

Report On
Sequence IIIGA 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 _____ conducted in a valid manner in accordance with the latest draft of Sequence IIIGA procedure 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 IIIGA

Table of Contents

| | | |
|-----|-----------------------------------|---------|
| 1. | Title / Validity Declaration Page | Form 1 |
| 2. | Table of Contents | Form 2 |
| 3. | Summary of Test Method | Form 3 |
| 4. | Test Result Summary | Form 4 |
| 5. | Operational Summary | Form 5 |
| 6. | Used Oil Analysis | Form 6 |
| 7. | Blowby Values & Plot | Form 7 |
| 8. | Hardware Information | Form 8 |
| 9. | Downtime & Outlier Report Form | Form 9 |
| 10. | ACC Conformance Statement | Form 10 |

Sequence IIIGA

Form 3

Summary of Test Method

The Sequence IIIGA Test is a fired-engine, dynamometer lubricant test for generating a used oil sample to evaluate the low-temperature performance of automotive engine oils after operation in a high-temperature environment. 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 IIIGA Test utilizes a 1996 General Motors Powertrain 3800 Series II, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIGA test engine is an overhead valve design (OHV) and uses a single camshaft operating both intake and exhaust valves via pushrods and hydraulic valve lifters in a sliding-follower arrangement. The engine uses one intake and one exhaust valve per cylinder. Induction is handled by a modified GM port fuel injection system setting the Air-to-Fuel ratio at 15:1. The test engine is overhauled prior to each test, during which critical engine dimensions are measured and rated or measured parts (pistons, camshaft, valve lifters, etc.) are replaced.

The Sequence IIIGA Test consists of a 10-minute operational check, followed by 100 hours of engine operation at moderately high speed, load, and temperature conditions. The 100-hour segment is broken down into five 20-hour test segments. Following each 20-hour segment, and the 10-minute operational check, oil samples are drawn from the engine.

The Sequence IIIGA Test is operated at the following test states during the 100-hour portion of the test:

| Parameter | Set Point |
|--------------------------------------|------------|
| Engine Speed | 3600 r/min |
| Engine Load | 250 N-m |
| Oil Filter Block Temperature | 150 °C |
| Coolant Outlet Temperature | 115 °C |
| Fuel Pressure | 377.5 kPa |
| Intake Air Temperature | 35 °C |
| Intake Air Pressure | 0.05 kPa |
| Intake Air Dew Point | 16.1 °C |
| Exhaust Back Pressure | 6 kPa |
| Engine Coolant Flow | 160 L/min |
| Breather Tube Coolant Flow | 10 L/min |
| Air-to-Fuel Ratio | 15.0:1 |
| Condenser Coolant Outlet Temperature | 40 °C |

**Sequence III GA
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 | | TMC Oil Code | |
| Test Length | | | |

| Pass/Fail Results | |
|--|--|
| Mini Rotary Viscometer Viscosity (cP) | |
| Original Units | |
| Transformed Results | |
| Industry Correction Factor | |
| Corrected Transformed | |
| Severity Adjustment | |
| Final Transformed Result | |
| Final Original Unit Result | |

| Additional Results | | | |
|---------------------------------------|--|--------------------|--|
| Oil Consumption Hours, h ^B | | Oil Consumption, L | |
| Yield Stress, Pa | | | |

| Most Recent Stand Reference Oil Test History^C | | | |
|---|--|------------|--|
| Test Number | | | |
| Oil Code | | | |
| Date Completed | | TMC Oil | |
| Final Mini Rotary Viscometer Result, cP | | Fuel Batch | |

^AReference Oil Tests Only

^BTest Hours at which Oil Consumption was calculated

^CNon-Reference Oil Tests Only

Sequence IIIGA
Form 5
Operational Summary

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

| Controlled Parameters | Parameter | Units | QI Threshold | EOT QI | Target | Average | Standard Deviation | Number of | |
|-----------------------|-----------------------------|-------|--------------|--------|--------|---------|--------------------|-----------|-----|
| | | | | | | | | Samples | BQD |
| | Speed | r/min | 0.000 | | 3600 | | | | |
| | Load | Nm | 0.000 | | 250 | | | | |
| | Oil Filter Block | °C | 0.000 | | 150.0 | | | | |
| | Engine Coolant Out | °C | 0.000 | | 115.0 | | | | |
| | Condenser Coolant Out | °C | 0.000 | | 40.0 | | | | |
| | Left Air-to-Fuel Ratio | | 0.000 | | 15.0 | | | | |
| | Right Air-to-Fuel Ratio | | 0.000 | | 15.0 | | | | |
| | Left Exhaust Back Pressure | kPa | 0.000 | | 6.0 | | | | |
| | Right Exhaust Back Pressure | kPa | 0.000 | | 6.0 | | | | |
| | Intake Air | kPa | 0.000 | | 0.05 | | | | |
| | Engine Coolant Flow | L/min | 0.000 | | 160.0 | | | | |

| Non-controlled Parameters | Parameter | Units | Average | Standard Deviation | Number of | |
|---------------------------|----------------------|-------|---------|--------------------|-----------|-----|
| | | | | | Samples | BQD |
| | Oil Sump | °C | | | | |
| | Pump Outlet Pressure | kPa | | | | |
| | Gallery Pressure | kPa | | | | |
| | Engine Coolant In | °C | | | | |
| | Fuel Inlet | °C | | | | |
| | Intake Air | °C | | | | |
| | Intake Air Dew Point | °C | | | | |
| | Intake Vacuum | kPa | | | | |
| | Crankcase | kPa | | | | |
| | Fuel Pressure | kPa | | | | |

| Oil Consumption Data | | | | | | |
|------------------------|----------------|--|--|--|--|--|
| Hours | Initial Run-in | | | | | |
| Level (ml) low | | | | | | |
| Total Oil Consumed (L) | | | | | | |

| NO _x Measurement | | | |
|-----------------------------|--|--|--|
| Hours | | | |
| NO _x , ppm | | | |

Sequence IIIGA

Form 6

Used Oil Analysis Results

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

| | |
|---|--|
| Cold Crank Simulator Results, D 5293 | |
| Specified Temperature, °C | |
| Cold-Crank Simulator Viscosity at Specified Temperature, cP | |

| | |
|---|--|
| Mini-Rotary Viscometer Results, D 4684 | |
| MRV Temperature, °C | |
| MRV Result, cP | |
| Yield Stress, Pa | |

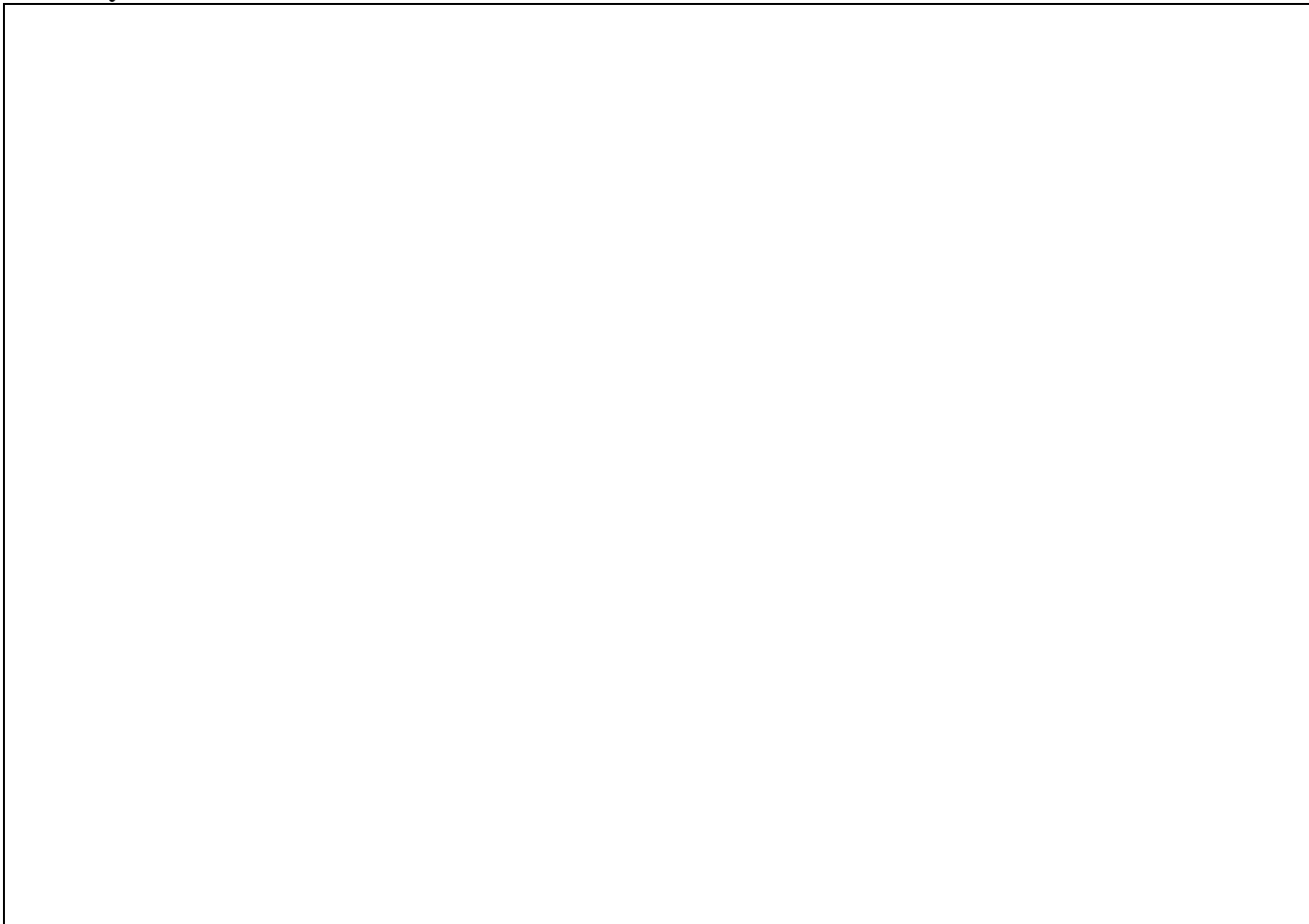
Sequence IIIGA

Form 7

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 | | Average | | | | | | | | |
| Blowby, L/min. | | | | | | | | | | |

Sequence III GA
Form 8
Hardware Information

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

| | | | |
|------------------------------------|--|----------------------------|----|
| Build Completion Date | | Piston Batch (Code) | |
| Block Serial Number | | Piston Size (Grade) | |
| Crankshaft Serial Number | | Piston Ring Batch Code | |
| Camshaft Serial Number | | Oil Filter Batch Code | |
| Camshaft Batch Code | | Oil Cooler Batch Code | |
| Cylinder Head Serial Number, Left | | Valve Springs Batch Code | |
| Cylinder Head Serial Number, Right | | Lifter Serial Number | 1 |
| Bearing Kit Serial Number | | | 2 |
| Top Ring Gap, mils | | | 3 |
| Bottom Ring Gap, mils | | | 4 |
| Intake Valve Seals Batch Code | | | 5 |
| Exhaust Valve Seals Batch Code | | | 6 |
| Rocker Arm Batch Code | | | 7 |
| Connecting Rod Type (CAST or PM) | | | 8 |
| | | | 9 |
| | | | 10 |
| | | | 11 |
| | | | 12 |

Sequence III GA

Form 10

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