Report On
Sequence IIIH 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 Stand		Stand Test		Lab Test	
Oil Code					
Formulation/Stand					
Alternate Codes					
EOT Date		EOT Time			

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

Sequence IIIH
Form 2
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Sequence IIIH
Form 3
Summary of Test Method

The Sequence IIIH Test is a fired-engine, dynamometer lubricant test for evaluating automotive engine oils for certain high-temperature performance characteristics, including oil thickening, varnish deposition, and oil consumption. 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 IIIH Test utilizes a 2012 Chrysler Penstar 3.6 Liter, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIH 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 IIIH 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 IIIH Test is operated at the following test states during the 90-hour portion of the test:

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

Sequence IIIH
Form 4

Test Result Summary

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

Date Started		Engine No.	
Time Started		Fuel Batch	
Date Completed		SAE Viscosity	
Time Completed		Reference Oil [A]	
Test Length			

Pass/Fail Results				
	Viscosity Increase (%)	**Average Weighted Piston Deposits (merits)**	**Phosphorus Retention %**	**Mini Rotary Viscometer Viscosity, D 4684**
Original Units				
Transformed Results[B]				
Industry Correction Factor				
Corrected Transformed				
Severity Adjustment				
Final Transformed Result				
Final Original Unit Result				

Additional Results

Oil Consumption Hours, h [B]		Oil Consumption, L	
Average Oil Ring Plugging, %		Number of Cold-Stuck Rings	
Number of Hot-Stuck Ring		Average Piston Varnish,	

[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, cP	
MRV Temperature, °C	
Yield Stress, Pa	

Sequence IIIH
Form 5
Operational Summary

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000		3900				
	Load	Nm	0.000		250				
	Oil, Block	°C	0.000		151				
	Coolant Out	°C	0.000		115				
	Coolant System	kPa			200				
	Intake Air	°C	0.000		35				
	Intake Air	kPa	0.000		0.05				
	Dew Point	°C	0.000		16.1				
	EBP Rt.	kPa	0.000		4.5				
	EBP Lt.	kPa	0.000		4.5				
	AFR, Rt.				14.4				
	AFR, Lt.				14.4				
	Fuel @ Rail	°C	0.000		30				
	Fuel @ Rail	kPa			420				
	Coolant Flow	L/min	0.000		170				

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Oil Sump	°C				
	Oil Pump	°C				
	Oil Cooler	°C				
	Coolant In	°C				
	Oil Gallery	kPa				
	Oil Pump	kPa				
	Manifold Absolute Pressure	kPaA				
	Right Exhaust Temperature	°C				
	Left Exhaust Temperature	°C				
	Fuel Flow	kg/H				
	Crankcase	kPa				
	Right NOx	ppm				
	Left NOx	ppm				

Sequence IIIH
Form 6
Oil Consumption Data Plot

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

Oil Consumption Data

Hours					**EOT**
Level low (mL)					
Total Oil Consumed (L)					

Oil Consumption Plot

Sequence IIIH

Form 7

Used Oil Analysis Results

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

Viscosity Increase Data (cSt @40 °C)			
Hours	**Viscosity [A]**	**Change**	**Percent**
New Oil			
Initial [B]			
EOT			

[A] *8000 cSt is maximum allowable viscosity*

[B] *Initial = At end of leveling run*

Highest Detergent Metal and Phosphorus Results by ICP (D 5185 Modified)			
Test Hour	**Detergent Metal**	**Phosphorus (P)**	**Phosphorus Retention [C]**
	ppm	ppm	Percent (%)
Initial[B]			
EOT			
Detergent Metal used for this test			

[C] *Phosphorus results analyzed by IIIGB Method.*

Sequence IIIH
Form 7a
Used Oil Analysis Results

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

Oxidation & Nitration Results						
Parameter	**Method**	**20 hours**	**40 hours**	**60 hours**	**80 hours**	**EOT**
DIR Oxidation	E168 IIIG Area					
DIR Nitration	E168 IIIG Area					

Total Acid Number						
Parameter	**Method**	**20 hours**	**40 hours**	**60 hours**	**80 hours**	**EOT**
TAN	D664					
TBN	D4739					

Metals Element Analysis – ICP Method D5185							
Element	**New Oil**	**Initial[A]**	**20 hours**	**40 hours**	**60 hours**	**80 hours**	**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 (Zn)							

[A] *Initial = At end of leveling run*

Sequence IIIH
Form 8

Summary of Ring Sticking

Lab		Oil Code			
Stand		Test No.			
Laboratory Oil Code					
Formulation Stand Code					
Rater			Rating Date		

Piston	% Oil Ring Plugging	Ring Sticking[A]	
		Hot-Stuck Rings	Cold-Stuck Rings
1			
2			
3			
4			
5			
6			
Total			
Average			

[A] Possible values
T = top compression ring
B = bottom compression ring
O = oil ring
N = none

Sequence IIIH
Form 9
Summary of Piston Deposits

Lab		Oil Code	
Stand		Test No.	
Laboratory Oil Code			
Formulation Stand Code			
Rater		Rating Date	

Un-weighted Piston Deposits, merits											**Weighted Piston Deposits**	
	Grooves			**Lands**		**Undercrown**		**Piston Boss Varnish**				
	1	2	3	2	3			Front	Rear	Average		Merits
Piston 1											Piston 1	
Piston 2											Piston 2	
Piston 3											Piston 3	
Piston 4											Piston 4	
Piston 5											Piston 5	
Piston 6											Piston 6	
WF	0.05	0.10	0.20	0.15	0.30	0.10				0.10	Average	

Sequence IIIH
Form 10
Blowby Values & Plot

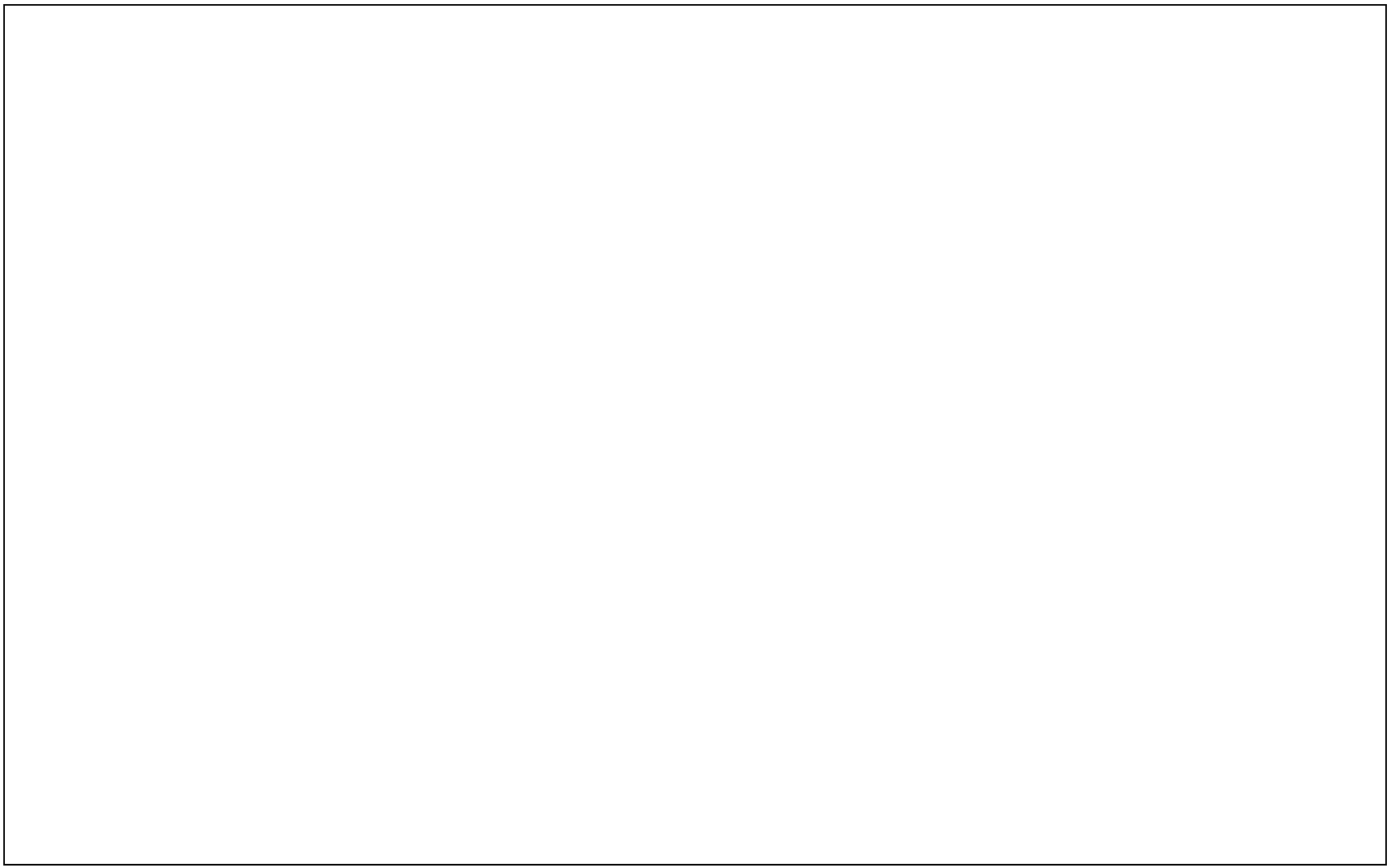
Lab		Oil Code	
Stand		Test No.	
Laboratory Oil Code			
Formulation Stand Code			

Blowby Plot

Test Hours	Blowby, L/min	Test Hours	Blowby, L/min	Test Hours	Blowby, L/min
				Average	

Sequence IIIH
Form 11
Viscosity Increase Plot

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



Sequence IIIH
Form 12
Hardware Information

Lab		Oil Code	
Stand		Test No.	
Laboratory Oil Code			
Formulation 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	Transverse				Longitudinal			
	Top	Middle	Bottom	Taper	Top	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 IIIH

Form 13

Downtime Summary

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

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

Sequence IIIH
Form 14
Test Comments

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

Number of Comment Lines		

Sequence IIIH

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)

	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