MESILLA VALLEY TRANSPORTATION SOLUTIONS
CERTIFIED
Fuel Economy Experts

Test performed and certified by Mesilla Valley Transportation Solutions (MVTS)

Third-Party Heavy Duty Engine Fuel Economy Test

"We saw positive fuel economy results with BG Heavy Duty Fuel System Performance Restoration. That's a big deal because we have never before successfully validated the claims of an additive used in a heavy-duty diesel fuel system or engine."

—D. Bear, Lead Engineer & Chief Operating Officer at MVTS

BG

The Fuel Economy Test evaluates the effectiveness of the BG Heavy Duty Fuel System Performance Restoration & BG EPR® Engine Performance Restoration® services in providing improved fuel economy and restored lost engine performance. The purpose of the test is to enable carriers to make informed decisions regarding the above-mentioned service.

Mesilla Valley Transportation Solutions (MVTS) designed this heavy duty fuel economy test to provide information relevant to the needs of carriers. Therefore, the format varies from traditional fuel economy and technical reports. The test was performed using MVTS proprietary methods, which have been developed and adapted from race car engineering and advanced vehicle test methods.

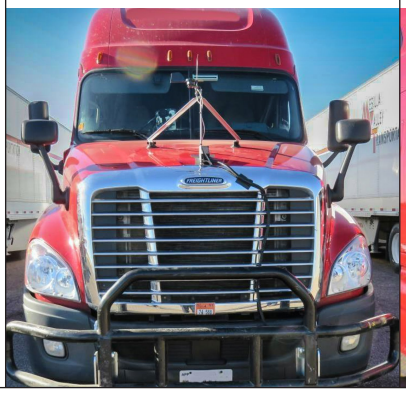
Mesilla Valley Transportation (fleet) has relied on these testing methods since 2012. The methods provide highly accurate and reliable answers on real-world fuel savings in comparison to other test methods.

TEST METHOD DETAILS

Vehicle Specifications and Identification

Three Class-8 sleeper cab trucks were used for the BG Heavy Duty Fuel System Performance Restoration (FSPR) & BG EPR® Engine Performance Restoration® test, detailed in the table below.

Trailers were inspected and received regular maintenance to ensure consistency. Trailers were loaded with water totes for ballast and secured in the trailers to ensure consistency throughout the test.

VEHICLE INFORMATION SUMMARY			
	Vehicle A	**Vehicle B**	**Vehicle C**
Purpose	Test Vehicle	Test Vehicle	Control Vehicle
Brand & Model	Freightliner Cascadia	International LT	Freightliner Cascadia
Model Year	2017	2017	2017
Engine	Detroit Diesel 15-Liter	Cummins X15 15- Liter	Detroit Diesel 15-Liter
Odometer	298,708	289,255	305,777
Trailer	2019 Hyundai 53’ Dry Van	2019 Hyundai 53’ Dry Van	2019 Hyundai 53’ Dry Van
Gross Vehicle Weight	43,700	44,200	43,480
			

Vehicle Fuel Economy Test Equipment

MVTS fuel economy testing uses a data acquisition system and sensors specifically for this testing. Data loggers were connected to the Controller Area Network (CAN) bus in each truck, to record engine and vehicle data.

MVTS test sensors include:

- Data acquisition system (records sensor data)
- Fuel flow meter (accurate to 0.2%)
- Fuel temperature sensor
- Tire temperature sensor
- Ground/road temperature sensor
- Wind speed air pressure sensor
- Wind direction sensor
- Ambient air temperature sensor
- Ambient air pressure sensor
- High Precision GPS

Data acquisition system

Fuel flow meter

Tire temperature sensor

Aerodynamic sensors

Pre-Test Service and Preparation

Several service tasks were completed prior to testing to ensure consistent engine variables for the duration of the test.

- New engine oil and oil filters
- New fuel filters
- New air filters
- New tires

The fuel was drained from the trucks and refilled from the same fuel source. Two auxiliary fuel containers were also filled from the same pumps, totaling 600 gallons. This fueling procedure was followed to ensure all trucks used the same batch of fuel throughout the entire test.

Engine and Fuel Additives Used

The purpose of the BG Service is to restore the lost engine performance, which can occur in normal and severe operation. Decreased engine performance occurs due to deposits forming on parts such as pistons, piston rings (via carbon-packing), fuel injectors, combustion chamber, and aftertreatment system among others.

PRODUCTS USED IN THE HEAVY DUTY ENGINE TESTING:

- **BG Heavy Duty Fuel System Performance Restoration** (Diesel Fuel System Cleaner). 32 oz. (946 mL) of BG Heavy Duty Fuel System Performance Restoration treats 100 gallons (378 Liters) of diesel fuel.
- **BG EPR® Engine Performance Restoration®** (Engine Cleaner). 32 oz. (946 mL) of BG EPR® to 10–16 quart (9–15 Liters) capacity crankcase.

The BG products are designed to be included with regular oil change service intervals, added prior to changing the engine oil. The purpose of conducting the BG service prior to an oil change is to allow the engine deposits which collect in the engine oil to be immediately removed from the engine.

A stationary regeneration is conducted, which takes approximately 45–60 minutes for most heavy-duty diesel engines. The stationary regeneration allows the engine to operate in a non-idle condition, while generating heat and cleaning the engine and aftertreatment system.

BG Fuel System Performance Restoration remains in the fuel tanks after the oil change and is consumed during regular usage; fuel tanks are not drained following the oil change.

Baseline Test

The baseline test consisted of 153 miles. The three vehicles had a 1-minute gap between them, which was equivalent to approximately one mile. The vehicles traveled at a steady speed of 65 miles per hour.

BG EPR® Engine Performance Restoration® & BG Heavy Duty Fuel System Performance Restoration Service Steps

Immediately following the baseline run, the two test trucks received the BG 2-Part Heavy Duty Engine & Fuel System Performance Restoration service. All three trucks had stationary regenerations performed and oil changes to maintain consistency between them. Details are shown in the table below.

BG PRODUCTS SERVICE STEPS				
Step		**Truck A Freightliner Detroit** - Test Truck	**Test B International Cummins** - Test Truck	**Truck C Freightliner Detroit** - Control Truck
A	BG Products: Heavy Duty Fuel System Performance Restoration	2 quarts added (1 quart per 100-gallon fuel tank)	2 quarts added (1 quart per 100-gallon fuel tank)	None
B	BG Products: EPR® Engine Performance Restoration®	3 quarts added (1 quart per 15 quarts engine oil)	3 quarts added (1 quart per 15 quarts engine oil)	None
C	Engine Stationary Regeneration Performed	Yes (after BG Product added)	Yes (after BG Product added)	Yes
D	Engine Oil Changed	Yes	Yes	Yes

1000-Mile Test Run

Following the BG product service and engine oil changes, the 1000-mile test run was performed. Vehicles were driven at 65 mph, in the same sequence with 1-minute intervals between them on a circular, nine-mile closed track. The vehicles stopped every 200 miles for data downloads and driver changes. Two drivers were assigned each truck, alternating each 200-mile test run.

Fuel consumption and engine data were collected during all driving miles throughout both the baseline run and the 1000-mile test run. Therefore, fuel consumption of the vehicles was compared for all miles driven.

Nine-mile closed test track in Pecos, Texas.

TEST RESULTS AND KEY FINDINGS

The fuel economy test results were determined from the final 200 mile-leg of the 1000-mile test. The Freightliner Cascadia Detroit Diesel saw steady improvement throughout the 1000 miles, after an initial loss in the first 200 miles. The International LT Cummins X15 saw an immediate improvement in the first 200 miles, then remained relatively steady until approximately 600 miles, at which point, it improved even more through the last 400 miles of the test.

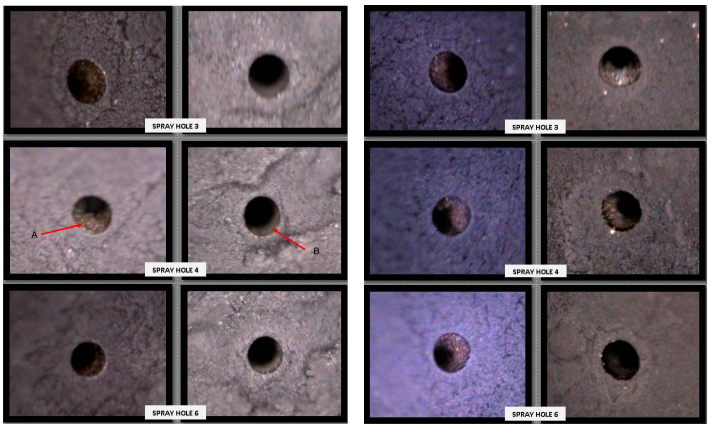
Visual Inspection

Fuel injectors were removed before and after testing to analyze the spray holes using a 200x digital microscope. Visual improvements were found on both engines' spray holes in the form of less blockage.

CYLINDER 1 INJECTOR SPRAY HOLES

Detroit Diesel DD15 *Cummins X15*

Before *After* *Before* *After*



FREIGHTLINER CASCADIA

Detroit Diesel DD15 Results

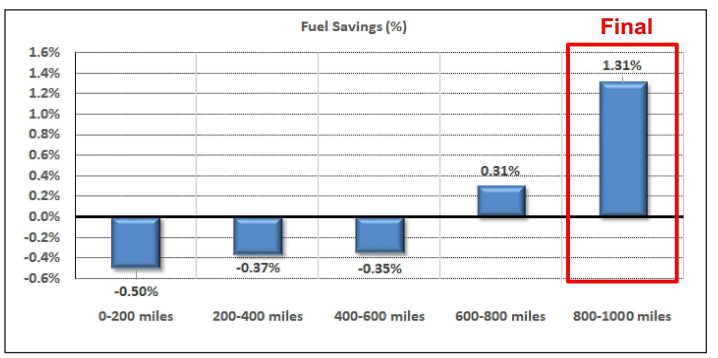
From 0–200 miles, the fuel consumption worsened with a value of –0.50%. This initial detriment to fuel consumption is not surprising. MVTS has experienced this trend in other engine and aftertreatment tests, which can occur for various reasons.

Two possible reasons for increased fuel consumption may be the cleaning process itself, temporarily leaving contaminants in those systems that clear out over time. And, possible changes in the engine and/or aftertreatment that cause the Engine Computer Management (ECM) to alter its programming, thereby negatively impacting fuel economy.

The fuel consumption continuously improved throughout the 1000-mile test, becoming positive during the 600–800 mile segment at 0.31%, and finally to 1.31% during the 800 to 1000-mile segment.

Test results suggest approximately 650 miles were required to experience the fuel consumption benefit on the Detroit Diesel DD15 engine with 300,000 miles accumulated. In other words, this was the break-in or conditioning period. However, it should be noted that engines may experience different break-in periods based on their condition, miles accumulated, or other important characteristics.

MVTS considers the final test results of 1.31% for the Detroit Diesel DD15 engine to be valid and pertinent. In fact, MVTS believes ***the results may have continued to improve if tested longer,*** based on the continuous upward trend leading up to 1000 miles. ***"We are very excited about the results we saw from the BG service,"*** says Daryl Bear, lead engineer & COO at MVT Solutions.



Detroit Diesel DD15, 15-Liter results by 200-mile test run

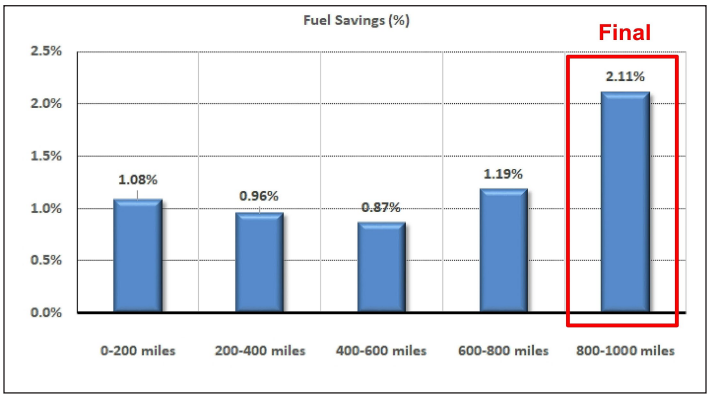
INTERNATIONAL LT

Cummins X15 Results

The Cummins X15 saw positive results in the 0–200 mile segment of 1.08%. Although this result was an immediate improvement, it remained near 1% for the first 600 miles, at which time it began to improve from that period until the end of the test at 1000 miles.

This improvement after approximately 600 miles was similar to the trend found with Detroit Diesel D15 engine discussed above. The only difference being that the Cummins X15 experienced an improvement in the 0–200 mile segment, whereas the Detroit Diesel DD15 saw a detriment initially.

By comparison, from 600 to 1000 miles, the Cummins X15 showed an improvement of 1.24% (from 0.87% to 2.11%) and the Detroit Diesel DD15 experienced an improvement of 1.66% (from -0.35 to 1.31%). Although the two engines had different trends in the first 200 miles after BG Products service treatment, they saw very similar results after 600 miles.



Cummins X15, 15-Liter results by 200-mile test run

Numbers and Calculations

The BG Heavy Duty Fuel System Performance Restoration & BG EPR service resulted in a fuel economy improvement of:

- **1.31% for the Freightliner Cascadia with Detroit Diesel DD15**
- **2.11% for the International LT with Cummins X15**

Fuel costs and surcharges account for a large portion of carrier expenses. Buyers of fuel economy technologies are most interested in saving money. The following calculations demonstrate the impact of the fuel savings observed in this test.

Fuel savings can be calculated by multiplying the **test result** or percentage fuel savings by the annual vehicle **fuel consumption** (gallons).

A sample vehicle traveling 125,000 miles per year at 7 mpg, will consume 17,857 gallons in a single year.

Annual financial savings can be calculated by multiplying the **fuel saved** by the **fuel price**.

According to the U.S. Energy Information Administration, the average retail price of diesel fuel March 2021 was $3.19 per gallon.

Detroit Diesel:
234 gallons saved
x $3.19 per gallon =
$746.46
Annual savings

Cummins X15:
377 gallons saved
x $3.19 per gallon =
$1,202.63
Annual savings

It is important to note that both the fuel savings and financial calculations represent a per vehicle savings. Carriers can calculate total fleet savings by multiplying these results by the number of vehicles in the fleet.

CONCLUSION

The BG Heavy Duty Fuel System Performance Restoration & BG EPR service deserves great recognition for achieving very positive results.

FUEL ECONOMY TEST RESULTS	
Engine Type	**Test Results**
Detroit Diesel DD15	1.31%
Cummins X15	2.11%

Test results suggest that 600 miles are required for a break-in period before seeing steady improvement. Because the improvement trend was still climbing at the 1000-mile mark, it raises the question of whether greater fuel savings would have been measured if the test was extended.

It has been historically difficult to find fuel economy improvements from a fuel system and/or engine oil additive. ***"An additive that saves fuel, lowers maintenance costs, and has no driver involvement is a home run. Many additive companies claim to provide benefits, but BG Products is the first we've seen prove it,"*** says Daryl Bear, lead engineer & COO at MVT Solutions.

The BG Heavy Duty Fuel System Performance Restoration & BG EPR service does not require drivers to add products with each fill-up. The service would be performed at regular intervals by carrier fleet maintenance technicians, virtually eliminating issues with compliance and consistency.

This is a procedure any trucking company could follow to improve fuel economy, potentially improve maintenance issues in the engine and aftertreatment systems, and ultimately, prevent premature part failures and downtime. ■

REFERENCES

To see the full details of the test: http://bgfor.me/MVTS

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