

**Test Method D8226 for Measurement of the Effects of Automotive Engine Oils on  
the Fuel Economy of Passenger Cars and Light Trucks in the Sequence VIF Spark  
Ignition Engine  
Report Cover Sheet**

Version:

Conducted For:

	<b>V = Valid</b>
	<b>I = Invalid</b>
	<b>N = Results cannot be interpreted (refer to comment section)</b>

	<b>NR = Non-reference Oil Test</b>
	<b>RO = Reference Oil Test</b>

Lab:	Date Completed:	Time Completed:	
<b>Test Number</b>			
Test Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			
Alternate Codes			

In my opinion this test \_\_\_\_\_ been conducted in a valid manner in accordance with the Test Method D8226 and the appropriate amendments through the Information Letter System. The remarks included in the report describe the anomalies associated with this test.

Submitted By: \_\_\_\_\_

Testing Laboratory

Signature

Typed Name

Title

## Form 2

### Sequence VIF

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<sup>A</sup> ACC Conformance Statement is required only for ACC registered tests

## Sequence VIF

### Form 3

#### Summary of Test Method

The Sequence VIF is an engine dynamometer test that measures a lubricant's ability to improve the fuel economy of passenger cars and light-duty trucks. The method compares the performance of a test lubricant to the performance of a baseline lubricant over six different stages of operation.

A General Motors 3.6L (LY7) V6, 4-cycle engine is used as the test apparatus. The engine incorporates Dual Overhead Camshafts, 4 Valves / Cylinder, Dual Stage Plenum Induction Manifold, 94x85.6mm Bore & Stroke, with 10.2:1 compression ratio.

The Sequence VIF test incorporates a flush and run type procedure. Each test consists of two 6-stage fuel economy measurements on baseline oil (BL), one at the beginning of the test and one at the end. The test oil is evaluated in between the two baseline runs. The test oil is initially aged during 16 hours of engine operation at 2250 r/min and 120°C oil temperature. After the initial aging, a 6-stage fuel economy measurement is taken. The test oil is then aged an additional 109 hours at an engine speed of 2250 r/min and 120°C oil temperature. Following this final aging, the test oil once again goes through a 6-stage fuel economy measurement. The two fuel economy measurements taken on the baseline oil (BL) and a final value for Fuel Economy Improvement is calculated for the test oil.

Below is a summary of the operation conditions for the aging and 6-stage fuel economy portions of the test.

<b>Fuel Economy Measurement and Aging Condition</b>				
<b>FE Stage</b>	<b>Speed (r/min)</b>	<b>Torque (N-m)</b>	<b>Oil Temp. (°C)</b>	<b>Coolant Temp. (°C)</b>
1	2000	105	100	94
2	2000	105	65	65
3	1500	105	100	94
4	695	20	100	94
5	695	20	35	35
6	695	40	100	94

<b>Aging Stage</b>	<b>Speed (r/min)</b>	<b>Torque (N-m)</b>	<b>Oil Temp. (°C)</b>	<b>Coolant Temp. (°C)</b>
1 & 2	2250	110	120	110

**Sequence VIF  
Form 4  
Test Result Summary  
Non-Reference & Reference Oil Tests**

Lab:	Date Completed:	Time Completed:
Test Number		
Stand:	Runs On The Stand:	Engine No.
Oil Code:	Engine Serial Number:	
Number of Full Length Tests Since Stand Calibration <sup>B</sup>		
Formulation/Stand Code:		

Test Documentation					
	BL Before 1	BL Before 2	BL Before 3	Test Oil	BL After
Start Date					
Start Time					
End Date					
End Time					
Oil Test Length, hhh:mm					
Calibration Oil Batch					
Flush Oil Batch					
Laboratory Oil Code					
SAE Viscosity Grade					
TMC Oil Code (Reference Oil Tests Only)					
New Oil Viscosity @ 40 °C, cSt					
New Oil Viscosity @ 100°C, cSt					
EOT Oil Viscosity @ 40 °C, cSt					
EOT Oil Viscosity @ 100°C, cSt					
Total Test Length, hhh:mm					
Total Engine Hours @ EOT					
Fuel Batch @ Start of Test					
Fuel Batch @ End of Test					
Test Hour During Which Fuel Batch was Changed					

Overall Results						
	BL Oil				Test Oil	
	Before 1	Before 2	Before 3	After	Phase I	Phase II
Fuel Consumed, Unweighted, kg						
Fuel Consumed, weighted, kg						
Shift Delta, % <sup>A</sup>						
Fuel Economy Improvement, %						
FEI Engine Hour Adjustment, %						
FEI Industry Correction Factor, %						
FEI Severity Adjustment, % (non-reference tests only)						
FEI Final Result, %						
FEI Sum, sum of FEI1 and FEI2 final results						
Total Oil Consumption, ml						

<sup>A</sup> Calculate Baseline shift % using unweighted fuel consumed values. When a 3<sup>rd</sup> set of BL Before is used, calculate BL shift after using the BL Before 3 for BL Before 2

<sup>B</sup> Non reference tests only, full length tests including current one, if full length

**Sequence VIF  
Form 5  
Operational Data Analysis**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>BL Before Test Oil 1</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>BL Before Test Oil 2</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

**Sequence VIF  
Form 6  
Operational Date Analysis**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>BL Before Test Oil 3</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>Test Oil Phase I</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

**Sequence VIF  
Form 7  
Operational Date Analysis**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>Test Oil Phase II</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

<b>Computed Averages</b>							
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V. %</b>	<b>Stage Length h</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>BL After Test Oil</b>	1			0.5	21.99	0.300	
	2			0.5	21.99	0.032	
	3			0.5	16.49	0.310	
	4			0.5	1.46	0.174	
	5			0.5	1.46	0.011	
	6			0.5	2.91	0.172	
<b>Total Fuel Consumed</b>							

**Sequence VIF  
Form 8  
General Parameter Listing**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**16 Hour Aging**

	Spec	Average	Max	Min
1. Speed, r/min	<b>2250 ±5</b>			
2. Torque, N-m	<b>110 ±0.10</b>			
3. Oil Gallery Temperature, °C	<b>120 ±2</b>			
4. Coolant Inlet Temperature, °C	<b>110 ±2</b>			
5. Oil Circulation Temperature, °C	<b>Record</b>			
6. Coolant Out Temperature, °C	<b>Record</b>			
7. Intake Air Temperature, °C	<b>29 ±2</b>			
8. Fuel to Flowmeter Temperature, °C	<b>20-32</b>			
9. Fuel to Fuel Rail Temperature, °C	<b>22 ±2</b>			
10. Load Cell Temperature, °C	<b>Record</b>			
11. Oil Heater Temperature, °C	<b>205 max</b>			
12. Intake Air Pressure, kPa	<b>0.05 ±0.02</b>			
13. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>			
14. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>			
15. Intake Manifold Pressure, kPa abs.	<b>Record</b>			
16. Exhaust Back Pressure, kPa abs.	<b>105 ±0.20</b>			
17. Engine Oil Pressure, kPa	<b>Record</b>			
18. Coolant Flow, L/min	<b>80 ±4</b>			
19. Fuel Flow, kg/h	<b>Record</b>			
20. Intake Air Humidity, grains/kg	<b>11.4±0.8</b>			
21. Air/Fuel Ratio	<b>Record</b>			
22. Crankcase Pressure, kPa	<b>0.00 ±0.25</b>			



**Sequence VIF  
Form 9  
General Parameter Listing**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**109 Hour Aging**

	Spec	Average	Max	Min
1. Speed, r/min	<b>2250 ± 5</b>			
2. Torque, N-m	<b>110 ±0.10</b>			
3. Oil Gallery Temperature, °C	<b>120±2</b>			
4. Coolant Inlet Temperature, °C	<b>110 ±2</b>			
5. Oil Circulation Temperature, °C	<b>Record</b>			
6. Coolant Out Temperature, °C	<b>Record</b>			
7. Intake Air Temperature, °C	<b>29 ±2</b>			
8. Fuel to Flowmeter Temperature, °C	<b>20-32</b>			
9. Fuel to Fuel Rail Temperature, °C	<b>22 ±2</b>			
10. Load Cell Temperature, °C	<b>Record</b>			
11. Oil Heater Temperature, °C	<b>205 max</b>			
12. Intake Air Pressure, kPa	<b>0.05 ±0.02</b>			
13. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>			
14. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>			
15. Intake Manifold Pressure, kPa abs.	<b>Record</b>			
16. Exhaust Back Pressure, kPa abs.	<b>105 ± 0.20</b>			
17. Engine Oil Pressure, kPa	<b>Record</b>			
18. Coolant Flow, L/min	<b>80±4</b>			
19. Fuel Flow, kg/h	<b>Record</b>			
20. Intake Air Humidity, grains/kg	<b>11.4 ±0.8</b>			
21. Air/Fuel Ratio	<b>Record</b>			
22. Crankcase Pressure, kPa	<b>0.00 ±0.25</b>			

**Sequence VIF  
Form 10  
General Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**BL Before Test Oil 1**

**General Parameters**

	Spec	Stage Average					
		1	2	3	4	5	6
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>≤ 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 11  
General Parameter Summary**

Lab	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**BL Before Test Oil 2**

**General Parameters**

	Spec	Stage Average					
		1	2	3	4	5	6
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>≤ 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 12  
General Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**BL Before Test Oil 3**

**General Parameters**

		Stage Average					
		1	2	3	4	5	6
	<b>Spec</b>						
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>≤ 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 13  
General Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**Test Oil Phase I  
General Parameters**

	Spec	Stage Average					
		1	2	3	4	5	6
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>&lt; 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 14  
General Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**Test Oil Phase II  
General Parameters**

		Stage Average					
	Spec	1	2	3	4	5	6
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>&lt; 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 15  
General Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**BL After Test Oil Phase**

**General Parameters**

		Stage Average					
	Spec	1	2	3	4	5	6
1. Oil Circulation Temperature, °C	<b>Record</b>						
2. Coolant Out Temperature, °C	<b>Record</b>						
3. Fuel to Flowmeter Temp., °C	<b>26±2</b>						
4. Load Cell Power Supply Temp., °C	<b>Record</b>						
5. Load Cell Temperature, °C	<b>Record</b>						
6. Delta Load Cell Temperature, °C <sup>A</sup>	<b>≤ 12</b>						
7. Oil Heater Temperature, °C	<b>205 max</b>						
8. Intake Air Pressure, kPa	<b>0.05 ± .02</b>						
9. Fuel to Flowmeter Pressure, kPa	<b>110±10</b>						
10. Fuel to Fuel Rail Pressure, kPa	<b>405±10</b>						
11. Intake Manifold Pressure, kPa abs.	<b>Record</b>						
12. Engine Oil Pressure, kPa	<b>Record</b>						
13. Coolant Flow, L/min	<b>80 ± 4</b>						
14. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>						
15. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>						
16. Barometric Pressure, kPa	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings

**Sequence VIF  
Form 16  
Critical Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**Stage 1 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>2000±5</b>						
Torque, N-m	<b>105±0.10</b>						
Oil Gallery Temperature, °C	<b>100±2</b>						
Coolant Inlet Temperature, °C	<b>94±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>105±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

**Stage 2 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>2000±5</b>						
Torque, N-m	<b>105±0.10</b>						
Oil Gallery Temperature, °C	<b>65±2</b>						
Coolant Inlet Temperature, °C	<b>65±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>105±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings.



**Sequence VIF  
Form 17  
Critical Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**Stage 3 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>1500±5</b>						
Torque, N-m	<b>105±0.10</b>						
Oil Gallery Temperature, °C	<b>100±2</b>						
Coolant Inlet Temperature, °C	<b>94±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>105±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

**Stage 4 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>695±5</b>						
Torque, N-m	<b>20±0.10</b>						
Oil Gallery Temperature, °C	<b>100±2</b>						
Coolant Inlet Temperature, °C	<b>94±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>104±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings.

**Sequence VIF  
Form 18  
Critical Parameter Summary**

Lab:	Date Completed:	Time Completed:	
Test Number			
Stand:	Runs On The Stand:	Engine No.	Runs on Engine:
Oil Code:			
Formulation/Stand Code:			

**Stage 5 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>695±5</b>						
Torque, N-m	<b>20±0.10</b>						
Oil Gallery Temperature, °C	<b>35±2</b>						
Coolant Inlet Temperature, °C	<b>35±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>104±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

**Stage 6 Average**

	Spec	BL Before Test Oil 1	BL Before Test Oil 2	BL Before Test Oil 3	Test Oil Phase I	Test Oil Phase II	BL After Test Oil
Speed, r/min	<b>695±5</b>						
Torque, N-m	<b>40±0.10</b>						
Oil Gallery Temperature, °C	<b>100±2</b>						
Coolant Inlet Temperature, °C	<b>94±2</b>						
Intake Air Temperature, °C	<b>29±2</b>						
Fuel to Fuel Rail Temperature, °C	<b>22±2</b>						
Exhaust Back Pressure, kPa abs.	<b>104±0.17</b>						
Fuel Flow, kg/h	<b>Record</b>						
Air/Fuel Ratio	<b>14.00–15.00</b>						
Delta AFR <sup>A</sup>	<b>≤ .50</b>						
BSFC, kg/Kw-h	<b>Record</b>						
BSFC, Standard Deviation	<b>Record</b>						
BSFC C.V., %	<b>Record</b>						

<sup>A</sup> Difference between the maximum stage average reading of the entire test and the individual stage average readings.







**Sequence VIF  
Form 20  
Test Fuel Analysis**

Laboratory:	EOT Date:	EOT Time:
Test Number:		
Oil Code:		
Formulation/Stand Code:		

TEST	Method	Units	Haltermann Specifications			Results
			Min	Target	Max	
Distillation – IBP	ASTM D86	°C	23.9		35.0	
5%		°C				
10%		°C	48.9		57.2	
20%		°C				
30%		°C				
40%		°C				
50%		°C	93.3		110.0	
60%		°C				
70%		°C				
80%		°C				
90%		°C	151.7		162.8	
95%		°C				
Distillation-EP			°C			212.8
Recovery		Vol %		Report		
Residue		Vol %		Report		
Loss		Vol %		Report		
Gravity@60°F/60°F	ASTM D4052	°API	58.7		61.2	
Density @ 15°C	ASTM D4052	kg/l	0.734		0.744	
Reid Vapor Pressure	D5191	kPa	60.1		63.4	

**Sequence VIF**  
**Form 21**  
**Test Fuel Analysis (cont)**

Laboratory:	EOT Date:	EOT Time:
Test Number:		
Oil Code:		
Formulation/Stand Code:		

TEST	Method	Units	Haltermann Specifications			Results
			Min	Target	Max	
Carbon	ASTM D3343	wt fraction		Report		
Carbon	ASTM D5291	wt fraction		Report		
Hydrogen	ASTM D5291	wt fraction		Report		
Hydrogen/Carbon ratio	ASTM D5291	mole/mole		Report		
Oxygen	ASTM D4815	wt %			0.05	
Sulfur	ASTM D5453	mg/kg	3		15	
Lead	ASTM D3237	mg/l			2.6	
Phosphorous	ASTM D3231	mg/l			1.3	
Composition, aromatics	ASTM D1319	vol %	26.0		32.5	
Composition, olefins	ASTM D1319	vol %			10.0	
Composition, saturates	ASTM D1319	vol %		Report		
Particulate matter	ASTM D5452	mg/l			1	
Oxidation Stability	ASTM D525	minutes	100 0			
Copper Corrosion	ASTM D130				1	
Gum content, washed	ASTM D381	mg/100mls			5.0	
Fuel Economy Numerator/C			240		2441	
Density	ASTM D4052		1			
C Factor	ASTM D5291			Report		
Research Octane Number	ASTM D2699		96.0			
Motor Octane Number	ASTM D2700			Report		
Sensitivity	ASTM D2700/ ASTM D2699		7.5			
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report		
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report		
Color	VISUAL	1.75 ptb		Red		
Top Tier Additive		69.3 ptb		Report		

**Sequence VIF  
Form 22  
American Chemistry Council Code of Practice  
Test Laboratory Conformance Statement**

Test Laboratory				
Test Sponsor				
Formulation / Stand Code				
Test Number				
Start Date		Start Time		Time Zone

Declarations

No. 1 All requirements of the ACC Code of Practice for which the test laboratory is responsible were met in the conduct of this test. Yes \_\_\_\_\_ No \_\_\_\_\_ \*

No. 2 The laboratory ran this test for the full duration following all procedural requirements; and all operational validity requirements of the latest version of the applicable test procedure (ASTM or other), including all updates issued by the organization responsible for the test, were met.  
Yes \_\_\_\_\_ No \_\_\_\_\_ \*

If the response to this Declaration is “No”, does the test engineer consider the deviations from operational validity requirements that occurred to be beyond the control of the laboratory? Yes \_\_\_\_\_ \* No \_\_\_\_\_

No 3. A deviation occurred for one of the test parameters identified by the organization responsible for the test as being a special case. Yes \_\_\_\_\_ \* No \_\_\_\_\_  
*(This currently applies only to specific deviations identified in the ASTM Information Letter System)*

***Check The Appropriate Conclusion***

	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
	*Operational review of this test indicates that the results should not be included in the Multiple Test Acceptance Criteria calculations.

Note: *Supporting comments are required for all responses identified with an asterisk.*

Comments

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Title