#### Report On Sequence IIIHA Evaluation Version

#### Conducted For

V = Valid
I = Invalid
N = Results cannot be interpreted as representative of oil performance (Non-
reference oil) and shall not be used for multiple test acceptance

NR = Non-reference oil test
RO = Reference oil test

Test Number							
Test StandRuns Since Last CalibrationTotal Runs on Stand							
Oil Code	Oil Code						
Formulation/Sta	Formulation/Stand						
Alternate Codes							
EOT Date		EOT Ti	me				

In my opinion this test been conducted in a valid manner in accordance with the Test Method, D XXXX, and appropriate amendments. The remarks included in the report describe the anomalies associated with this test.

Submitted By:

Testing Laboratory

Signature

Typed Name

Title

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### Sequence IIIHA Form 3 Summary of Test Method

The Sequence IIIHA Test is a fired-engine, dynamometer lubricant test for evaluating automotive engine oils for certain high-temperature performance characteristics. Such oils include both single viscosity grade and multi-viscosity grade oils that are used in spark-ignition, gasoline-fueled engines, as well as diesel engines. The Sequence IIIHA Test utilizes a 2012 Chrysler Pentastar 3.6 Liter, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIHA test engine is an overhead valve design (OHV) and uses dual overhead camshafts operating both intake and exhaust valves. The engine uses two intake and two exhaust valve per cylinder. The test engine is overhauled prior to each test, during which critical engine dimensions are measured and rated or measured parts (pistons, rings, etc.) are replaced.

The Sequence IIIHA Test consists 90 hours of engine operation at moderately high speed, load, and temperature conditions. The 90-hour segment is broken down into four 20-hour test segments and one 10-hour segment. Following each 20-hour segment, the 10 hour segment, and the 10-minute operational check, oil samples are drawn from the engine. The kinematic viscosities of the 20-hour segment samples and 10 hour segment samples are compared to the viscosity of the initial sample to determine the viscosity increase of the test oil.

The Sequence IIIHA Test is operated at the following test states during the 90-hour portion of the test:

Quantity	Set Point
Engine Speed	3900 r/min
Engine Load	250 N·m
Oil Temperature, Block	151° C
Coolant Outlet Temperature	115° C
Fuel Temperature	30° C
Intake Air Temperature	35° C
Intake Air Pressure	0.05 kPa
Intake Air Dew Point	16.1° C
Exhaust Back Pressure	4.5 kPa
Engine Coolant Flow	170 L/min
Coolant Pressure	200 kPa

# Sequence IIIHA Form 4

# **Test Result Summary**

Lab		Oil Code	
Stand		Test No.	
Laboratory Oil Code		e	
Formulation Stand Code		Code	

Date Started	Engine No.
Time Started	Fuel Batch
Date Completed	SAE Viscosity
Time Completed	Reference Oil <sup>A</sup>
Test Length	

	Mini Rotary Viscometer Viscosity, D 4684
Original Units	
Transformed Results <sup>B</sup>	
Industry Correction Factor	
Corrected Transformed Result	
Severity Adjustment	
Final Transformed Result	
Final Original Unit Result	

### **Additional Results**

Oil Consumption Hours, h <sup>B</sup>	Oil Consumption, L
4	

A Reference Oil Tests Only B Test Hours at which Oil Consumption was calculated

### **Cold Crank Simulator Results, D 5293**

Specified Temperature, °C	
Cold-Crank Simulator Viscosity at Specified Temperature, mPa·s	
MRV Temperature, °C	
Yield Stress, Pa	

# Sequence IIIHA Form 5 Operational Summary

Lab	Oil Cod	
Stand	Test No	
Laboratory Oil Code		
Formu	ation Stand Code	

			OI	БОТ			Ctan dand	Numb	er of
	Quantity	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Samples	BQD
	Speed	r/min	0.000		3900				
S	Load	N·m	0.000		250				
ete	Oil, Block	°C	0.000		151				
ameters	Coolant Out	°C	0.000		115				
ar	Coolant System	kPa			200				
d P	Intake Air	°C	0.000		35				
ontrolled	Intake Air	kPa	0.000		0.05				
tro	Dew Point	°C	0.000		16.1				
	EBP Rt.	kPa	0.000		4.5				
U	EBP Lt.	kPa	0.000		4.5				
	Fuel @ Rail	°C	0.000		30				
	Fuel @ Rail	kPa			420				
	Coolant Flow	L/min	0.000		170				

				Standard	Num	ber of
	Quantity	Units	Average	Deviation	Samples	BQD
	Oil Sump	°C				
	Oil Pump	°C				
ers	Oil Cooler	°C				
Parameters	Coolant In	°C				
rar	Oil Gallery	kPa				
Pa	Oil Pump	kPa				
ed	Manifold Absolute Pressure	kPaA				
llo.	Right Exhaust Temperature	°C				
ntı	Left Exhaust Temperature	°C				
Non-controlled	Fuel Flow Rate	kg/h				
0U	Crankcase	kPa				
Ζ	Right NOx	mg/kg				
	Left NOx	mg/kg				
	AFR, Rt.					
	AFR, Lt.					

### Sequence IIIHA Form 6 Oil Consumption Data Plot

Lab		Oil Code	
Stand		Test No.	
Labora	tory Oil Code	e	
Formulation Stand Code			

# **Oil Consumption Data**

Hours			ЕОТ
Level low (mL)			
Total Oil Consumed (L)			

### **Oil Consumption Plot**

Γ	٦

# Sequence IIIHA

# Form 7

# Used Oil Analysis Results

Lab	Oil Code		
Stand		Test No.	
Laboratory Oil Code		<b>e</b>	
Formulation Stand Code		Code	

		Oxidatio	on & Nitratio	on Results			
Parameter	Method			Test ]	Hours		EOT
DIR Oxidation	E168 IIIG	Area					
DIR Nitration	Nitration E168 IIIG Area						
BIR Nitration E108 mO Alea					<u> </u>		
		Tot	al Acid Num	ber			
Parameter	M	ethod					EOT
TAN	D664						
TBN	D	4739					
	•		:	1	:	:	
	Metals	<b>Element Ana</b>	<u>lysis – ICP N</u>	Iethod D51	85 mg/kg		
Element	New Oil	<b>Initial</b> <sup>A</sup>					EOT
Aluminum (Al)							
Boron (B)							
Calcium (Ca)							
Copper (Cu)							
Iron (Fe)							
Potassium (K)							
Magnesium (Mg)							
Manganese (Mn)							
Molybdenum (Mo)							
Sodium (Na)							
Phosphorus (P)							
Lead (Pb)							
Silicon (Si)							
Tin (Sn)							
$Zinc_A(Zn)$							

AInitial = At end of leveling run

### Sequence IIIHA Form 8 Blowby Values & Plot

Lab		Oil Code	
Stand		Test No.	
Laborato	ory Oil Code		
Formulation Stand Code			

Blowby Plot

Test Hours	Blowby, L/min	Test Hours	Blowby, L/min	<b>Test Hours</b>	Blowby, L/min
				Average	

### Sequence IIIHA Form 9 Hardware Information

Lab	Oil Code	
Stand	Test No.	
Labora	tory Oil Code	
Formu	lation Stand Code	

Hardware Information					
Engine Build Date					
Block Serial Number					
Ring Batch Code					
Oil Control (OC) Ring Batch Code					
Expander Ring (EXP) Batch Code					
Cylinder Head Serial Number, Left					
Cylinder Head Serial Number, Right					
Lab Block Number					
Piston Batch Code					

	Cylinder Bore Measurements									
Cylinder		Trans	sverse		Longitudinal					
	Top Middle Bottom Taper				Тор	Middle	Bottom	Taper		
2										
4										
6										
1										
3										
5										

Cylinder Bore Measurements					
Cylinder	Rk	Rpk	Rvk	Rz	Mr2
2					
4					
6					
1					
3					
5					

### Sequence IIIHA Form 10 Downtime Summary

Lab	Oil Code	
Stand	Test No.	
Labora	tory Oil Code	
Formulation Stand Code		

Number of Downtime Occurrences		currences	
Test Hours	Date	Downtime	Reasons
			Total Downtime (hours) – Maximum allowable downtime: 24 hours

### Sequence IIIHA Form 11 Test Comments

Lab		Oil Code	
Stand		Test No.	
Labora	Laboratory Oil Code		
Formu	Formulation Stand Code		

Number of Comment Lines	

### **Sequence IIIHA**

### Form 12 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)

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