Used Oil LSPI
Form 1
Version
UOLSPI VERSION 20230510 Beta
Conducted For
TSTSPON1
TSTSPON2

LABVALID	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

TSTOIL	NR = Non-reference oil
	RO = Reference oil

Test Number, Aging							
Stand	STANDA	# of Runs since last Calibration	CALCOI	Total runs on stand	TOTSTRUN		
Test Number, LSPI							
Stand	STANDL	Stand Run	STRUN	Engine	ENGNO	Engine Run	ENRUN
Oil Code:	OILCODE						
Formulation Stand Code	FORM						
Alternate Codes	ALTCODE1			ALTCODE2		ALTCODE3	
Date Started, Aging	DTSTRT			Time Started, Aging		STRTTIME	
Date Started, LSPI	DTSTRTL			Time Started, LSPI		STRTTIML	
Date Completed, Aging	DTCOMP			Time Completed, Aging		EOTTIME	
Date Completed, LSPI	DTCOMPL			Time Completed, LSPI		EOTTIMEL	
Test Length, Aging	TESTLEN			Total Downtime, Aging		TOTLDOWN	
Test Length, LSPI	TESTLENL			Total Downtime, LSPI		TOTDOWNL	
Ref Oil Code[A]:	IND						
SAE Viscosity	SAEVISC						

[A] Reference Tests Only

In my opinion this test OPVALID 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: SUBLAB
Testing Laboratory

SUBSIGIM
Signature

SUBNAME
Typed Name

SUBTITLE
Title

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Form 3
Summary of Test Method

The Used Oil LSPI test is a fired engine dynamometer lubricant test which evaluates the ability of a test lubricant to reduce pre-ignition events on an aged oil. The test method consists of a is a cyclic test for aging and a steady state test for preignition.

The Pre-ignition test uses a Ford water cooled, 4 cycle, in-line cylinder, 2.0 liter EcoBoost 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 for aging is summarized below and runs for 72 hours.

Parameter	Units	Quantity
Duration	H	72
Engine Speed	r/min	2500
Engine Torque	N·m	128
Oil Gallery Temperature	°C	100
Coolant Out Temperature	°C	85
Coolant Flow	L/min	70
Intake Air Temperature	°C	32
Intake Air Pressure	kPa	0.05
Intake Air Humidity	g/kg	11.4
Coolant Pressure	kPa	70
Air Charge Temperature	°C	30
Air-Fuel Ratio	λ	1.0
Exhaust Backpressure	kPa	107
Blowby Flowrate	L/min	65-75

The test sequence for LSPI 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

Used Oil LSPI
Form 4

Test Result Summary, Aging

Lab	LAB	Oil Code	OILCODE		
Stand	STANDA	Test No.	TESTNUM		
Laboratory Oil Code			LABOCODE		
Engine No.		ENGNO		Fuel Batch	FUELBTID
SAE Viscosity		SAEVISC		Reference Oil	IND

Critical Oil Analysis Results

Analysis Parameter	New Oil	End of Test
Total Acid Number	TAN_NEW	TANEOT
Total Base Number	TBNNEW	TBNEOT
Kinematic Viscosity @ 40 °C	V40NEW	V40EOT
Kinematic Viscosity @ 100 °C	V100NEW	V100EOT
Soot Concentration		EOTSOOT
Oxidation, FTIR by D7414		IROEOT
Nitration, FTIR by D7624		IRNEOT
Fuel dilution, D3525		FUELEOT
Weight of Oil Drain @ End of Test		OILWTEOT

Blowby	
Test Hours	**Blowby, L/min**
23.5 to 23.75	BBY_H023
47.5 to 47.75	BBY_H047
71.5 to 71.75	BBY_H071
Maximum	BBYMAX
Minimum	BBYMIN
Average	ABLOWBY

Used Oil LSPI
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Test Results Summary, LSPI

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Summary of Valid Iterations		
Iteration	**Number of Events***	
A	NOEVENTA	
B	NOEVENTB	
C	NOEVENTC	
D	NOEVENTD	
Total Number of Pre-ignitions, Valid Iterations	TOTNOPRE	
Pass/Fail Parameters		
	Average	**Maximum**
Results from Valid Iterations	AVGNOPRE	MAXNOPRE
Transformed results Valid Iterations	TAVGPRE	TMAXPRE
Industry Correction Factor	AVGPRECF	MAXPRECF
Corrected Transformed Pre-ignitions	AVGPICOR	MAXPICOR
Severity Adjustment	AVGPRESA	MAXPRESA
Final Transformed Result	TAVGPFNL	TMAXPFNL
Final Original Unit Result	AVGPIFNL	MAXPIFNL

		Number of Cycles (per cylinder) #								
		Cylinder 1		Cylinder 2		Cylinder 3		Cylinder 4		Iteration
Iteration	**Number of Events***	**Invalid**	**Valid**	**Invalid**	**Valid**	**Invalid**	**Valid**	**Invalid**	**Valid**	**Validity**
ITERR001	NEVIR001	ICC1R001	VCC1R00	ICC2R001	VCC2R00	ICC3R001	VCC3R0(	ICC4R001	VCC4R0(	VAL_R001
ITERR002	NEVIR002	ICC1R002	VCC1R00	ICC2R002	VCC2R00	ICC3R002	VCC3R0(	ICC4R002	VCC4R0(	VAL_R002
ITERR003	NEVIR003	ICC1R003	VCC1R00	ICC2R003	VCC2R00	ICC3R003	VCC3R0(	ICC4R003	VCC4R0(	VAL_R003
ITERR004	NEVIR004	ICC1R004	VCC1R00	ICC2R004	VCC2R00	ICC3R004	VCC3R0(	ICC4R004	VCC4R0(	VAL_R004
ITERR005	NEVIR005	ICC1R005	VCC1R00	ICC2R005	VCC2R00	ICC3R005	VCC3R0(	ICC4R005	VCC4R0(	VAL_R005
ITERR006	NEVIR006	ICC1R006	VCC1R00	ICC2R006	VCC2R00	ICC3R006	VCC3R0(	ICC4R006	VCC4R0(	VAL_R006
ITERR007	NEVIR007	ICC1R007	VCC1R00	ICC2R007	VCC2R00	ICC3R007	VCC3R0(	ICC4R007	VCC4R0(	VAL_R007
ITERR008	NEVIR008	ICC1R008	VCC1R00	ICC2R008	VCC2R00	ICC3R008	VCC3R0(	ICC4R008	VCC4R0(	VAL_R008
ITERR009	NEVIR009	ICC1R009	VCC1R00	ICC2R009	VCC2R00	ICC3R009	VCC3R0(	ICC4R009	VCC4R0(	VAL_R009
ITERR010	NEVIR010	ICC1R010	VCC1R01	ICC2R010	VCC2R01	ICC3R010	VCC3R0	ICC4R010	VCC4R01	VAL_R010
ITERR011	NEVIR011	ICC1R011	VCC1R01	ICC2R011	VCC2R01	ICC3R011	VCC3R0	ICC4R011	VCC4R01	VAL_R011
ITERR012	NEVIR012	ICC1R012	VCC1R01	ICC2R012	VCC2R01	ICC3R012	VCC3R0	ICC4R012	VCC4R01	VAL_R012
ITERR013	NEVIR013	ICC1R013	VCC1R01	ICC2R013	VCC2R01	ICC3R013	VCC3R0	ICC4R013	VCC4R01	VAL_R013

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

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Operational Summary, Aging

Lab	LAB	Oil Code	OILCODEL
Stand	STANDA	Test No.	TESTNUM
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000	QRPM	2500	ARPM	NRPM	BRPM
	Torque	N·m	0.000	QTORQUE	128	ATORQUE	NTORQUE	BTORQUE
	Oil Gallery Temperature	°C	0.000	QOILGAL	100	AOILGAL	NOILGAL	BOILGAL
	Coolant Out Temperature	°C	0.000	QCOOLOU	85	ACOOLOUT	NCOOLOUT	BCOOLOUT
	Coolant System Pressure	kPa	0.000	QCOOLPRI	70	ACOLPRE	NCOLPRE	BCOLPRE
	Engine Coolant Flow	L/min	0.000	QENGFLO	70	AENGFLO	NENGFLO	BENGFLO
	Intake Air Humidity	g/kg	0.000	QAIRHUM	11.4	AAIRHUM	NAHUM	BAHUM
	Intake Air Pressure	kPa	0.000	QINAIRP	0.05	AINAIRP	NINAIRP	BINAIRP
	Exhaust Back Pressure	kPa abs.	0.000	QEXHBP	107	AEXHBP	NEXHBP	BEXHBP
	Intake Air Temperature	°C	0.000	QINAIRT	32	AINAIRT	NINAIRT	BINAIRT
	Air Charge Temperature	°C	0.000	QAIRCHT	30	AAIRCHT	NAIRCHT	BAIRCHT
	Lambda	λ	0.000	QLAMBDA	1	ALAMBDA	NLAMBDA	BLAMBDA
	Blowby Flowrate	L/min			65-75	ABLOWBY		

	Parameter	Units	Average	Number of Samples	Number of BQD
Non Controlled	Ambient Cell	°C	ACELAMBT	NCELAMBT	BCELAMBT
	Fuel Flow	kg/h	AFUELRT	NFUELRT	BFUELRT
	Ignition Voltage	V	AIGNVOLT	NIGNVOLT	BIGNVOLT
	Fuel Temperature	°C	AFUELT	NFUELT	BFUELT
	Coolant In Temperature	°C	AECOLIN	NECOLIN	BECOLIN
	Oil Filter In Temperature	°C	AOTEMP	NOTEMP	BOTEMP
	Exhaust Temperature	°C	AEXTEMP	NEXTEMP	BEXTEMP
	Manifold Absolute Pressure	kPa abs.	AINMAP	NINMAP	BINMAP
	Boost Pressure	kPa abs.	ABPRES	NBPRES	BBPRES
	Barometric Pressure	kPa abs.	ABARO	NBARO	BBARO
	Oil Gallery Pressure	kPa	AOGALP	NOGALP	BOGALP
	Oil Head Pressure	kPa	AOHEADP	NOHEADP	BOHEADP
	Crankcase Pressure	kPa	ACCASEP	NCCASEP	BCCASEP
	Fuel Pressure	kPa	APFUEL	NPFUEL	BPFUEL
	Pre-Intercooler Pressure	kPa abs.	APREINTP	NPREINTP	BPREINTP

Used Oil LSPI
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Operational Summary – Iteration A

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	
Fuel Batch		FUELBATA	

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000	QRPMITA	1750	ARPMITA	SRPMITA	NRPMITA	BRPMITA
	Torque	Nm	0.000	QTORQITA	269	ATORQITA	STORQITA	NTORQITA	BTORQITA
	Coolant Out	ºC	0.000	QCOUTITA	95	ACOUTITA	SCOUTITA	NCOUTITA	BCOUTITA
	Oil Gallery	ºC	0.000	QOILGITA	95	AOILGITA	SOILGITA	NOILGITA	BOILGITA
	Inlet Air	ºC	0.000	QILATITA	30	AILATITA	SILATITA	NILATITA	BILATITA
	Air Charge	ºC	0.000	QACTITA	43	AACTITA	SACTITA	NACTITA	BACTITA
	Fuel	ºC	0.000	QFUELITA	30	AFUELITA	SFUELITA	NFUELITA	BFUELITA
	Inlet Air	kPaA	0.000	QIAPITA	0.05	AIAPITA	SIAPITA	NIAPITA	BIAPITA
	Exhaust Back	kPaA	0.000	QEBPITA	104	AEBPITA	SEBPITA	NEBPITA	BEBPITA
	Coolant	kPaG	0.000	QCOLPITA	70	ACOLPITA	SCOLPITA	NCOLPITA	BCOLPITA
	Humidity	g/kg	0.000	QHUMITA	11.4	AHUMITA	SHUMITA	NHUMITA	BHUMITA
	Coolant Flow	L/min	0.000	QCFLOITA	55	ACFLOITA	SCFLOITA	NCFLOITA	BCFLOITA

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC	ACOINITA	SCOINITA	NCOINITA	BCOINITA
	Oil Sump (optional)	ºC	ASUMPITA	SSUMPITA	NSUMPITA	BSUMPITA
	Exhaust	ºC	AEXHTITA	SEXHTITA	NEXHTITA	BEXHTITA
	Boost Pressure	kPaA	ABPITA	SBPITA	NBPITA	BBPITA
	Intake Manifold	kPaA	AIMPITA	SIMPITA	NIMPITA	BIMPITA
	Barometric	kPaA	ABAROITA	SBAROITA	NBAROITA	BBAROITA
	Crankcase	kPaG	ACCPITA	SCCPITA	NCCPITA	BCCPITA
	Fuel	kPaG	AFPRITA	SFPRITA	NFPRITA	BFPRITA
	Fuel Flow	kg/h	AFFLOITA	SFFLOITA	NFFLOITA	BFFLOITA
	Power	kW	APWRITA	SPWRITA	NPWRITA	BPWRITA
	Equivalence Ratio	ʎ	ALAMBITA	SLAMBITA	NLAMBITA	BLAMBITA

Used Oil LSPI
Form 8
Operational Summary – Iteration B

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	
Fuel Batch		FUELBATB	

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000	QRPMITB	1750	ARPMITB	SRPMITB	NRPMITB	BRPMITB
	Torque	Nm	0.000	QTORQITB	269	ATORQITB	STORQITB	NTORQITE	BTORQITE
	Coolant Out	ºC	0.000	QCOUTITB	95	ACOUTITB	SCOUTITB	NCOUTITE	BCOUTITE
	Oil Gallery	ºC	0.000	QOILGITB	95	AOILGITB	SOILGITB	NOILGITB	BOILGITB
	Inlet Air	ºC	0.000	QILATITB	30	AILATITB	SILATITB	NILATITB	BILATITB
	Air Charge	ºC	0.000	QACTITB	43	AACTITB	SACTITB	NACTITB	BACTITB
	Fuel	ºC	0.000	QFUELITB	30	AFUELITB	SFUELITB	NFUELITB	BFUELITB
	Inlet Air	kPaA	0.000	QIAPITB	0.05	AIAPITB	SIAPITB	NIAPITB	BIAPITB
	Exhaust Back	kPaA	0.000	QEBPITB	104	AEBPITB	SEBPITB	NEBPITB	BEBPITB
	Coolant	kPaG	0.000	QCOLPITB	70	ACOLPITB	SCOLPITB	NCOLPITB	BCOLPITB
	Humidity	g/kg	0.000	QHUMITB	11.4	AHUMITB	SHUMITB	NHUMITB	BHUMITB
	Coolant Flow	L/min	0.000	QCFLOITB	55	ACFLOITB	SCFLOITB	NCFLOITB	BCFLOITB

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC	ACOINITB	SCOINITB	NCOINITB	BCOINITB
	Oil Sump (optional)	ºC	ASUMPITB	SSUMPITB	NSUMPITB	BSUMPITB
	Exhaust	ºC	AEXHTITB	SEXHTITB	NEXHTITB	BEXHTITB
	Boost Pressure	kPaA	ABPITB	SBPITB	NBPITB	BBPITB
	Intake Manifold	kPaA	AIMPITB	SIMPITB	NIMPITB	BIMPITB
	Barometric	kPaA	ABAROITB	SBAROITB	NBAROITB	BBAROITB
	Crankcase	kPaG	ACCPITB	SCCPITB	NCCPITB	BCCPITB
	Fuel	kPaG	AFPRITB	SFPRITB	NFPRITB	BFPRITB
	Fuel Flow	kg/h	AFFLOITB	SFFLOITB	NFFLOITB	BFFLOITB
	Power	kW	APWRITB	SPWRITB	NPWRITB	BPWRITB
	Equivalence Ratio	ʎ	ALAMBITB	SLAMBITB	NLAMBITB	BLAMBITB

Used Oil LSPI
Form 9
Operational Summary – Iteration C

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	
Fuel Batch		FUELBATC	

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000	QRPMITC	1750	ARPMITC	SRPMITC	NRPMITC	BRPMITC
	Torque	Nm	0.000	QTORQITC	269	ATORQITC	STORQITC	NTORQITC	BTORQITC
	Coolant Out	ºC	0.000	QCOUTITC	95	ACOUTITC	SCOUTITC	NCOUTITC	BCOUTITC
	Oil Gallery	ºC	0.000	QOILGITC	95	AOILGITC	SOILGITC	NOILGITC	BOILGITC
	Inlet Air	ºC	0.000	QILATITC	30	AILATITC	SILATITC	NILATITC	BILATITC
	Air Charge	ºC	0.000	QACTITC	43	AACTITC	SACTITC	NACTITC	BACTITC
	Fuel	ºC	0.000	QFUELITC	30	AFUELITC	SFUELITC	NFUELITC	BFUELITC
	Inlet Air	kPaA	0.000	QIAPITC	0.05	AIAPITC	SIAPITC	NIAPITC	BIAPITC
	Exhaust Back	kPaA	0.000	QEBPITC	104	AEBPITC	SEBPITC	NEBPITC	BEBPITC
	Coolant	kPaG	0.000	QCOLPITC	70	ACOLPITC	SCOLPITC	NCOLPITC	BCOLPITC
	Humidity	g/kg	0.000	QHUMITC	11.4	AHUMITC	SHUMITC	NHUMITC	BHUMITC
	Coolant Flow	L/min	0.000	QCFLOITC	55	ACFLOITC	SCFLOITC	NCFLOITC	BCFLOITC

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC	ACOINITC	SCOINITC	NCOINITC	BCOINITC
	Oil Sump (optional)	ºC	ASUMPITC	SSUMPITC	NSUMPITC	BSUMPITC
	Exhaust	ºC	AEXHTITC	SEXHTITC	NEXHTITC	BEXHTITC
	Boost Pressure	kPaA	ABPITC	SBPITC	NBPITC	BBPITC
	Intake Manifold	kPaA	AIMPITC	SIMPITC	NIMPITC	BIMPITC
	Barometric	kPaA	ABAROITC	SBAROITC	NBAROITC	BBAROITC
	Crankcase	kPaG	ACCPITC	SCCPITC	NCCPITC	BCCPITC
	Fuel	kPaG	AFPRITC	SFPRITC	NFPRITC	BFPRITC
	Fuel Flow	kg/h	AFFLOITC	SFFLOITC	NFFLOITC	BFFLOITC
	Power	kW	APWRITC	SPWRITC	NPWRITC	BPWRITC
	Equivalence Ratio	ʎ	ALAMBITC	SLAMBITC	NLAMBITC	BLAMBITC

Used Oil LSPI
Form 10
Operational Summary – Iteration D

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	
Fuel Batch		FUELBATD	

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of Samples	Number of BQD
Controlled Parameters	Speed	r/min	0.000	QRPMITD	1750	ARPMITD	SRPMITD	NRPMITD	BRPMITD
	Torque	Nm	0.000	QTORQITD	269	ATORQITD	STORQITD	NTORQITD	BTORQITD
	Coolant Out	ºC	0.000	QCOUTITD	95	ACOUTITD	SCOUTITD	NCOUTITD	BCOUTITD
	Oil Gallery	ºC	0.000	QOILGITD	95	AOILGITD	SOILGITD	NOILGITD	BOILGITD
	Inlet Air	ºC	0.000	QILATITD	30	AILATITD	SILATITD	NILATITD	BILATITD
	Air Charge	ºC	0.000	QACTITD	43	AACTITD	SACTITD	NACTITD	BACTITD
	Fuel	ºC	0.000	QFUELITD	30	AFUELITD	SFUELITD	NFUELITD	BFUELITD
	Inlet Air	kPaA	0.000	QIAPITD	0.05	AIAPITD	SIAPITD	NIAPITD	BIAPITD
	Exhaust Back	kPaA	0.000	QEBPITD	104	AEBPITD	SEBPITD	NEBPITD	BEBPITD
	Coolant	kPaG	0.000	QCOLPITD	70	ACOLPITD	SCOLPITD	NCOLPITD	BCOLPITD
	Humidity	g/kg	0.000	QHUMITD	11.4	AHUMITD	SHUMITD	NHUMITD	BHUMITD
	Coolant Flow	L/min	0.000	QCFLOITD	55	ACFLOITD	SCFLOITD	NCFLOITD	BCFLOITD

	Parameter	Units	Average	Standard Deviation	Number of Samples	Number of BQD
Non-controlled Parameters	Coolant In	ºC	ACOINITD	SCOINITD	NCOINITD	BCOINITD
	Oil Sump (optional)	ºC	ASUMPITD	SSUMPITD	NSUMPITD	BSUMPITD
	Exhaust	ºC	AEXHTITD	SEXHTITD	NEXHTITD	BEXHTITD
	Boost Pressure	kPaA	ABPITD	SBPITD	NBPITD	BBPITD
	Intake Manifold	kPaA	AIMPITD	SIMPITD	NIMPITD	BIMPITD
	Barometric	kPaA	ABAROITD	SBAROITD	NBAROITD	BBAROITD
	Crankcase	kPaG	ACCPITD	SCCPITD	NCCPITD	BCCPITD
	Fuel	kPaG	AFPRITD	SFPRITD	NFPRITD	BFPRITD
	Fuel Flow	kg/h	AFFLOITD	SFFLOITD	NFFLOITD	BFFLOITD
	Power	kW	APWRITD	SPWRITD	NPWRITD	BPWRITD
	Equivalence Ratio	ʎ	ALAMBITD	SLAMBITD	NLAMBITD	BLAMBITD

Used Oil LSPI
Form 11
Operational Summary – CAN BUS, Iterations A and B

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

	Iteration A	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º	ACBITIMA	SCBITIMA	NCBITIMA	BCBITIM
	Absolute Throttle Position	%	ACBATPSA	SCBATPSA	NCBATPSA	BCBATPS
	Engine Coolant Temperature	ºC	ACBECTA	SCBECTA	NCBECTA	BCBECTA
	Intake Air Temperature	ºC	ACBIATA	SCBIATA	NCBIATA	BCBIATA
	Equivalence Ratio (Lambda)	ʎ	ACBLAMB	SCBLAMB	NCBLAMBA	BCBLAM
	Absolute Load Value	%	ACBALDA	SCBALDA	NCBALDA	BCBALDA
	Intake Manifold Absolute Pressure	kPaA	ACBMAPA	SCBMAPA	NCBMAPA	BCBMAP
	Fuel Rail Pressure	kPa	ACBFPA	SCBFPA	NCBFPA	BCBFPA
	Boost Absolute Pressure - Raw Value	kPaA	ACBBAPA	SCBBAPA	NCBBAPA	BCBBAPA
	Turbocharger/Supercharger Wastegate	%	ACBWGA	SCBWGA	NCBWGA	BCBWGA
	Actual Intake (A) Camshaft Position	º	ACBICPA	SCBICPA	NCBICPA	BCBICPA
	Actual Exhaust (B) Camshaft Position	º	ACBECPA	SCBECPA	NCBECPA	BCBECPA
	Intake (A) Camshaft Position Actuator Duty	%	ACBICDCA	SCBICDCA	NCBICDCA	BCBICDC
	Exhaust (B) Camshaft Position Actuator Duty	%	ACBECDC	SCBECDCA	NCBECDCA	BCBECDC
	Charge Air Cooler Temperature	ºC	ACBACTA	SCBACTA	NCBACTA	BCBACTA

	Iteration B	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º	ACBITIMB	SCBITIMB	NCBITIMB	BCBITIM
	Absolute Throttle Position	%	ACBATPSB	SCBATPSB	NCBATPSB	BCBATPS
	Engine Coolant Temperature	ºC	ACBECTB	SCBECTB	NCBECTB	BCBECTB
	Intake Air Temperature	ºC	ACBIATB	SCBIATB	NCBIATB	BCBIATB
	Equivalence Ratio (Lambda)	ʎ	ACBLAMB	SCBLAMB	NCBLAMBB	BCBLAM
	Absolute Load Value	%	ACBALDB	SCBALDB	NCBALDB	BCBALDB
	Intake Manifold Absolute Pressure	kPaA	ACBMAPB	SCBMAPB	NCBMAPB	BCBMAP
	Fuel Rail Pressure	kPa	ACBFPB	SCBFPB	NCBFPB	BCBFPB
	Boost Absolute Pressure - Raw Value	kPaA	ACBBAPB	SCBBAPB	NCBBAPB	BCBBAPB
	Turbocharger/Supercharger Wastegate	%	ACBWGB	SCBWGB	NCBWGB	BCBWGB
	Actual Intake (A) Camshaft Position	º	ACBICPB	SCBICPB	NCBICPB	BCBICPB
	Actual Exhaust (B) Camshaft Position	º	ACBECPB	SCBECPB	NCBECPB	BCBECPB
	Intake (A) Camshaft Position Actuator Cycle	%	ACBICDCB	SCBICDCB	NCBICDCB	BCBICDC
	Exhaust (B) Camshaft Position Actuator Duty	%	ACBECDCB	SCBECDCB	NCBECDCB	BCBECDC
	Charge Air Cooler Temperature	ºC	ACBACTB	SCBACTB	NCBACTB	BCBACTB

Used Oil LSPI
Form 12
Operational Summary – CAN BUS, Iterations C and D

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

	Iteration C	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º	ACBITIMC	SCBITIMC	NCBITIMC	BCBITIMC
	Absolute Throttle Position	%	ACBATPSC	SCBATPSC	NCBATPSC	BCBATPSC
	Engine Coolant Temperature	ºC	ACBECTC	SCBECTC	NCBECTC	BCBECTC
	Intake Air Temperature	ºC	ACBIATC	SCBIATC	NCBIATC	BCBIATC
	Equivalence Ratio (Lambda)	ʎ	ACBLAMI	SCBLAMB	NCBLAMBC	BCBLAMB
	Absolute Load Value	%	ACBALDC	SCBALDC	NCBALDC	BCBALDC
	Intake Manifold Absolute Pressure	kPaA	ACBMAPC	SCBMAPC	NCBMAPC	BCBMAPC
	Fuel Rail Pressure	kPa	ACBFPC	SCBFPC	NCBFPC	BCBFPC
	Boost Absolute Pressure - Raw Value	kPaA	ACBBAPC	SCBBAPC	NCBBAPC	BCBBAPC
	Turbocharger/Supercharger Wastegate	%	ACBWGC	SCBWGC	NCBWGC	BCBWGC
	Actual Intake (A) Camshaft Position	º	ACBICPC	SCBICPC	NCBICPC	BCBICPC
	Actual Exhaust (B) Camshaft Position	º	ACBECPC	SCBECPC	NCBECPC	BCBECPC
	Intake (A) Camshaft Position Actuator Duty	%	ACBICDC	SCBICDCC	NCBICDCC	BCBICDCC
	Exhaust (B) Camshaft Position Actuator	%	ACBECDC	SCBECDCC	NCBECDCC	BCBECDCC
	Charge Air Cooler Temperature	ºC	ACBACTC	SCBACTC	NCBACTC	BCBACTC

	Iteration D	Units	Average	Standard Deviation	Number of Samples	Number of BQD
PCM CAN BUS Channels	Ignition Timing Advance for #1 Cylinder	º	ACBITIMI	SCBITIMD	NCBITIMD	BCBITIMI
	Absolute Throttle Position	%	ACBATPS	SCBATPSD	NCBATPSD	BCBATPSI
	Engine Coolant Temperature	ºC	ACBECTD	SCBECTD	NCBECTD	BCBECTD
	Intake Air Temperature	ºC	ACBIATD	SCBIATD	NCBIATD	BCBIATBI
	Equivalence Ratio (Lambda)	ʎ	ACBLAMI	SCBLAMB	NCBLAMBD	BCBLAMI
	Absolute Load Value	%	ACBALDI	SCBALDD	NCBALDD	BCBALDI
	Intake Manifold Absolute Pressure	kPaA	ACBMAPI	SCBMAPD	NCBMAPD	BCBMAPI
	Fuel Rail Pressure	kPa	ACBFPD	SCBFPD	NCBFPD	BCBFPD
	Boost Absolute Pressure - Raw Value	kPaA	ACBBAPD	SCBBAPD	NCBBAPD	BCBBAPD
	Turbocharger/Supercharger Wastegate	%	ACBWGD	SCBWGD	NCBWGD	BCBWGD
	Actual Intake (A) Camshaft Position	º	ACBICPD	SCBICPD	NCBICPD	BCBICPD
	Actual Exhaust (B) Camshaft Position	º	ACBECPD	SCBECPD	NCBECPD	BCBECPD
	Intake (A) Camshaft Position Actuator Cycle	%	ACBICDC	SCBICDCD	NCBICDCD	BCBICDCI
	Exhaust (B) Camshaft Position Actuator	%	ACBECDC	SCBECDCI	NCBECDCD	BCBECDC
	Charge Air Cooler Temperature	ºC	ACBACTI	SCBACTD	NCBACTD	BCBACTD

Used Oil LSPI
Form 13
Cycle Count and Type Summary

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

	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	PPEVT1T	MFEVT1	BEV1ITA	PPEVT1T	MFEVT1	BEV1ITE	PPEVT1T	MFEVT1	BEV1ITC	PPEVT1T	MFEVT1	BEV1ITL
2	PPEVT2T	MFEVT2	BEV2ITA	PPEVT2T	MFEVT2	BEV2ITE	PPEVT2T	MFEVT2	BEV2ITC	PPEVT2T	MFEVT2	BEV2ITL
3	PPEVT3T	MFEVT3	BEV3ITA	PPEVT3T	MFEVT3	BEV3ITE	PPEVT3T	MFEVT3	BEV3ITC	PPEVT3T	MFEVT3	BEV3ITL
4	PPEVT4T	MFEVT4	BEV4ITA	PPEVT4T	MFEVT4	BEV4ITE	PPEVT4T	MFEVT4	BEV4ITC	PPEVT4T	MFEVT4	BEV4ITL
All	PPEVTA'	MFEVTA	BEVAIT/	PPEVTA'	MFEVTA	BEVAITI	PPEVTA'	MFEVTA	BEVAITC	PPEVTA'	MFEVTA	BEVAITI

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	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(	PPEVM(
PP Std Dev	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVSC	PPEVC1	PPEVC2	PPEVC3	PPEVC4
PP F Value	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC	PPEVFC
PP Thresh	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC	PPEVTC
MFB2 Mean	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM	MFEVM
MFB2 Std Dev	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVS(	MFEVC	MFEVC	MFEVC	MFEVC
MFB2 F Value	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(	MFEVF(
MFB2 Thresh	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT	MFEVT

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

Used Oil LSPI
Form 14
Summary of Pre-ignition Events, Iteration A

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLAR00	PCYAR001	PRPAR001	PMFAR00	PCTAR001
PCLAR00	PCYAR002	PRPAR002	PMFAR00	PCTAR002
PCLAR00	PCYAR003	PRPAR003	PMFAR00	PCTAR003
PCLAR00	PCYAR004	PRPAR004	PMFAR00	PCTAR004
PCLAR00	PCYAR005	PRPAR005	PMFAR00	PCTAR005
PCLAR00	PCYAR006	PRPAR006	PMFAR00	PCTAR006
PCLAR00	PCYAR007	PRPAR007	PMFAR00	PCTAR007
PCLAR00	PCYAR008	PRPAR008	PMFAR00	PCTAR008
PCLAR00	PCYAR009	PRPAR009	PMFAR00	PCTAR009
PCLAR01	PCYAR010	PRPAR010	PMFAR01	PCTAR010
PCLAR01	PCYAR011	PRPAR011	PMFAR01	PCTAR011
PCLAR01	PCYAR012	PRPAR012	PMFAR01	PCTAR012
PCLAR01	PCYAR013	PRPAR013	PMFAR01	PCTAR013
PCLAR01	PCYAR014	PRPAR014	PMFAR01	PCTAR014
PCLAR01	PCYAR015	PRPAR015	PMFAR01	PCTAR015
PCLAR01	PCYAR016	PRPAR016	PMFAR01	PCTAR016
PCLAR01	PCYAR017	PRPAR017	PMFAR01	PCTAR017
PCLAR01	PCYAR018	PRPAR018	PMFAR01	PCTAR018
PCLAR01	PCYAR019	PRPAR019	PMFAR01	PCTAR019
PCLAR02	PCYAR020	PRPAR020	PMFAR02	PCTAR020
PCLAR02	PCYAR021	PRPAR021	PMFAR02	PCTAR021
PCLAR02	PCYAR022	PRPAR022	PMFAR02	PCTAR022
PCLAR02	PCYAR023	PRPAR023	PMFAR02	PCTAR023
PCLAR02	PCYAR024	PRPAR024	PMFAR02	PCTAR024
PCLAR02	PCYAR025	PRPAR025	PMFAR02	PCTAR025
PCLAR02	PCYAR026	PRPAR026	PMFAR02	PCTAR026
PCLAR02	PCYAR027	PRPAR027	PMFAR02	PCTAR027
PCLAR02	PCYAR028	PRPAR028	PMFAR02	PCTAR028

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLAR02	PCYAR029	PRPAR029	PMFAR029	PCTAR029
PCLAR03	PCYAR030	PRPAR030	PMFAR030	PCTAR030
PCLAR03	PCYAR031	PRPAR031	PMFAR031	PCTAR031
PCLAR03	PCYAR032	PRPAR032	PMFAR032	PCTAR032
PCLAR03	PCYAR033	PRPAR033	PMFAR033	PCTAR033
PCLAR03	PCYAR034	PRPAR034	PMFAR034	PCTAR034
PCLAR03	PCYAR035	PRPAR035	PMFAR035	PCTAR035
PCLAR03	PCYAR036	PRPAR036	PMFAR036	PCTAR036
PCLAR03	PCYAR037	PRPAR037	PMFAR037	PCTAR037
PCLAR03	PCYAR038	PRPAR038	PMFAR038	PCTAR038
PCLAR03	PCYAR039	PRPAR039	PMFAR039	PCTAR039
PCLAR04	PCYAR040	PRPAR040	PMFAR040	PCTAR040
PCLAR04	PCYAR041	PRPAR041	PMFAR041	PCTAR041
PCLAR04	PCYAR042	PRPAR042	PMFAR042	PCTAR042
PCLAR04	PCYAR043	PRPAR043	PMFAR043	PCTAR043
PCLAR04	PCYAR044	PRPAR044	PMFAR044	PCTAR044
PCLAR04	PCYAR045	PRPAR045	PMFAR045	PCTAR045
PCLAR04	PCYAR046	PRPAR046	PMFAR046	PCTAR046
PCLAR04	PCYAR047	PRPAR047	PMFAR047	PCTAR047
PCLAR04	PCYAR048	PRPAR048	PMFAR048	PCTAR048
PCLAR04	PCYAR049	PRPAR049	PMFAR049	PCTAR049
PCLAR05	PCYAR050	PRPAR050	PMFAR050	PCTAR050
PCLAR05	PCYAR051	PRPAR051	PMFAR051	PCTAR051
PCLAR05	PCYAR052	PRPAR052	PMFAR052	PCTAR052
PCLAR05	PCYAR053	PRPAR053	PMFAR053	PCTAR053
PCLAR05	PCYAR054	PRPAR054	PMFAR054	PCTAR054
PCLAR05	PCYAR055	PRPAR055	PMFAR055	PCTAR055
PCLAR05	PCYAR056	PRPAR056	PMFAR056	PCTAR056

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

Used Oil LSPI
Form 15
Summary of Pre-ignition Events, Iteration B

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLBR001	PCYBR001	PRPBR001	PMFBR001	PCTBR001
PCLBR002	PCYBR002	PRPBR002	PMFBR002	PCTBR002
PCLBR003	PCYBR003	PRPBR003	PMFBR003	PCTBR003
PCLBR004	PCYBR004	PRPBR004	PMFBR004	PCTBR004
PCLBR005	PCYBR005	PRPBR005	PMFBR005	PCTBR005
PCLBR006	PCYBR006	PRPBR006	PMFBR006	PCTBR006
PCLBR007	PCYBR007	PRPBR007	PMFBR007	PCTBR007
PCLBR008	PCYBR008	PRPBR008	PMFBR008	PCTBR008
PCLBR009	PCYBR009	PRPBR009	PMFBR009	PCTBR009
PCLBR010	PCYBR010	PRPBR010	PMFBR010	PCTBR010
PCLBR011	PCYBR011	PRPBR011	PMFBR011	PCTBR011
PCLBR012	PCYBR012	PRPBR012	PMFBR012	PCTBR012
PCLBR013	PCYBR013	PRPBR013	PMFBR013	PCTBR013
PCLBR014	PCYBR014	PRPBR014	PMFBR014	PCTBR014
PCLBR015	PCYBR015	PRPBR015	PMFBR015	PCTBR015
PCLBR016	PCYBR016	PRPBR016	PMFBR016	PCTBR016
PCLBR017	PCYBR017	PRPBR017	PMFBR017	PCTBR017
PCLBR018	PCYBR018	PRPBR018	PMFBR018	PCTBR018
PCLBR019	PCYBR019	PRPBR019	PMFBR019	PCTBR019
PCLBR020	PCYBR020	PRPBR020	PMFBR020	PCTBR020
PCLBR021	PCYBR021	PRPBR021	PMFBR021	PCTBR021
PCLBR022	PCYBR022	PRPBR022	PMFBR022	PCTBR022
PCLBR023	PCYBR023	PRPBR023	PMFBR023	PCTBR023
PCLBR024	PCYBR024	PRPBR024	PMFBR024	PCTBR024
PCLBR025	PCYBR025	PRPBR025	PMFBR025	PCTBR025
PCLBR026	PCYBR026	PRPBR026	PMFBR026	PCTBR026
PCLBR027	PCYBR027	PRPBR027	PMFBR027	PCTBR027
PCLBR028	PCYBR028	PRPBR028	PMFBR028	PCTBR028

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLBR029	PCYBR029	PRPBR029	PMFBR029	PCTBR029
PCLBR030	PCYBR030	PRPBR030	PMFBR030	PCTBR030
PCLBR031	PCYBR031	PRPBR031	PMFBR031	PCTBR031
PCLBR032	PCYBR032	PRPBR032	PMFBR032	PCTBR032
PCLBR033	PCYBR033	PRPBR033	PMFBR033	PCTBR033
PCLBR034	PCYBR034	PRPBR034	PMFBR034	PCTBR034
PCLBR035	PCYBR035	PRPBR035	PMFBR035	PCTBR035
PCLBR036	PCYBR036	PRPBR036	PMFBR036	PCTBR036
PCLBR037	PCYBR037	PRPBR037	PMFBR037	PCTBR037
PCLBR038	PCYBR038	PRPBR038	PMFBR038	PCTBR038
PCLBR039	PCYBR039	PRPBR039	PMFBR039	PCTBR039
PCLBR040	PCYBR040	PRPBR040	PMFBR040	PCTBR040
PCLBR041	PCYBR041	PRPBR041	PMFBR041	PCTBR041
PCLBR042	PCYBR042	PRPBR042	PMFBR042	PCTBR042
PCLBR043	PCYBR043	PRPBR043	PMFBR043	PCTBR043
PCLBR044	PCYBR044	PRPBR044	PMFBR044	PCTBR044
PCLBR045	PCYBR045	PRPBR045	PMFBR045	PCTBR045
PCLBR046	PCYBR046	PRPBR046	PMFBR046	PCTBR046
PCLBR047	PCYBR047	PRPBR047	PMFBR047	PCTBR047
PCLBR048	PCYBR048	PRPBR048	PMFBR048	PCTBR048
PCLBR049	PCYBR049	PRPBR049	PMFBR049	PCTBR049
PCLBR050	PCYBR050	PRPBR050	PMFBR050	PCTBR050
PCLBR051	PCYBR051	PRPBR051	PMFBR051	PCTBR051
PCLBR052	PCYBR052	PRPBR052	PMFBR052	PCTBR052
PCLBR053	PCYBR053	PRPBR053	PMFBR053	PCTBR053
PCLBR054	PCYBR054	PRPBR054	PMFBR054	PCTBR054
PCLBR055	PCYBR055	PRPBR055	PMFBR055	PCTBR055
PCLBR056	PCYBR056	PRPBR056	PMFBR056	PCTBR056

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

Used Oil LSPI
Form 16
Summary of Pre-ignition Events, Iteration C

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLCR001	PCYCR001	PRPCR001	PMFCR001	PCTCR001
PCLCR002	PCYCR002	PRPCR002	PMFCR002	PCTCR002
PCLCR003	PCYCR003	PRPCR003	PMFCR003	PCTCR003
PCLCR004	PCYCR004	PRPCR004	PMFCR004	PCTCR004
PCLCR005	PCYCR005	PRPCR005	PMFCR005	PCTCR005
PCLCR006	PCYCR006	PRPCR006	PMFCR006	PCTCR006
PCLCR007	PCYCR007	PRPCR007	PMFCR007	PCTCR007
PCLCR008	PCYCR008	PRPCR008	PMFCR008	PCTCR008
PCLCR009	PCYCR009	PRPCR009	PMFCR009	PCTCR009
PCLCR010	PCYCR010	PRPCR010	PMFCR010	PCTCR010
PCLCR011	PCYCR011	PRPCR011	PMFCR011	PCTCR011
PCLCR012	PCYCR012	PRPCR012	PMFCR012	PCTCR012
PCLCR013	PCYCR013	PRPCR013	PMFCR013	PCTCR013
PCLCR014	PCYCR014	PRPCR014	PMFCR014	PCTCR014
PCLCR015	PCYCR015	PRPCR015	PMFCR015	PCTCR015
PCLCR016	PCYCR016	PRPCR016	PMFCR016	PCTCR016
PCLCR017	PCYCR017	PRPCR017	PMFCR017	PCTCR017
PCLCR018	PCYCR018	PRPCR018	PMFCR018	PCTCR018
PCLCR019	PCYCR019	PRPCR019	PMFCR019	PCTCR019
PCLCR020	PCYCR020	PRPCR020	PMFCR020	PCTCR020
PCLCR021	PCYCR021	PRPCR021	PMFCR021	PCTCR021
PCLCR022	PCYCR022	PRPCR022	PMFCR022	PCTCR022
PCLCR023	PCYCR023	PRPCR023	PMFCR023	PCTCR023
PCLCR024	PCYCR024	PRPCR024	PMFCR024	PCTCR024
PCLCR025	PCYCR025	PRPCR025	PMFCR025	PCTCR025
PCLCR026	PCYCR026	PRPCR026	PMFCR026	PCTCR026
PCLCR027	PCYCR027	PRPCR027	PMFCR027	PCTCR027
PCLCR028	PCYCR028	PRPCR028	PMFCR028	PCTCR028

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLCR029	PCYCR029	PRPCR029	PMFCR029	PCTCR029
PCLCR030	PCYCR030	PRPCR030	PMFCR030	PCTCR030
PCLCR031	PCYCR031	PRPCR031	PMFCR031	PCTCR031
PCLCR032	PCYCR032	PRPCR032	PMFCR032	PCTCR032
PCLCR033	PCYCR033	PRPCR033	PMFCR033	PCTCR033
PCLCR034	PCYCR034	PRPCR034	PMFCR034	PCTCR034
PCLCR035	PCYCR035	PRPCR035	PMFCR035	PCTCR035
PCLCR036	PCYCR036	PRPCR036	PMFCR036	PCTCR036
PCLCR037	PCYCR037	PRPCR037	PMFCR037	PCTCR037
PCLCR038	PCYCR038	PRPCR038	PMFCR038	PCTCR038
PCLCR039	PCYCR039	PRPCR039	PMFCR039	PCTCR039
PCLCR040	PCYCR040	PRPCR040	PMFCR040	PCTCR040
PCLCR041	PCYCR041	PRPCR041	PMFCR041	PCTCR041
PCLCR042	PCYCR042	PRPCR042	PMFCR042	PCTCR042
PCLCR043	PCYCR043	PRPCR043	PMFCR043	PCTCR043
PCLCR044	PCYCR044	PRPCR044	PMFCR044	PCTCR044
PCLCR045	PCYCR045	PRPCR045	PMFCR045	PCTCR045
PCLCR046	PCYCR046	PRPCR046	PMFCR046	PCTCR046
PCLCR047	PCYCR047	PRPCR047	PMFCR047	PCTCR047
PCLCR048	PCYCR048	PRPCR048	PMFCR048	PCTCR048
PCLCR049	PCYCR049	PRPCR049	PMFCR049	PCTCR049
PCLCR050	PCYCR050	PRPCR050	PMFCR050	PCTCR050
PCLCR051	PCYCR051	PRPCR051	PMFCR051	PCTCR051
PCLCR052	PCYCR052	PRPCR052	PMFCR052	PCTCR052
PCLCR053	PCYCR053	PRPCR053	PMFCR053	PCTCR053
PCLCR054	PCYCR054	PRPCR054	PMFCR054	PCTCR054
PCLCR055	PCYCR055	PRPCR055	PMFCR055	PCTCR055
PCLCR056	PCYCR056	PRPCR056	PMFCR056	PCTCR056

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

Used Oil LSPI
Form 17
Summary of Pre-ignition Events, Iteration D

Lab	LAB	Oil Code	OILCODEL
Stand	STANDL	Test No.	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLDR00	PCYDR001	PRPDR001	PMFDR00	PCTDR001
PCLDR00	PCYDR002	PRPDR002	PMFDR00	PCTDR002
PCLDR00	PCYDR003	PRPDR003	PMFDR00	PCTDR003
PCLDR00	PCYDR004	PRPDR004	PMFDR00	PCTDR004
PCLDR00	PCYDR005	PRPDR005	PMFDR00	PCTDR005
PCLDR00	PCYDR006	PRPDR006	PMFDR00	PCTDR006
PCLDR00	PCYDR007	PRPDR007	PMFDR00	PCTDR007
PCLDR00	PCYDR008	PRPDR008	PMFDR00	PCTDR008
PCLDR00	PCYDR009	PRPDR009	PMFDR00	PCTDR009
PCLDR01	PCYDR010	PRPDR010	PMFDR01	PCTDR010
PCLDR01	PCYDR011	PRPDR011	PMFDR01	PCTDR011
PCLDR01	PCYDR012	PRPDR012	PMFDR01	PCTDR012
PCLDR01	PCYDR013	PRPDR013	PMFDR01	PCTDR013
PCLDR01	PCYDR014	PRPDR014	PMFDR01	PCTDR014
PCLDR01	PCYDR015	PRPDR015	PMFDR01	PCTDR015
PCLDR01	PCYDR016	PRPDR016	PMFDR01	PCTDR016
PCLDR01	PCYDR017	PRPDR017	PMFDR01	PCTDR017
PCLDR01	PCYDR018	PRPDR018	PMFDR01	PCTDR018
PCLDR01	PCYDR019	PRPDR019	PMFDR01	PCTDR019
PCLDR02	PCYDR020	PRPDR020	PMFDR02	PCTDR020
PCLDR02	PCYDR021	PRPDR021	PMFDR02	PCTDR021
PCLDR02	PCYDR022	PRPDR022	PMFDR02	PCTDR022
PCLDR02	PCYDR023	PRPDR023	PMFDR02	PCTDR023
PCLDR02	PCYDR024	PRPDR024	PMFDR02	PCTDR024
PCLDR02	PCYDR025	PRPDR025	PMFDR02	PCTDR025
PCLDR02	PCYDR026	PRPDR026	PMFDR02	PCTDR026
PCLDR02	PCYDR027	PRPDR027	PMFDR02	PCTDR027
PCLDR02	PCYDR028	PRPDR028	PMFDR02	PCTDR028

Cylinder	Cycle	Peak Pressure	MFB2	Type
PCLDR02	PCYDR029	PRPDR029	PMFDR029	PCTDR029
PCLDR03	PCYDR030	PRPDR030	PMFDR030	PCTDR030
PCLDR03	PCYDR031	PRPDR031	PMFDR031	PCTDR031
PCLDR03	PCYDR032	PRPDR032	PMFDR032	PCTDR032
PCLDR03	PCYDR033	PRPDR033	PMFDR033	PCTDR033
PCLDR03	PCYDR034	PRPDR034	PMFDR034	PCTDR034
PCLDR03	PCYDR035	PRPDR035	PMFDR035	PCTDR035
PCLDR03	PCYDR036	PRPDR036	PMFDR036	PCTDR036
PCLDR03	PCYDR037	PRPDR037	PMFDR037	PCTDR037
PCLDR03	PCYDR038	PRPDR038	PMFDR038	PCTDR038
PCLDR03	PCYDR039	PRPDR039	PMFDR039	PCTDR039
PCLDR04	PCYDR040	PRPDR040	PMFDR040	PCTDR040
PCLDR04	PCYDR041	PRPDR041	PMFDR041	PCTDR041
PCLDR04	PCYDR042	PRPDR042	PMFDR042	PCTDR042
PCLDR04	PCYDR043	PRPDR043	PMFDR043	PCTDR043
PCLDR04	PCYDR044	PRPDR044	PMFDR044	PCTDR044
PCLDR04	PCYDR045	PRPDR045	PMFDR045	PCTDR045
PCLDR04	PCYDR046	PRPDR046	PMFDR046	PCTDR046
PCLDR04	PCYDR047	PRPDR047	PMFDR047	PCTDR047
PCLDR04	PCYDR048	PRPDR048	PMFDR048	PCTDR048
PCLDR04	PCYDR049	PRPDR049	PMFDR049	PCTDR049
PCLDR05	PCYDR050	PRPDR050	PMFDR050	PCTDR050
PCLDR05	PCYDR051	PRPDR051	PMFDR051	PCTDR051
PCLDR05	PCYDR052	PRPDR052	PMFDR052	PCTDR052
PCLDR05	PCYDR053	PRPDR053	PMFDR053	PCTDR053
PCLDR05	PCYDR054	PRPDR054	PMFDR054	PCTDR054
PCLDR05	PCYDR055	PRPDR055	PMFDR055	PCTDR055
PCLDR05	PCYDR056	PRPDR056	PMFDR056	PCTDR056

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

Used Oil LSPI
Form 18
Hardware Information

Lab	LAB	Oil Code	OILCODE
Stand, Aging	STANDA	Test No. Aging	TESTNUM
Stand LSPI	STANDL	Test No. LSPI	TESTNUML
Laboratory Oil Code		LABOCODE	
Formulation Stand Code		FORM	

Aging Hardware

Oil Weight at SOT (kg)	OILWSOT	Piston Batch	PISTBAT
Short Block ID	SBLOCKID	Engine Hours	ENGINEHR
Cylinder Head ID	CYLHDID	Cylinder Head Hours	HEADHRSA
Turbocharger ID	TCHARGID	Turbocharger Hours	TCHARGHR
PCM Calibration Identification	PCMID		

LSPI Hardware

Oil Weight at SOT (kg)	OILWSOTL	Piston Batch	PISTBATL
Short Block ID	SBLCKIDL	Engine Hours	ENGINEHL
Cylinder Head ID	CYLHDIDL	Cylinder Head Hours	HEADHRSL
Turbocharger ID	TCHARIDL	Turbocharger Hours	TCHARHRL
PCM Calibration Identification	PCMIDL		

Transducer Replacement History

Cylinder	Iteration							
	1	2	3	4	5	6	7	8
1	TDCRC1I1	TDCRC1I2	TDCRC1I3	TDCRC1I4	TDCRC1I5	TDCRC1I6	TDCRC1I7	TDCRC1I8
2	TDCRC2I1	TDCRC2I2	TDCRC2I3	TDCRC2I4	TDCRC2I5	TDCRC2I6	TDCRC2I7	TDCRC2I8
3	TDCRC3I1	TDCRC3I2	TDCRC3I3	TDCRC3I4	TDCRC3I5	TDCRC3I6	TDCRC3I7	TDCRC3I8
4	TDCRC4I1	TDCRC4I2	TDCRC4I3	TDCRC4I4	TDCRC4I5	TDCRC4I6	TDCRC4I7	TDCRC4I8

Used Oil LSPI
Form 19
Chemical Analyses

Lab	LAB	Oil Code	OILCODE
Stand, Aging	STANDA	Test No. Aging	TESTNUM
Stand LSPI	STANDL	Test No. LSPI	TESTNUML
Laboratory Oil Code		LABOCODE	
Formulation Stand Code		FORM	

Analytical Measurement	New Oil	Aged Oil	New LSPI	Iteration A	Iteration B	Iteration C	Iteration D
Aluminum (Al) by D5185	ALWMNEW	ALWMAGE	ALWMNEWL	ALWMITA	ALWMITB	ALWMITC	ALWMITD
Boron (B) by D5185	BWMNEW	BWMAGE	BWMNEWL	BWMITA	BWMITB	BWMITC	BWMITD
Calcium (Ca) by D5185	CAWMNEW	CAWMAGE	CAWMNEWL	CAWMITA	CAWMITB	CAWMITC	CAWMITD
Chromium (Cr) by D5185	CRWMNEW	CRWMAGE	CRWMNEWL	CRWMITA	CRWMITB	CRWMITC	CRWMITD
Copper (Cu) by D5185	CUWMNEW	CUWMAGE	CUWMNEWL	CUWMITA	CUWMITB	CUWMITC	CUWMITD
Iron (Fe) by D5185	FEWMNEW	FEWMAGE	FEWMNEWL	FEWMITA	FEWMITB	FEWMITC	FEWMITD
Lead (Pb) by D5185	PBWMNEW	PBWMAGE	PBWMNEWL	PBWMITA	PBWMITB	PBWMITC	PBWMITD
Magnesium (Mg) by D5185	MGWMNEW	MGWMAGE	MGWMNEWL	MGWMITA	MGWMITB	MGWMITC	MGWMITD
Manganese (Mn) by D5185	MNWMNEW	MNWMAGE	MNWMNEWL	MNWMITA	MNWMITB	MNWMITC	MNWMITD
Molybdenum (Mo) by D5185	MOWMNEW	MOWMAGE	MOWMNEWL	MOWMITA	MOWMITB	MOWMITC	MOWMITD
Potassium (K) by D5185	KWMNEW	KWMAGE	KWMNEWL	KWMITA	KWMITB	KWMITC	KWMITD
Phosphorus (P) by D5185	PWMNEW	PWMAGE	PWMNEWL	PWMITA	PWMITB	PWMITC	PWMITD
Silicone (Si) by D5185	SIWMNEW	SIWMAGE	SIWMNEWL	SIWMITA	SIWMITB	SIWMITC	SIWMITD
Sodium (Na) by D5185	NAWMNEW	NAWMAGE	NAWMNEWL	NAWMITA	NAWMITB	NAWMITC	NAWMITD
Tin (Sn) by D5185	SNWMNEW	SNWMAGE	SNWMNEWL	SNWMITA	SNWMITB	SNWMITC	SNWMITD
Titanium (Ti) by D5185	TIWMNEW	TIWMAGE	TIWMNEWL	TIWMITA	TIWMITB	TIWMITC	TIWMITD
Zinc (Zn) by D5185	ZNWMNEW	ZNWMAGE	ZNWMNEWL	ZNWMITA	ZNWMITB	ZNWMITC	ZNWMITD
Total Acid Number	TAN_NEW	TANEOT	TANNEWL				
Total Base Number	TBNNEW	TBNEOT	TBNNEWL				
Kinematic Viscosity @ 40 °C	V40NEW	V40EOT	V40NEWL	V40ITA	V40ITB	V40ITC	V40ITD
Kinematic Viscosity @ 100 °C	V100NEW	V100EOT	V100NEWL	V100ITA	V100ITB	V100ITC	V100ITD
Soot Concentration		EOTSOOT	NEWSOOTL				
Oxidation, FTIR by D7414		IROEOT	IRONEWL				
Nitration, FTIR by D7624		IRNEOT	IRNNEWL				
Fuel Dilution by GC D3525		FUELEOT	FUELDILN	FUELDILA	FUELDILB	FUELDILC	FUELDILD

Used Oil LSPI
Form 20

Downtime Record

Lab	LAB	Oil Code	OILCODE
Stand, Aging	STANDA	Test No. Aging	TESTNUM
Stand LSPI	STANDL	Test No. LSPI	TESTNUML
Laboratory Oil Code		LABOCODE	
Formulation Stand Code		FORM	

Number of Downtime Occurrences			DWNOCR	
Test Hours	**Date**	**Downtime**	**Reasons**	
DOWNR001	DDATR001	DTIMR001	DREAR001	
DOWNR002	DDATR002	DTIMR002	DREAR002	
DOWNR003	DDATR003	DTIMR003	DREAR003	
DOWNR004	DDATR004	DTIMR004	DREAR004	
DOWNR005	DDATR005	DTIMR005	DREAR005	
DOWNR006	DDATR006	DTIMR006	DREAR006	
DOWNR007	DDATR007	DTIMR007	DREAR007	
DOWNR008	DDATR008	DTIMR008	DREAR008	
DOWNR009	DDATR009	DTIMR009	DREAR009	
DOWNR010	DDATR010	DTIMR010	DREAR010	
DOWNR011	DDATR011	DTIMR011	DREAR011	
DOWNR012	DDATR012	DTIMR012	DREAR012	
DOWNR013	DDATR013	DTIMR013	DREAR013	
DOWNR014	DDATR014	DTIMR014	DREAR014	
DOWNR015	DDATR015	DTIMR015	DREAR015	
DOWNR016	DDATR016	DTIMR016	DREAR016	
DOWNR017	DDATR017	DTIMR017	DREAR017	
DOWNR018	DDATR018	DTIMR018	DREAR018	
DOWNR019	DDATR019	DTIMR019	DREAR019	
DOWNR020	DDATR020	DTIMR020	DREAR020	
		TOTLDOWN	**Total Downtime (hours)**	

Aged Oil LSPI
Form 20a

Downtime Record, LSPI

Lab	LAB	Oil Code	OILCODEL
Stand, Aging	STANDA	Test No. Aging	TESTNUM
Stand LSPI	STANDL	Test No. LSPI	TESTNUML
Laboratory Oil Code		LABOCODL	
Formulation Stand Code		FORM	

Number of Downtime Occurrences			DWNOCR	
Test Hours	**Date**	**Downtime**	**Reasons**	
DOWLR001	DDTLR001	DTILR001	DRELR001	
DOWLR002	DDTLR002	DTILR002	DRELR002	
DOWLR003	DDTLR003	DTILR003	DRELR003	
DOWLR004	DDTLR004	DTILR004	DRELR004	
DOWLR005	DDTLR005	DTILR005	DRELR005	
DOWLR006	DDTLR006	DTILR006	DRELR006	
DOWLR007	DDTLR007	DTILR007	DRELR007	
DOWLR008	DDTLR008	DTILR008	DRELR008	
DOWLR009	DDTLR009	DTILR009	DRELR009	
DOWLR010	DDTLR010	DTILR010	DRELR010	
DOWLR011	DDTLR011	DTILR011	DRELR011	
DOWLR012	DDTLR012	DTILR012	DRELR012	
DOWLR013	DDTLR013	DTILR013	DRELR013	
DOWLR014	DDTLR014	DTILR014	DRELR014	
DOWLR015	DDTLR015	DTILR015	DRELR015	
DOWLR016	DDTLR016	DTILR016	DRELR016	
DOWLR017	DDTLR017	DTILR017	DRELR017	
DOWLR018	DDTLR018	DTILR018	DRELR018	
DOWLR019	DDTLR019	DTILR019	DRELR019	
DOWLR020	DDTLR020	DTILR020	DRELR020	
		TOTDOWNL	**Total Downtime (hours)**	

Used Oil LSPI
Form 21
Comment Record

Lab	LAB	Oil Code	OILCODE
Stand, Aging	STANDA	Test No. Aging	TESTNUM
Stand LSPI	STANDL	Test No. LSPI	TESTNUML
Laboratory Oil Code		LABOCODE	
Formulation Stand Code		FORM	

Number of Comment Lines	TOTCOM
OCOMR001	
OCOMR002	
OCOMR003	
OCOMR004	
OCOMR005	
OCOMR006	
OCOMR007	
OCOMR008	
OCOMR009	
OCOMR010	
OCOMR011	
OCOMR012	
OCOMR013	
OCOMR014	
OCOMR015	
OCOMR016	
OCOMR017	
OCOMR018	
OCOMR019	
OCOMR020	

Used Oil LSPI
Form 22
American Chemistry Council Code of Practice
Test Laboratory Conformance Statement

Test Laboratory	LAB				
Test Sponsor	TSTSPON1				
Formulation / Stand Code	FORM				
Test Number, Aging	TESTNUM				
Test Number, LSPI	TESTNUML				
Start Date	DTSTRT	Start Time	STRTTIME	Time Zone	TZONE

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 YESRQMI No NORQMI*

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 YESFULL No NOFULL *

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 YESNODE* No NONODEC

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 YESDEV* No NODEV (This currently applies only to specific deviations identified in the ASTM Information Letter System)

INCLUDE	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
DONOTINC	*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
ACCCOMM1
ACCCOMM2
ACCCOMM3
ACCCOMM4

SUBSIGIM
Signature

SUBDATE
Date

SUBNAME
Typed Name

SUBTITLE