



**Pre-Ignition Test  
Form 2  
Table of Contents**

1.	Title / Validity Declaration Page	Form 1
2.	Table of Contents	Form 2
3.	Test Results Summary	Form 3
4.	Summary of LSPI Iterations	Form 4
5.	Operational Summary – Iteration A	Form 5
6.	Operational Summary – Iteration B	Form 6
7.	Operational Summary – Iteration C	Form 7
8.	Operational Summary – Iteration D	Form 8
9.	Operational Summary – CAN BUS, Iterations A and B	Form 9
10.	Operational Summary – CAN BUS, Iterations C and D	Form 10
11.	LSPI Cycle Count and Type Summary	Form 11
12.	LSPI Events Summary-Iteration A	Form 12
13.	LSPI Events Summary-Iteration B	Form 13
14.	LSPI Events Summary-Iteration C	Form 14
15.	LSPI Events Summary-Iteration D	Form 15
16.	Chem Analysis	Form 16
17.	Hardware Information	Form 17
18.	Downtime Record	Form 18
19.	Comment Record	Form 19
19.	ACC Conformance	Form 20

**Pre-ignition Test  
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 EcoTech 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 are tabulated at the end of test the end of test.

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

<b>Parameters</b>	<b>Units</b>	<b>Iteration</b>			
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Duration	cycles	175000	175000	175000	175000
Engine Speed	r/min	1750	1750	1750	1750
Torque	Nm	269	269	269	269
Equivalence Ratio	$\lambda$	1.00	1.00	1.00	1.00
Coolant Out Temperature	°C	95	95	95	95
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

**Pre-Ignition Test  
Form 4  
Test Results Summary**

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

<b>Summary of Valid Iterations</b>	
<b>Iteration</b>	<b>Number of Events*</b>
A	
B	
C	
D	
Average of Valid Iterations	
Total Number of Pre-ignitions, Valid Iterations	

<b>Summary of LSPI Events</b>							
<b>Iteration</b>	<b>Number of Events*</b>	<b>Number of Cycles</b>	<b>Number of Invalid Cycles (per cylinder)</b>				<b>Iteration Validity</b>
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	

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

**Pre-Ignition Test  
Form 5  
Operational Summary – Iteration A**

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

Controlled Parameters	Parameter	Unit	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Equivalence	$\lambda$	0.000		1.00				
	Coolant Out	°C	0.000		95				
	Oil Gallery	°C	0.000		95				
	Inlet Air	°C	0.000		30				
	Air Charge	°C	0.000		35				
	Fuel	°C	0.000		30				
Inlet Air	kPa	0.000		0.05					
Exhaust Back	kPa	0.000		104					

Non-controlled Parameters	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
	Coolant In	°C				
	Oil Sump	°C				
	Exhaust	°C				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPa				
	Fuel	kPa				
	Coolant	kPa				
	Fuel Flow	L/min				
Coolant Flow	L/min					
Power	kW					

**Pre-Ignition Test  
Form 6  
Operational Summary – Iteration B**

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

Controlled Parameters	Parameter	Unit	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Equivalence	λ	0.000		1.00				
	Coolant Out	°C	0.000		95				
	Oil Gallery	°C	0.000		95				
	Inlet Air	°C	0.000		30				
	Air Charge	°C	0.000		35				
	Fuel	°C	0.000		30				
Inlet Air	kPa	0.000		0.05					
Exhaust Back	kPa	0.000		104					

Non-controlled Parameters	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
	Coolant In	°C				
	Oil Sump	°C				
	Exhaust	°C				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPa				
	Fuel	kPa				
	Coolant	kPa				
	Fuel Flow	L/min				
Coolant Flow	L/min					
Power	kW					

**Pre-Ignition Test  
Form 7  
Operational Summary – Iteration C**

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

Controlled Parameters	Parameter	Unit	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Equivalence	$\lambda$	0.000		1.00				
	Coolant Out	°C	0.000		95				
	Oil Gallery	°C	0.000		95				
	Inlet Air	°C	0.000		30				
	Air Charge	°C	0.000		35				
	Fuel	°C	0.000		30				
	Inlet Air	kPa	0.000		0.05				
	Exhaust Back	kPa	0.000		104				

Non-controlled Parameters	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
	Coolant In	°C				
	Oil Sump	°C				
	Exhaust	°C				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPa				
	Fuel	kPa				
	Coolant	kPa				
	Fuel Flow	L/min				
	Coolant Flow	L/min				
	Power	kW				

**Pre-Ignition Test  
Form 8  
Operational Summary – Iteration D**

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

Controlled Parameters	Parameter	Unit	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
	Speed	r/min	0.000		1750				
	Torque	Nm	0.000		269				
	Equivalence	$\lambda$	0.000		1.00				
	Coolant Out	°C	0.000		95				
	Oil Gallery	°C	0.000		95				
	Inlet Air	°C	0.000		30				
	Air Charge	°C	0.000		35				
	Fuel	°C	0.000		30				
Inlet Air	kPa	0.000		0.05					
Exhaust Back	kPa	0.000		104					

Non-controlled Parameters	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
	Coolant In	°C				
	Oil Sump	°C				
	Exhaust	°C				
	Boost Pressure	kPaA				
	Intake Manifold	kPaA				
	Barometric	kPaA				
	Crankcase	kPa				
	Fuel	kPa				
	Coolant	kPa				
	Fuel Flow	L/min				
Coolant Flow	L/min					
Power	kW					



**Pre-Ignition Test  
Form 9  
Operational Summary – CAN BUS, Iterations A and B**

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

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

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

**Pre-Ignition Test  
Form 10  
Operational Summary – CAN BUS, Iterations C and D**

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

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

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

**Pre-Ignition Test  
Form 11  
LSPI Cycle Count and Type Summary**

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

Cylinder	Iteration A			Iteration B			Iteration C			Iteration D		
	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**

Parameter	Iteration A				Iteration B				Iteration C				Iteration D			
	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 Stat																
PP Thresh																
MFB2 Mean																
MFB2 Std Dev																
MFB2 F Stat																
MFB2 Thresh																

**Legend:**

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



















**LSPI**  
**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

\_\_\_\_\_