1P – D 6681 Final Report Cover Sheet

Method Version Conducted For

1	V = Valid
I	I = Invalid
7	N = Results Cannot be Interpreted as Representative of Oil Performance (Non-
R	Reference Oil) and Shall Not be Used in Determining an Average Test Result
L	Using Multiple Test Criteria.
	Toot Number
Test Stand:	Engine Run #:
EOT Time:	EOT Date:
Oil Code ^A :	
Formulation/Stand Code:	de:

In my opinion this test been conducted in a valid manner in accordance with the ASTM Test Method D 6681 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

Alternate Codes:

			Submitted By:
Title	Typed Name	Signature	Testing Laboratory

^A CMIR or Non-Reference Oil Code

Form 1 Test Report Summary **1P**

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	ode:		
Oilcodse/CMIR:			

Start Date:	Total Test Length:	TMC Oil Type:
Lab Internal Oil Code:	Er	Engine Serial Number:

	Correction Effective Date	WDP	\mathbf{TGC}	\mathbf{TLC}	Oil Transformed Consumption Oil g/h Consumption	Transformed Oil Consumption	ЕОТОС g/h	Transformed EOTOC
Unadjusted Lab Rating								
Industry Correction (If Any)								
Subtotal								
Lab Severity Adjustment (If Any) ^B								
Total								

	Correction Effective				Oil Consumption	Transformed Oil	ЕОТОС	[ranformed
	Date	WDP	TGC	TLC	g/h	g/h Consumption	g/h	g/h EOTOC
Test Target Mean A								
Test Target STD A								
API Pass Limit ^B	SS							

	Top	Int. 1	Oil	Piston Crown	Piston Skirt	Liner
Ring Loss of Side Clearance (mm)						
Ring End Gap Increase (mm)						
Is the Ring Stuck?						
Scuffed Area %						
Average Wear Step (µm)						
% Bore Polish						

Notes: A Reference oil tests or as requested by test sponsor B Non-reference oil tests only

Operational Summary Form 2 **1**P

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

				275	kPa		0.00	Fuel From Head	
				265	kPa		0.00	Exhaust (Absolute)	
				272	kPa		0.00	Inlet Air (Absolute)	
				415	kPa		0.00	Oil To Manifold	
								Pressures	
				42	°C		0.00	Fuel Into Head	
				60	°C		0.00	Inlet Air	Cont
				130	°C		0.00	Oil To Manifold	
				90	°C		0.00	Coolant Out	ed l
								Temperature	Para
				75	L/min		0.00	Coolant Flow	
				17.8	g/kg		0.00	Humidity	ers
				185	g/min		0.00	Fuel Flow	
				1800	r/min		0.00	Engine Speed	
Over/Under Range ^C	BQD ^B	Samples A	Target Average		Units	Quality Index	Index Threshold	Operating Parameter	
oints	otal Data Points	Tot		Process		EOT	Quality		

				RS	ИЕТЕ	ARAN	LED P	rol	CONT	NON-	ì					
	Operating	Parameter	Intake Air Flow	Power	Torque	Blowby	Temperature	Coolant In	Coolant Delta T	Oil Cooler In	Heating Oil		Exhaust	Pressures	Crankcase	Coolant to Jug
		Units	kg/h	kW	Nm	L/min		°C	°C	°C		°C	°C		kPa	kPa
Process	Typical	Range "	312-378	53-57	248-301	20-56		85-88	2-6	128-131	165	maximum	463-492		0.09-0.3	64-92
		Average														
T	Samples	A														
Total Data Points	D B	BQD ^B														
Points	Over/Under	Range														

A Total number of data points taken as determined from test length and procedural specified sampling rate.

B Number of Bad Quality Data points not used in the calculation of the statistical measures.

C Number of points clipped by over/under range limits of the statistical measures.

D Gathered from 1P Matrix Test data.

Assembly Measurements and Parts Record Form 3 1P

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

Assembly Measurements and Parts Record	ind Parts Record
Injector Setting (GO / NO-GO)	
Was Timing Initialized? (YES/NO)	
Piston/Head Clearance mm	
Cam Gear Backlash mm	
Desired Fuel Timing °BTC	
Intake Valve Open °ATC	
Injector Plunger Lift mm @ 72°	
Intake Valve Lift mm @ 456°	
Exhaust Valve Lift mm @ 247°	

	Part Number	Serial Number	Date Code	Inspection Code
Liner	A	В	В	
Top Ring	С	Е		
Intermediate Ring	C	Ε		
Oil Ring	С	Е		
Piston Crown	D	D	F	G
Piston Skirt	Н	I		
Fuel Injector	J	K		
ECM EPROM				
Piston Cooling Jet				

A On liner O.D.
B On liner O.D. (NNAN)
C On box label
D On top of piston

E On paper envelope containing the ring F Number below "E" located on piston top Number below "E" located on piston top

H On bottom surface skirt

On bottom surface under pin bore

On top surface of plunger

K On top surface of plunger

1P Form 4 Piston Rating Summary

Test	t Identification	on		Lab:	I	EOT Dat	e:		En	d Time:		St	and:		Run #:		M	lethod:		
	nulation/Stan	d Code:								Oilco	ode:									
Test	Fuel:			Fuel Bat	ch:				Date	Rated:			Rater	Initials:			V	erified By	y:	
	Last Stand		ee																	
	Inform	ation		Date Con	pleted	:			Stan	ıd:			Run:	T. 0	1.0			il Code:		, ,
				77	/DD		TC	7.0		TLO		Oil Cons			ormed O	11	EOTO			formed
7	Last Reference	a this Sto	ınd	W	'DP		TC	JC		TLC		g/	h	Const	ımption		g/h		EO	1C
	Industry A		iiid																	
	Industry																			
Tota	al Piston Rat		ımarv																	
		B		ooves			Laı	nds			Gro	ove		Lan	ds		()il	Ur	nder
		No	o. 1	No.	2	No	o. 1	No	. 2			o. 3	No	o. 3	No	o. 4	-	oling		own
	Deposit									Deposit										
-	Factor	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	Factor	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.
C A	HC - 1.0									T										
R	MC - 0.5													1		•				
В	LC25																			
O																			l	
N	Total																			
						_														
	8 – 9																			
	7 - 7.9									7.5										
V	6 - 6.9 5 - 5.9																			
A	4 - 4.9									4.5										
R	3 - 3.9									4.5										
N	2 - 2.9																			
I	1 - 1.9									1.5										
S	>0 - 0.9																			
Н	Clean		0		0		0		0	Clean		0		0		0		0		0
	Total																			
Rati																				•
	ation Factor		2	3			1	3	}		2	20	2	20	6	0	C).5		1
Ind.	Rating																			
	WI)P				ГGC			op Lan Carbon		U	nweighte	d Deposi	its		То	p Land l	Flaked C	arbon %)
									<u></u>											

1P Form 4A Piston Rating Worksheet

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

Lab:			EOT D	ate:				End T	ime:			Method:			
Stand:								Run N	lumber:						
Formulation/Stand	Code	:													
Oilcode:															
				Carbon						7	√arnish				
Deposit T	ype		НС	MC	LC	8 - 9	7 - 7.9	6 - 6.9	5 - 5.9	4 - 4.9	3 - 3.9	2 - 2.9	1 - 1.9	>0 -	Clean
	1	T													
		В													
Groove															
Top	2	T													
and	_	В													
Bottom															
	3	T													
		В													
								L							
		<u>T</u>													
	1	В													
		BK													
		_													
Top Bottom and		T													
Back of	2	В													
Rings		BK													
		T													
	1	T												 	
	3	В												 	
		BK													
Additional Deposit	& C	ondition	Ratings	5											
Piston Crown															
Additional Deposit Piston Crown Piston Skirt Rings Liner															
Rings															
Liner															

1P Form 5A Referee Rating

Test Identification				
Lab:	EOT Date:	End Time:	Method:	
Stand:	Run:			
Formulation/Stand Code:				
Oilcode:				
Referee Rating Informatio	n			
Company:	Rating Number:	Date Rated:	Rater:	

	al Piston Ra			oves			Laı	nds] [Gro	ove		Lan	ds		О	il	Un	der
	Deposit	N	o. 1		o. 2	No	o. 1		o. 2	Deposit	No		No	. 3		o. 4	Cooling		Cro	own
	Factor	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	Factor	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM
С																				
4	HC - 1.0																			
R	MC - 0.5																			
В	LC25																			
O						I						1	1							
N	Total																			
				1	1	1														
	8 - 9																			
	7 - 7.9									7.5										
	6 - 6.9																			
V	5 - 5.9																			
A	4 - 4.9									4.5										
R	3 - 3.9																			
N	2 - 2.9																			
I	1 - 1.9									1.5										
S H	>0 - 0.9		•				0		0							0				
п	Clean		0		0		0		0			0		0		0		0		0
	T. 4 1			I		1							<u>' </u>					I		
n .	Total									-										
	ting									-										
Lo	cation																			
Fac	ctor		2		3		1	,	3		2	0	2	0	6	0	0.	.5		1
Ind	.Rating																			
		VDP				TGC			TLO	C	1	Jnweig	htad D	anacite		To	n Land	Flaked	Carbon	0/0

1P Form 6 Oil Analysis

Test Identification				
Lab:	EOT Date:	End Time:	Method:	
Stand:	Run:			
Formulation/Stand Code:	·			
Oilcode:				
Test Fuel:		Fuel Batch:		-

Oil Analysis	New	24	48	72	96	120	144	168	192	216	240	264	288	312	336	360
Viscosity @																
100°C																
Viscosity @ 40°C														1		
TBN D4739																
TAN D664																
Wear Metals																
Fe (ppm)								1								
Al (ppm)												1		1		
Si (ppm)								1								
Cu (ppm)																
Cr (ppm)												1				
Pb (ppm)								1				1				
Fuel																
Dilution %								1				1		1		
Blowby																
(L/min)	1															
Oil Consumption g/h for hrs ending																
Oil Consumption r2																
Fuel Position (mm)																

1P Form 7 Downtime Summary

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

								Number of C	Other C									Test Hours	Number of Downtime Occurrences
								Number of Comment Lines	Other Comments									Date	owntime Oc
							-	es										Downtime	currences
										Total Downtime (125								Rea	
										25 Hour Maximum)								Reasons	

1P Form 7A Downtime Summary

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

	ies	Number of Comment Lines	Number of
		Other Comments	Other
Total Downtime (125 Hour Maximum)		-	
Reasons	Downtime	Date	Test Hours
	ccurrences	Number of Downtime Occurrences	Number of I

1P Form 7B Downtime Summary

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

	es	Number of Comment Lines	Number of
		Other Comments	Other
Total Downtime (125 Hour Maximum)			
Reasons	Downtime	Date	Test Hours
	currences	Number of Downtime Occurrences	Number of I

1P Form 8 Ring Measurements

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

All Ring Measurements Are Made Using Metric Feeler Gages

y Smy my	Jeastiemes / He ivi	THE THEORY OF THE TIME CONTRACT OF THE CONTRACT CONTRACT OF THE TIME CONTRACT OF THE TIME CONTRACT OF THE TIME CONTRACT OF THE	on Ses
Ring Gaps (mm)	Тор	Intermediate	Oil
Specifications	$0.724 \pm 0.076 \text{ mm}$	$0.673 \pm 0.076 \mathrm{mm}$	$0.51 \pm 0.13 \text{ mm}$
Pre-Test			
Post-Test			
Increase			

Ring Clear	Ring Side Clearance*	A	В	С	D	Average	Average Minimum	Specification
	Pre-Test							
Top	Post-Test							0.13+0.04 mm
	LSC							
	Pre-Test							
Int.	Post-Test							0.18+0.04 mm
	LSC							
	Pre-Test							
Oil	Post-Test							0.07 +0.02 mm
	LSC							

* Notes:

- 1. Write "STUCK" in place of dimension when applicable.
- 2. Write "<0.038 mm " for clearance when applicable.
- 3. Write ">" before calculated decrease or average decrease values that incorporate a "<0.038 mm" in calculation.
- 4. LSC: Loss of Side Clearance
- 5. MIN: Intermediate and Oil Ring minimum side clearance is measured 360° around piston.

1P Form 9 Liner Measurements

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	le:		
 Oilcode/CMIR:			

		25 mm	50 mm	130 mm	Distance From Top Transverse	Liner Surface
(Spec: 0.4-0.8 μm)	Total Average				Longitudinal	Liner Surface Finish (Micrometer)
					Average	

%Liner Bore Polish - Grid
(Add T/AT Values From Grid)
Thrust
Anti_thrust
Total

					15mm
					Wear Step @
A	T	Rear	nt	Front	
Transverse		al	Longitudinal		
	rofile)	After Test - (Surface Profile)	After Test		
				max)	Taper (0.050 max)
					15 mm
					25 mm
					50 mm
					130 mm
					170 mm
					210 mm
					250 mm
(0.038 mm maximum)					
Out of Round	Transverse		Longitudinal	ht	Bore Height
	Bore Gage)	Before Test - Diameter (Dial Bore Gage)	iore Test - Di	Bef	
m)	Liner Bore Measurement (137.154mm minimum)	ment (137.15	ore Measure	Liner B	

1**P** Form 10

Characteristics of the Data Acquisition System	Characterist	tics of the	Data Acc	uisition	System
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Lab:	EOT Date:	End Time:	Method:				
Stand:	Run Number:						
Formulation/Stand Code:							
Oilcode/CMIR:							

Parameter	Sensing	Calibration	Record	Observation	Record	Log	System
(4)	Device	Frequency	Device	Frequency	Frequency	Frequency	Response
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Operation Conditions				1			
Engine Speed (r/min)							
Engine Power (kW)							
Fuel Flow (g/min)							
Humidity (g/kg)							
Temperatures (°C)							
Coolant Out							
Coolant In							
Oil to Manifold							
Oil Cooler In							
Inlet Air							
Exhaust							
Fuel to Head							
Pressures (kPa)							
Oil To Manifold							
Inlet Air							
Exhaust							
Fuel to Head							
Crankcase							
Flows (L/min)							
Blowby							
Coolant Flow							

Legend:

- (1) Operating Parameter
- (2) The type of device used to measure temperature, pressure or flow
- (3) Frequency at which the measurement system is calibrated
 (4) The type of device where data is recorded LG Hand log sheet
- - DL Automatic data logger
 - C/M Computer, using manual data entry

- (5) Data area observed but only recorded if off specification(6) Data are recorded but are not retained at EOT
- (7) Data are logged as permanent record, note specify if: SS Snapshot taken at specified frequency

- AG/X average of x data points at specified frequency
 (8) Time for the output to reach 63.2% of final value for step change at input

1**P**

Form 11 Engine Operational Data Plots

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Cod	de:		
Oilcode/CMIR:			

Form 12 Torque and Exhaust Temperature History

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code	e:		
Oilcode/CMIR:			

Data From Last 10 Tests

Test No.	1	2	3	4	5	6	7	8	9	10
Average Exhaust Temperature ° C										
Average Engine Torque Nm										

1P Form 13 Oil Consumption Plot

Lab:			ЕОТ	Date	: :					Er	nd Tir	ne:						Met	hod:					
Stand:			Run	Num	ber:																			
Formulation	/Stand	Code:																						
Oilcode/CM	IR:																							
	_																							
Oil	30																							
Consumption g/kW-h	28																							
8	26																							
Beginning of	24																							
Oil Test Consumption	22																							
1	20																							
End of Test	18																							
Oil	16																							
Consumption	14																							
0 11 0 1	12																							
Overall Oil Consumption	10																							
•	8																							
	6																							
	4																							
	2																							
	0																							
	0	12	24	36	<u> </u>	.8	60	72	84	96	10	08	20 1	32	144	168	18	0 1	192	204	216	228	240	252

Hours

1P Form 14 Piston Ring and Liner Photographs

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

1P Form 15 Severity Adjustment History

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:			
Oilcode/CMIR:			

		-	 ı	1					·
Usage Dates	Start								
Dates	Time								
WDP	Zi								
)P	S.A.								
TGC	Zi								
Ç	S.A.								
TLC	Zi								
Ç	S.A.								
Transformed OC	Zi								
	S.A.								
Transformed EOTOC	Zi								
rmed)C	S.A.								

1P Form 16 Fuel Batch Analysis

Lab:	EOT Date:	End Time:	Method:
Stand:	Run Number:		
Formulation/Stand Code:	de:		
Oilcode/CMIR:			

1P Form 17 TMC Control Chart Analysis (Reference Oil Tests Only)

	Lab:	EOT Date:	End Time:	Method:
	Stand:	Run Number:		
, .	Formulation/Stand Code:			
_	Oilcode/CMIR:			
ı				

American Chemistry Council Code of Practice Test Laboratory Conformance Statement Form 18

Test Laboratory	atory			
Test Sponsor Formulation /	or n / Stand Code			
Test Number				
Start Date		Start Time	Time Zone	
		Declarations	ns	
No. 1	All requirements of the ACC Code omet in the conduct of this test. Yes	ACC Code of Practice for is test. Yes N	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*	ē
No. 2	The laboratory ran this operational validity req other), including all up Yes	test for the full duration for uirements of the latest vers dates issued by the organizing	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*	[or
	If the response to this I operational validity req	Declaration is "No", does the uirements that occurred to	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*	٦
No 3.	A deviation occurred for one of the the test as being a special case. Yes specific deviations identified in the A	A deviation occurred for one of the test parameters identified by the conthetest as being a special case. Yes* No (This specific deviations identified in the ASTM Information Letter System)	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)	for to
	Check Appropriate Conclusion	Conclusion		
	Operational revie Multiple Test Ac *Operational revi Multiple Test Ac	Operational review of this test indicates that the Multiple Test Acceptance Criteria calculations. *Operational review of this test indicates that the Multiple Test Acceptance Criteria calculations.	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: Suppo	rting comments are rec	Note: Supporting comments are required for all responses identified with an asterisk. Comments	entified with an asterisk.	
Signature		Date		
Typed Name	; D	Title		