

**Sequence VIBSJ  
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>

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					

<p>In my opinion this test _____ been conducted in a valid manner in accordance with the Test Method D 6837 and the appropriate amendments through the Information Letter System. The remarks included in the report describe the anomalies associated with this test.</p>
--

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

Testing Laboratory

\_\_\_\_\_  
Signature

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

\_\_\_\_\_  
Title

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**Sequence VIBSJ  
Form 3**

**Summary of Test Method**

The Sequence VIB 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 five different stages of operation.

A 1993 Ford 4.6L spark ignition, V-8 cylinder design, 4-cycle engine is used as the test apparatus. The engine incorporates overhead camshafts, a cross-flow, fast-burn cylinder head design, two valves per cylinder, and an electronic port fuel injection.

The Sequence VIBSJ test incorporates a flush and run type procedure. Each test consists of two 5-stage fuel economy measurements on baseline oil (BC) and test oil. The test oil is aged during 16 hours of engine operation at 1500 r/min and 125°C oil temperature. The fuel economy measurements taken on the baseline oil (BC) and test oil are used to calculate a final value for Fuel Economy Improvement.

Below is a summary of the operation conditions for the aging and 5-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	1500	98	125	105
2	800	26	105	95
3	800	26	70	60
4	1500	98	70	60
5	1500	98	45	45

<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	1500	98	125	105

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

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

Test Documentation		
	BC Before	Test Oil
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		
Total Test Length, hhh:mm		
Total Engine Hours @ EOT		
Most Recent Fuel Batch		

Overall Results		
	BC Oil	Test Oil
Fuel Consumed, kg		
Fuel Economy Improvement, %		
FEI Industry Correction Factor, %		
FEI Severity Adjustment, % (non-reference tests only)		
<b>FEI Final Result, %</b>		

Last Reference Oil Test on Stand/Engine History (Non-Reference Tests Only)			
Date Completed		Fuel Batch	
TMC Oil Code		SAE Viscosity Grade	
Oilcode		Calibration Oil Batch	
Runs on Stand		Runs on Engine	
		<b>Phase I</b>	<b>Phase II</b>
Final FEI Results			

**Sequence VIBSJ  
Form 5  
Operational Data Analysis**

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

<b>Computed Averages</b>						
<b>Oil</b>	<b>Stage</b>	<b>BSFC kg/kW-h</b>	<b>BSFC C.V.%</b>	<b>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>BC Oil</b>	1			15.39	0.0802	
	2			2.18	0.0787	
	3			2.18	0.0848	
	4			15.39	0.0864	
	5			15.39	0.0699	
<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>Nominal Power kW</b>	<b>Weight Factor</b>	<b>Weighted Fuel Consumed kg</b>
<b>Test Oil</b>	1			15.39	0.0802	
	2			2.18	0.0787	
	3			2.18	0.0848	
	4			15.39	0.0864	
	5			15.39	0.0699	
<b>Total Fuel Consumed</b>						

**Sequence VIBSJ  
Form 6  
General Parameter Listing**

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

**16 Hour Aging**

	Spec	Average <sup>A</sup>	Max <sup>A</sup>	Min <sup>A</sup>
1. Speed, r/min	<b>1500 ±5</b>			
2. Torque, N-m	<b>98 ±0.10</b>			
3. Oil Gallery Temperature, °C	<b>125 ±2</b>			
4. Coolant Inlet Temperature, °C	<b>105 ±2</b>			
5. Oil Circulation Temperature, °C	<b>Record</b>			
6. Coolant Out Temperature, °C	<b>Record</b>			
7. Intake Air Temperature, °C	<b>27 ±2</b>			
8. Fuel to Flowmeter Temperature, °C	<b>20-32</b>			
9. Fuel to Fuel Rail Temperature, °C	<b>20 ±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>100 min</b>			
14. Fuel to Fuel Rail Pressure, kPa	<b>205-310</b>			
15. Intake Manifold Pressure, kPa abs.	<b>Record</b>			
16. Exhaust Back Pressure, kPa abs.	<b>104 ±0.20</b>			
17. Engine Oil Pressure, kPa	<b>Record</b>			
18. Coolant Flow, L/min	<b>130 ±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>			

<sup>A</sup> Based on a minimum of one determination per hour

**Sequence VIBSJ  
Form 7  
General Parameter Summary**

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

**BC Oil**

**General Parameters**

	Spec	Stage				
		1	2	3	4	5
1. Oil Circulation Temperature,	<b>Record</b>					
2. Coolant Out Temperature, °C	<b>Record</b>					
3. Fuel to Flowmeter	<b>20-32</b>					
4. Delta Fuel to Flowmeter	<b>≤4</b>					
5. Test Cell Temperature, °C	<b>Record</b>					
6. Load Cell Temperature, °C	<b>Record</b>					
7. Delta Load Cell Temperature,	<b>≤12</b>					
8. Oil Heater Temperature, °C	<b>205 max</b>					
9. Intake Air Pressure, kPa	<b>0.05 ±</b>					
10. Fuel to Flowmeter Pressure,	<b>100 min</b>					
11. Fuel to Fuel Rail Pressure,	<b>205-310</b>					
12. Intake Manifold Pressure, kPa	<b>Record</b>					
13. Engine Oil Pressure, kPa	<b>Record</b>					
14. Coolant Flow, L/min	<b>130 ±4</b>					
15. Intake Air Humidity,	<b>11.4 ±0.8</b>					
16. Crankcase Pressure, kPa	<b>0.00 ±</b>					
17. Blowby, L/min <sup>B</sup>	<b>Record</b>					
18. 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

<sup>B</sup> Not required by test procedure

**Sequence VIB  
Form 8  
General Parameter Summary**

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

**Test Oil**

**General Parameters**

	Spec	Stage				
		1	2	3	4	5
1. Oil Circulation Temperature, °C	<b>Record</b>					
2. Coolant Out Temperature, °C	<b>Record</b>					
3. Fuel to Flowmeter Temperature, °C	<b>20-32</b>					
4. Delta Fuel to Flowmeter Temp., °C <sup>A</sup>	<b>≤ 4</b>					
5. Test Cell Temperature, °C	<b>Record</b>					
6. Load Cell Temperature, °C	<b>Record</b>					
7. Delta Load Cell Temperature, °C <sup>A</sup>	<b>≤ 12</b>					
8. Oil Heater Temperature, °C	<b>205 max</b>					
9. Intake Air Pressure, kPa	<b>0.05 ± .02</b>					
10. Fuel to Flowmeter Pressure, kPa	<b>100 min</b>					
11. Fuel to Fuel Rail Pressure, kPa	<b>205 – 310</b>					
12. Intake Manifold Pressure, kPa abs.	<b>Record</b>					
13. Engine Oil Pressure, kPa	<b>Record</b>					
14. Coolant Flow, L/min	<b>130 ± 4</b>					
15. Intake Air Humidity, grains/kg	<b>11.4 ± 0.8</b>					
16. Crankcase Pressure, kPa	<b>0.00 ± 0.25</b>					
17. 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 VIBSJ  
Form 9  
Critical Parameter Summary - Stage 1**

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

**BC Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/kW-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		1500 ± 2	98 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				125 ± 1	105 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

**Test Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/Kw-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		1500 ± 2	98 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				125 ± 1	105 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

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

**Sequence VIBSJ  
Form 10  
Critical Parameter Summary - Stage 2**

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

**BC Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/kW-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		800 ± 2	26 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				105 ± 1	95 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

**Test Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/Kw-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		800 ± 2	26 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				105 ± 1	95 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

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

**Sequence VIBSJ  
Form 11  
Critical Parameter Summary - Stage 3**

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

**BC Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/kW-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		800 ± 2	26 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				70 ± 1	60 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

**Test Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/Kw-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		800 ± 2	26 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				70 ± 1	60 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

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

**Sequence VIBSJ  
Form 12  
Critical Parameter Summary - Stage 4**

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

**BC Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/kW-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		1500 ± 2	98 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				70 ± 1	60 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

**Test Oil**

Step	BSFC	Speed	Torque	Oil	Coolant	Intake	Fuel Rail	EBP	Fuel	AFR	Delta <sup>A</sup>
SPEC	kg/Kw-h	r/min	N-m	Gallery	In	Air	Temp, °C	kPa	Flow	14.00-	AFR
		1500 ± 2	98 ± .07	Temp. °C	Temp, °C	Temp, °C	Temp, °C	104 ±	kg/h	15.00	< .50
1				70 ± 1	60 ± 1	27 ± 2	20 ± 2	.17	Record		
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

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

**Sequence VIBSJ  
Form 13  
Critical Parameter Summary – Stage 5**

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

**BC Oil**

Step SPEC	BSFC kg/kW-h	Speed r/min 1500 ± 2	Torque N-m 98 ± .07	Oil Gallery Temp. °C 45 ± 1	Coolant In Temp, °C 45 ± 1	Intake Air Temp, °C 27 ± 2	Fuel Rail Temp, °C 20 ± 2	EBP kPa 104 ± .17	Fuel Flow kg/h Record	AFR 14.00- 15.00	Delta <sup>A</sup> AFR < .50
1											
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

**Test Oil**

Step SPEC	BSFC kg/Kw-h	Speed r/min 1500 ± 2	Torque N-m 98 ± .07	Oil Gallery Temp. °C 45 ± 1	Coolant In Temp, °C 45 ± 1	Intake Air Temp, °C 27 ± 2	Fuel Rail Temp, °C 20 ± 2	EBP kPa 104 ± .17	Fuel Flow kg/h Record	AFR 14.00- 15.00	Delta <sup>A</sup> AFR < .50
1											
2											
3											
4											
5											
6											
AVG.											
SD											
C.V.											

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









**Sequence VIBSJ  
Form 15  
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