Sequence IX
Form 1

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
	RO = Reference oil

Test Number							
Stand		Stand Run		Engine		Engine Run	
Oil Code:							
Hours on Engine				Hours on Cylinder Head			
Formulation Stand Code							
Alternate Codes							
Date Started				Time Started			
Date Completed				Time Completed			
Test Length				Total Downtime			
Ref Oil Code[A]:							
SAE Viscosity							

[A] Reference Tests Only

In my opinion this test been conducted in a valid manner in accordance with test Method DXXXX 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 IX
Form 2
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Sequence IX
Form 3
Summary of Test Method

The Pre-ignition test is a fired engine dynamometer lubricant test which evaluates the ability of a test lubricant to reduce pre-ignition events. The test method is a cyclic test.

The Pre-ignition test uses a Ford water cooled, 4 cycle, in-line cylinder, 2.0 liter eoctec engine as the test apparatus. The engine incorporates a dual overhead cam, four valves per cylinder (2 intake; 2 exhaust), and direct acting mechanical bucket lifter valve train design. The engine is monitored for pre-ignition events and total number of pre-ignition events. Results are tabulated at the end of test.

The test sequence is repeated for 4 test iterations. Each iteration is outlined in the table below:

		Iteration			
Parameters	**Units**	**A**	**B**	**C**	**D**
Duration	cycles	175000	175000	175000	175000
Engine Speed	r/min	1750	1750	1750	1750
Torque	Nm	269	269	269	269
Equivalence Ratio	λ	1.00	1.00	1.00	1.00
Coolant Out Temperature	°C	95	95	95	95
Coolant Flow	L/min	55	55	55	55
Oil Gallery Temperature	°C	95	95	95	95
Inlet Air Temperature	°C	30	30	30	30
Air Charge Temperature	°C	43	43	43	43
Fuel Temperature	°C	30	30	30	30
Inlet Air Pressure	kPa	0.05	0.05	0.05	0.05
Exhaust Back Pressure	kPaA	104	104	104	104

Sequence IX
Form 4
Test Results Summary

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

Summary of Valid Iterations		
Iteration	**Number of Events***	
A		
B		
C		
D		
Total Number of Pre-ignitions, Valid Iterations		
Pass/Fail Parameters		
	Average	**Maximum**
Results from Valid Iterations		
Transformed results Valid Iterations		
Industry Correction Factor		
Corrected Transformed Pre-ignitions		
Severity Adjustment		
Final Transformed Result		
Final Original Unit Result		

Iteration	**Number of Events***	**Number of Cycles (per cylinder) #**								**Iteration Validity**
		Cylinder 1		**Cylinder 2**		**Cylinder 3**		**Cylinder 4**		
		Invalid	**Valid**	**Invalid**	**Valid**	**Invalid**	**Valid**	**Invalid**	**Valid**	

*Events are defined as the total number of pre-ignition events from all four cylinders during each iteration.

Sequence IX
Form 5
Operational Summary – Iteration A

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Coolant Out	ºC	0.000		95				
	Oil Gallery	ºC	0.000		95				
	Inlet Air	ºC	0.000		30				
	Air Charge	ºC	0.000		43				
	Fuel	ºC	0.000		30				
	Inlet Air	kPaA	0.000		0.05				
	Exhaust Back	kPaA	0.000		104				
	Coolant	kPaG	0.000		70				
	Humidity	g/kg	0.000		11.4				
	Coolant Flow	L/min	0.000		55				

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC				
	Oil Sump (optional)	ºC				
	Exhaust	ºC				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPaG				
	Fuel	kPaG				
	Fuel Flow	L/min				
	Power	kW				
	Equivalence Ratio	ʎ				

Sequence IX
Form 6
Operational Summary – Iteration B

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Coolant Out	ºC	0.000		95				
	Oil Gallery	ºC	0.000		95				
	Inlet Air	ºC	0.000		30				
	Air Charge	ºC	0.000		43				
	Fuel	ºC	0.000		30				
	Inlet Air	kPaA	0.000		0.05				
	Exhaust Back	kPaA	0.000		104				
	Coolant	kPaG	0.000		70				
	Humidity	g/kg	0.000		11.4				
	Coolant Flow	L/min	0.000		55				

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC				
	Oil Sump (optional)	ºC				
	Exhaust	ºC				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPaG				
	Fuel	kPaG				
	Fuel Flow	L/min				
	Power	kW				
	Equivalence Ratio	ʎ				

Sequence IX
Form 7
Operational Summary – Iteration C

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Coolant Out	ºC	0.000		95				
	Oil Gallery	ºC	0.000		95				
	Inlet Air	ºC	0.000		30				
	Air Charge	ºC	0.000		43				
	Fuel	ºC	0.000		30				
	Inlet Air	kPaA	0.000		0.05				
	Exhaust Back	kPaA	0.000		104				
	Coolant	kPaG	0.000		70				
	Humidity	g/kg	0.000		11.4				
	Coolant Flow	L/min	0.000		55				

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC				
	Oil Sump (optional)	ºC				
	Exhaust	ºC				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPaG				
	Fuel	kPaG				
	Fuel Flow	L/min				
	Power	kW				
	Equivalence Ratio	ʎ				

Sequence IX
Form 8
Operational Summary – Iteration D

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Coolant Out	ºC	0.000		95				
	Oil Gallery	ºC	0.000		95				
	Inlet Air	ºC	0.000		30				
	Air Charge	ºC	0.000		43				
	Fuel	ºC	0.000		30				
	Inlet Air	kPaA	0.000		0.05				
	Exhaust Back	kPaA	0.000		104				
	Coolant	kPaG	0.000		70				
	Humidity	g/kg	0.000		11.4				
	Coolant Flow	L/min	0.000		55				

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC				
	Oil Sump (optional)	ºC				
	Exhaust	ºC				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPaG				
	Fuel	kPaG				
	Fuel Flow	L/min				
	Power	kW				
	Equivalence Ratio	ʎ				

Sequence IX
Form 9
Operational Summary – CAN BUS, Iterations A and B

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

	Iteration A	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º				
	Absolute Throttle Position	%				
	Engine Coolant Temperature	ºC				
	Intake Air Temperature	ºC				
	Equivalence Ratio (Lambda)	ʎ				
	Absolute Load Value	%				
	Intake Manifold Absolute Pressure	kPaA				
	Fuel Rail Pressure	kPaA				
	Boost Absolute Pressure - Raw Value	kPaA				
	Turbocharger/Supercharger Wastegate	%				
	Actual Intake (A) Camshaft Position	º				
	Actual Exhaust (B) Camshaft Position	º				
	Intake (A) Camshaft Position Actuator Duty	%				
	Exhaust (B) Camshaft Position Actuator Duty	%				
	Charge Air Cooler Temperature	ºC				

	Iteration B	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º				
	Absolute Throttle Position	%				
	Engine Coolant Temperature	ºC				
	Intake Air Temperature	ºC				
	Equivalence Ratio (Lambda)	ʎ				
	Absolute Load Value	%				
	Intake Manifold Absolute Pressure	kPaA				
	Fuel Rail Pressure	kPaA				
	Boost Absolute Pressure - Raw Value	kPaA				
	Turbocharger/Supercharger Wastegate	%				
	Actual Intake (A) Camshaft Position	º				
	Actual Exhaust (B) Camshaft Position	º				
	Intake (A) Camshaft Position Actuator Cycle	%				
	Exhaust (B) Camshaft Position Actuator Duty	%				
	Charge Air Cooler Temperature	ºC				

Sequence IX
Form 10
Operational Summary – CAN BUS, Iterations C and D

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

	Iteration C	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º				
	Absolute Throttle Position	%				
	Engine Coolant Temperature	ºC				
	Intake Air Temperature	ºC				
	Equivalence Ratio (Lambda)	ʎ				
	Absolute Load Value	%				
	Intake Manifold Absolute Pressure	kPaA				
	Fuel Rail Pressure	kPaA				
	Boost Absolute Pressure - Raw Value	kPaA				
	Turbocharger/Supercharger Wastegate	%				
	Actual Intake (A) Camshaft Position	º				
	Actual Exhaust (B) Camshaft Position	º				
	Intake (A) Camshaft Position Actuator Duty	%				
	Exhaust (B) Camshaft Position Actuator	%				
	Charge Air Cooler Temperature	ºC				

	Iteration D	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º				
	Absolute Throttle Position	%				
	Engine Coolant Temperature	ºC				
	Intake Air Temperature	ºC				
	Equivalence Ratio (Lambda)	ʎ				
	Absolute Load Value	%				
	Intake Manifold Absolute Pressure	kPaA				
	Fuel Rail Pressure	kPaA				
	Boost Absolute Pressure - Raw Value	kPaA				
	Turbocharger/Supercharger Wastegate	%				
	Actual Intake (A) Camshaft Position	º				
	Actual Exhaust (B) Camshaft Position	º				
	Intake (A) Camshaft Position Actuator Cycle	%				
	Exhaust (B) Camshaft Position Actuator	%				
	Charge Air Cooler Temperature	ºC				

Sequence IX
Form 11
Cycle Count and Type Summary

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

	Iteration A			Iteration B			Iteration C			Iteration D		
Cylinder	**PP Only**	**MFB2 Only**	**PP and MFB2**	**PP Only**	**MFB2 Only**	**PP and MFB2**	**PP Only**	**MFB2 Only**	**PP and MFB2**	**PP Only**	**MFB2 Only**	**PP and MFB2**
1												
2												
3												
4												
All												

Evaluation Criteria

	Iteration A				Iteration B				Iteration C				Iteration D			
Parameter	**Cyl 1**	**Cyl 2**	**Cyl 3**	**Cyl 4**	**Cyl 1**	**Cyl 2**	**Cyl 3**	**Cyl 4**	**Cyl 1**	**Cyl 2**	**Cyl 3**	**Cyl 4**	**Cyl 1**	**Cyl 2**	**Cyl 3**	**Cyl 4**
PP Mean																
PP Std Dev																
PP F Value																
PP Thresh																
MFB2 Mean																
MFB2 Std Dev																
MFB2 F Value																
MFB2 Thresh																

Legend:
PP **Peak Pressure Only**
MFB2 **Mass Fraction Burn 2% Only**
PP& MFB2 **Both Peak Pressure and Mass Fraction Burn 2%**

Sequence IX
Form 12
Summary of Pre-ignition Events, Iteration A

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

Cylinder	Cycle	Peak Pressure	MFB2	Type

Cylinder	Cycle	Peak Pressure	MFB2	Type

Legend:
PP **Peak Pressure Only**
MFB2 **Mass Fraction Burn @2% Only**
PP&MFB2 **Both Peak Pressure and Mass Fraction Burn @ 2%**

Sequence IX

Form 13

Summary of Pre-ignition Events, Iteration B

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

Cylinder	Cycle	Peak Pressure	MFB2	Type

Cylinder	Cycle	Peak Pressure	MFB2	Type

Legend:

PP Peak Pressure Only

MFB2 Mass Fraction Burn @2% Only

PP&MFB2 Both Peak Pressure and Mass Fraction Burn @ 2%

Sequence IX
Form 14
Summary of Pre-ignition Events, Iteration C

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

Cylinder	Cycle	Peak Pressure	MFB2	Type

Cylinder	Cycle	Peak Pressure	MFB2	Type

Legend:
PP Peak Pressure Only
MFB2 Mass Fraction Burn 2% Only
PP&MFB2 Both Peak Pressure and Mass Fraction Burn 2%

Sequence IX
Form 15
Summary of Pre-ignition Events, Iteration D

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

Cylinder	Cycle	Peak Pressure	MFB2	Type

Cylinder	Cycle	Peak Pressure	MFB2	Type

Legend:
PP Peak Pressure Only
MFB2 Mass Fraction Burn 2% Only
PP&MFB2 Both Peak Pressure and Mass Fraction Burn 2%

Sequence IX
Form 16
Hardware Information

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

Oil Weight at SOT (kg)		Piston Batch	
Short Block ID		Engine Hours	
Cylinder Head ID		Cylinder Head Hours	
Turbocharger ID		Turbocharger Hours	
PCM Calibration Identification			

Transducer Replacement History

Cylinder	**Iteration**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1								
2								
3								
4								

Sequence IX
Form 17
Chemical Analyses

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

Iteration	mg/kg								Fuel Dilution By GC, Wt.% D3525	Vis, @ 40°C, cSt D445	Vis, @ 100°C, cSt D445
	Ag	Al	Cu	Fe	Na	Pb	Si	Sn			
New Oil											
A											
B											
C											
D											

Sequence IX
Form 18
Downtime Record

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

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours)

Sequence IX
Form 19
Comment Record

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

Number of Comment Lines	

Sequence IX

Form 20
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