**TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION**

**D4858 ASTM TC SEQUENCE III Test Procedure**
**Title / Validity Declaration Page**

**VERSION** 20020115

CONDUCTED FOR

| | |
|---|---|
| | V = VALID |
| | I = INVALID |

| **Non-Reference** |
|---|
| Primary Oil Code: |
| Test Number: |
| EOT Date: |
| EOT Time: |
| Alternate Codes: |

I certify that test number _____ was conducted to the best of my knowledge, in accordance with the conditions specified in Test Method D4858. The results of this test indicate that the candidate lubricant _____ demonstrated performance equal to or better than that of the reference lubricant within the tolerences specified in Test Method D4858.

SUBMITTED BY: _____
Testing Laboratory

_____
Signature

_____
Typed Name

_____
Title

# TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
# D4858 ASTM TC SEQUENCE III

## Objective

This procedure is designed to evaluate the performance of a two-cycle engine lubricant relative to the incidence of deposit-induced engine malfunction. Specifically, the following characteristics are considered:

1. Preignition
2. Spark Plug Fouling
3. Exhaust Blockage

## Summary of Procedure

The engine employed is an air-cooled, single cylinder Yamaha CE50S engine with the following general specifications:

| | |
|---|---|
| Displacement | 3.0 cu. in. (49 $cm^3$) |
| Cylinder Bore | 1.57 in. (40 mm) |
| Stroke | 1.54 in. (39.2 mm) |
| Compression Ratio | 7.2:1 |

The cylinder head is fitted with a combustion chamber thermocouple to facilitate observation of preigintion frequency and severity (magnitude). The engine is assembled with a new piston, rings, piston pin, gaskets, muffler, and spark plug. Other components are replaced as necessary.

A two-hour cyclic break-in is completed before each test begins. Next, the cylinder head is retorqued and the engine is run until it is stabilized at test operating conditions. At this time the 50 hour test begins. These are the test conditions:

| | |
|---|---|
| Engine, r/min | 4000 ± 100 |
| Engine Load | W.O.T. |
| Spark Plug Gasket Temp., ˚C | 392 ± 5 |
| Fuel Oil Ratio | 20:1 |

Test operation is halted whenever any one of three engine malfunctions occur:

1. Major Preignition - a sudden increase in combustion chamber temperature 18˚F or greater.

2. Spark Plug Fouling - a rapid decrease in spark plug gasket temperature accompanied by engine speed, torque, and combustion chamber temperature decreases.

3. Exhaust Blockage - a constant torque reading of 10% below nominal torque.

The test is restarted after appropriate correction of malfunction. Correction many consist of cleaning piston and cylinder head, replacement of spark plug, or replacement of muffler.

At the conclusion of the test, the number of occurrences of the above malfunctions is used to rate a non-reference lubricant.

The non-reference oil shall have no more than 1 major preignition in a test period of 50 h.

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
ASTM TC SEQUENCE III

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

| | | |
|---|---|---|
| Sponsor Code: | Test Number: | Start Date: |
| Lab Code: | Fuel Oil Ratio: | E.O.T. Date: |
| Fuel Code: | Stand Number: | Hours: |
| Industry Oil Code: | | |

Test Conditions Data

| Miscellaneous | Maximum | Minimum | Average |
|---|---|---|---|
| Engine Speed, r/min | | | |
| Observed Load, hp | | | |
| Corrected Load, hp* | | | |
| Fuel Flow, lb/h. | | | |
| Exhaust Back Press. in. H2O | | | |
| Barometer, in. Hg | | | |
| **Temperature, ˚F** | | | |
| Spark Plug | | | |
| Combustion Chamber | | | |
| Exhaust | | | |
| Fuel | | | |
| Intake Air, Carburetor | | | |
| Ambient | | | |
| Wet | | | |
| Dry | | | |

| | Preignition | | Spark Plug | Exhaust |
|---|---|---|---|---|
| | Major | Minor | Change | Change |
| Totals | | | | |

Previous Reference Data

| Code | Test No. | Date | Preignition Major | Preignition Minor |
|---|---|---|---|---|

[A]Corrected To:
Barometric Pressure - 29.92
Temperature - 60˚F

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
ASTM TC SEQUENCE III

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

Sponsor Code: _____ Lab Code: _____ Test Number: _____

Test Conditions Data

| Test | Preignition, °F | | Spark Plug | Exhaust |
|---|---|---|---|---|
| Hours | Major | Minor | Change | Change |

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
ASTM TC SEQUENCE III

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

Sponsor Code: _____ Lab Code: _____ Test Number: _____

Engine Inspection

| | Merit Number |
|---|---|
| Piston Varnish | |
| Thrust | |
| Anti-Thrust | |
| Average | |
| Top Ring Land | |
| Second Ring Land | |
| Undercrown | |
| Ring Sticking | |
| Top Ring | |
| Second Ring | |
| Cylinder Liner Varnish | |
| Wristpin Varnish | |
| Wristpin Bearing Varnish | |
| Deposits | |
| Piston Crown | |
| Cylinder Head | |
| Exhaust Port Clogging | |
| Piston Scuffing | |
| Thrust | |
| Anti-Thrust | |
| Cylinder Linder Scuffing | |
| Total CRC Demerit | |
| Top Ring Land | |
| Second Ring Land | |

## TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION

## ASTM TC SEQUENCE III Test Procedure

| **Test Oil Code:** | **Test Number:** | **EOT Date:** |
|---|---|---|

Total Number of Remarks or Deviations

Remark or Deviation

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
ASTM TC SEQUENCE III

SUMMARY OF ENGINE TEST RESULTS

| | | |
|---|---|---|
| **Lab:** | **EOT Date:** | **End Time:** |
| **Stand:** | **Run Number:** | |
| **Oilcode:** | | |
| **Formulation / Stand Code:** | | |
| **Supplier:** | **Batch Identifier:** | |

| Measurement | Specs. | Analysis | Test Method |
|---|---|---|---|
| Gravity, ˚API | | | |
| Color | | | |
| Doctor Test | | | |
| Copper Corrosion, 3 h @ 212 ˚F | 1 Maximum | | D 130 |
| Reid Vapor Pressure, psig | | | |
| Research Octane Number | | | |
| Motor Octane Number | | | |
| (Research + Motor) / 2 | | | |
| Total Sulfur, % Weight | 0.04 - 0.05 | | D 2622 |
| Gum, mg/100 mL | | | |
| Oxidation Stablility, min | | | |
| Lead, g/gal | | | |
| **Distillation, ˚C** | | | |
| IBP | Report | | D 86 |
| 10% | Report | | D 86 |
| 50% | Report | | D 86 |
| 90% | 282 - 338 | | D 86 |
| EP | Report | | D 86 |
| Recovery, % | | | |
| **Pona, % vol** | | | |
| Paraffins + Napthenes | | | |
| Olefin | Report | | D 1319 |
| Aromatics % Vol. | 28 - 33 | | D 1319 |