TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION

D4863 ASTM TC SEQUENCE II Test Procedure
Title / Validity Declaration Page

VERSION TC2 VERSION 20011213

CONDUCTED FOR

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

C	V = VALID
	I = INVALID

Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Reference		Non-Reference	
Primary Oil	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	Primary Oil	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
EOT Date:	YYYYMMDD	EOT Date:	YYYYMMDD
EOT Time:	HH:MM	EOT Time:	HH:MM

Alternate Codes: CCCCCCCCCCCCCCC CCCCCCCCCCCCCCC CCCCCCCCCCCCCCC

Test Stand: CCCCC Stand Run#: CCCCC Lab Run #: CCCCC

Formulation/Stand Code: CC-CCCCCCCCCC-C-C-CCCCCC-CC-CC-CCCCC

In my opinion this test CCCCCCCC been conducted in a valid manner in accordance with the ASTM Test Method D4863 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

SUBMITTED BY: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Testing Laboratory

Signature Image

Signature

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Typed Name

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Title

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
D4863 ASTM TC SEQUENCE II

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

Test Number:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	Fuel:	CCCCCCCCCCCC	Start Date:	YYYYMMDD
Stand Number:	CCCCC	Fuel/Oil Ratio:	CCCCC	E.O.T. Date:	YYYYMMDD
Test Length:	S1234	Fuel Batch ID:	CCCCCCCCCCCCCCC		

Delta Torque, lbs. in.

Lubricant Code: CCCCCCCCCCCC Ind Bench: CCCCCCCCCCCC Lab Code: CCCCCCCCCCCCCCC Tightening No.: CCCCCCC

Temperature, ˚C	S12	S12	S12	S12	S12	S12	S12	Mean
300	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
325	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
350	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Lubricant Code: CCCCCCCCCCCC Ind: CCCCCCCC Lab Code: CCCCCCCCCCCCCCC Tightening No.: CCCCCCC

Temperature, ˚C	S12	S12	S12	S12	S12	S12	S12	Mean
300	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
325	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
350	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Lubricant Code: CCCCCCCCCCCC Ind Bench: CCCCCCCCCCCC Lab Code: CCCCCCCCCCCCCCC Tightening No.: CCCCCCC

Temperature, ˚C	S12	S12	S12	S12	S12	S12	S12	Mean
300	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
325	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
350	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Lubricant Code: CCCCCCCCCCCC Ind: CCCCCCC Lab Code: CCCCCCCCCCCCCCC Tightening No.: CCCCCCC

Temperature, ˚C	S12	S12	S12	S12	S12	S12	S12	Mean
300	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
325	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
350	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Temperature, ˚C	Mean	Mean
300	S1.12	S1.12
325	S1.12	S1.12
350	S1.12	S1.12

Previous Reference Data

Code	Date	Test Number	Mean
CCCCCCCCCCCCCCC	YYYYMMDD	CCCCCCCCCCCCCCC	S1.12
CCCCCCCCCCCCCCC			S1.12
CCCCCCCCCCCCCCC	YYYYMMDD	CCCCCCCCCCCCCCC	S1.12
CCCCCCCCCCCCCCC			S1.12

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
D4863 ASTM TC SEQUENCE II

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

Lubricant Code: CCCCCCCCCCCCCCCCCCCCCCCCCCC Test Number: CCCCCCCCCCCCCCCCCCCCCC E.O.T. Date: YYYYMMDD

Student T Test For Significance of Difference Between

	Benchmark	Non-Reference	
Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	CCCCCCCCCCCCCC	
Lab Code:	CCCCCCCCCCCC	CCCCCCCCCCCCCCCCCCCC	
Number of Data Points:	S12	S12	
Mean:	S1.12	S1.12	CCCC
Std. Dev. (n-1):	S1.1234	S1.1234	
Outlier Tightening Numbers:	CCCCCCCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCCC	
Variance:	S1.1234	S1.1234	
Combined Estimate of Std. Dev:	S1.1234		
Degrees of Freedom:	S12		
Critical Value t*:	S1.1234		
t Critical 0.05 (95% confidence):			
Confidence Level:	S1.123		

On the basis of the Student "T" test there is CCC a significant difference between the reference and non reference lubricants at the 95% confidence level.

t* is compared to the critical value of t, t critical, from table A4.1.

TABLE A4.1 Critical Values of the t -

Degrees of Freedom	Degrees of Confidence				
	90%	95%	97.5%	99%	99.5%
10	1.372	1.812	2.228	2..764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.705	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC Lubricant Code: CCCCCCCCCCCC Lab Code: CCCCCCC Tightening No.:

Operating Parameters

Miscellaneous

Tightening No.	S12	S12	S12	S12	S12	S12	S12	Average
Seconds	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Fuel Flow, lb/h	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Horsepower, ft-lbf.	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Barometer Press., in. Hg	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Temperature, ˚F

Ambient	S12	S12	S12	S12	S12	S12	S12	S12
Wet	S12	S12	S12	S12	S12	S12	S12	S12
Dry	S12	S12	S12	S12	S12	S12	S12	S12
Dynamometer	S12	S12	S12	S12	S12	S12	S12	S12
Intake Air	S12	S12	S12	S12	S12	S12	S12	S12
Fuel	S12	S12	S12	S12	S12	S12	S12	S12
Exhaust	S123	S123	S123	S123	S123	S123	S123	S123

Torque, lbf-in.

@ 170˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 200˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Delta Torque, lbf-in.

@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
D4863 ASTM TC SEQUENCE II

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC Lubricant Code: ________ CCCCCCCCCCCCCCCCCCCCC Lab Code: ________ Tightening No.: ________ CCCCCCC

Operating Parameters

Miscellaneous

Tightening No.	S12	S12	S12	S12	S12	S12	S12	Average
Seconds	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Fuel Flow, lb/h	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Horsepower, ft-lbf.	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Barometer Press., in. Hg	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Temperature, ˚F

Ambient	S12	S12	S12	S12	S12	S12	S12	S12
Wet	S12	S12	S12	S12	S12	S12	S12	S12
Dry	S12	S12	S12	S12	S12	S12	S12	S12
Dynamometer	S12	S12	S12	S12	S12	S12	S12	S12
Intake Air	S12	S12	S12	S12	S12	S12	S12	S12
Fuel	S12	S12	S12	S12	S12	S12	S12	S12
Exhaust	S123	S123	S123	S123	S123	S123	S123	S123

Torque, lbf-in.

@ 170˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 200˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Delta Torque, lbf-in.

@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
D4863 ASTM TC SEQUENCE II

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC Lubricant Code: CCCCCCCCCCCC Lab Code: CCCCCCC Tightening No.:

Operating Parameters

Miscellaneous

Tightening No.	S12	S12	S12	S12	S12	S12	S12	Average
Seconds	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Fuel Flow, lb/h	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Horsepower, ft-lbf.	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Barometer Press., in. Hg	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Temperature, ˚F

Ambient	S12	S12	S12	S12	S12	S12	S12	S12
Wet	S12	S12	S12	S12	S12	S12	S12	S12
Dry	S12	S12	S12	S12	S12	S12	S12	S12
Dynamometer	S12	S12	S12	S12	S12	S12	S12	S12
Intake Air	S12	S12	S12	S12	S12	S12	S12	S12
Fuel	S12	S12	S12	S12	S12	S12	S12	S12
Exhaust	S123	S123	S123	S123	S123	S123	S123	S123

Torque, lbf-in.

@ 170˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 200˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Delta Torque, lbf-in.

@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION
D4863 ASTM TC SEQUENCE II

SUMMARY OF ENGINE TEST RESULTS
YAMAHA CE50S TIGHTENING TEST

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCCC CCCCCCC

Lubricant Code: ____________ Lab Code: ____________ Tightening No.: ____________

Operating Parameters

Miscellaneous

Tightening No.	S12	S12	S12	S12	S12	S12	S12	Average
Seconds	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Fuel Flow, lb/hr	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Horsepower, ft-lbf.	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
Barometer Press., in. Hg	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Temperature, ˚F

Ambient	S12	S12	S12	S12	S12	S12	S12	S12
Wet	S12	S12	S12	S12	S12	S12	S12	S12
Dry	S12	S12	S12	S12	S12	S12	S12	S12
Dynamometer	S12	S12	S12	S12	S12	S12	S12	S12
Intake Air	S12	S12	S12	S12	S12	S12	S12	S12
Fuel	S12	S12	S12	S12	S12	S12	S12	S12
Exhaust	S123	S123	S123	S123	S123	S123	S123	S123

Torque, lbf-in.

@ 170˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 200˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

Delta Torque, lbf-in.

@ 300˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 325˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12
@ 350˚C	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12	S1.12

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION

D4863 ASTM TC SEQUENCE II

Test Oil Code: CCCCCCCCCCCCCCCCCCCC	**Test Number:** CCCCCCCCCCCCCCCCCCCC	**EOT Date:** CCYYYYMMDDCCC

Total Number of Remarks or Deviations S12

Remark or Deviation

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

TWO-STROKE-CYCLE GASOLINE ENGINE LUBRICANT EVALUATION

D4863 ASTM TC SEQUENCE II

Test Fuel Analysis (Last Batch)

Lab: CC	**EOT Date:** YYYYMMDD	**End Time:** HH:MM
Stand: CCCCC	**Run Number:** CCCCCCCCCCCCCCC	
Formulation / Stand Code: CC-CCCCCCCCCC-C-C-CCCCCC-CC-CC-CCCCC		
Supplier: CCCCCCCCCCCC	**Batch Identifier:** CCCCCCCCCCCCCCC	

Measurement	Specs.	Analysis	Test Method
Gravity, ˚API		S1.1	
Color		CCCCCCCC	
Doctor Test		CCCCCCCC	
Copper Corrosion, 3 h @ 212 ˚F	1 Maximum	S123	D 130
Reid Vapor Pressure, psig		S.1	
Research Octane Number		S1.1	
Motor Octane Number		S1.1	
(Research + Motor) / 2		S1.1	
Total Sulfur, % Weight	0.04 - 0.05	S1.12	D 2622
Gum, mg/100 mL		S.1	
Oxidation Stability, min		S1234	
Lead, g/gal		S1.123	
Distillation, ˚C			
IBP	Report	S1234	D 86
10%	Report	S1234	D 86
50%	Report	S1234	D 86
90%	282 - 338	S1234	D 86
EP	Report	S1234	D 86
Recovery, %		S12.1	
Pona, % vol			
Paraffins + Napthenes		S12.1	
Olefin	Report	S12.1	D 1319
Aromatics % Vol.	28 - 33	S12.1	D 1319