a European reference fuel, RF-93-T-95. The passing criteria is 15% flow remaining at 0.1 mm Pintle lift. In this test procedure, the HPP DXL additive was used at 39 ppm w/w, well below the L10-IDT Keep Clean Test.

The response curve of Peugeot XUD9 Keep Clean tests shows that HPP DXL will pass the test at as low as 20 ppm w/w. At 40 ppm w/w and higher, the test pass repeatability is very high.

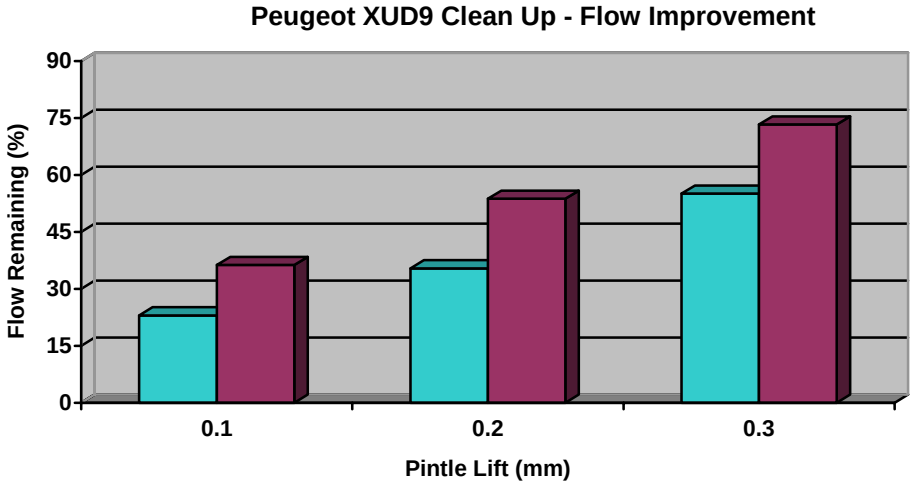




PEUGEOT XUD9 NOZZLE COKING TEST

CLEAN UP DATA

In this clean up test, injector deposits were formed by operating the engine on untreated fuel. These same injectors were then used to run the Peugeot XUD9 test on the reference fuel treated with HPP DXL Series additive at 114 ppm w/w. The result was a 58% improvement in injector flow, which demonstrates the additive's ability to clean up existing injector deposits. This test was run at Ricardo Test Services in West Sussex, England.



CUMMINS L10 INJECTOR DEPOSITING TEST

BACKGROUND

Cummins had a field problem that occurred in fleet operating in hilly terrains or stop and go traffic. In this duty cycle, significant injector deposits developed that led to a noticeable decrease in engine power. Cummins developed a test method to simulate these duty cycles and duplicate the deposits in the laboratory. This test can be used to discriminate fuel/fuel additive quality.

TEST SUMMARY

- Engines: Two (2) Cummins '88 L10 engines operated in tandem
- Cylinders, Displacement: 6 Cylinders, 10 L Displacement
- Speed: 2300 RPM
- Load: ~50-60 HP
- Test Cycle: 15 second cycle - one engine driving, the other being driven. The roles are reversed for each subsequent 15-second cycle.
- Duration: 125 Hours
- Passing Criteria: Average Injector Plunger Rating </= 10
  Average Injector Flow loss </= 6%

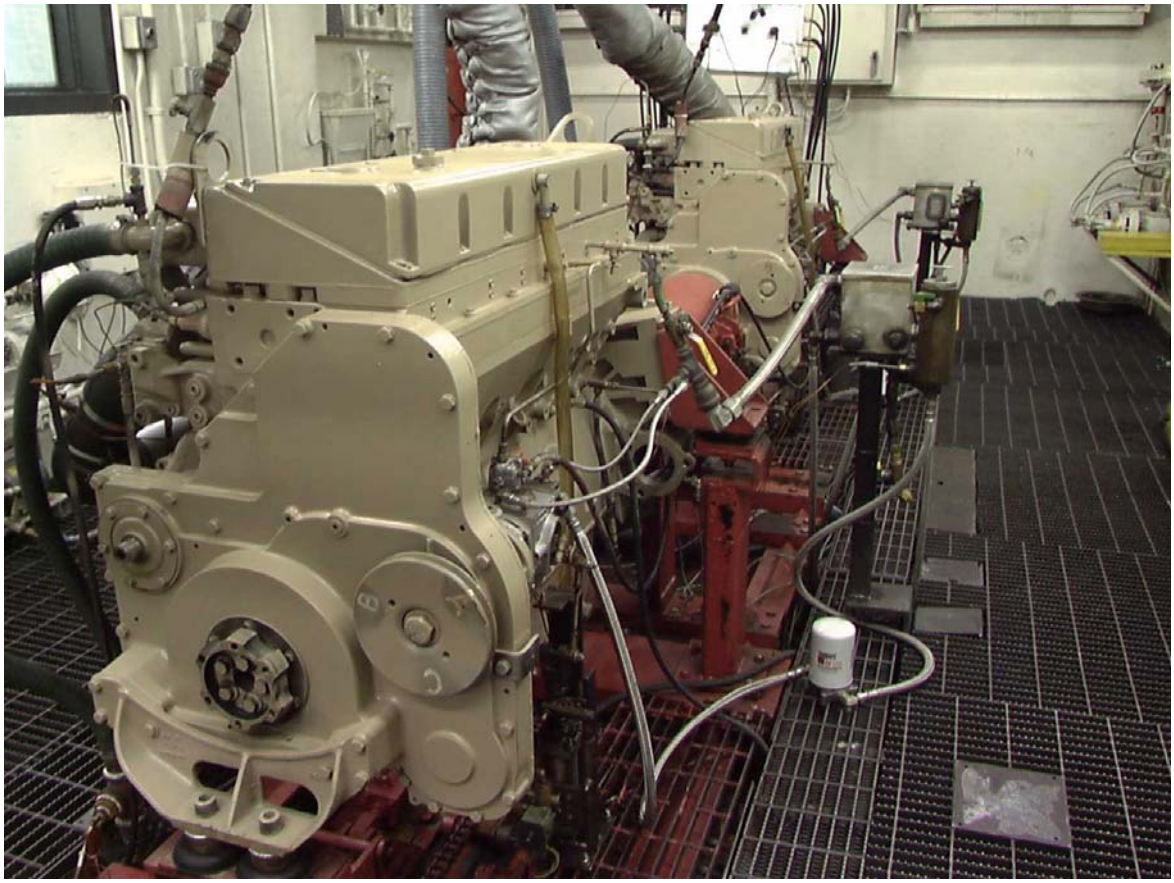
INJECTOR PLUNGER RATING METHOD

- Based on CRC piston and ring rating system as described in CRC manual 18.
- Scale runs from 0 to 100, with 0 being perfectly clean.
- Cummins has determined that the lacquer deposits have a lesser effect on injector flow performance and carbon is a more significant factor in performance degradation therefore, carbon is weighted at 10 times the weighting of lacquer.
- All six injectors are individually rated then averaged

TEST RESULTS

Attached in table and graphical form, the HPP DXL Series of diesel fuel additives show excellent results in this test as evidenced by the consistent multiple passes that have been achieved. Multiple passing tests help demonstrate how robust a detergent additive package is and ensures a high degree of customer confidence in the product and its performance.

CUMMINS L10 INJECTOR DEPOSITING TEST



CUMMINS L10-IDT SET UP AT ETS

FAIL **PASS**

INJECTORS RUN IN THE CUMMINS L10-IDT

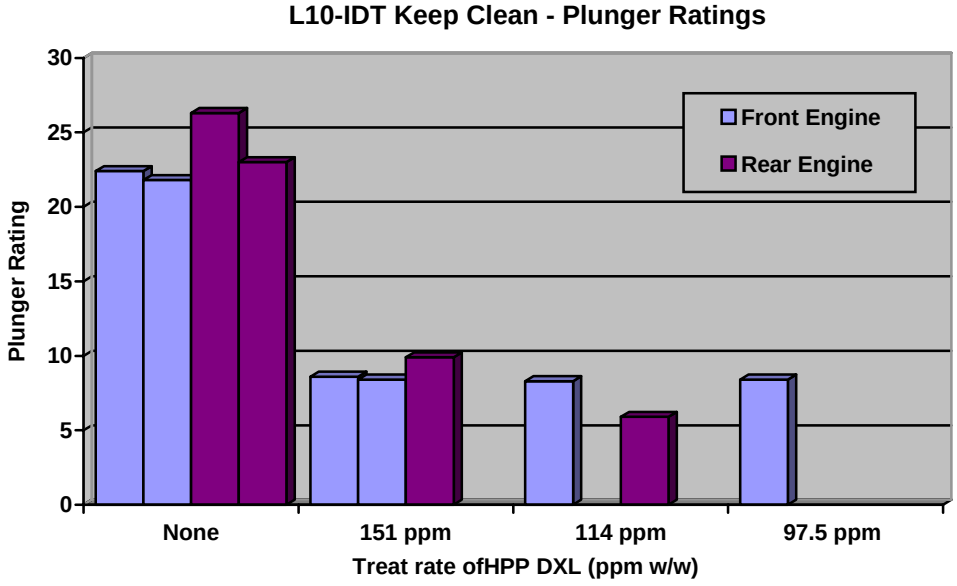
CUMMINS L10 INJECTOR DEPOSITING TEST

KEEP CLEAN DATA

Duplicate testing with and without HPP DXL Series additive demonstrates improved injector keep clean performance in the Cummins L10 Injector Depositing Test (L10-IDT. The base fuel is a high sulfur fuel labeled Cat 1K fuel. All testing was completed at Engineering Test Services (ETS). The passing criteria is an injector rating </= 10 and a flow loss </= 6%.

CUMMINS L10-IDT KEEP CLEAN RESULTS

Fuel	LZ 9570 Series (ppm w/w)	Engine	Plunger Rating
CAT 1K	None	Rear	26.3
CAT 1K	151	Rear	9.9
CAT 1K	None	Front	22.4
CAT 1K	151	Front	8.6
CAT 1K	None	Front	21.8
CAT 1K	151	Front	8.4
CAT 1K	114	Front	8.3
CAT 1K	94.5	Front	8.4
CAT 1K	None	Rear	23.0
CAT 1K	114	Rear	5.9



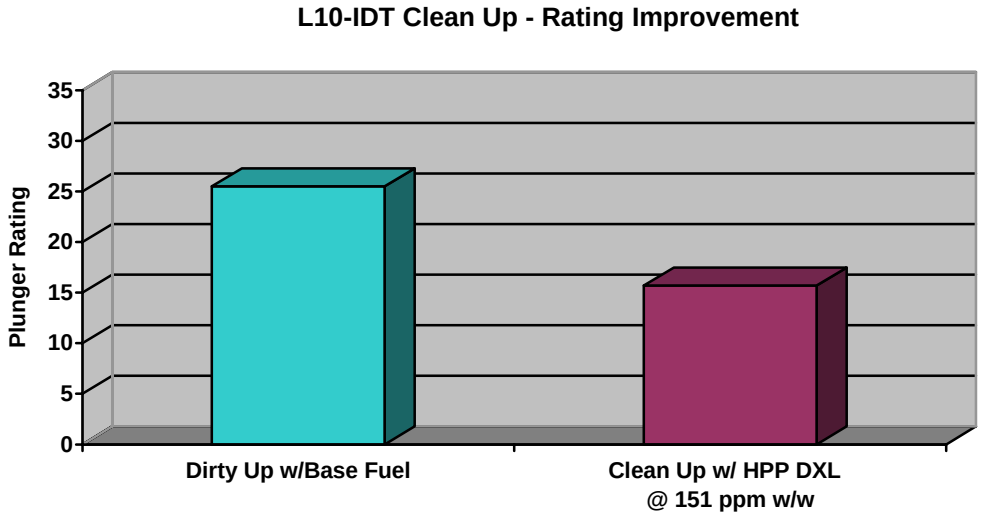
INJECTOR CLEAN UP DATA

CLEAN UP DATA - CUMMINS L10-IDT CYCLE

The ability of HPP DXL Series additives to clean up existing injector deposits was evaluated using the Cummins L10 Injector Depositing Test (L10-IDT) cycle. A set of injectors was run for 125 hours in the Cummins L10-IDT using untreated Cat 1K fuel. After the injectors were flowed and rated, they were reinstalled in the engine. They were run for an additional 125 hours in the L10-IDT cycle with Cat 1K fuel treated with Lubrizol 9570 at 151 ppm w/w. This test showed a reduction in average injector deposits of 37.8 percent.

CUMMINS L10 CLEAN UP TEST RESULTS

	PLUNGER RATING	INJECTOR FLOW (ml/stroke)
Start of test	25.5	135.5
End of test	15.7	134.3
% Improvement	38.4	-0.9



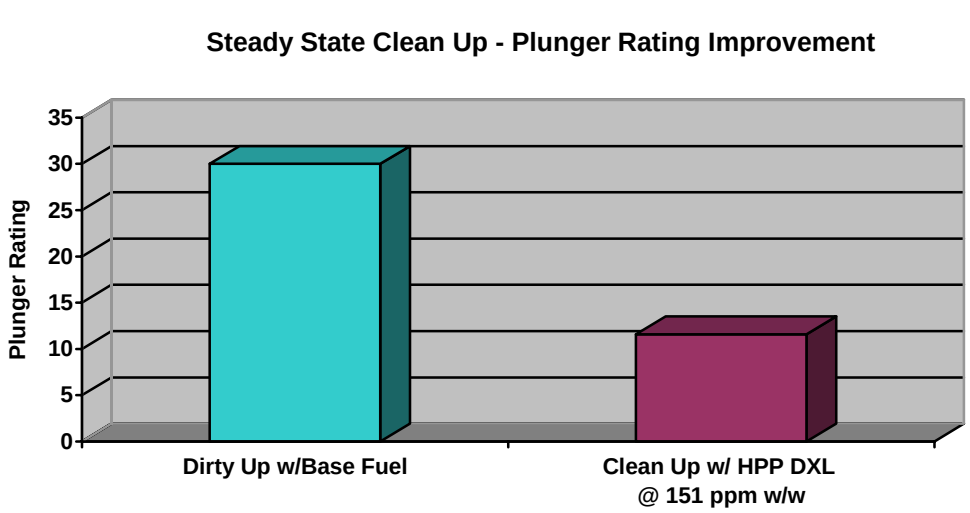
INJECTOR CLEAN UP DATA

Steady State On Highway Cycle - 1800 RPM, 600 Ft-Lb Torque

The ability of HPP DXL Series to clean up existing injector deposits was evaluated using a steady state cycle (1,800 RPM, 600 ft-lbs torque). This cycle simulates a heavy duty truck cruising at normal road speed. A set of injectors was 'dirtied up' on the Cummins L10-IDT using untreated Cat 1K fuel. Following plunger rating, the injectors were installed in an '88 L10 engine on a dynamometer for baseline FTP transient emissions testing. The engine was then run at steady state conditions until 2,270 liters (600 US gallons) of fuel treated with HPP DXL @ 151 ppm w/w was consumed. FTP emissions were run at the mid-point (300 US gallons) and end (600 US gallons) of test. The injectors were again rated when all emissions were completed. This test showed a reduction in average injector deposits of 61.3%. Specific regulated emissions were reduced up to 14.6% and brake specific fuel consumption (BSFC) decreased by 2.6%. All testing was completed at Engineering Test Services (ETS). Test results are highlighted in the following tables.

INJECTOR PLUNGER DEPOSIT AND FLOW COMPARISON

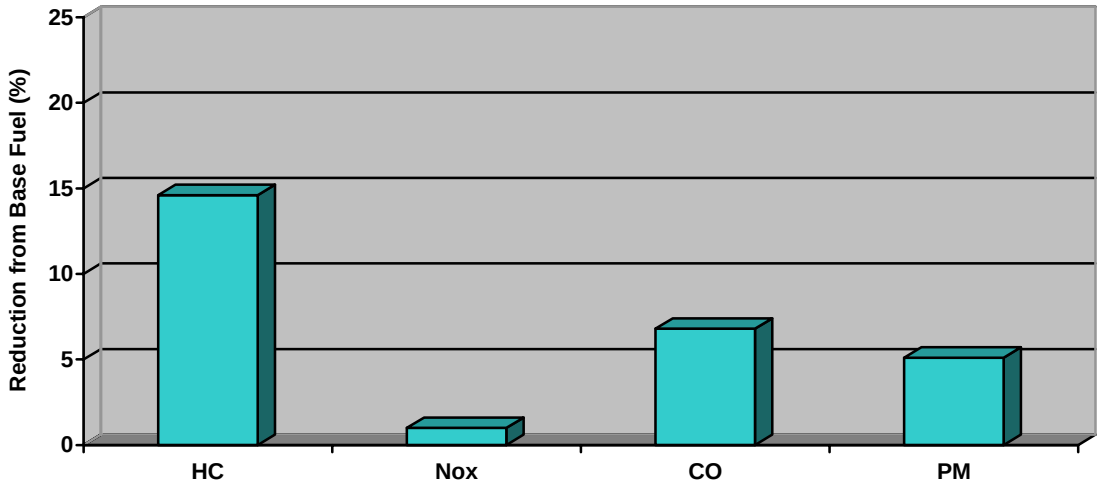
	PLUNGER RATING	INJECTOR FLOW (ml/stroke)
Start of test	30.0	133.0
End of test	11.6	136.6
% Improvement	61.3	2.8



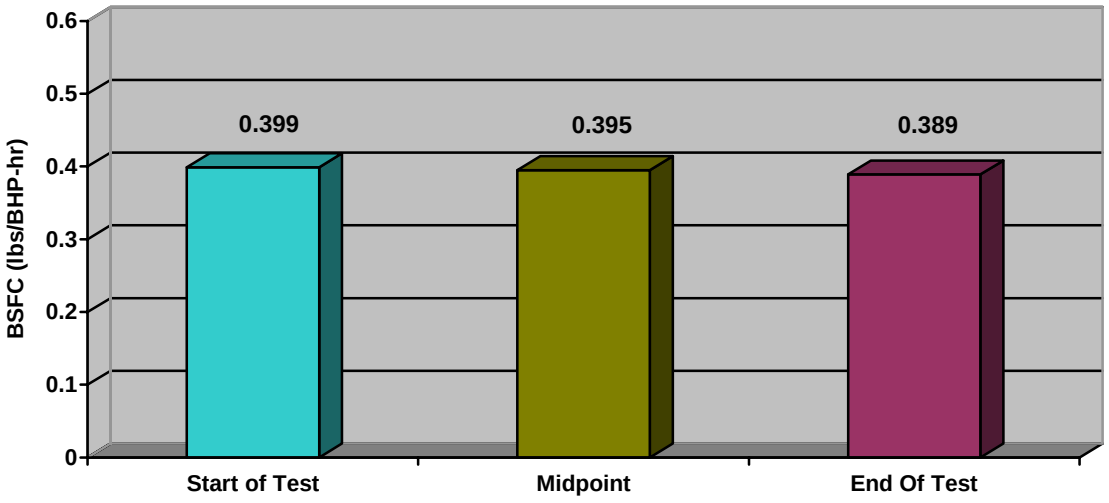
COMPARISON OF EXHAUST EMISSIONS AND ENGINE PERFORMANCE

	HC	NOx	CO	PM	BSFC
Start of test	0.776	4.44	4.132	0.564	0.399
Midpoint	0.728	4.47	3.837	0.562	0.395
End of test	0.662	4.40	3.852	0.535	0.389
% Improvement	14.6	1.0	6.8	5.1	2.6

Steady State Clean Up - Emissions Improvement



Steady State Clean Up - Fuel Economy Improvement



FLEET TESTING

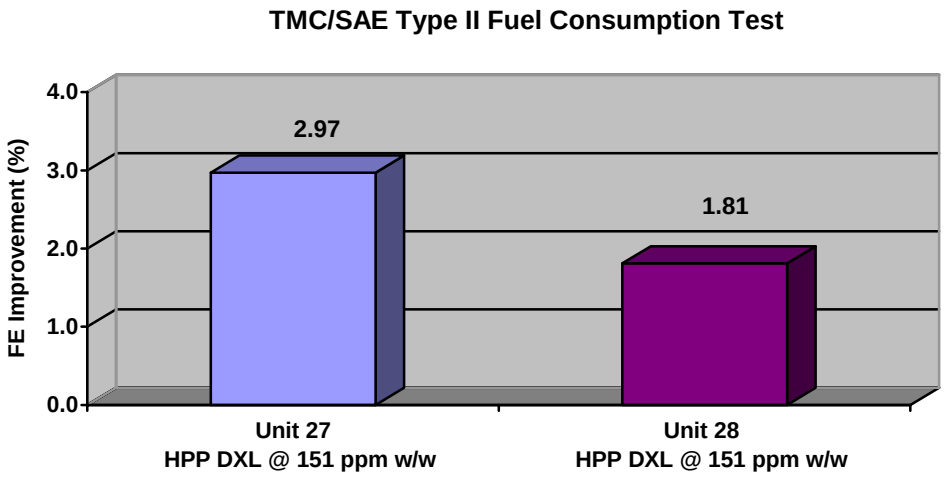
"Joint TMC/SAE Fuel Consumption Test Procedure - Type II

Three (3) Freightliner trucks equipped with Detroit DD60 engines from an in-use fleet were used for this testing. The trucks were numbered as follows:

- Unit 27 - Test Truck, starting mileage of 337,000 miles
- Unit 28 - Test Truck, starting mileage of 603,000 miles
- Unit 31 - Control Truck, starting mileage of 322,000 miles

Prior to training the truck drivers to run the procedure, all trucks were inspected, fluids were changed, and rig alignments were performed. Baseline fuel consumption measurements were obtained using the base fuel on all three (3) trucks.

In order not to damage the control truck, that truck was parked until end of test measurements were required. The remaining two (2) test trucks were driven 15,000 miles on base fuel additized with HPP DXL at 151 ppm w/w. Once the test miles were accumulated, fuel consumption measurements on all three (3) trucks were again obtained with the base fuel. Both trucks run with fuel additized with HPP DXL showed improved fuel economy relative to the control truck.



LABORATORY BENCH TESTS

The following laboratory tests can be used to evaluate diesel fuel quality and additive effectiveness. Below is a short description of each test. The following pages give test conditions, equipment schematics and test results using HPP DXL Series diesel fuel additives. HPP DXL Series additives offer excellent corrosion protection, wear protection, thermal stability, oxidation stability, and water separation.

NACE (National Association of Corrosion Engineers) RUST TEST: measure of the anti-corrosion ability of a fuel.

SCUFFING LOAD BOCLE TEST (ASTM D6078): measure of a fuel's lubricity characteristic.

HIGH FREQUENCY RECIPROCATING RIG TEST (ASTM D6079): measure of a fuel's lubricity characteristic.

FUEL OIL THERMAL STABILITY TEST (ASTM D6468): measure of the thermal stability of a diesel fuel. This test is used by the National Conference of Weights and Measures to help define premium diesel fuel.

OXIDATION STORAGE STABILITY (ASTM D2274): measure of a diesel fuel's ability to withstand oxidation under accelerated conditions.

WATER TOLERANCE/DEMULSIBILITY (ASTM D1094): measure of a fuel's ability to separate from water.

CUMMINS FUEL FILTER COMPATIBILITY TEST: demonstrates no-harm performance of the additive on fuel filter materials.

CUMMINS ELASTOMER COMPATIBILITY TEST: demonstrates no-harm performance of the additive on elastomers typically found in diesel engines.

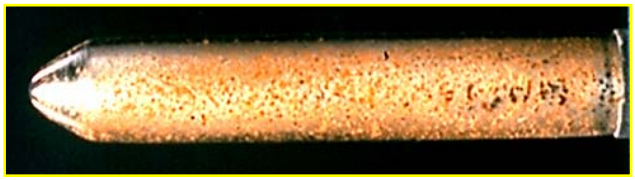
NACE RUST TEST

TEST PARAMETERS

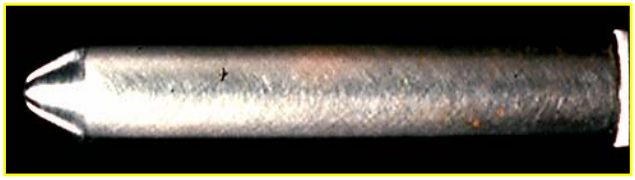
Base Fuel:	Fuel A - Depolarized Isooctane (700 ml) Fuel B - Commercial Low Sulfur No. 2 Diesel Fuel
Temperature:	37.8 Deg C (100 Deg F)
Water Phase:	Distilled
Fuel/Water Contact:	Stir 300 ml of fuel for 30 minutes. Introduce 30 ml distilled water to fuel. Stir additional 3.5 hours.
Steel Spindle:	Polished, Cold Rolled SAE 1020, 1/2”
Performance Criteria:	Visual evidence of rust

RESULTS

Additive	NACE Visual Rating	% Rust
Base Fuel A	E	75-100%
Fuel A + HPP DXL @ 94.5 ppm w/w	B	<10%
Fuel A + HPP DXL @ 180ppm w/w	A	None
Base Fuel B	D	50-75%
Fuel B + HPP DXL @ 94.5 ppm w/w	B+	<1%



‘E’ NACE RATING



‘A’ NACE RATING

CONCLUSIONS

HPP DXL Series additives provide superior anti-corrosion protection in extremely severe diesel fuels. This characteristic ensures anti-rust protection to storage facilities, fuel handling systems, and end user’s diesel engines.

SCUFFING LOAD BALL ON CYLINDER LUBRICITY EVALUATOR (SLBOCLE)
ASTM D6078

TEST PARAMETERS

Base Fuel:	Low Sulfur Diesel (50 ml)
Temperature:	25 °C (77°F)
Relative Humidity:	50%
Test Conditions:	Non-rotating ball applies 500 to 6000 grams force to cylinder rotating @ 525 RPM.
Test Duration:	60 seconds duration per load.
Performance Criteria:	Measure friction load to scuff cylinder. Report average of two (2) tests.

TEST RESULTS

	Scuffing Load (grams)
Base Fuel	2750
HPP DXL @ 180 ppm w/w	4550
Typical Pass/Fail Criteria	>/=3100

CONCLUSIONS

The Scuffing Load BOCLE test was developed to evaluate the lubricating properties of distillate fuels. The wear mechanism is related to wear mechanisms in a diesel engine.

HPP DXL additives, when added to a low lubricity fuel, provide excellent anti-wear performance as measured by the ASTM D6078 Scuffling Load BOCLE Test.

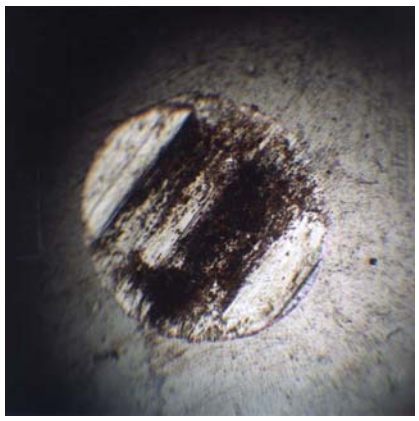
HIGH FREQUENCY RECIPROCATING RIG (HFRR)
ASTM D6079

TEST PARAMETERS

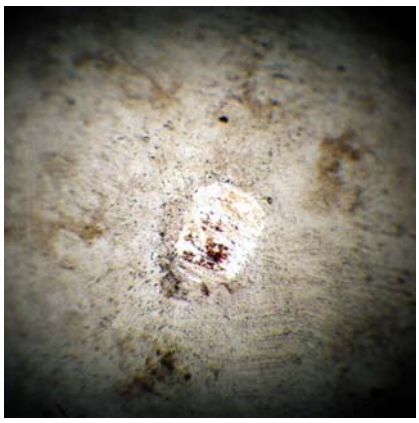
Base Fuel:	Low Sulfur Diesel (2 ml)
Temperature:	60°C (140°F)
Relative Humidity:	>30%
Test Conditions:	50 Hz reciprocating ball with stroke length of 1 mm is brought into contact with stability disk.
Test Duration:	75 minutes
Performance Criteria:	Measure wear scar diameter (WSD) on ball

TEST RESULTS

	Mean Wear Scar Diameter (MWSD)
Base Fuel A	0.57 mm
Fuel A + HPP DXL @ 180 ppm w/w	0.37 mm
Base Fuel B	0.50 mm
Fuel B + HPP DXL @ 180 ppm w/w	0.46 mm
Typical Pass/Fail Criteria	≤ 0.46 mm (460 microns)



Fail MWSD



Pass MWSD

CONCLUSIONS

Adding High Performance Plus diesel additives to a base diesel fuel can improve lubricity performance to within the typical passing range in this test. This performance enhances the wear protection of fuel pumps and other fuel system components.

FUEL OIL STABILITY TEST
ASTM D6468

TEST PARAMETERS

Base Fuels:	Commercial Low Sulfur No. 2 Diesel (2-50 ml)
Temperature:	150°C (302°F)
Test Duration:	180 Minutes
Performance Criteria:	Percent Reflectance Using Proper Light Meter

RESULTS

	Fuel Color (D1500) Initial	Final	% Reflectance
Base Fuel A	1.5	<3.5	57
Fuel A + HPP DXL @ 94.5 ppm w/w	<2.5	<3.0	85
Base Fuel B	<1.5	<2.0	62
Fuel B + HPP DXL @ 94.5 ppm w/w	<1.5	<1.5	87
Base Fuel C	1.5	<3.5	48
Fuel C + HPP DXL @ 94.5 ppm w/w	<2.0	<2.0	88
NCWM Pass/Fail Criteria			>80

Fail <80% Reflectance

Pass >80% Reflectance

CONCLUSIONS

In this test, High Performance Plus additives provide excellent stability as illustrated by the high light reflection. Thermal degradation of diesel fuel can cause the formation of gums, which can increase deposits and the chance of filter plugging. HPP DXL Series additives protect against this thermal degradation and meet the requirements for the National Council of Weights and Measures (NCWM) Premium Diesel Fuel Specification.

OXIDATION STORAGE STABILITY TEST
ASTM D2274

TEST PARAMETERS

Base Fuel:	Commercial No. 2 Diesel Fuel
Temperature:	95°C (203°F)
Test Duration:	16 Hours
Test Conditions:	Bubble oxygen through sample at a rate of 3 liter/hour
Performance Criteria:	Amount of insolubles and fuel color change

RESULTS

	Fuel Color (D1500) Initial	Final	Total Insolubles (mg/100 ml)
Base Fuel A	<1.5	<2.0	0.16
Base Fuel A + HPP DXL @ 151 ppm w/w	<1.5	<2.0	0.03
Base Fuel B	<1.5	<2.0	0.23
Base Fuel B + HPP DXL @ 114 ppm w/w	<1.0	<1.5	0.21
Base Fuel B + HPP DXL @ 151 ppm w/w	<1.0	<1.5	0.14

Typical Pass/Fail Criteria No Harm

CONCLUSIONS

In this test,High Performance Plus Series additives provide excellent stability as illustrated by the reduction in fuel insolubles and the strong color stability. Oxidation of diesel fuel can cause the formation of gums, which can increase the formation of deposits and increase the chance of filter plugging. Lubrizol 9570 Series additives protect against
oxidation.

WATER TOLERANCE
ASTM D1094

TEST PARAMETERS

Base Fuel:	LSRD-4
Temperature:	25°C (77°F)
Water Phase:	Distilled
Water/Fuel Contact:	Hand Shake for 2 Minutes (80 ml of fuel, 20 ml of water)
Settle Time:	5 Minutes
Performance Criteria:	Degree of Fuel/Water Separation Clarity of Phases Interface Rating

RESULTS

	Ratings after 15 Min		
	Interface	Separation	Fuel Clarity
Base Fuel	3	2	2
Base Fuel + HPP DXL @ 94.5 ppm w/w	1b	2	2-3
Base Fuel + HPP DXL @ 114 ppm w/w	1b	2	2-3
Base Fuel + HPP DXL @ 151 ppm w/w	1b	2	2-3

CONCLUSIONS

High Performance Plus Series additives maintain similarfuel/water-separation performance to base fuels and ensure trouble free handling after any contact with water. HPP DXL Series will ensure that emulsions will not readily form, thus prohibiting drivability and rusting concerns.

CUMMINS FUEL FILTER COMPATIBILITY TEST

TEST PARAMETERS

Filter Used:	Fleetguard F105d and F1212
Base Fuel:	Low Sulfur Reference Diesel (LSRD-4) With and without 1% distilled water added
Aging Cycle:	Filters filled with fuel and stored for three (3) weeks at 160^{o}F. Additive treated at two (2) times recommended treat rate.
Performance:	Pressure drop measured before and after aging at 20, 60 and 100 gallons per hour.

RESULTS

	Flow (gph)	ΔP Change
Base Fuel	20	None
	60	None
	100	None
Base Fuel + HPP DXL @ 302 ppm w/w	20	None
	60	None
	100	None
Base Fuel+ 1% Water	20	None
	60	None
	100	None
Base Fuel + 1% Water + HPP DXL @ 302 ppm w/w	20	None
	60	None
	100	None
Typical Pass/Fail Criteria	No Harm, Increase <0.2 in hg.	

CONCLUSIONS

HPP DXL Series additives are completely compatible with diesel fuel filters and will not harm their performance by increasing the pressure drop or restriction across the filter. No signs of residue form on the filter media. The plastic material joining the filter media and the metal end plates remains unchanged.

CUMMINS ELASTOMER COMPATIBILITY TEST

TEST PARAMETERS

Base Fuel:	Low Sulfur Reference Diesel (LSRD-4)
Aging Cycle:	Samples stored for three (3) weeks at 160°F
Performance:	Components stored in the additized fuel should not show excessive degradation compared to samples stored in the base fuel.

RESULTS

	Base Fuel	w/LZ 9570 @ 151ppm w/w	% Change from Base
Change in Elongation (%)			
Low Swell Nitrile	43.6	50.1	6.5
Medium Swell Nitrile	17.4	20.0	2.5
Fluoroelastomer	15.0	16.1	1.1
Change in Tensile Strength (%)			
Low Swell Nitrile	0.0	0.0	0.0
Medium Swell Nitrile	-8.0	-14.8	6.8
Fluoroelastomer	30.8	13.2	17.6
Change in Volume (%)			
Low Swell Nitrile	114.7	97.3	17.4
Medium Swell Nitrile	55.5	32.0	23.5
Fluoroelastomer	5.1	-5.1	10.1
Change in Hardness (%)			
Low Swell Nitrile	5.0	4.0	0
Medium Swell Nitrile	3.0	1.0	1
Fluoroelastomer	-4.0	-2.0	1
Surface Cracks	None	None	
Typical Pass/Fail Criteria	No Harm		

CONCLUSIONS

HPP DXL Series additives are completely compatible with elastomers and seal materials typically found in diesel engines and will not harm their performance.

PHYSICAL AND CHEMICAL CHARACTERISTICS

The primary physical and chemical characteristics of HPP DXL additive are shown below and in the Product Data Sheet located in the Appendix. HPP DXL is the base product. Alternate formulations containing additional components such as lubricity improver, cetane improver and cold flow additives are also available.

Parameter	Typical value
Viscosity at 40°C, cSt 25°C, cSt 0°C, cSt	48 86 302
Color	L5.0
Specific Gravity @ 15.6 °C	0.919
Nitrogen content, % wt	1.75
Flash Point, °C	58
Pour Point, °C	-42

This data is considered provisional until statistical data from Manufacturing Quality Assurance is gathered.