

Sequence VH O&H Meeting + Sequence VJ Working Group
May 19th, 2026 at 3:00 PM EST via MS Teams

Attendees: Ben Maddock, Dylan Beck, Todd Dvorak, Joe Anthony, Al Lopez, Christian Exposito, Rob Zdrodowski, Tony Catanese, Pat Lang, Bill Du Chene, Mike Deegan, Ramiro Ramirez

Overview:

1. Hardware
2. Operation
3. Fuel
4. VJ Working Group

1. Hardware

- a. Inventory Life (as of December 2025)
 - i. Lab A = ~2028
 - ii. Lab B = ~2030
 - iii. Lab D = ~2030
 - iv. Lab G = ~2028
 - v. What date should labs target?
 1. Depends on VJ development, dexos1 Gen 4, and GF-8 forecasted timeline
 2. Tentatively labs are truing up to 2030 but that could change
- b. Various hardware orders – **PENDING FCS Contact at Ford**
 - i. **Bishop Order 2026**
 1. Labs agreed this is important but no immediate action required. Dexos implications could drastically change forecasts. O&H will monitor and act prior to June 2026 ASTM
 - ii. **FCS Order 2026**
 1. Ford will work with FCS contact to straighten out part numbers and minimum orders
 2. Execution of this order is closely tied to GM dexos demand
 - iii. **FCS Oil Pump order** expected ahead of larger FCS order
- c. Ford has been pursuing a new internal Ford Component Sales (FCS) contact as the previous has retired. Ford also agreed to speak with GM about expected VH demand from dexos1 Gen 4
 - i. Read across?
 - ii. Limits?

d. Pencool in RAC system

- i. As discussed: [VHOandHMinutes20250128.pdf](#)

8.4 *Coolants:*

8.4.1 *Description*—The engine coolant is equal parts of demineralized (less than 0.34 g/kg) or distilled water and a fully formulated ethylene glycol based automotive antifreeze to protect against corrosion of all system components. The RAC coolant is a solution of demineralized (less than 0.34 g/kg) or distilled water and an additive treatment of 475 mL of Pencool 2000^{26,13} per 15 L of water.

²⁶ The sole source of supply of Pencool 2000 coolant known to the committee at this time is Penray Cos., Inc., 1801 Estes Ave., Elk Grove, IL 60007.

- ii.
- iii. **Motion:** Penray has discontinued their entire Pencool lineup and do not offer an alternative. Labs have identified that Nalcool Nalfleet 2000 is an allowable alternative. Modify Section 8.4.1 and remove footnote 26 as follows:

8.4.1 Description—The engine coolant is equal parts of demineralized (less than 0.34 g/kg) or distilled water and a fully formulated ethylene glycol based automotive antifreeze to protect against corrosion of all system components. The RAC coolant is a solution of demineralized (less than 0.34 g/kg) or distilled water and a coolant additive treatment¹³ of 475 mL of per 15 L of water. **Pencool 2000 and Nalfleet 2000 are the only approved coolant additive treatments in the RAC coolant.**

iv. This will go for motion at the next Surveillance Panel.

2. Operation

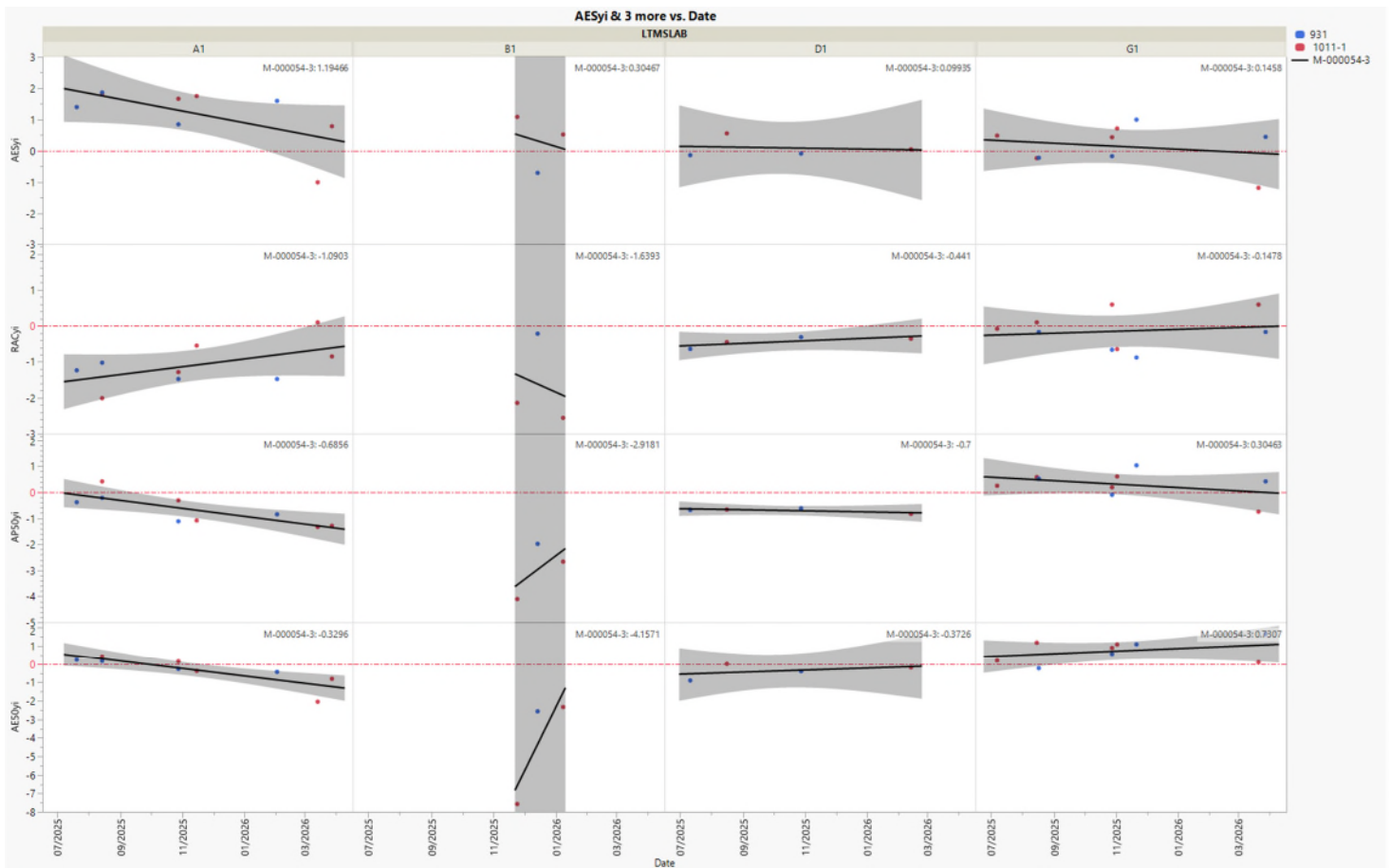
a. ON HOLD until after M-000054-3 stats review - Tightened piston to bore clearance

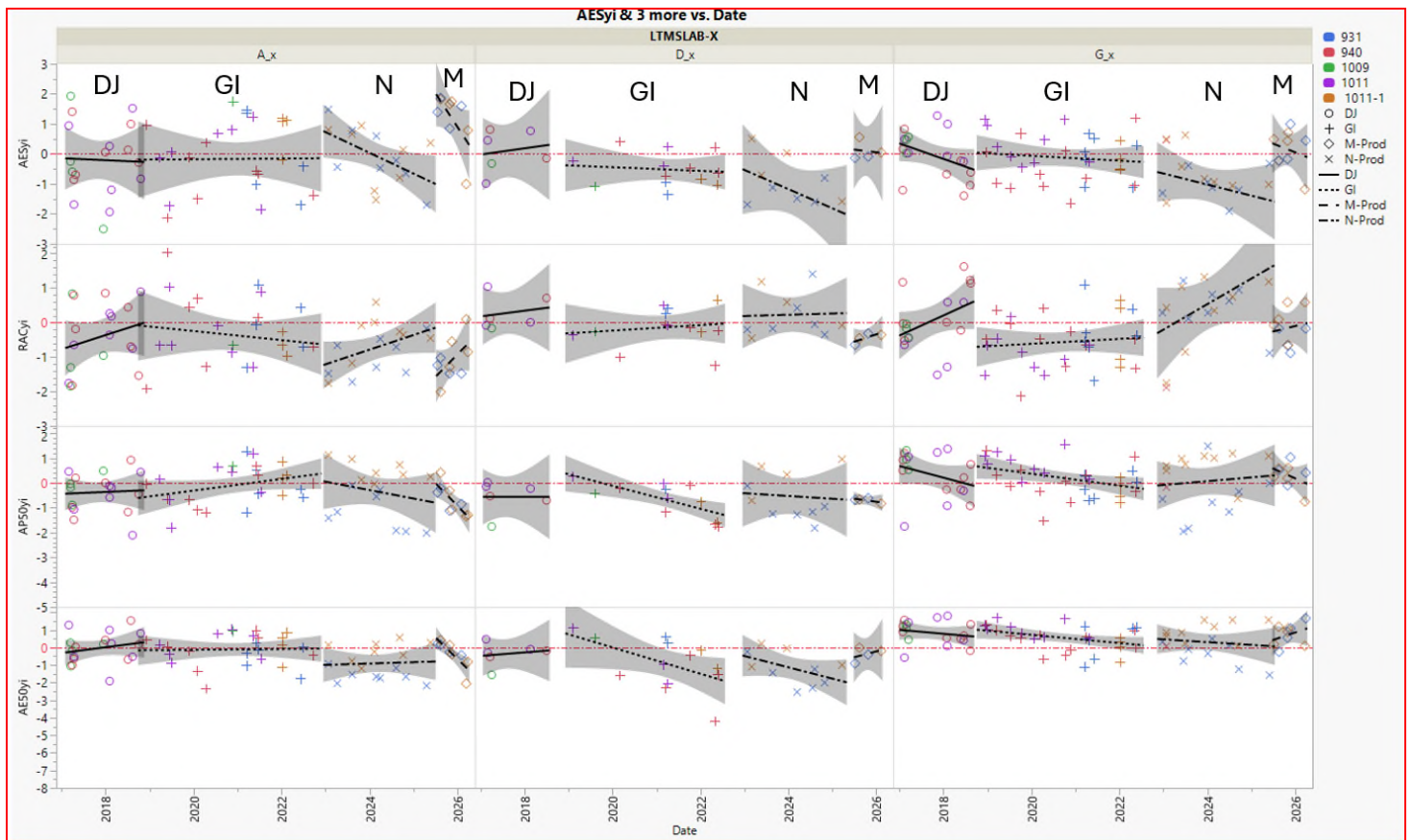
- Current: 0.020 to 0.046 mm
- Proposed 0.030 to 0.038mm, average of all eight cylinders

3. Fuel

a. Stats Group provided a preliminary analysis that will be reviewed at the next Surveillance Panel meeting. In short, Stats Group largely believes the decision for no ICF is still appropriate.

- i. 13 tests were used to approve M-000054-3
- ii. Twelve additional data points now available
- iii. Presentation not attached to these minutes as they will be available with the next Surveillance Panel minutes.





b. Fuel Properties

i. Fuel Supplier survey results

1. <https://www.astmtmc.org/ftp/docs/gas/sequencev/minutes/V%20%20and%20H%20S%20ubpanel/VHOandHMinutes20260217.pdf>
2. Labs need to devise an action plan

4. **VJ Working Group**

a. Lubrizol update

- i. See presentation below
- ii. AES = 8.85 merits at 216 hours of operation with high oil consumption (3666 grams)
- iii. Next test is targeting lower oil consumption

b. SwRI update

- i. See presentation below
- ii. Latest test was milder than first with AES = 9.24 merits at 216 hours with similar high oil consumption
- iii. Next test also targeting lower oil consumption

c. Intertek update

- i. Converting stand to Haltech

d. Afton update

- i. Terminated run at 72 h due to excessive oil consumption

e. Excessive oil consumption discussion

- i. Oil consumption persisted despite Wiseco vs factory piston or $\sim 0.100''$ vs $\sim 0.050''$ ring gaps
- ii. Some indication at SwRI that blowby tree configuration needs to be redesigned to utilize the factory separator as opposed to out of the RAC port.
- iii. Oil consumption persisted despite various honing configurations.

Historical Logbook

Date	Topic	Description	Comments
2/12/24	-	O&H formed.	
2/29/24	Hardware	Cam cap anaerobic sealant	IL24-1
3/5/24	Hardware	Cam bearings resolved with King Bearing supply to TEI.	Incl. SwRI bearing analysis
3/12/24	Fuel	N-000010-1+ CofA data integrity review.	Included lab samples to Saybolt
3/26/24	Fuel	Quarterly samples now from test cell	
4/9/24	Hardware	Piston oil hole size differences by piston size not statistically significant to APV	
4/16/24	Operation	Build Workshop conducted	IL24-3 and IL24-4
5/21/24	Fuel	AO content depletion in transit	
5/21/24	Operation	Honing data analysis uninterpretable due to measurement differences	This will be revisited after 2025 fuel approval matrix
6/4/24	Hardware	OHT3G-096-1 brushes explained	IIIG efforts
7/9/24	Operation	OSCR raters group imprecision reviewed	
8/27/24	Hardware	FCS order placed on pistons and rings	
8/27/24	Operation	N-10-1 approval vs PM statistical analysis	
1/7/25	Fuel	RVP adjustments vs fuel dilution	
4/29/25	Operation	Blowby Cart Questions - 5/16" orifice	Equation difference, ~0.1 L/min
8/19/25	Hardware	2024 FCS order has completed	
9/16/25	Operation	Engine Swap experiment Lab A & G	Fuel dilution moves with build
10/28/25	Fuel	M-000054-3 fuel batch approved.	
12/17/25	Operation	Updated report form to capture piston dia.	Version: 20251222
2/17/26	Operation	Severity alarms discussed ahead of Stats review	Some indication of RAC ICF. Other parameters are lab issues
2/17/26	Fuel	Fuel supplier feedback on ethanol, distillation and oxidation stability	O&H needs to summarize and create action plan
5/19/26	Fuel	Preliminary review of updated M-000054-3 stats analysis	No ICF is still appropriate

LZ 2nd VJ TEST RESULTS

Seq VJ 2nd Test Build Summary

Major changes from Test 1 highlighted

- Ford 2.5L Inline 4-Cylinder Engine
- Bored 0.25mm over stock (2nd Run Size for VH)
- Honed cylinders similar to VH
- Prototype 10:1 Compression Pistons
 - Wiseco forged aluminum pistons
 - 1st & 2nd Ring Grooves wider than stock to prevent ring sticking
- Larger Piston Ring Gaps for higher blowby
 - 0.112" Top Ring Gap, 0.117" Second Ring Gap
- Advanced Intake Cam Timing
 - To convert Atkinson cycle to Otto cycle
- Stock piston oil squirters replaced with plugs
- Haltech aftermarket ECU
- Test run on previous VH fuel batch, N-000010-14
- Ran Cooler Engine Oil and Coolant Temp in Stage 1 (58°C Oil & 45°C Coolant)

Seq VJ 2nd Test Operations Summary

- Test was again run on reference oil 940-1
- Test ran well operationally, but Blowby was low (120hr avg = 33.39L/min, std 60-70L/min)
- Fuel Dilution average was 6.37%
- Again, engine was consuming excessive amounts of oil in test
- Test ran to full 216 hrs, despite exceeding VH Oil Addition Limit of 2,000 grams
 - Total oil consumption was 3,666 grams

- Priority for next test is to reduce oil consumption!

Ratings

VJ Rating Summary

Test Number: 245-0-2
 Sample Number: 265-28579,
 Run ID: TRN72SPCB

Date: 4/30/2026
 Rater: PHAU
 Room Temp: 71

Sludge Deposits

Rocker Arm Cover	9.28
Block Front	9.40
Oil Pan	9.30
Oil Pan Baffle	6.73
Valve Deck	8.10
PCV Gallery	9.70
Front Cover	9.43
Average Sludge	8.85

Sticking

Total Hot Stuck Rings	0
Total Cold Stuck Rings	0

Varnish

Rocker Cover	7.29
Front Cover	8.53
Oil Pan	9.60
Oil Pan Baffle	8.60
Piston Skirts	6.84
Average Varnish	8.17

Clogging

Oil Screen Sludge %	0
Oil Screen Debris %	3
Oil Ring Clogging %	0

R.A.C. Sludge Ave.
9.28

Oil Drain Analytics – 1 of 3

Lubrizol Full Length VJ Test

Test # 245-0-2

Oil 940-1

Test Length 216

Low Compression Pistons

Otto Cycle

0.112"/0.117" Ring

Gaps

Blocked Oil Squirters

Test Hours:	New Oil	24	48	72	96	120	144	168	192	216
Blowby, lpm	--	32.11	33.87	33.74	35.50	31.75	34.38	34.36	35.10	31.93
Cum. Oil Consumption, g	--	54	590	450	474	450	510	638	500	
Viscosity 40C, Cst	62.53	38.55	41.34	42.77	48.24	56.31	58.77	62.17	63.80	70.62
Viscosity 100C, Cst	10.45	--	--	--	--	--	--	--	--	--
D3525 Gas Dilution	--	7.40	6.70	6.50	6.20	6.40	6.20	6.00	6.00	5.90
D4739 TBN	6.70	5.30	3.70	2.80	1.20	1.00	0.80	0.70	0.70	0.70
D893B Pentane Insolubles	--	--	1.04	--	2.97	--	3.66	--	3.53	5.31

120-HR Average Blowby	33.39
Total Added, g	3666

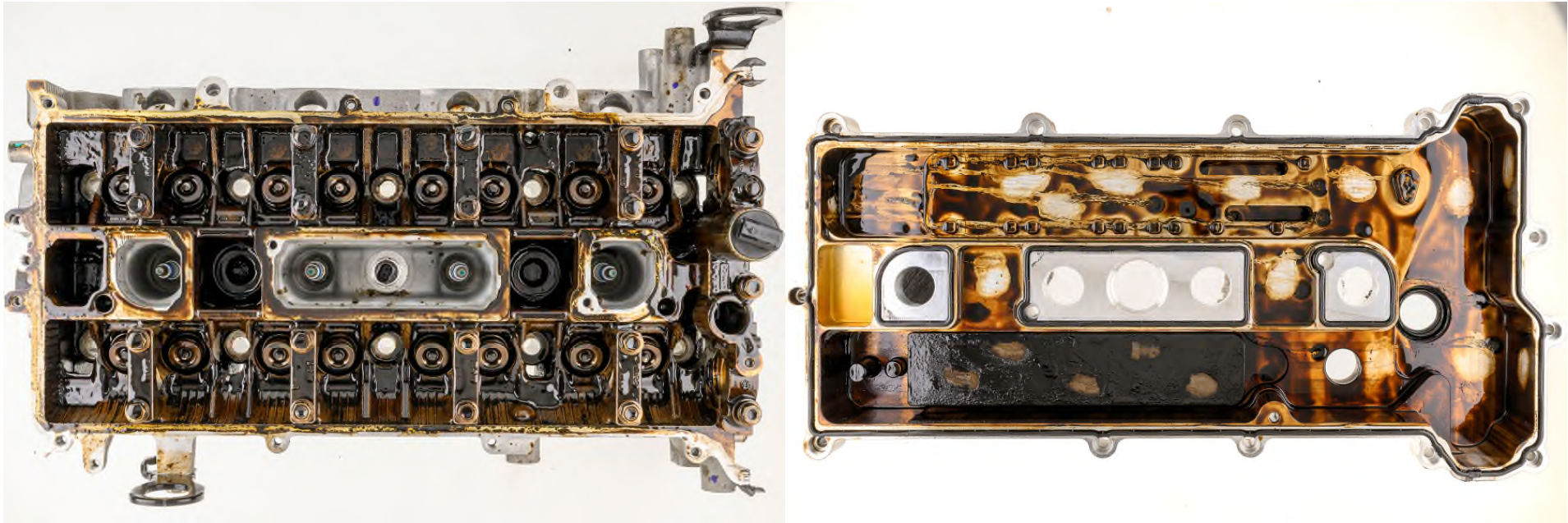
Oil Drain Analytics – 2 of 3

Metals Element Analysis - ICP - Method D 5185												
Test Hours:		New Oil	24	48	72	96	120	144	168	192	216	
	SILVER ppm	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	ALUMINIUM ppm	2.4	12.7	14.3	14.8	15.3	16.9	19.0	22.5	21.7	23.5	
	BORON ppm	0.5	0.0	1.5	2.6	1.0	0.8	0.7	1.5	2.4	1.2	
	BARIUM ppm	1.9	9.2	9.5	7.9	7.3	6.6	6.1	6.0	4.8	4.1	
	CALCIUM ppm	2498.5	2326.4	2333.7	2332.6	2402.7	2457.2	2510.1	2497.4	2581.6	2676.2	
	CADMIUM ppm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	CHROMIUM ppm	0.0	2.0	2.6	2.7	3.3	3.7	4.4	5.1	5.1	5.5	
	COPPER ppm	0.0	66.9	67.1	63.2	59.1	56.7	54.3	50.8	46.4	42.1	
	IRON ppm	0.9	70.5	97.3	111.0	132.0	155.3	182.2	203.9	205.7	218.8	
	MAGNESIUM ppm	6.0	9.4	14.0	9.3	13.7	13.2	14.3	11.3	9.5	14.3	
	MANGANESE ppm	0.6	6.9	7.6	7.1	7.1	7.1	7.3	7.1	6.5	6.1	
	MOLYBDENUM ppm	37.0	35.1	34.4	36.1	36.6	37.3	38.1	38.0	39.1	40.1	
	SODIUM ppm	0.0	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	NICKEL ppm	0.0	0.3	0.6	0.7	0.5	0.5	0.5	0.5	0.6	0.7	
	PHOSPHORUS ppm	754.1	697.7	702.1	687.9	713.6	725.9	738.2	729.7	755.7	795.4	
	LEAD ppm	0.3	0.3	0.5	0.4	0.6	0.5	0.6	1.4	0.6	0.5	
	SULFUR ppm	3085.7	2870.2	2975.4	3079.2	3110.2	3140.4	3168.2	3103.4	3208.3	3149.8	
	SILICON ppm	10.7	36.6	37.6	37.6	36.8	36.6	36.3	39.1	36.7	36.8	
	TIN ppm	1.5	1.0	1.0	0.9	1.0	0.9	0.9	3.5	1.2	1.2	
	VANADIUM ppm	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	
	ZINC ppm	851.4	766.4	753.0	787.4	817.2	839.2	863.0	868.2	892.9	917.1	
	TITANIUM ppm	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	
	POTASSIUM ppm	0.0	6.9	7.0	6.9	6.5	6.1	5.2	4.9	3.7	3.8	

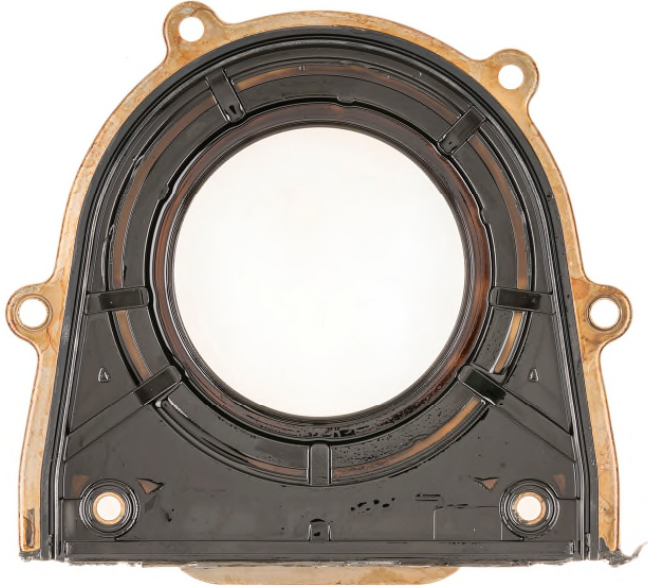
Oil Drain Analytics – 3 of 3

Oxidation and Nitration Analysis - Methods D7414 & D7624											
Test Hours:	New Oil	24	48	72	96	120	144	168	192	216	
Oxidation_Direct	7.26	7.26	7.26	7.26	7.26	7.26	7.26	7.26	7.26	7.26	
Oxidation_Differential	-	17.13	25.77	29.72	35.87	42.86	48.22	51.63	41.10	49.66	
Nitration_Direct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nitration_Differential	-	0.55	2.40	5.65	7.92	10.36	13.07	15.87	15.81	16.85	

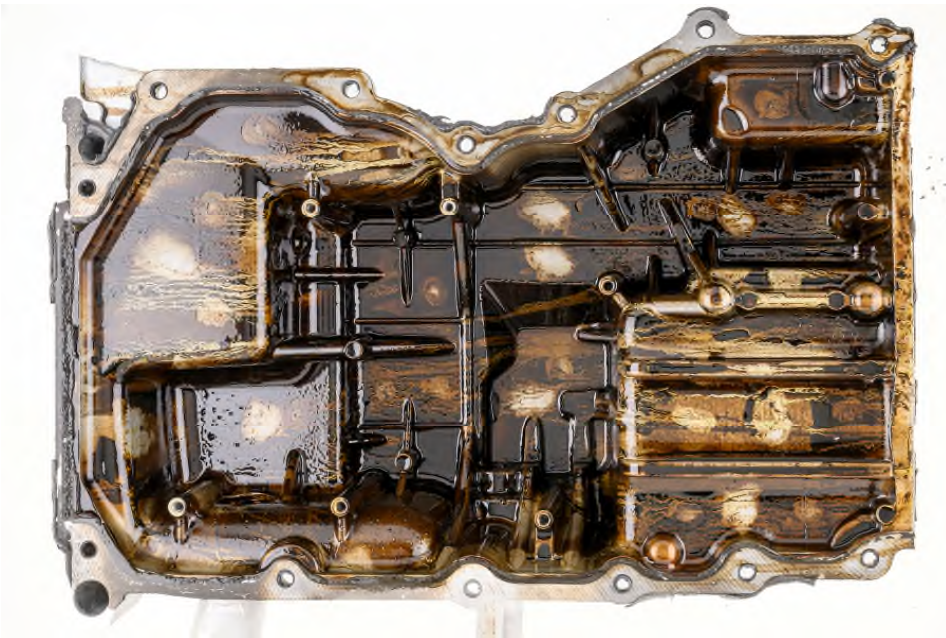
Engine Photos



Engine Photos



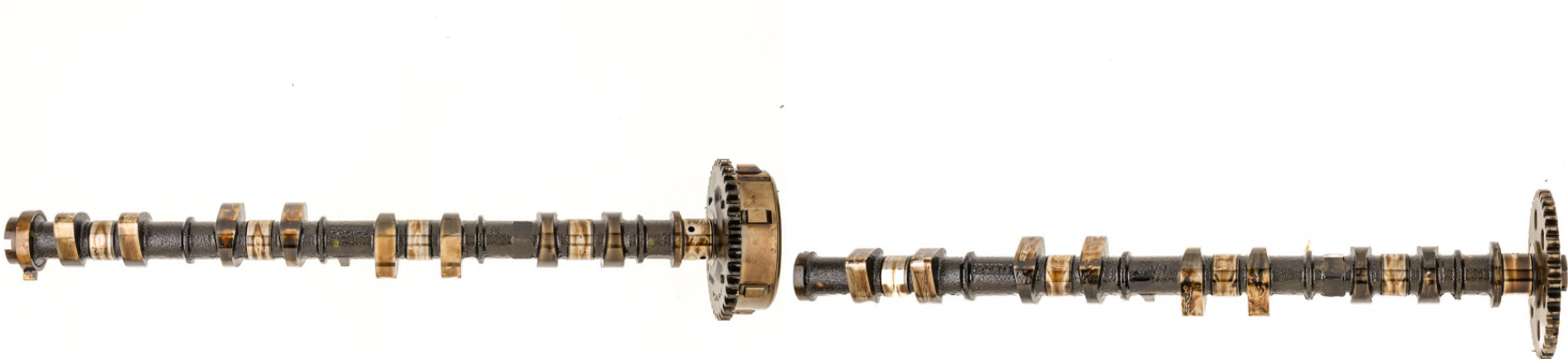
Engine Photos



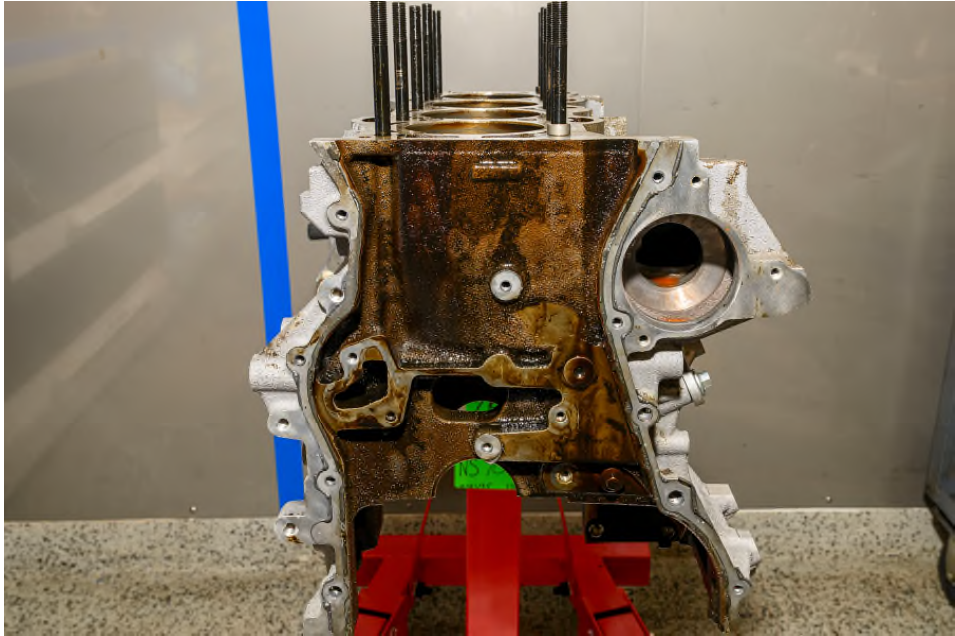
Engine Photos



Engine Photos



Engine Photos



Engine Photos



Sequence VJ Development Test 1 & 2 Results

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Sr. Research Engineer



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Reminder of what the first run is:

- Stock Engine Built
 - No piston squirters
 - TEI RAC and OHT Pan with no insulation
 - Cam timing modifications
 - Haltech ECU
 - Lambda using test stand ECM Combination
NOx Lambda Sensor
- Stage modifications and ECU tuning
- M-batch fuel (no Ethanol)
- 940-I reference oil
- **Engine was cleaned prior to reassembly**

Piston #	Ring Gaps
1	106/111
2	106/110
3	108/111
4	107/111

ENGINE #3

VJ CYLINDER BORE

		CYLINDER #1	CYLINDER #2	CYLINDER #3	CYLINDER #4
FRONT/ REAR	TOP	89.005	89.001	89.001	89.002
	CENTER	89.004	89.005	89.008	89.004
	BOTTOM	89.000	89.004	89.008	89.000
THRUST/ANTI	TOP	89.001	89.001	89.001	89.004
	CENTER	89.001	88.996	88.999	89.004
	BOTTOM	89.004	88.996	89.001	89.004
		UNCOATED AREA COATED AREA			
PISTON DIAMATER		88.961	88.988		



Operational Conditions

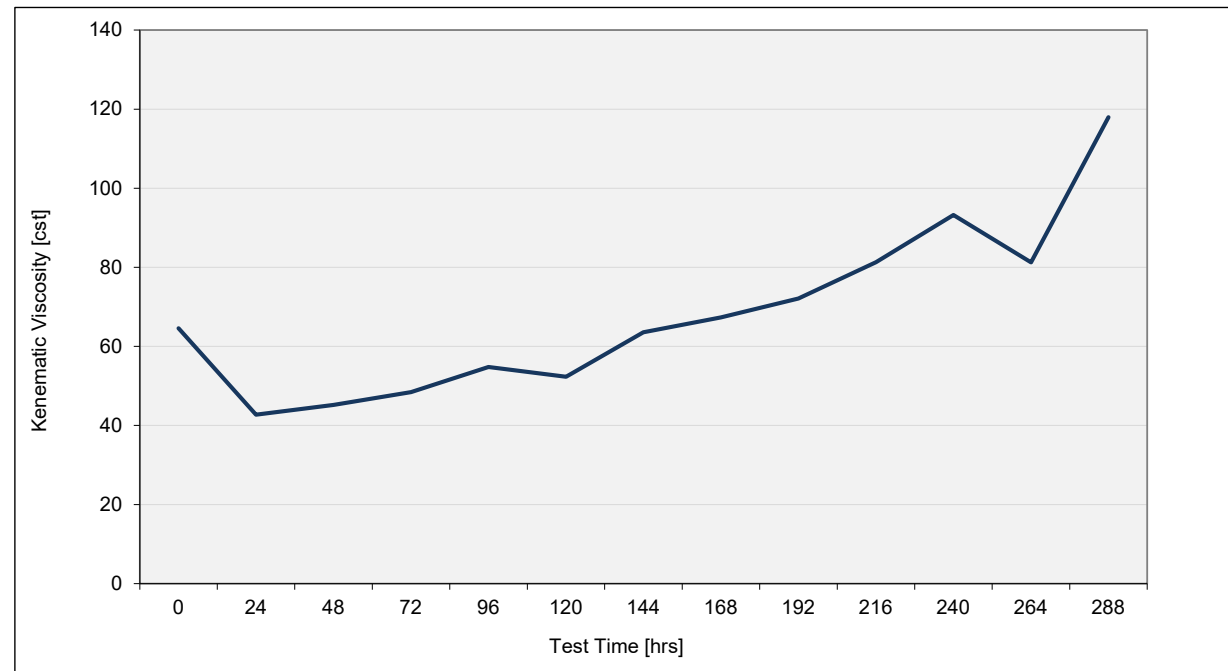
Condition	Stage 1		Stage 2		Stage 3	
	VJ Orig.	SwRI	VJ Orig.	SwRI	VJ Orig.	SwRI
Duration, min.	120	120	75	75	45	45
Engine speed, RPM	1750	1750	3250	3250	800	800
Engine Oil in, °C	68	58	100	100	45	40
Engine coolant out, °C	57	45	85	85	45	40
Engine coolant flow, L/min.	40	120	70	120	28	120
Engine coolant, kPag	70	70	70	70	70	70
RAC coolant in, °C	29	25	85	85	29	25
Rocker flow, L/min.	15	15	15	15	15	15
Intake. air, °C	30	30	30	30	30	30
Intake air press, kPag	0.05	0.05	0.05	0.05	0.05	0.05
Lambda	1	1	1	1	0.75	0.75
Intake air humidity, g/kg	11.4	11.4	11.4	11.4	11.4	11.4
Exhaust back pressure, kPaA	104	104	107	107		
Spark Timing, degrees	25	33*	25	35	25	20
Torque, N/m	105	105	110	110	36	36

*raised from 32 degrees due to lower initial NOx

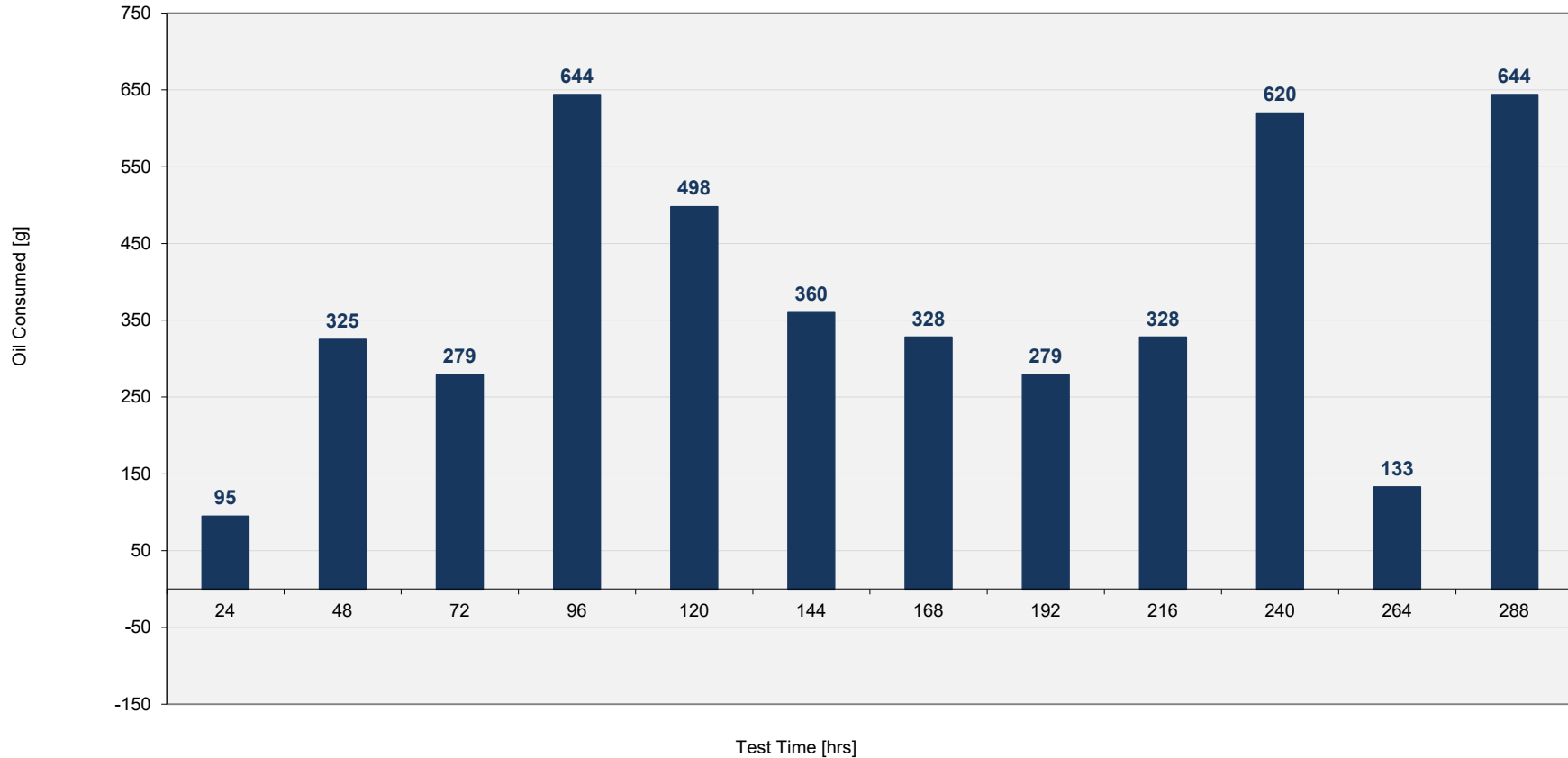


Chem Summary

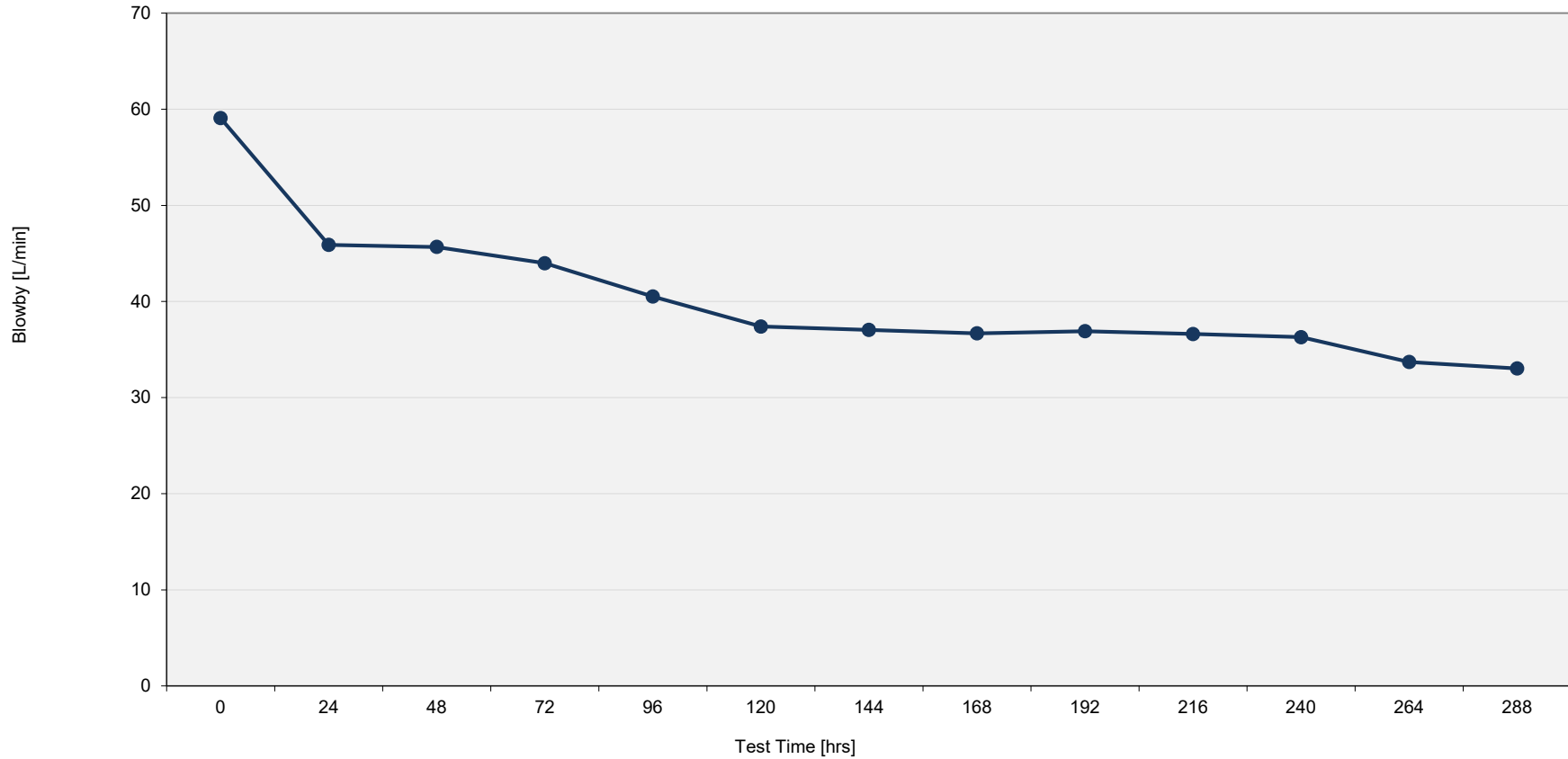
- Oil is moved in the right direction despite high oil consumption
- OBERG has plugged four times
- Lower blowby (high drop off)



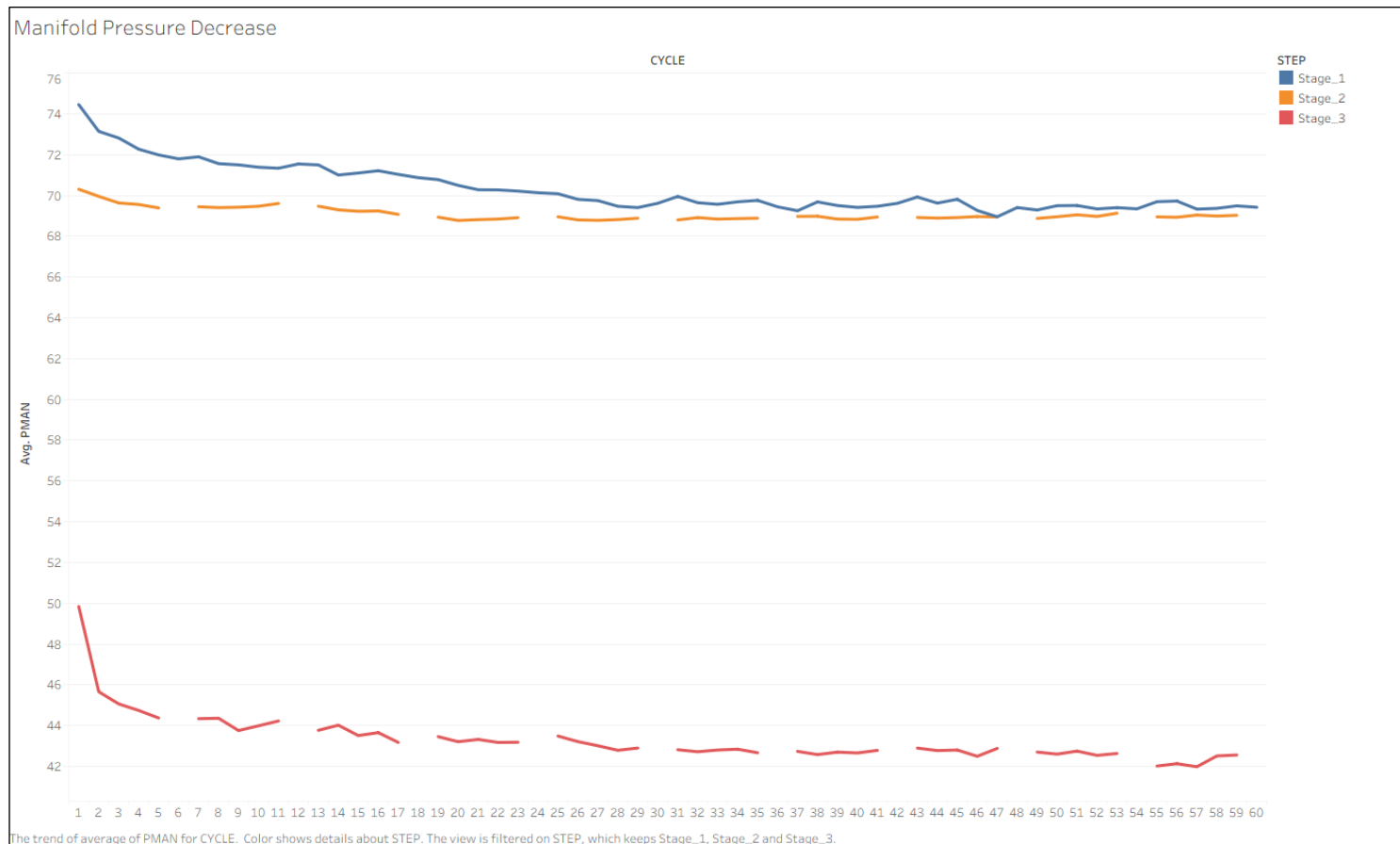
High Oil Consumption – 406 l grams added



Drop off in Blowby



Manifold Pressure Decrease



The trend of average of PMAN for CYCLE. Color shows details about STEP. The view is filtered on STEP, which keeps Stage_1, Stage_2 and Stage_3.



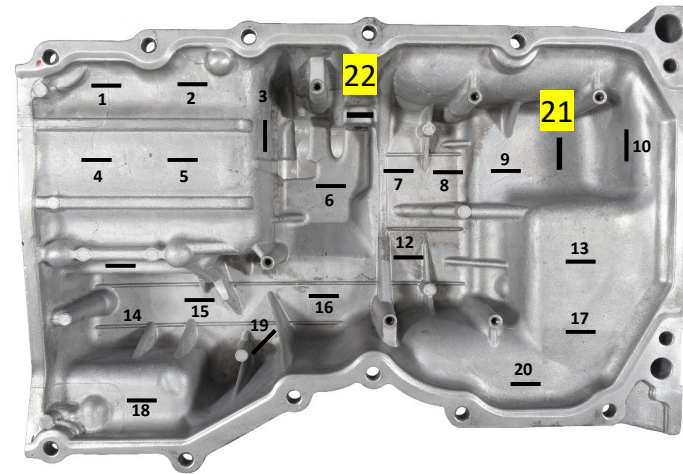
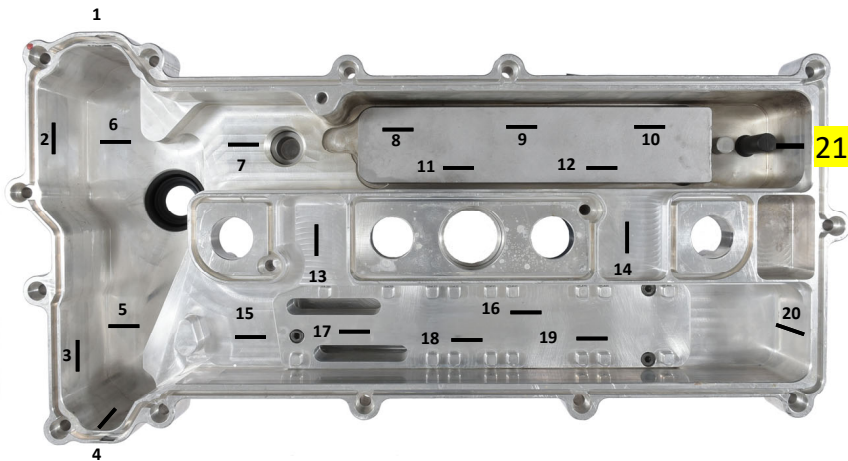
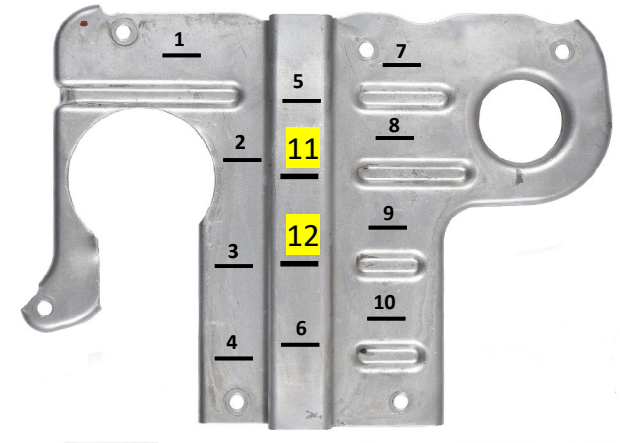
Chem Data Detail

ASTM Method	Analysis Description	Units	0	24	48	72	96	120	144	168	192	216	240	264	288
D445	Kinematic Viscosity @ 100°C	cSt	10.73	7.96	8.08	8.41	8.84	8.67	9.13	9.87	10.38	14.58	18.58	14.25	26.74
	Kinematic Viscosity @ 40°C	cSt	64.56	42.71	45.19	48.42	54.80	52.32	63.56	67.31	72.15	81.31	93.23	81.28	117.94
D3525-M	Fuel Dilution	wt. %		5.4	5.1	4.9	5.0	5.6	6.2	5.5	5.9	5.7	5.7	5.8	5.3
D5185 (ICP)	Al	ppm	<1	8	11	15	17	18	18	19	21	22	24	22	25
	Sb	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ba	ppm	<1	5	5	5	4	3	3	3	2	2	2	<1	1
	B	ppm	<1	2	2	2	2	1	1	1	1	<1	<1	<1	<1
	Ca	ppm	2294	2168	2247	2257	2308	2278	2267	2292	2249	2245	2226	2218	2226
	Cr	ppm	<1	<1	<1	<1	1	1	2	2	2	2	2	2	3
	Cu	ppm	<1	47	53	52	50	43	37	35	32	29	27	22	22
	Fe	ppm	<1	68	92	119	143	138	142	148	169	182	198	190	218
	Pb	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Mg	ppm	2	9	10	12	13	12	11	11	11	10	10	8	9
	Mn	ppm	<1	4	5	6	7	7	6	6	6	6	5	3	5
	Mo	ppm	38	37	38	37	37	36	36	35	35	34	34	34	35
	Ni	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	P	ppm	738	685	686	659	682	672	657	655	660	642	651	693	668
	Si	ppm	3	22	26	26	25	21	19	18	18	17	17	14	16
	Ag	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Na	ppm	<5	5	5	8	7	7	<5	<5	<5	<5	<5	<5	<5
	Sn	ppm	<1	<1	<1	<1	1	<1	<1	<1	1	1	1	<1	2
	Zn	ppm	783	741	758	750	769	760	744	757	750	727	749	784	749
	K	ppm	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Sr	ppm	<1	<1	<1	1	1	2	2	2	2	1	2	<1	1	
V	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Ti	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Cd	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
D4739	TBN	mg KOH/g	6.95	3.64	2.16	1.08	0.78	0.85	0.77	0.67	0.47	0.40	0.43	0.54	0.34
D893B	Pentane Insolubles	% weight		0.05	1.25	2.65			3.96	4.43			5.64	4.51	5.87
FTIR	Oxidation (peak)	ABS/cm ²		18.4	28.9	43.8	91.0	110.3	299.0	345.6	459.0	527.1	704.5	693.6	882.0
	Nitration (peak)	ABS/cm ²		9.1	29.5	122.3	270.9	489.9	572.2	612.2	651.7	709.9	718.4	700.6	693.2
	Oxidation (area)	ABS/cm ²		5.9	10.4	16.0	19.9	20.4	22.5	24.7	27.9	30.3	32.4	31.7	36.7
	Nitration (area)	ABS/cm ²		1.2	4.7	10.8	17.5	22.0	22.9	26.3	29.9	33.5	35.2	34.1	36.9
D5762	Nitration	µg/g													3106

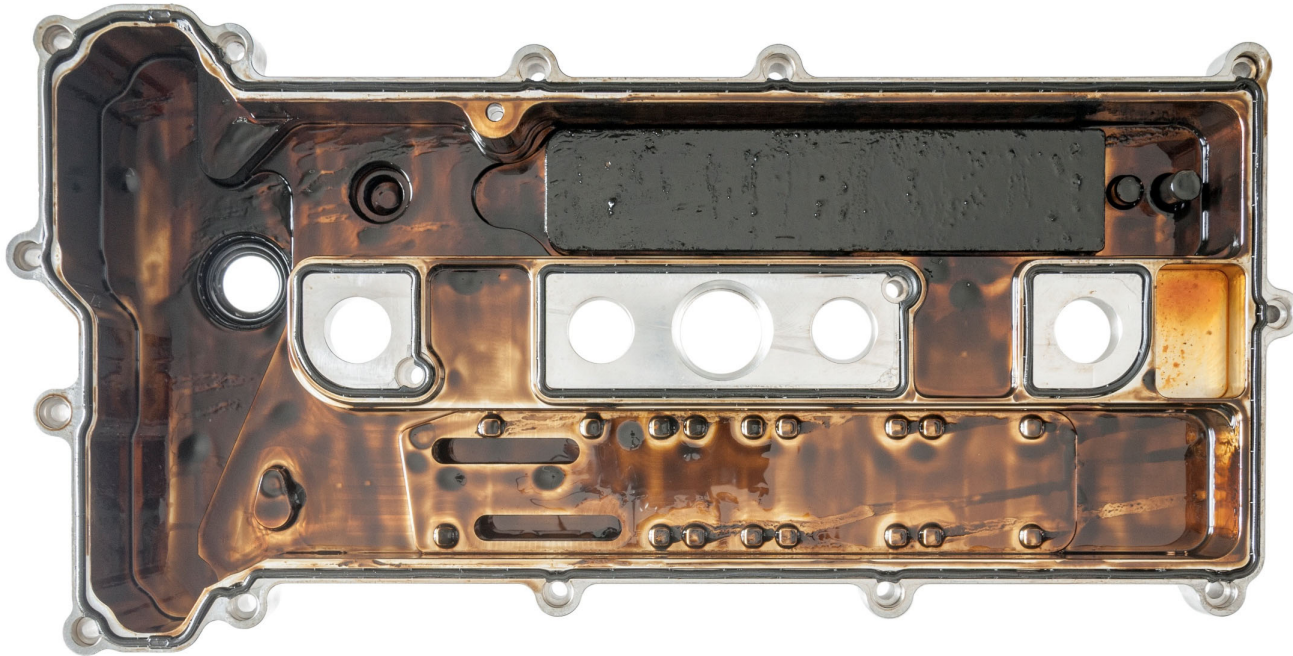


Sludge Ratings

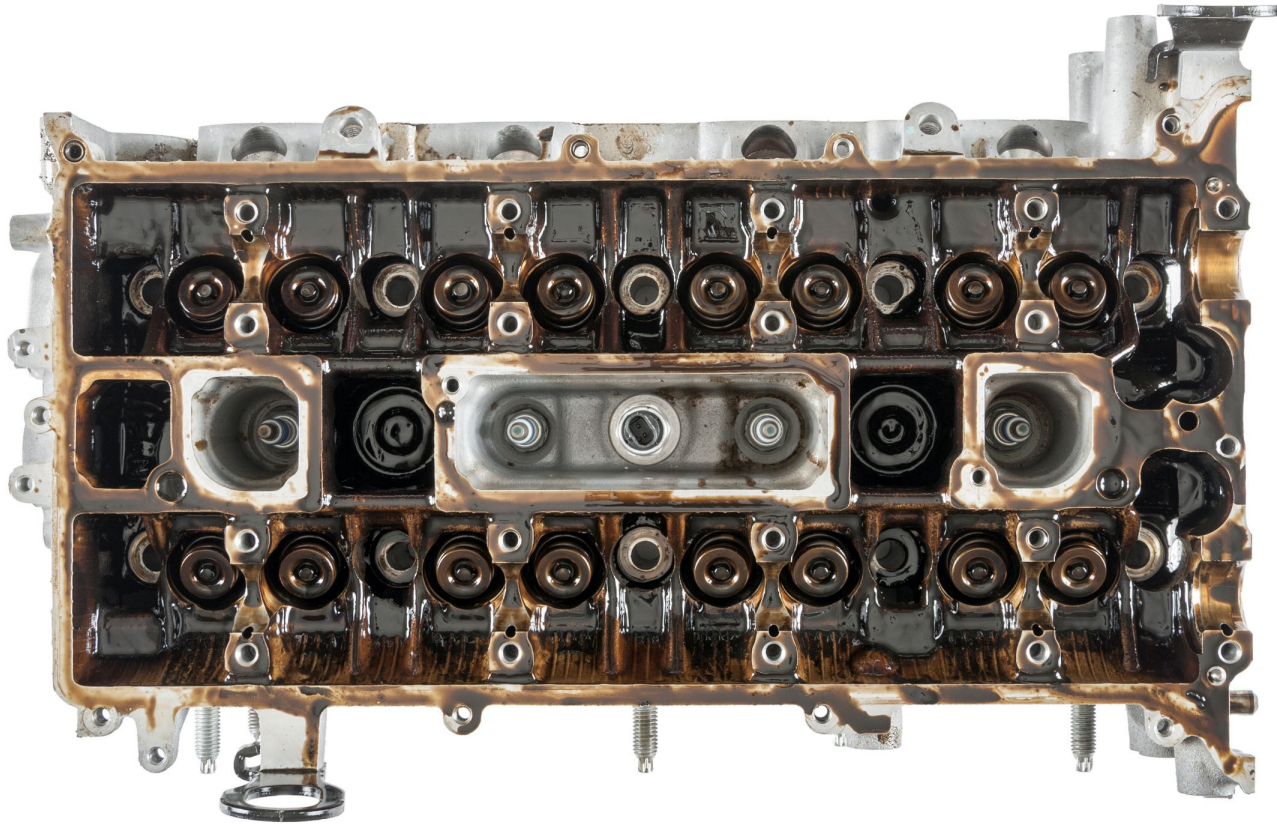
Sludge		Sludge Extra	
Front Cover	8.91	Front Cover	8.91
Rocker Cover	8.81	Rocker Cover (21)	8.77
Oil Pan	8.85	Oil Pan (22)	8.77
Oil Pan Baffle	7.36	Oil Pan Baffle (12)	7.23
Valve Deck	6.86	Valve Deck	6.86
Block Front	8.19	Block Front	8.19
PCV Gallery	8.12	PCV Gallery	8.12
ASTM Round	8.16 AES	ASTM Round	8.12 AES



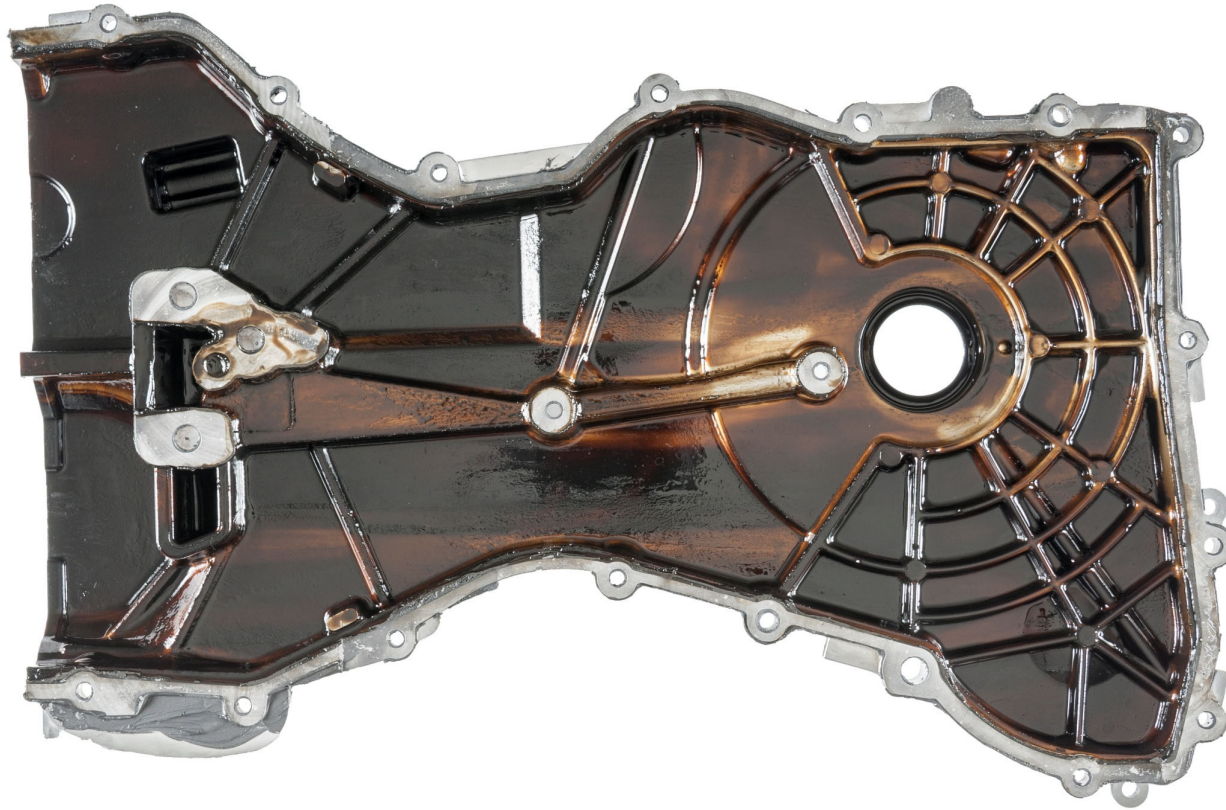
EOT Rocker Cover



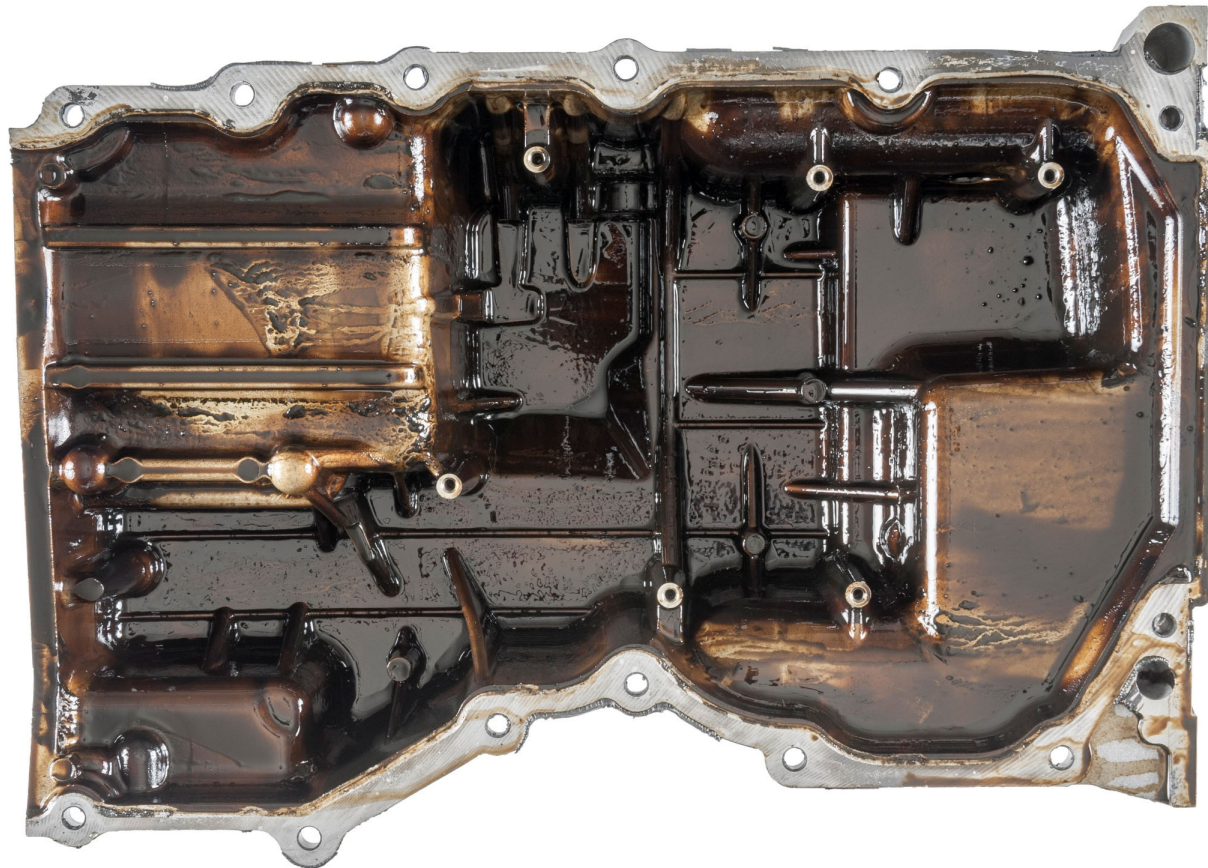
EOT Valve Deck



EOT Timing Chain Cover



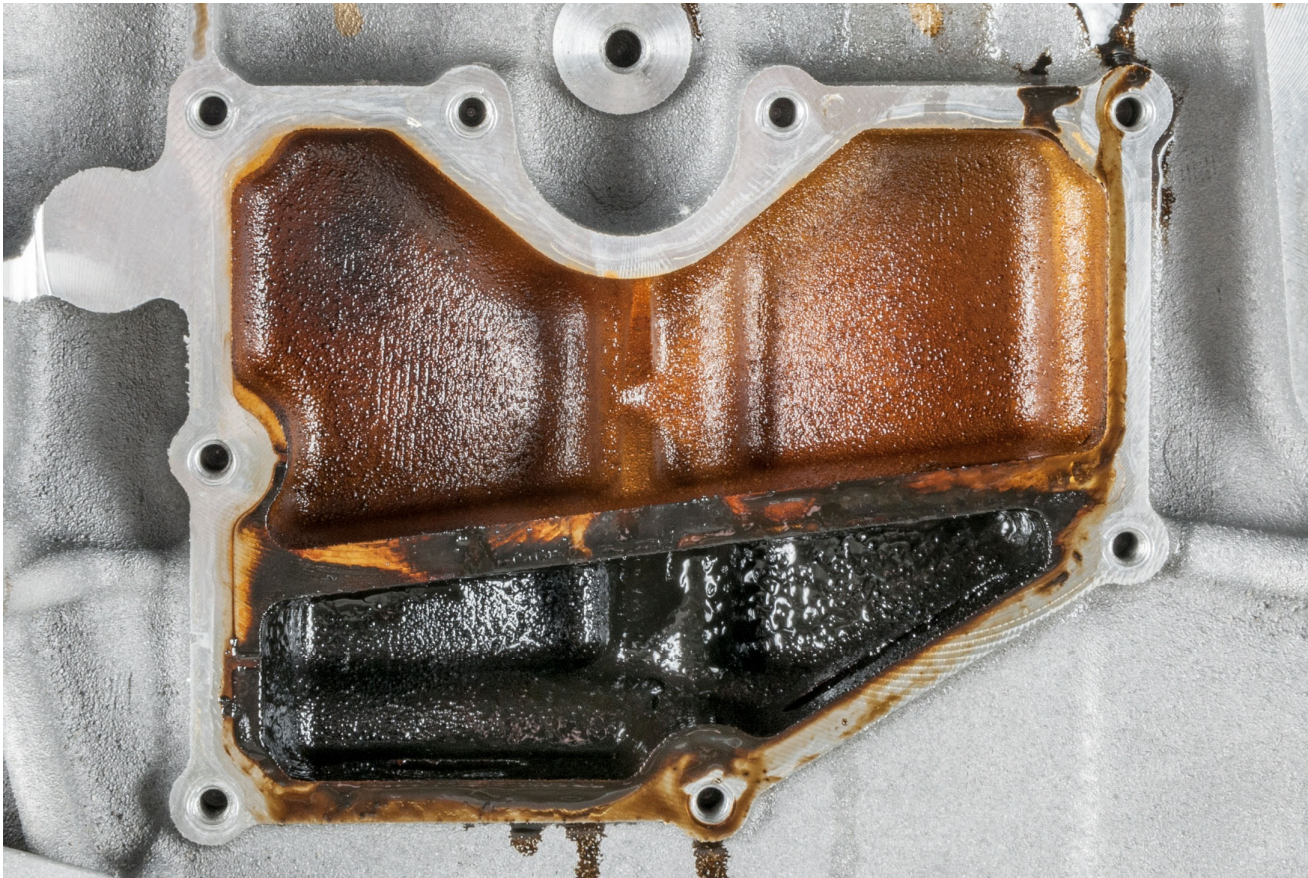
EOT Oil Pan



EOT Oil Pan Baffle



EOT PCV Gallery



EOT Oil Pickup Screen

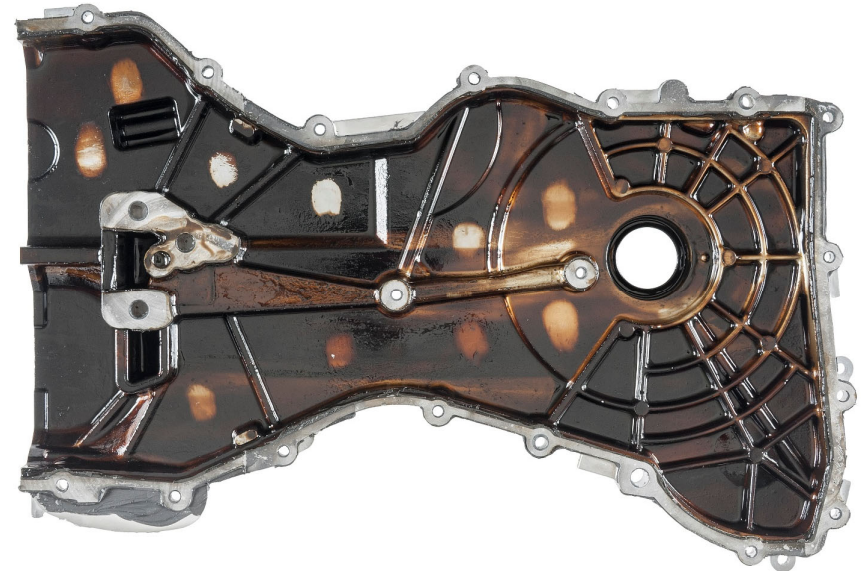
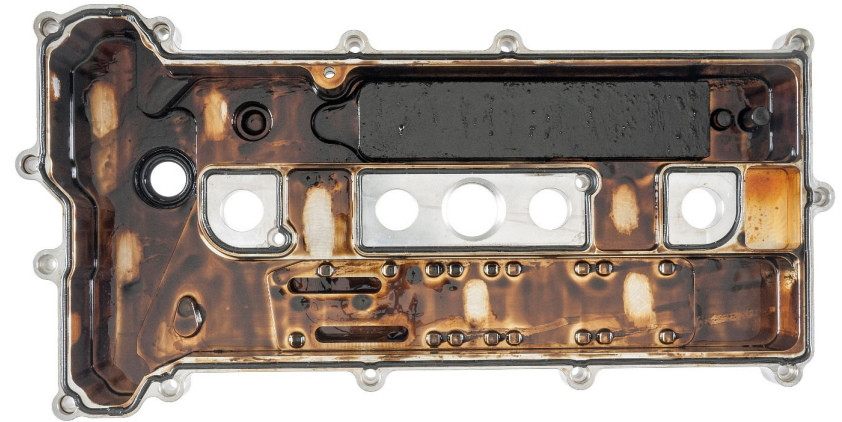
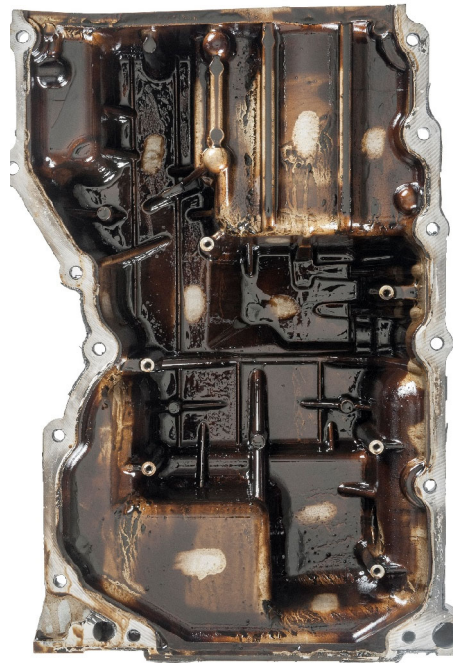


EOT Rear Cover

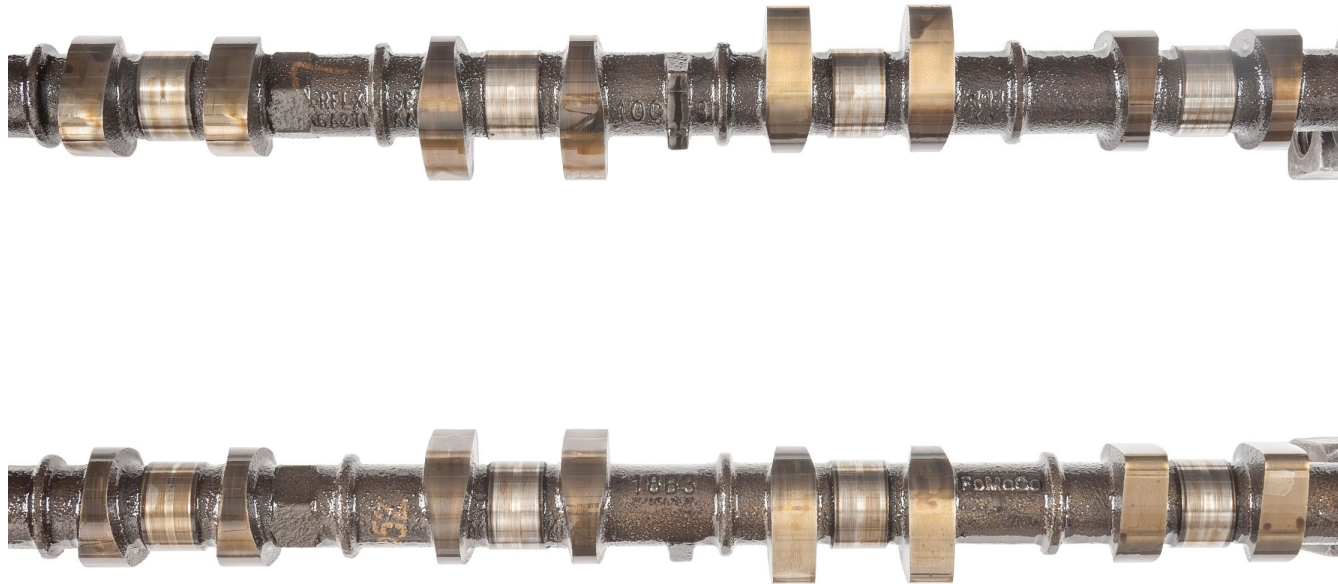


Varnish

- Front Cover: 6.69
- Rocker Cover: 8.12
- Oil Pan: 9.2
- Oil Pan Baffle: 9.06
- AEV: 9.06

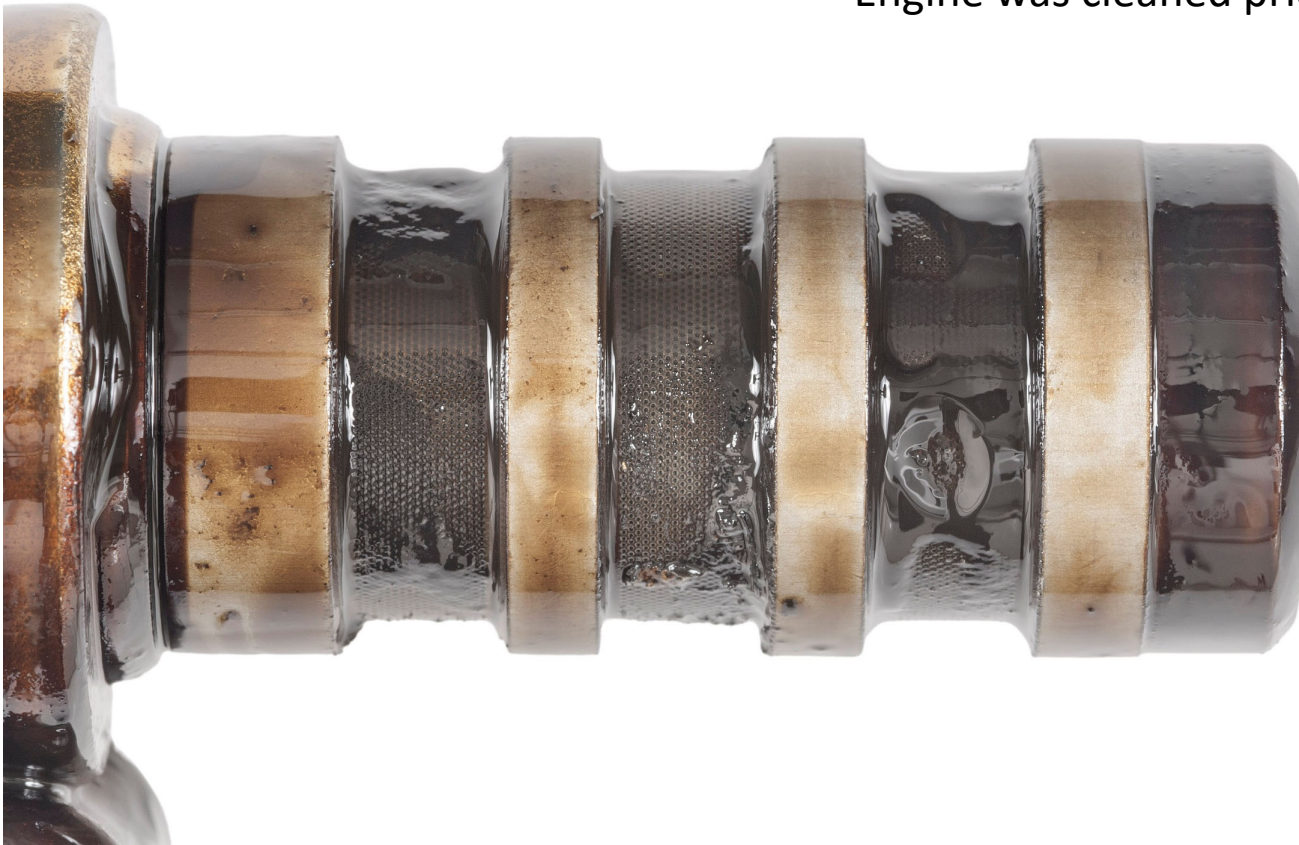


EOT Camshafts Journals



EOT VVT Solenoid

*Engine was cleaned prior to the test



Pistons

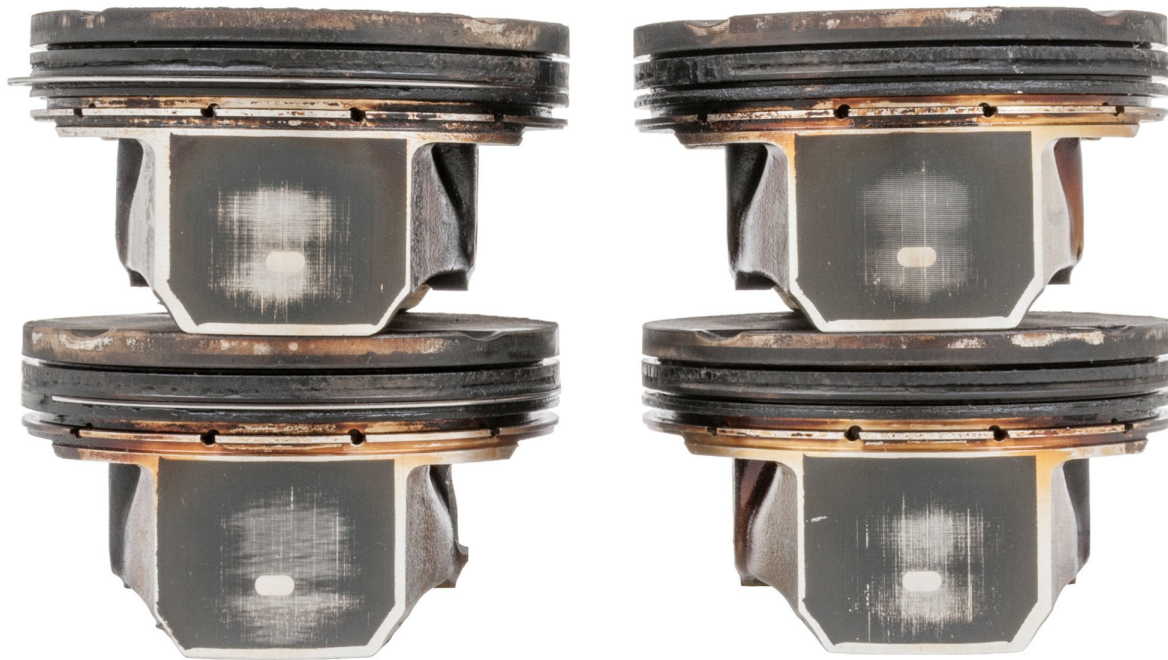
Un-Weighted Pison Deposits							Weighted Piston Deposits			
	Grooves			Lands		Undercrown	Piston Boss Varnish		Merits	
	1	2	3	2	3		Front	Rear		
Piston 1	0.58	0.00	2.37	0.78	0.83	1.00	5.77	2.98	Piston 1	1.78
Piston 2	0.65	0.70	3.86	0.72	0.76	1.07	3.59	6.01	Piston 2	2.17
Piston 3	0.75	0.59	1.71	0.77	1.08	1.07	5.53	3.86	Piston 3	1.92
Piston 4	0.72	0.00	2.23	0.75	0.68	1.07	3.11	4.71	Piston 4	1.65
									Average	1.88



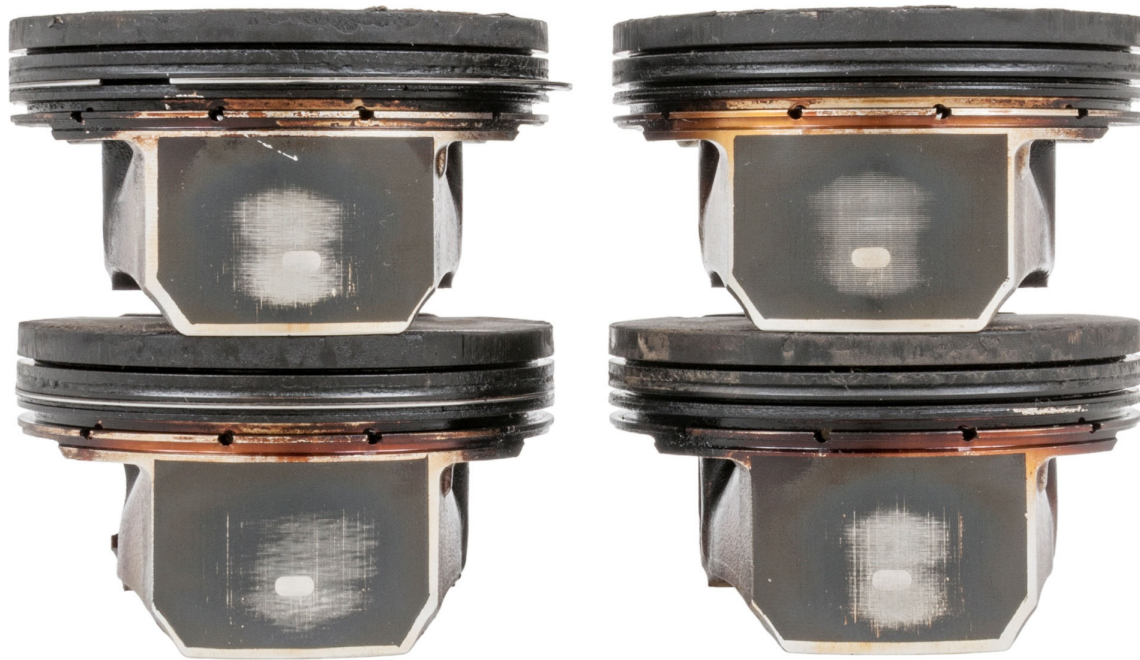
EOT Hot Stuck Ring



EOT Pistons



EOT Pistons



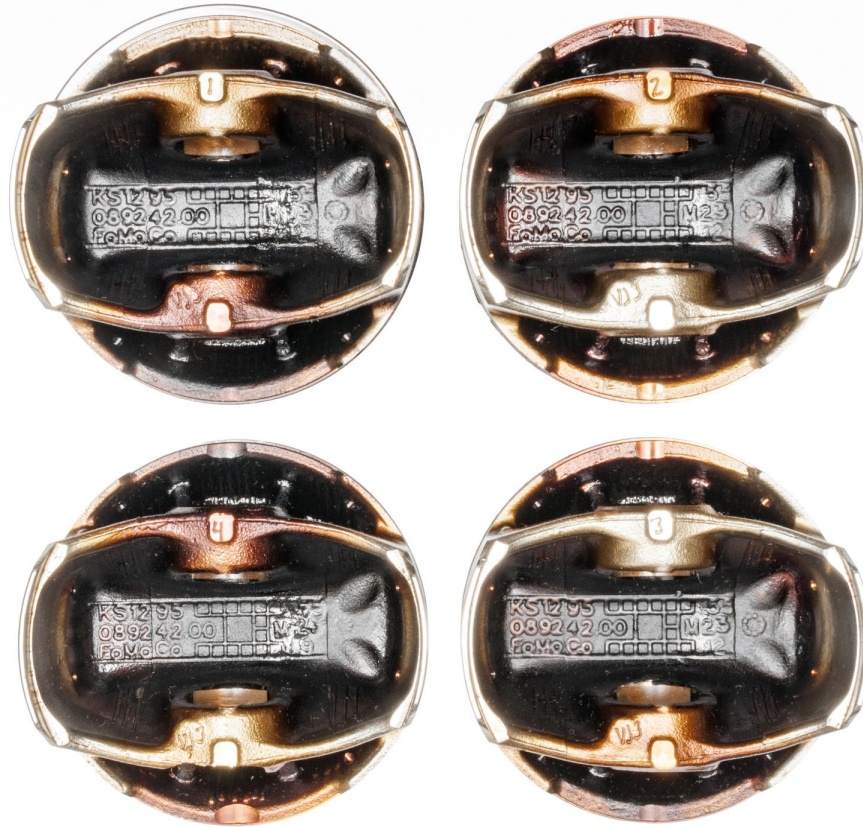
EOT Pistons



EOT Pistons



EOT Pistons



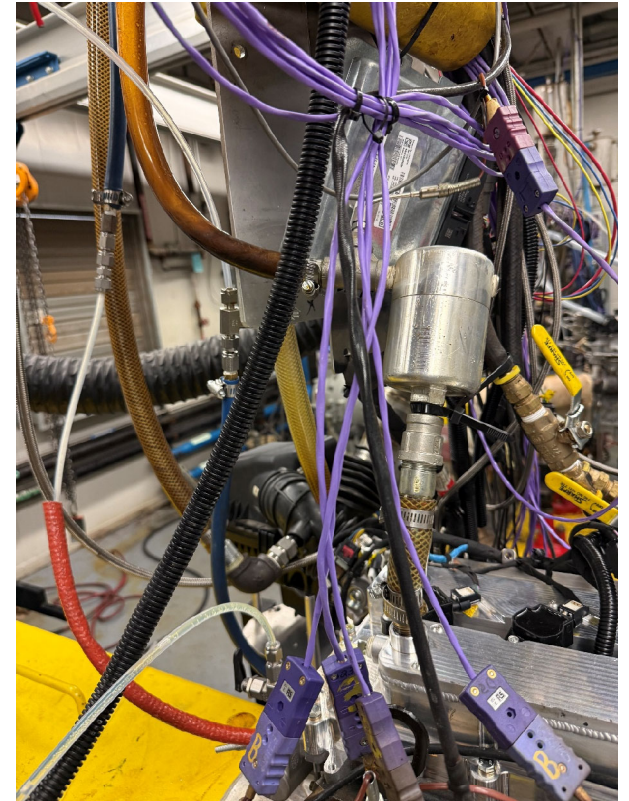
Modifications Second Test

- Same Stage Conditions
 - Reallocate 15 minutes from Stage 2 to 3 to try to drop varnish
- Lower Ring gaps to attempt to control oil consumption
 - 53/58
- Factory Hone, most traces ~6-7 Ra thrust/anti-thrust

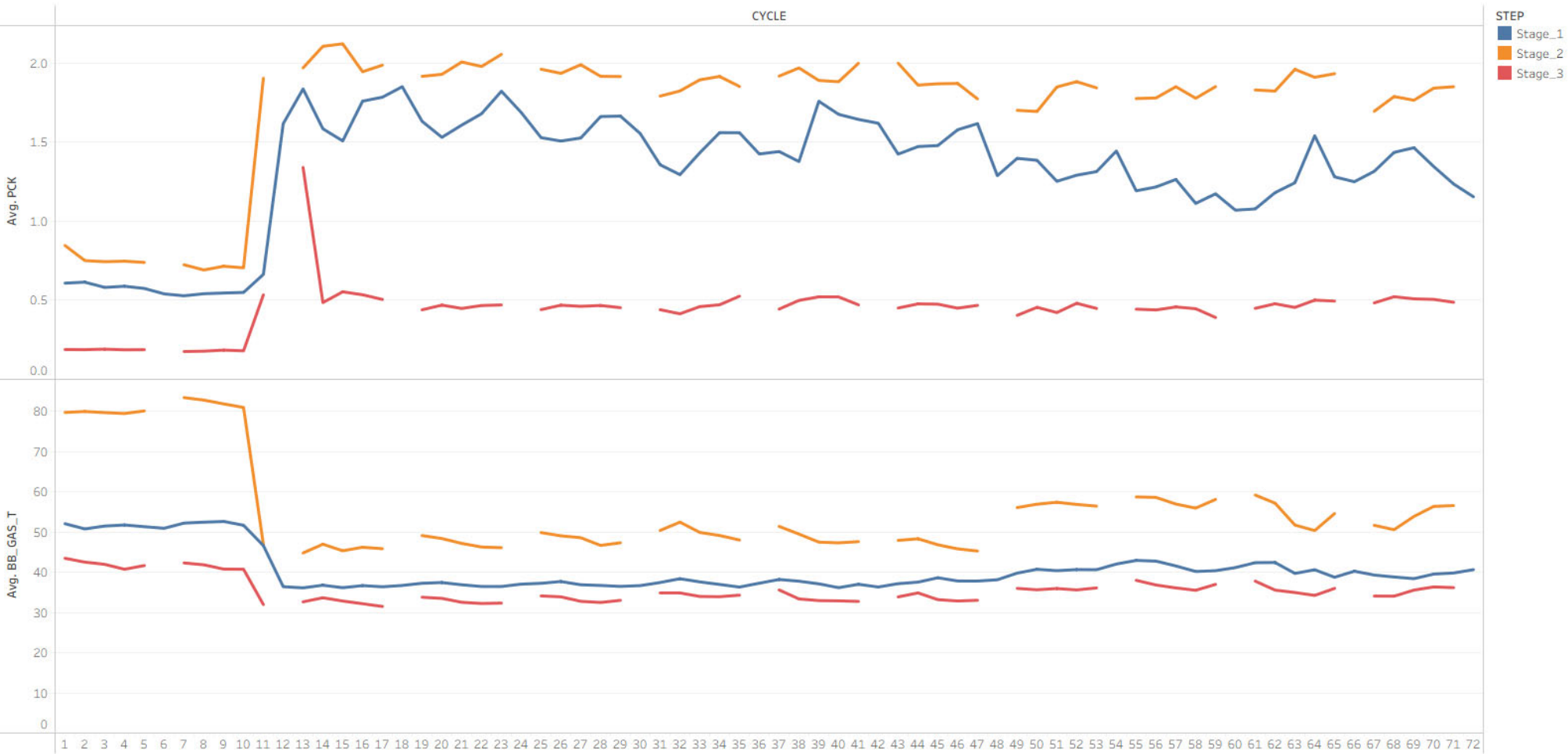


Second Test – PCV Modifications

- 24 hour oil level was -390 grams
- Checked PCV and found oil in tube past the oil separator
- Shut test down and reconfigured PCV
- New PCV setup used factory separator
 - VH configuration
 - Plugged head port
 - Used Dip stick plug for Crankcase pressure



Crankcase Pressure and Blowby Temp

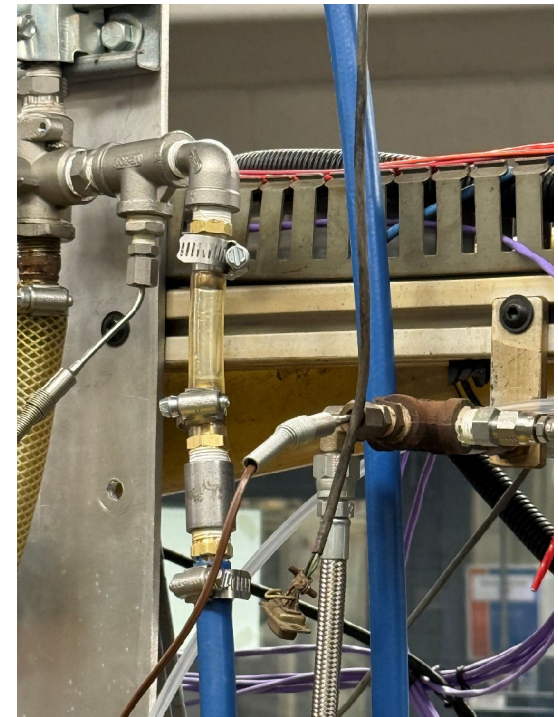


The trends of average of PCK and average of BB_GAS_T for CYCLE. Color shows details about STEP. The data is filtered on testnumber, which keeps 15-D-2. The view is filtered on STEP, which keeps Stage_1, Stage_2 and Stage_3.



Summary of Second Test

- Test was milder (AES 9.24)
 - Oxidation/nitration decreased in comparison to previous test
 - Likely combination of ring gap (blowby) and temp. at same time
- All 2nd rings cold stuck
- 3085 grams of oil added vs 4061 grams on previous test
 - Cleaner throttle body and intake after test



Second Test Chem Data

ASTM Method	Analysis Description	Units	0	24	48	72	96	120	144	168	192	216	240	264	288
D445	Kinematic Viscosity @ 100°C	cSt	10.74	7.60	7.73	8.13	8.10	8.44	8.76	8.94	8.97	9.60	10.24	11.12	9.70
	Kinematic Viscosity @ 40°C	cSt	64.15	39.67	41.29	43.61	45.13	55.23	59.07	58.71	57.31	59.77	66.36	75.32	60.26
D3525-M	Fuel Dilution	wt. %		7.1	6.3	5.5	5.8	6.0	6.3	6.0	6.3	5.5	5.9	5.5	6.1
D5185 (ICP)	Al	ppm	<1	9	12	18	18	23	24	24	25	27	29	30	30
	Sb	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ba	ppm	<1	5	5	5	4	4	4	3	2	2	2	2	2
	B	ppm	<1	2	2	2	2	1	2	1	<1	<1	<1	<1	<1
	Ca	ppm	2312	2195	2168	2192	2233	2209	2249	2233	2269	2288	2254	2318	2275
	Cr	ppm	<1	<1	<1	1	2	2	2	2	3	3	3	4	4
	Cu	ppm	<1	77	77	82	67	68	64	54	50	46	42	39	33
	Fe	ppm	<1	51	72	93	94	120	129	132	136	150	158	180	181
	Pb	ppm	<1	<1	1	1	<1	<1	1	<1	<1	<1	<1	<1	<1
	Mg	ppm	2	13	12	13	11	13	12	12	11	11	9	10	6
	Mn	ppm	<1	4	5	6	6	6	6	6	5	5	5	5	4
	Mo	ppm	40	37	37	36	37	36	37	37	35	36	36	36	36
	Ni	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	P	ppm	732	685	672	655	676	662	676	660	653	660	655	667	671
	Si	ppm	3	21	25	26	23	24	22	20	17	17	16	16	14
	Ag	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Na	ppm	<5	8	8	9	8	8	8	<5	6	<5	<5	<5	<5
	Sn	ppm	<1	<1	<1	<1	1	1	1	2	1	2	2	2	2
	Zn	ppm	801	739	737	740	740	763	781	770	759	767	757	777	763
	K	ppm	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Sr	ppm	<1	1	2	2	2	2	2	2	2	2	2	2	2	
V	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Ti	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Cd	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
D4739	TBN	mg KOH/g	6.71	4.84	2.70	1.60	1.52	0.94	0.93	0.99	0.80	0.66	0.67	0.62	0.74
D893B	Pentane Insolubles	% weight		0.12	1.46	2.22	2.00	3.04	3.59	3.75	4.08	4.32	4.71	4.06	2.74
FTIR	Oxidation (peak)	ABS/cm ²		21.9	26.2	45.0	147.9	258.0	261.9	287.6	392.6	459.2	494.1	503.1	513.9
	Nitration (peak)	ABS/cm ²		3.6	14.9	49.3	62.3	154.3	174.1	192.9	210.8	240.2	255.7	278.8	272.6
	Oxidation (area)	ABS/cm ²		5.0	8.3	12.0	12.5	17.4	18.4	19.2	20.4	22.2	23.6	25.4	24.4
	Nitration (area)	ABS/cm ²		0.3	2.1	5.7	6.7	13.5	15.5	17.0	18.6	20.7	22.5	24.2	23.4
D6304C	Water	mg/kg	217	343	483	598	647	689	872	548	616	587	659	547	612
D5762	Nitration	µg/g	503	741	1084	1538									



Direction forward

- Continue to use factory separator
 - Asked Ford for input on rate that factory separator is still functional
 - Rob reached out internally
 - Dual ports (RAC and Factory) to increase blowby if we're at max of factory
- Evaluate Stage Conditions (Speed and Load) for Oil Consumption with shakedown engine (Same 53/58 Gaps as second test)
 - Start with Stage 2 so we have a cookoff stage for 1 and 3
 - If/Once Stage 2 under control move to Stage 3
 - Finish with Stage 1
- After Stage Condition and PCV reconfiguration completed, evaluate a full run with modified hardware

