Summary Report of SEMA Emissions Certification Testing of Speed of Air® Engine Technologies' Hyperformance Pistons®

25 October, 2024

PRESS RELEASE

FOR IMMEDIATE RELEASE

Speed of Air® Engine Technologies Secures SEMA Emissions Certification for High-Efficiency Duramax Diesel Pistons

Reno, NV – October 25, 2024 – Speed of Air® Engine Technologies, a pioneer in piston innovation, has received the world's first SEMA Emissions Certification for piston technology, awarded for select GMC and Chevy 2500/3500 trucks with 6.6L Duramax engines. Developed with partners DFC Diesel and United Engine & Machine Company, Speed of Air's certified Hyperformance Pistons® demonstrated a significant reduction in emissions and similar gains in torque, horsepower, and fuel economy.

Featuring CNC-machined turbulators and advanced aerospace coatings, Speed of Air's patented Hyperformance Pistons® provide an unparalleled solution for improving engine efficiency while reducing all criteria emissions-particularly NOx and diesel particulate matter (PM 2.5). This certification is a pivotal first step toward expanding Speed of Air's clean combustion technology to a full lineup of on-road diesel applications in both medium- and heavy-duty markets, continuing the company's commitment to a cleaner environment and higher operational value for fleets.

For general information, visit Speed of Air or the SEMA Garage Emissions Certification page.

Editors: Please contact Speed of Air CEO, Chris Parkhurst at 1-833-762-4649, ext. 700 or cjparkhurst@speedofair.com

OVERVIEW

In May of 2023, Speed of Air Engine Technologies contracted with the Specialty Equipment Manufacturers Association's (SEMA) Emissions Compliance Center to test its patented piston technology in a SEMA-owned 2015 Chevrolet Silverado 2500HD equipped with a Duramax 6.6L LML turbo-diesel engine. The SEMA Emissions Compliance Center is certified by both the EPA and California Air Resource Board (CARB) to conduct emissions certification testing for aftermarket products. This testing was done in partnership with DFC Diesel, Canada's largest diesel engine remanufacturer and United Engine & Machine Company, a manufacturing licensee of Speed of Air's patented piston technology. Speed of Air's technology is engineered to influence the thermo-physical boundary layer inside the combustion chamber of an internal combustion engine. The efficiencies gained by changing combustion dynamics mean that more of the available fuel/air charge is converted to mechanical energy which effects power, torque, fuel consumption and most criteria emissions. Additionally, the thermal efficiencies gained, which result in much lower Exhaust Gas Temperatures (EGTs), have a significant impact on the formation of Oxides of Nitrogen (NOx).

SCOPE

The Duramax certification testing was conducted from May of 2023 to October of 2024. A 2015 LML Duramax was selected because it is considered a 'worst-case' for attaining emissions certification, meaning the emissions standard for an LML Duramax is considered more difficult to meet. The purpose of this phase of testing was not merely to gain product certification, but to gather a comprehensive comparative dataset from an independent laboratory certified by US emissions regulatory authorities. In addition to measuring the effect that Speed of Air's technology has on emissions at the tailpipe, this test series also recorded changes in raw emissions captured prior to being treated with the after-gas system1 as well as the effects on horsepower, torque and fuel economy. After-gas emissions control devices are designed to capture emissions by-products; thus, they will naturally mask many of the benefits of a more efficient combustion process. Every test phase was done with by-passing the after-gas emissions control devices and with the after-gas devices intact.

METHODOLOGY

The test protocol was designed around an "A-B-A" testing strategy, where a stock engine was tested to establish a baseline, followed by testing an engine modified with Speed of Air pistons, and finally, retesting the stock engine to measure for any variance or regression. To accomplish this, DFC diesel built two identical LML Duramax long blocks, one with OE pistons and one with Speed of Air pistons. The original engine was removed from the test truck and all ancillary components (turbocharger, injectors and related components) were installed on the DFC long block with OE pistons. Once all testing was completed on the 'A' engine, the process was repeated by replacing the long block with the Speed of Air-equipped long block ('B' engine), using the same turbo and injectors from the first engine. Finally, the 'A' engine was re-installed and all test protocols were repeated a third time before re-installing the original factory engine at the conclusion of testing. Test profiles conducted were FTP-75, US06 and HWFET.

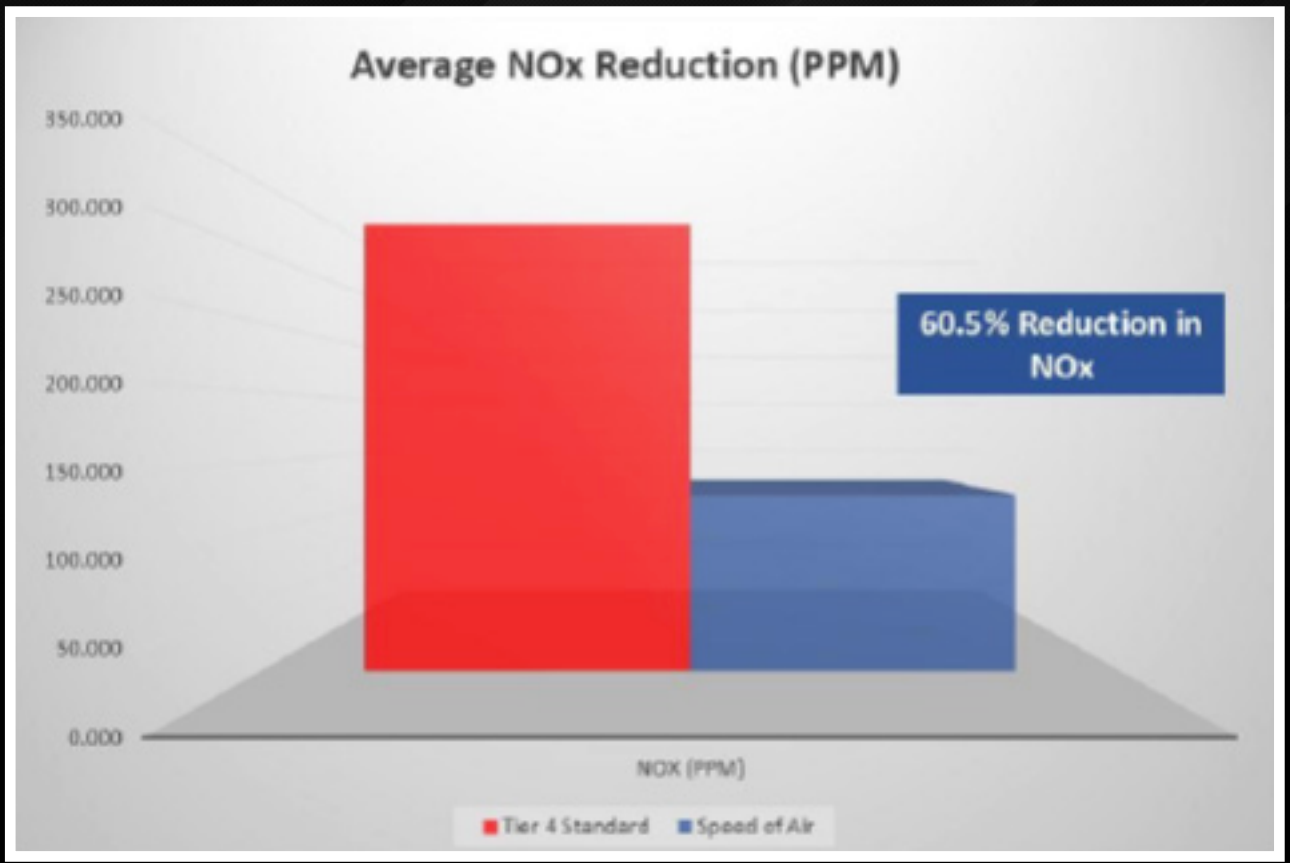
[1] The subject test vehicle is equipped with Exhaust Gas Recirculation (EGR), Diesel Oxygenating Catalyst (DOC), Diesel Particulate Filter (DPF) and Selective Catalyst Regeneration (SCR). Testing of raw exhaust gasses was done by by-passing the DOC, DPF and SCR. The EGR system remained active for all testing.

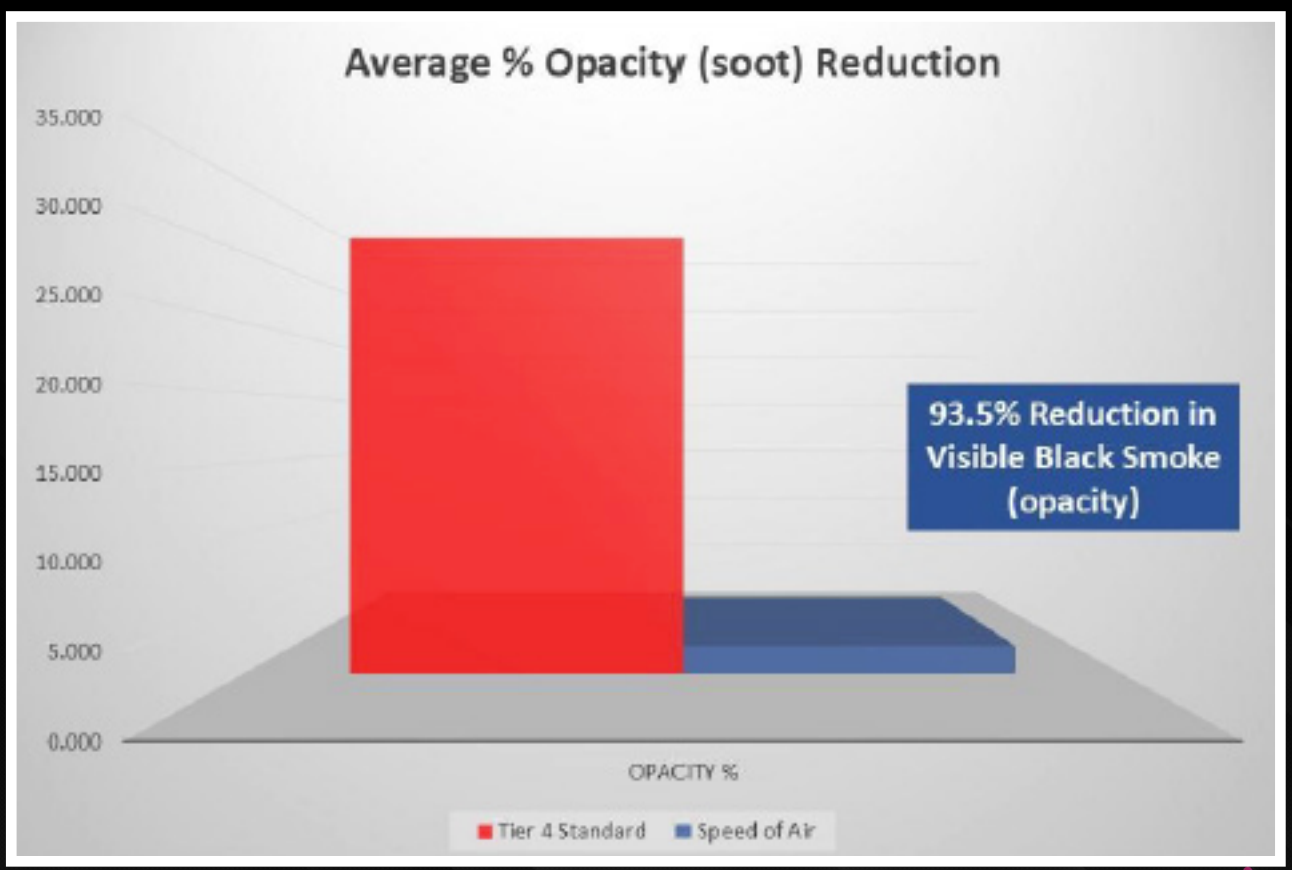
SUMMARY OF RESULTS

The following data are summarized in the graphs below:

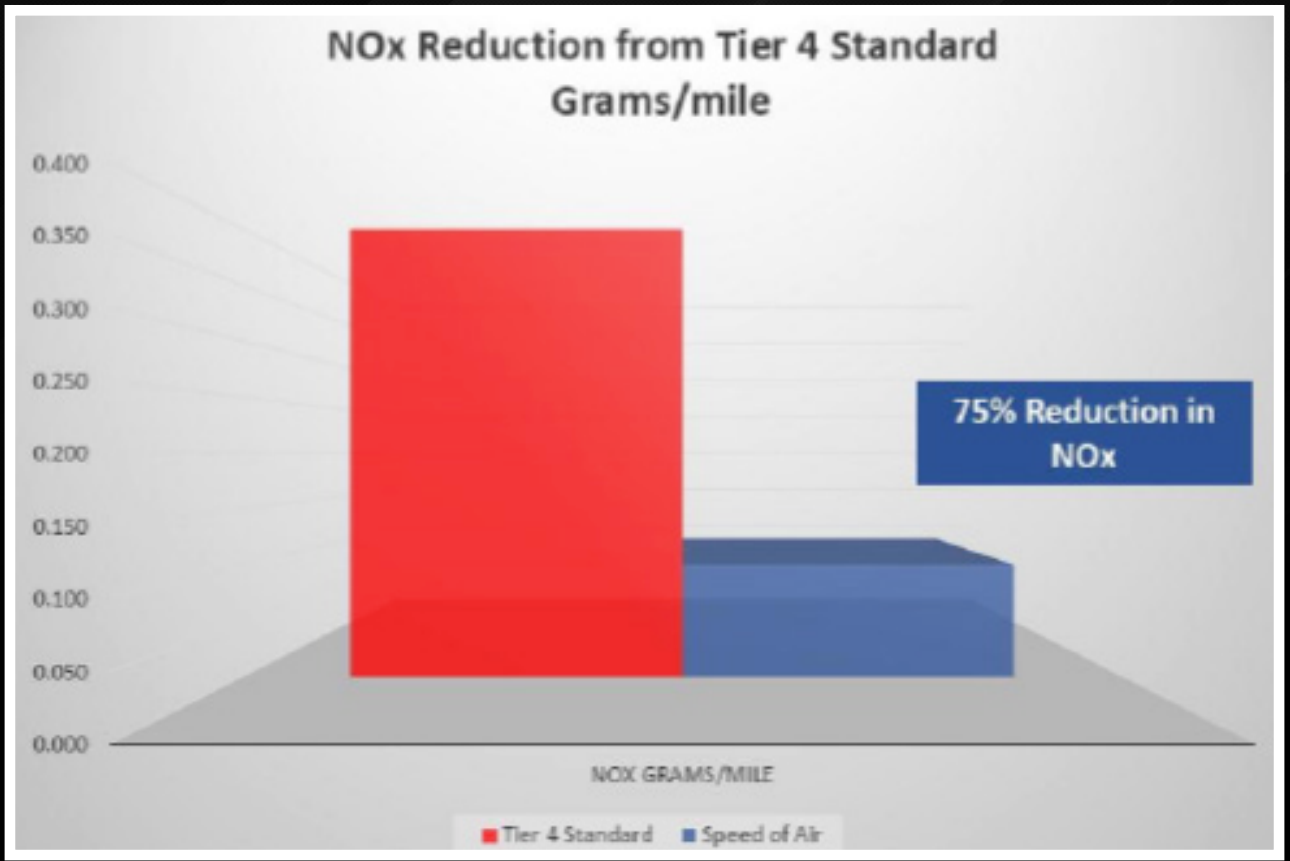
- Comparative measures of opacity (black smoke or soot) between the stock engine and Speed of Air equipped engine, taken from an untreated exhaust flow.
- Comparative measures of NOx between the stock engine and Speed of Air-equipped engine, taken from an untreated exhaust flow.
- Deviations from the 2015 EPA Tier 4 (FTP UL) emissions standard for the Speed of Air-equipped engine, measured at the tailpipe with after-gas systems intact.
- Horsepower and torque dynamometer results.

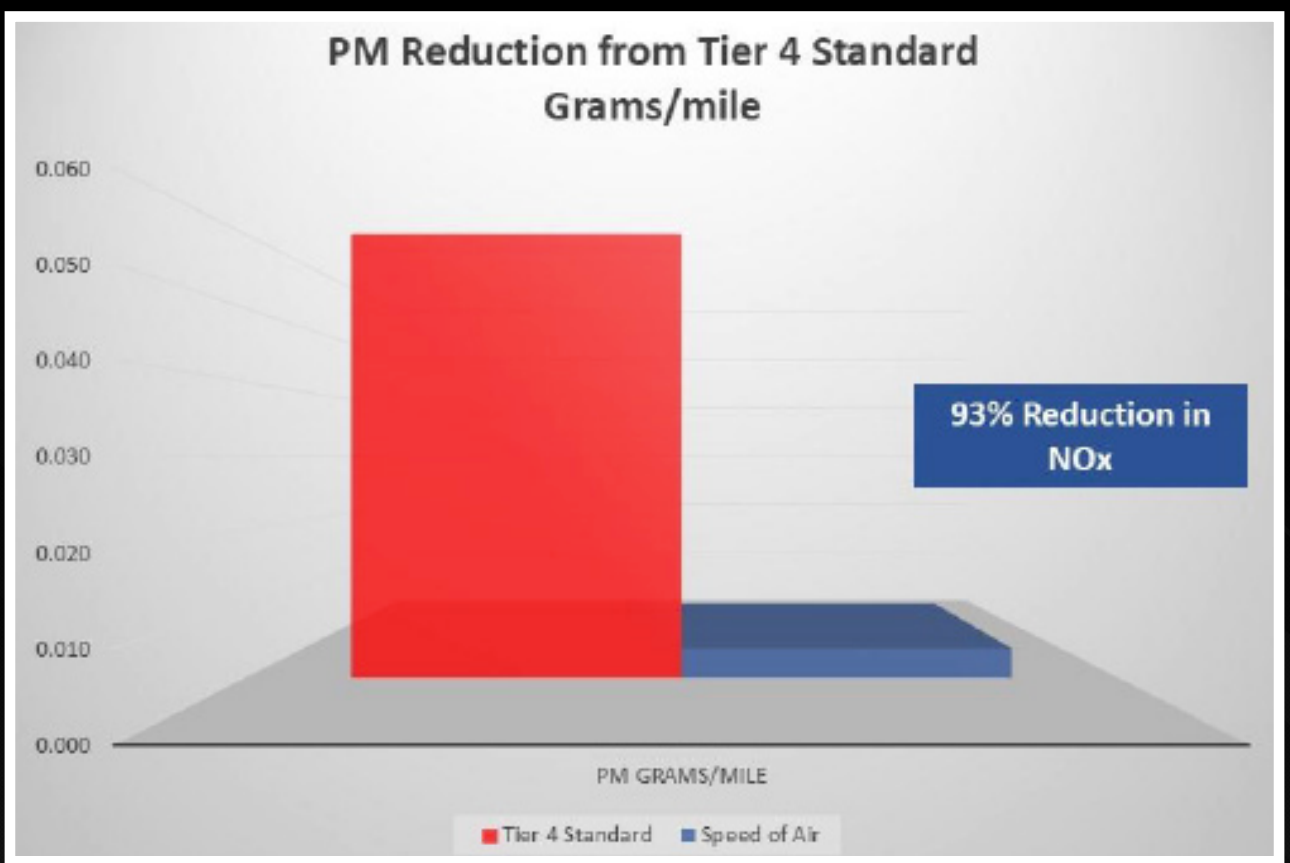
RAW GAS DATA (by-pass after-gas system)

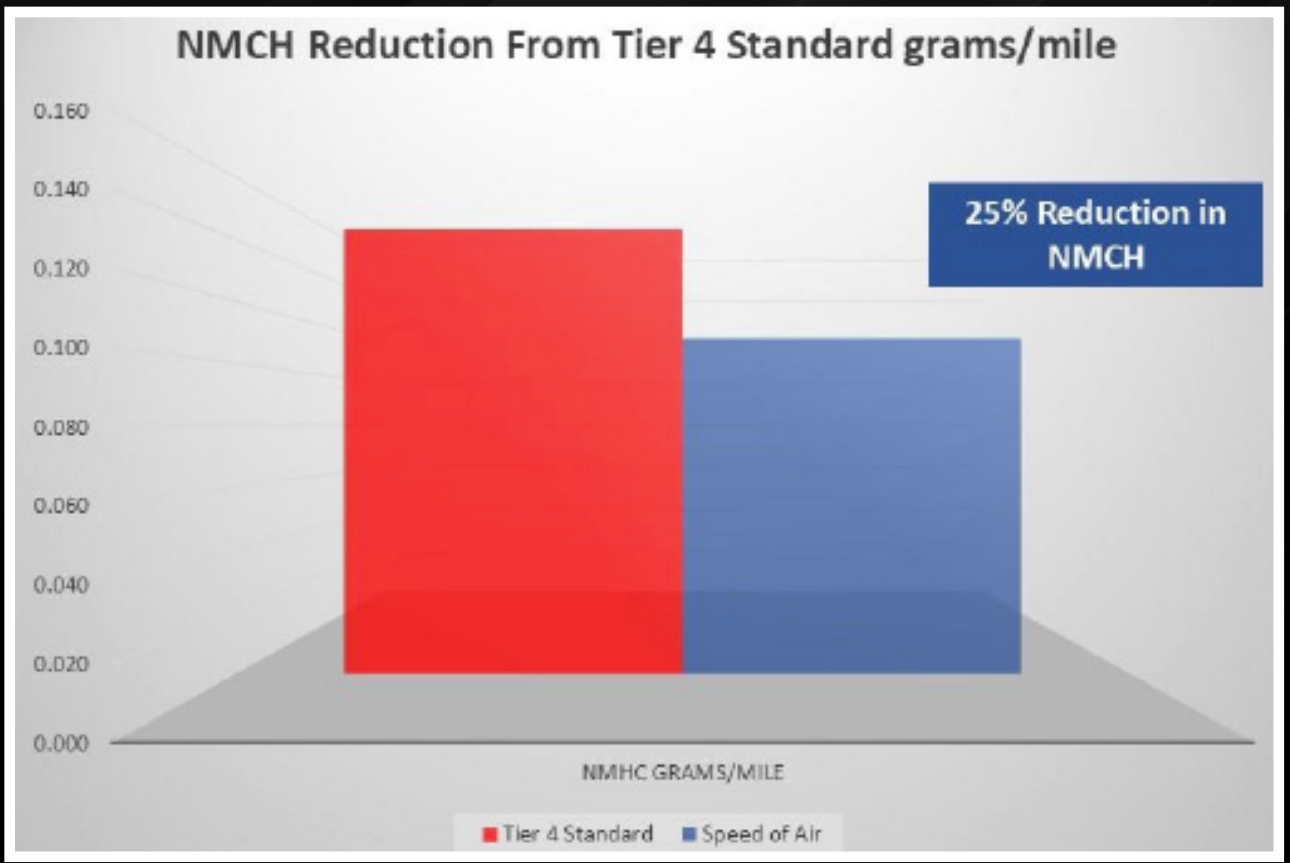


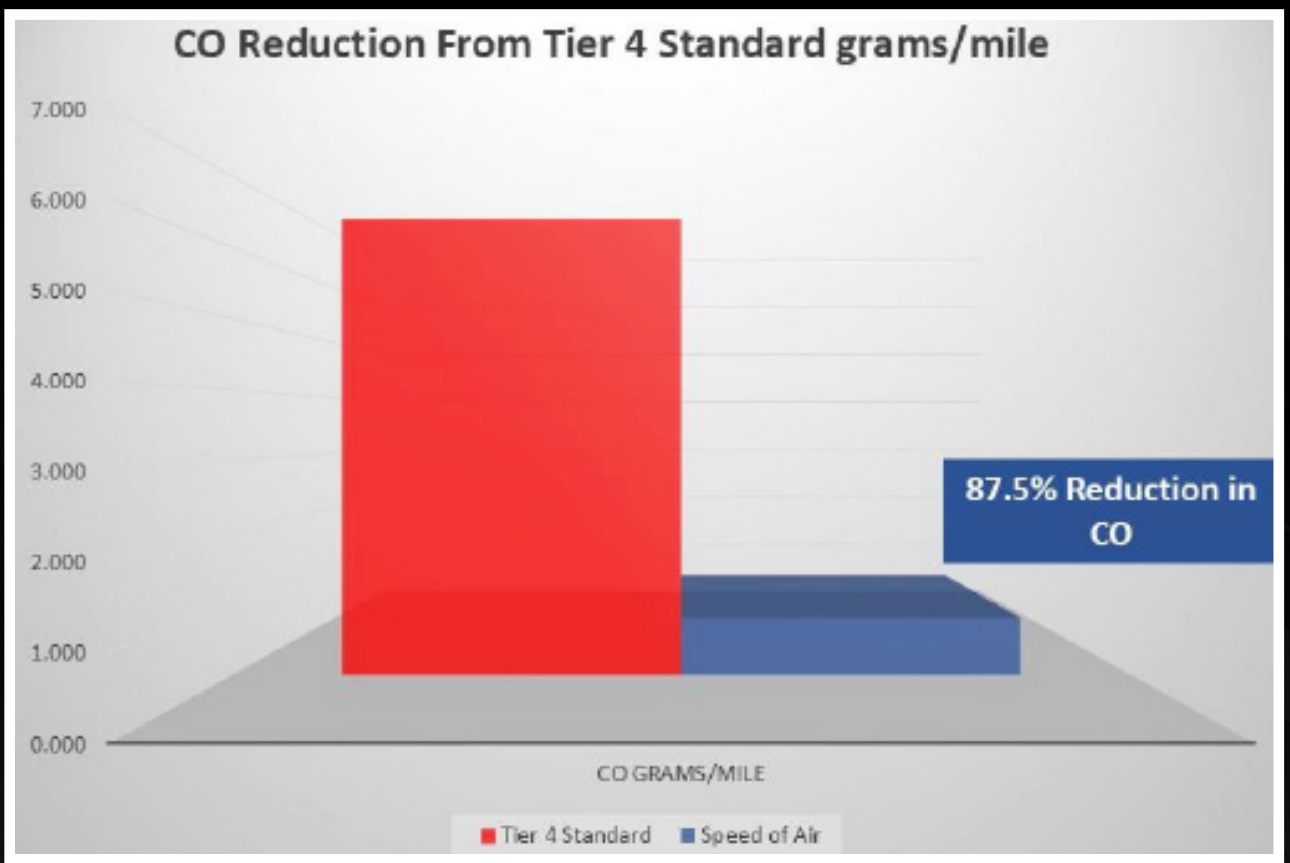


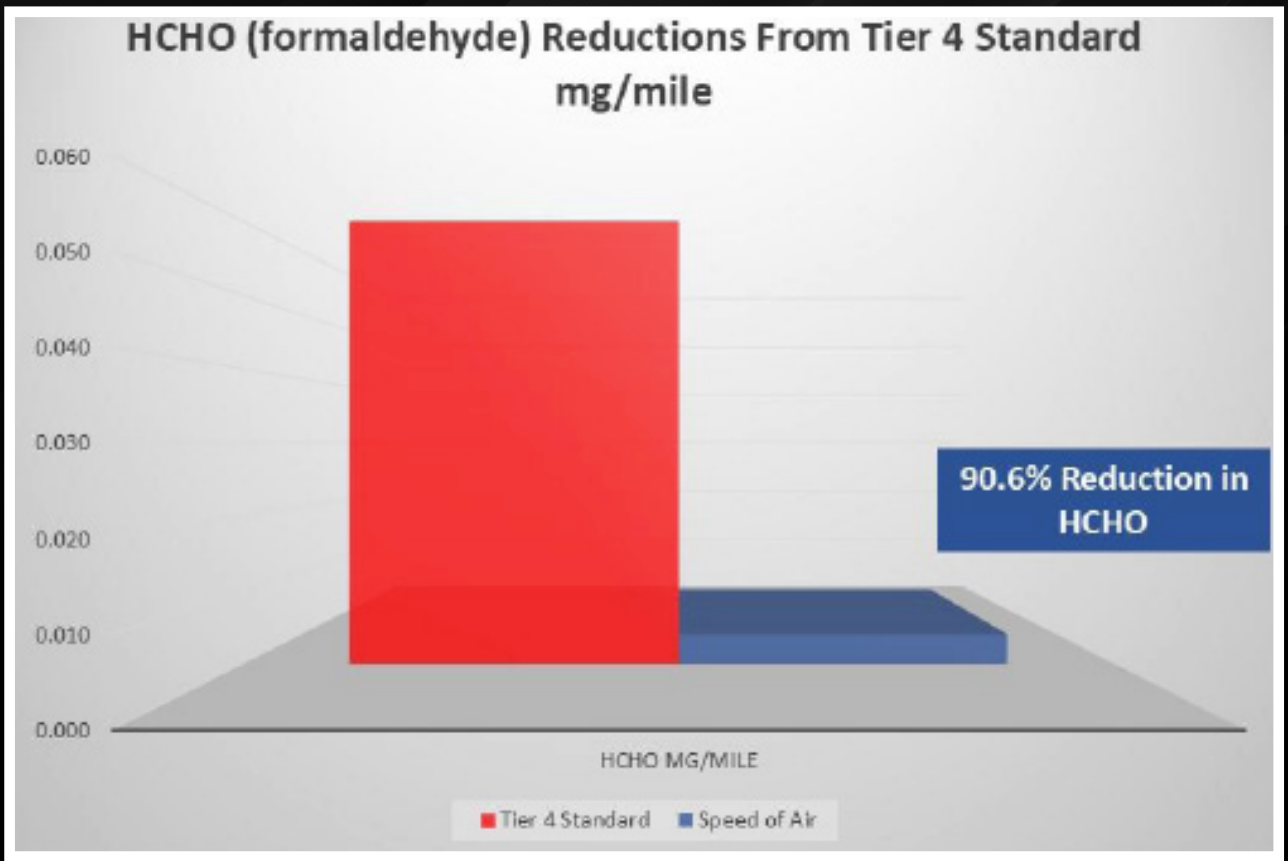
SPEED OF AIR-EQUIPPED ENGINE PERFORMANCE RELATIVE TO TIER 4 STANDARDS



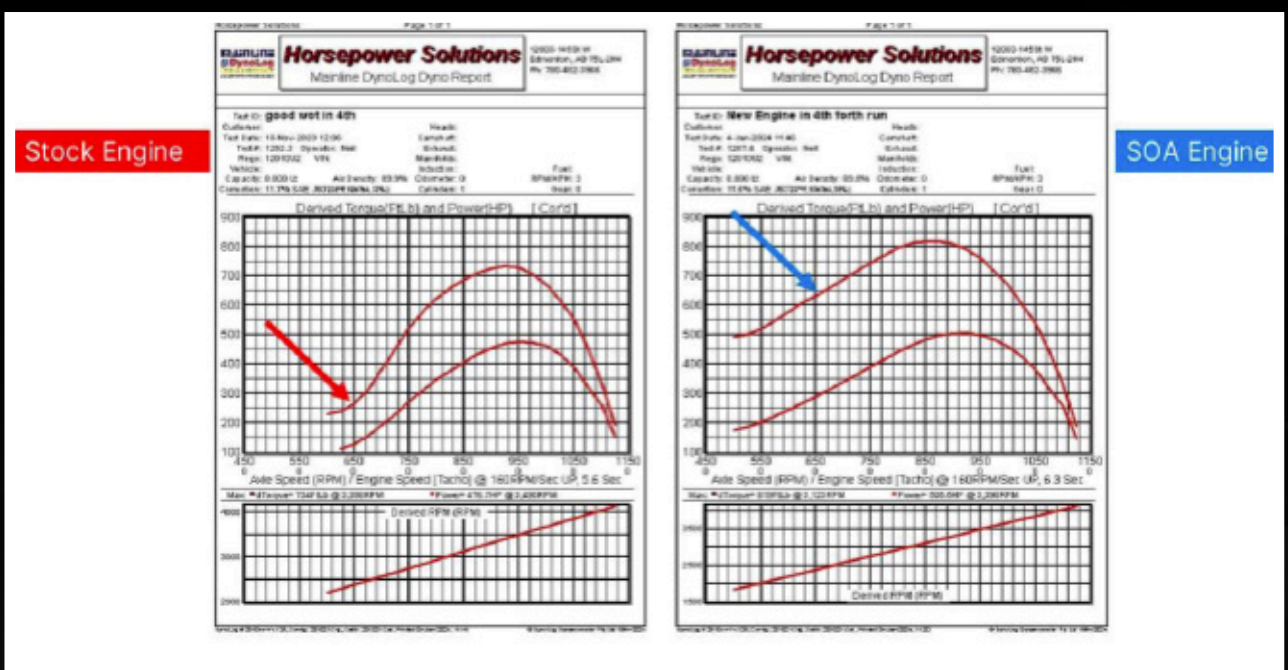



NMCH Reduction From Tier 4 Standard grams/mile
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
25% Reduction in NMCH
NMHC GRAMS/MILE
Tier 4 Standard
Speed of Air


CO Reduction From Tier 4 Standard grams/mile
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
87.5% Reduction in CO
CO GRAMS/MILE
Tier 4 Standard
Speed of Air



DYNAMOMETER RESULTS



ACCEPT: ☑

Signature: _____

Date: 9/6/24

EMISSIONS COMPLIANCE CENTER TEST SUMMARY

Lab Manager: Dan Ogden
Prepared by: Peter Treydte
04/17/2024

The SEMA Emissions Compliance Center is a Certification Ready Automotive Emissions Testing Laboratory located in Diamond Bar, California at 1577 Valley Vista Drive. The lab is equipped with a 48" AVL-Zollner 2 wheel-drive chassis dynamometer, AVL i60 CVS System, AVL i60 AMA emissions analyzer bench with HC, NO_x, CO, CO_2 and CH_4 analyzers, Dilution Tunnel with AVL SPC 478 Particulate Matter (PM) Sampler, and an AVL 4-station Canister Loading Bench.

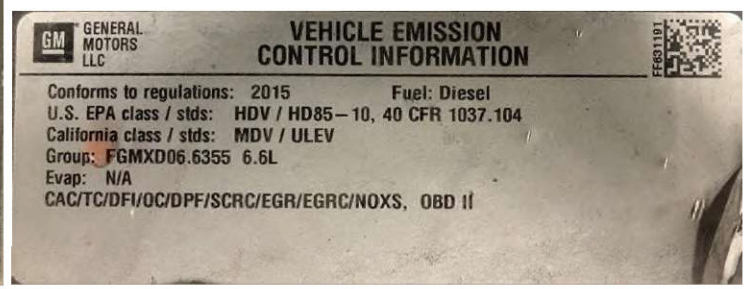
Client: Speed of Air
Contact: Chris Parkhurst (cjparkhurst@speedofair.com)
Device Under Test: Engine equipped with SOA Pistons
Part #(s): N/A

Test Vehicle: 2015 Chevrolet Silverado
VIN: 1GC1KVE88FF631191
Engine: 6.6L Turbodiesel

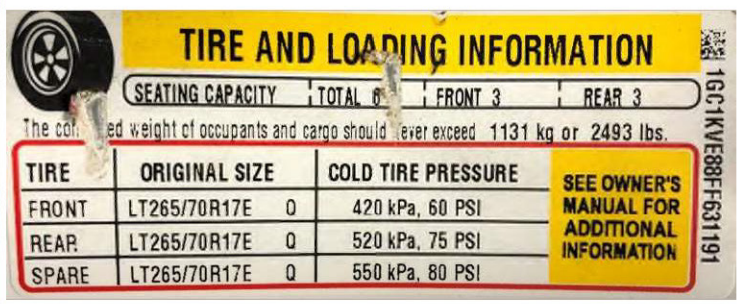
Test Group: FGMXD06.6355
CA Emissions Category: LEV2 ULEV
EPA Emissions Category: HDV

Test Vehicle

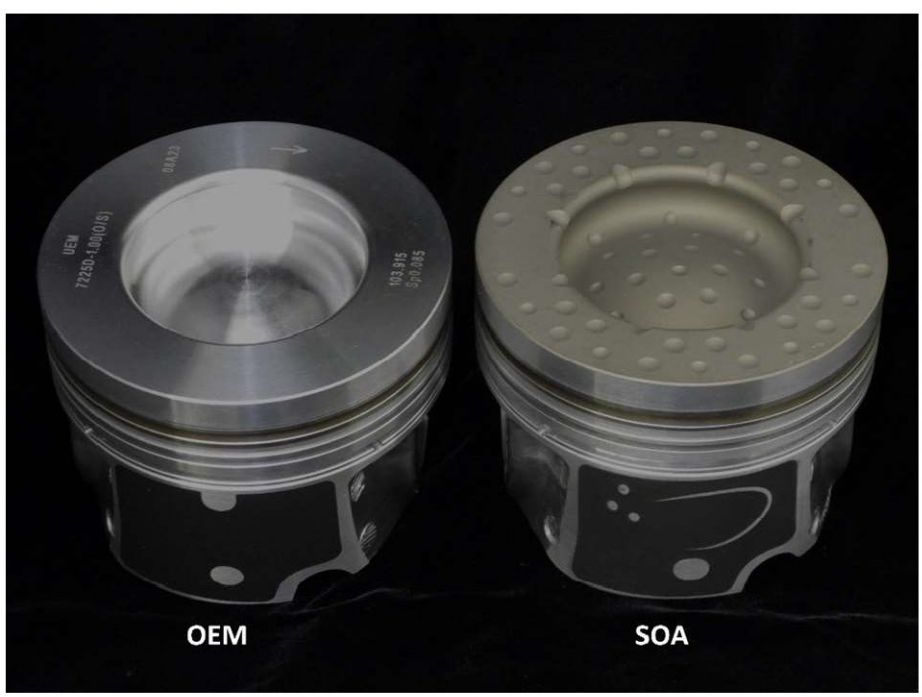
VIN Tag



VECI Label



Tire Info



Product

Test Fuel: Certification Diesel
Tire Size: LT265/70R17E
Vehicle Test Weight: 9500 lbs.
Dyno Set Coefficients: A=33.521, B=0.92428, C=0.069209
Dyno Target Coefficients: A=58.310, B=1.73450, C=0.063460

Notes:

- The test vehicle remained in the custody of the SEMA Emissions Lab staff throughout the testing process.
- The product was installed on the vehicle on or about 12/20/2023.
- Testing parameters taken from EPA CSI document page 4 and confirmed by CARB
- All emissions testing was conducted with an AVL road speed fan.

PROCEDURE SEQUENCE

Date	Condition	Odo Start	Odo End	Event	File name
11/13/2023	Baseline			Vehicle Check-in	
				OBD, As Received	
11/13/2023	Baseline			Road Load Determination	
11/13/2023	Baseline	70739	70746	Prep	UDDS_20231113_05_TC1
11/13/2023	Baseline			6-36 hour soak	
11/14/2023	Baseline	70746	70757	FTP-75	FTP75_20231114_01_TC1
11/14/2023	Baseline	70757	70777	HWFET	HWFET_HWFET_20231114_02_TC1
11/14/2023	Baseline	70777	70793	US06 (Void, regen)	US06_US06_20231114_03_TC1
11/14/2023	Baseline	70793	70808	US06 (Void, regen)	US06_US06_20231114_04_TC1
11/14/2023	Baseline	70808	70815	Prep	UDDS_20231114_05_TC1
11/14/2023	Baseline	70815	70830	US06 (Void, regen)	US06_US06_20231114_06_TC1
11/14/2023	Baseline	70830	70837	Prep	UDDS_20231114_07_TC1
11/14/2023	Baseline	70837	70843	Prep	no report
11/14/2023	Baseline	70837	70855	US06 (Void, regen)	US06_US06_20231114_11_TC1
11/14/2023	Baseline	70855	70862	Prep	UDDS_20231114_12_TC1
11/14/2023	Baseline			6-36 hour soak	
11/15/2023	Baseline	70862	70873	FTP-75	FTP75_20231115_01_TC1
11/15/2023	Baseline	70873	70893	HWFET	HWFET_HWFET_20231115_02_TC1
11/15/2023	Baseline	70893	70909	US06	US06_US06_20231115_03_TC1
11/15/2023	Baseline	70909	70924	US06	US06_US06_20231115_04_TC1
				Product Installation	
				Mileage Accumulation	
2/27/2024	Modified	79141	79141	OBD, Post Mileage	
2/28/2024	Modified	79169	79176	Prep	UDDS_20240228_04_TC1
2/29/2024	Modified	79176	79187	FTP-75	FTP75_20240229_05_TC1
2/29/2024	Modified	79187	79207	HWFET	HWFET_HWFET_20240229_06_TC1
2/29/2024	Modified	79207	79223	US06	US06_US06_20240229_07_TC1
2/29/2024	Modified	79223	79230	Prep	UDDS_20240229_08_TC1
3/1/2024	Modified	79230	79241	FTP-75	FTP75_20240301_05_TC1
3/1/2024	Modified	79241	79261	HWFET	HWFET_HWFET_20240301_06_TC1
3/1/2024	Modified	79261	79270	US06 (void, system error)	no report
3/1/2024	Modified	79270	79286	US06	US06_US06_20240301_09_TC1
3/1/2024	Modified	79286	79286	OBD, Post Test	

OBD SUMMARY

Date	Mileage	Report Type	Misfire	Fuel System	Component	NMHC Catalyst	NOx Aftertreatment	Boost Pressure	Exhaust Gas Sensor	PM Filtering	EGR/VVT	MIL Status	OBD Codes
2/27/2024	79141	As Received	C	C	C	C	C	C	C	C	C	OFF	None
3/1/2024	79286	Post-Test	C	C	C	C	C	C	C	C	C	OFF	None
C=Monitor Complete													
I=Monitor Incomplete													

RESULTS SUMMARY

Date Tested	Date Prepared	Prepared By	Approved By
2/28/2024	5/14/2024	P. Treydte	P. Treydte

Full DFs					Vehicle Mileage=	79176
NMHC	NOX	CO	PM	HCHO	Ex. Useful Life=	120000
0.0536	1.305	0.36	0.001	0	UL Factor=	*64.8%*

	NMHC	NOx	NMHC+NOx	CO	PM	HCHO
FTP Test Result #1	0.1088	0.1319		0.6799	0.0031	0.0020
FTP Test Result #2	0.0704	0.1559		0.6690	0.0028	0.0010
FTP Average	*0.0896*	*0.1439*		*0.6745*	*0.0030*	*0.0015*
DAF	0	0.044		0	0.001	0
Additive DF	*0.0189*			*0.1267*	*0.0004*	*0.0000*
Multiplicative DF		*1.1073*				
Result	*0.1085*	*0.2081*	*0.3165*	*0.8011*	*0.0043*	*0.0015*

HWFET Test Result #1		0.0634
HWFET Test Result #2		0.0981
HWFET Average		*0.0808*
DAF		0.044
Additive DF		
Multiplicative DF		*1.1073*
Result		*0.1381*

	NMHC	NOx	CO	PM	HCHO*
FTP UL Std.	0.143	0.2	6.4	0.06	16
Final Result	***0.108***	***0.2***	***0.8***	***0.004***	***1.5***
% of Std	***75.8%***	***100.0%***	***12.5%***	***7.2%***	***9.4%***
PASS/FAIL	**PASS**	**PASS**	**PASS**	**PASS**	**PASS**

	NOx
HWFET UL Std.	0.4
Final Result	***0.1***
% of Std	***34.5%***
PASS/FAIL	**PASS**

Results Summary Notes

- *All values shown in grams per mile unless marked with a *, in which case it is milligrams per mile*
- *Light grey cells with italicized numbers are calculated*
- *DFs taken from EPA Certificate Summary Data and adjusted by 45.1% for vehicle mileage of 56,290*

SPEED OF AIR®
ENGINE TECHNOLOGIES

SEMA GARAGE
CERTIFICATE OF COMPLIANCE
WITH EPA TAMPERING POLICY OF 2020

VOLUNTARY LABELING CATEGORY 2

This product is covered under a SEMA Certified Emissions Certification or has otherwise met the requirements of the EPA's Tampering Policy and is emissions legal for sale in states that do not mandate an EO.

Certificate Issued To:	Speed of Air Engine Technologies	**Effective Date:**	10/2/2024
		Revision Date:	N/A
Certificate Number:	SC-SOA01-0119	**Revision No.:**	N/A

Dean Schlingmann
Director of Emissions Compliance

Test Vehicle (Year, Make, Model):	2015 Chevrolet Silverado 2500		
Test Group Name:	FGMXD06.6355	**Exhaust Emissions Standards:**	LEV2 ULEV / HDV1
Exhaust Emissions Test Fuel Type:	CERTIFICATION DIESEL	**Engine Displacement:**	6.6L
Product Category:	Other	**Product Name:**	Engine Piston Kit

Components Included with Device:
Pistons, piston ring set, pins, retainer clips.

Pursuant to the EPA tampering policy of 2020, and in accordance with 40 CFR Part 86, this certificate of compliance is hereby issued with respect to test vehicles which have been found to conform to the requirements of the regulations on Control of Air Pollution from New & In Use Motor Vehicles and which represent the motor vehicle models listed on this certificate by test group and evaporative/refueling emission family, more fully described in the application of the above named device manufacturer. Vehicles covered by this certificate have demonstrated compliance with the applicable emission standards as more fully described in the SEMA test report, with the named device installed in accordance with the manufacturer's installation instructions.

SEMA Certified is a voluntary program to independently test, evaluate, and verify the emissions performance of a manufacturer's product. SEMA/SEMA Garage warrants only the accuracy of the information and representations published herein. SEMA/SEMA Garage, EXCEPT AS OTHERWISE EXPRESSLY PROVIDED HEREIN, DISCLAIMS ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, APPLICATION OF THE PROGRAM AND NONINFRINGEMENT. SEMA/SEMA Garage further disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the use of, or reliance on, SEMA Certified. SEMA Certified is not an agent of the U.S Government, the EPA, or any other federal or state regulatory agency.

Issuance of this certificate is evidence that the specified device has been tested on a vehicle representative of the models listed, and the results have been determined to be in compliance with the applicable Federal standards. It is further stated that the issuance of this certificate is in part predicated on information provided and attested to by the applicant. If any of this information is later deemed to be false, inaccurate, misleading, or incomplete, this certificate is no longer valid.

Any party participating in the SEMA Certified should rely on their own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonableness in any given circumstances.

Users of SEMA Certified should be aware that these documents may be superseded at any time by the issuance of an update. SEMA/SEMA Garage reserve the sole, exclusive right to issue any interpretive statements related to SEMA Certified.

Use or reference to SEMA Certified, and any related intellectual property, must be complete and accurate. Any deletions, additions, misrepresentations about, or changes to this Certificate may, at the sole discretion of SEMA/SEMA Garage, void the Certification and impact the party's future ability to participate in the SEMA Program. Any violator of the foregoing agrees to indemnify and hold SEMA/SEMA Garage harmless as a condition of their participation in the SEMA Certified Program.

This certificate does not constitute an endorsement of any claims by the applicant concerning the benefits of this device.

Summary of Tests Performed

Test	Results (Cert | Standard | %)																					
FTP	NMHC			CO			PM			HCHO			NOx									
	0.108	0.143	76%	0.8	6.4	13%	0.004	0.06	7%	1.5	16	9%	0.2	0.2	100%							
HWFET	NOx																					
	0.1	0.4	25%																			

Pertinent Information: Internal engine parts.

	Applicable Models	SC-SOA01-0119

Device P/N	Make	Model	Eng. Disp.	Eng. Desc.	Fuel Type	Model Year	Test Group (*Excluded)
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2011	BGMXD06.6355
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2012	CGMXD06.6355
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2013	DGMXD06.6355
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2014	EGMXD06.6355
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2015	FGMXD06.6355
DU10063	GMC	SIERRA 2500	6.6L	TURBOCHARGED	DIESEL	2016	GGMXD06.6355
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2011	BGMXD06.6365
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2012	CGMXD06.6365
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2013	DGMXD06.6365
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2014	EGMXD06.6365
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2015	FGMXD06.6365
DU10063	GMC	SIERRA 3500	6.6L	TURBOCHARGED	DIESEL	2016	GGMXD06.6365
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2011	BGMXD06.6355
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2012	CGMXD06.6355
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2013	DGMXD06.6355
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2014	EGMXD06.6355
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2015	FGMXD06.6355
DU10063	CHEVROLET	SILVERADO 2500	6.6L	TURBOCHARGED	DIESEL	2016	GGMXD06.6355
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2011	BGMXD06.6365
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2012	CGMXD06.6365
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2013	DGMXD06.6365
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2014	EGMXD06.6365
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2015	FGMXD06.6365
DU10063	CHEVROLET	SILVERADO 3500	6.6L	TURBOCHARGED	DIESEL	2016	GGMXD06.6365

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