Sequence VH O&H Meeting
March 11th, 2025 at 3PM EST via MS Teams

Attendees: Mike Deegan, Al Lopez, Tony Catanese, Doug Wentworth, Adam Wheeler, Ben Maddock, Dylan Beck

Overview:

1. Hardware
2. Operation
3. Fuel
4. Other

Notes:

1. Hardware

- Runs per camshaft
    - TMC has requested labs to provide camshaft run number values for all reference results
    - Proposal: **Complete by March 31st, 2025** to allow labs the time to balance with fuel approval matrix and standard workload
    - Two labs still working to complete

2. Operation

- Continued discussion on tightened surface target for upcoming fuel approval matrix
        - Proposal: Request that test labs target Ra between 9 and 12 for the fuel approval matrix
        - See presentation
    - Feedback
        - Lubrizol, IAR and Afton were supportive. SwRI didn't make the call.
        - Discussion around crevice volume
            - All labs in the small dataset indicate they're well outside of the range provided by Ford
            - Lubrizol had success lowering their crevice volume by adjusting to higher load and fewer strokes
            - While there's interest here, labs don't want to impart a major shift in industry performance by targeting a different parameter than Ra.
            - All of these findings need to be leveraged in the VJ
        - Big difference between IIIH/GMOD is the stone material. Diamond stones should be explored eventually, more likely in the VJ

- Blowby Orifice Plate Diameter
    - 1982 GM Orifice plate drawings
    - Two orifice sizes could be used to meet the 60-70 L/min window (5/8" and 5/16")
    - Labs were going off memory, most are using 5/16" because it's the more appropriate flow curve for our target blowby

3. <u>Fuel</u>

- M-000054 Fuel Batch Approval
    - ~~Full tank~~ Pilot batch adjustment in process
    - Fuel is late, latest provided ship date is March 13th
    - Tentative forecast (updated best case):
        - 3/13 – Fuel is ready for shipping
        - 3/17 - Labs start RO 940 run
        - 4/1 - Review 940 data
        - 4/3 – Labs start remaining Row 1
        - 4/17 – Review row 1 data
        - 4/28 – Complete big batch adjustment and ship fuel to labs
        - 5/1 – Release row 2 & 3
        - 5/29 – Completed fuel approval matrix
        - 6/5 – Candidate testing resumes
- Lab calibrations
    - Attempting a calibration in Afton's second stand
    - Lubrizol is purchasing the latest batch of fuel and attempting calibration

4. <u>Other</u>

a. FCS Order through TEI
    i. "The Pistons and Rings were ordered on November 1st. The lead time for the rings is 69 days and 127 days for the pistons."
    ii. Rings expected January 9th, 2025
        1. Arrived early but missing some from one size.
    iii. Pistons expected March 8th, 2025

b. Pencool 2000 shortage
    i. PenRay discontinued their entire PenCool line (2000, 3000, 4000 and the associated filters). They do not offer an alternative.
    ii. Alternatives
        1. Nalcool NalFleet 2000
        2. DELO Extended Life coolant
        3. Motorcraft, Dexcool, Peak
    iii. Labs to check inventory and consult internal experts
        1. SwRI, IAR and Afton reported at least 6 months inventory available
        2. This topic will be shelved until later in the year

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	

Surface Finish – Sequence VH

March 11, 2025

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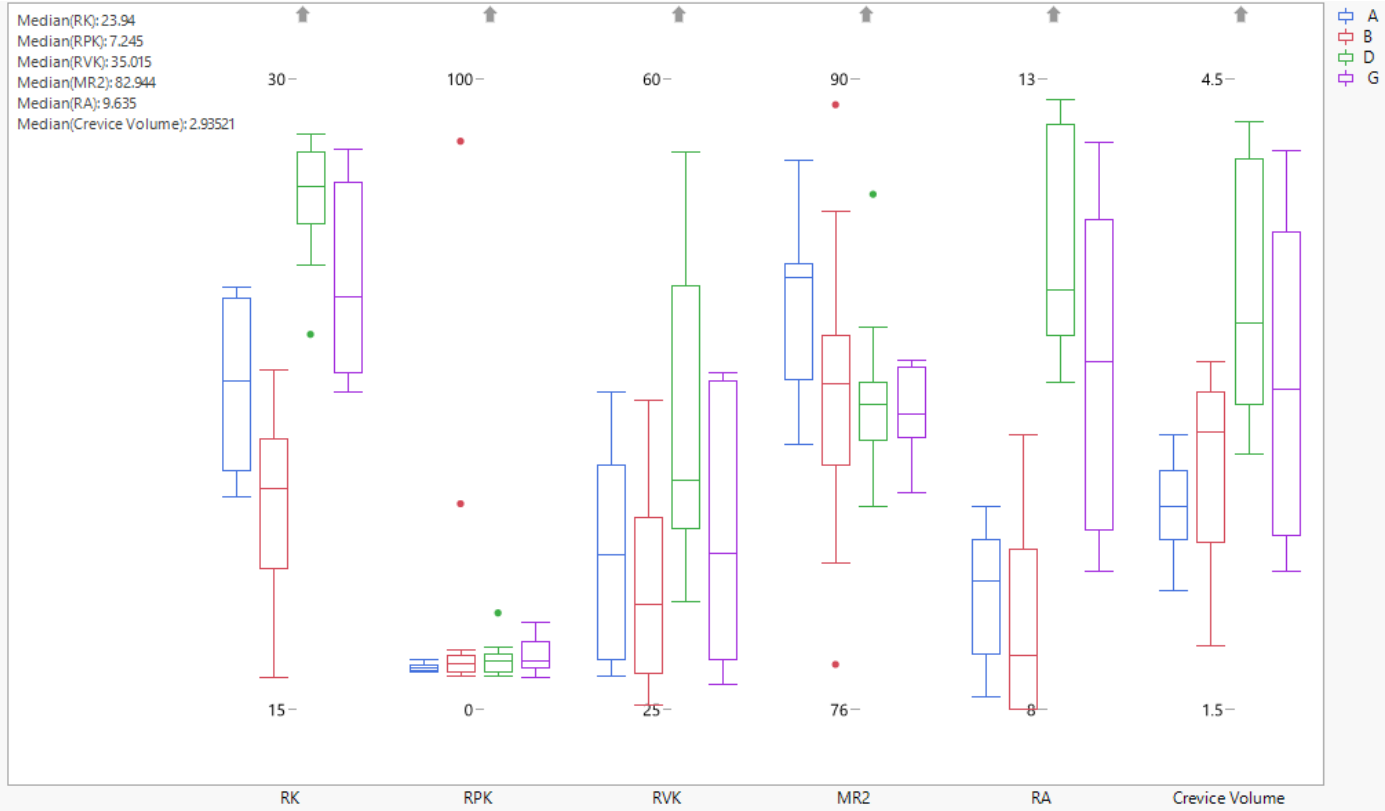
Sequence VH Surface Finish

- **Objective**: Improve precision of the Sequence VH by converting the labs to bearing ratio curve surface parameters

- Process
  - Current: Ra = 8 to 13 µin
  - Revised proposal – 3/11/25
  - Lab agreement to target a tighter specification. Set new targets into the procedure following the fuel approval matrix

- Proposal:
  - Labs target 9 to 12 µin Ra for the upcoming fuel approval matrix

Sequence VH Surface Finish



NOTE: Very small dataset, 1 test at A & G, 2 at B and 2 at D

Sequence VH Surface Finish

- Proposal: Labs target the proposed range without validity implications

	Sequence VH		
	Nominal	**Proposed Range**	
Parameter	**Observed**	**Min**	Max
Rpk	7	4	10
Rk	25	19	31
Rvk	34	31	37
Rz	108	94	122
MR2	84	70% min	
Ra	10	9	~~11~~ 12
Crevice Volume (100-MR2)xRvk/200	2.72	0.39	2.36

- By tightening the labs on Ra only and letting the other parameters float, we'll come out of the fuel approval matrix with a better understanding of what's normal within a smaller range than an Ra of 8 to 13

Appendix

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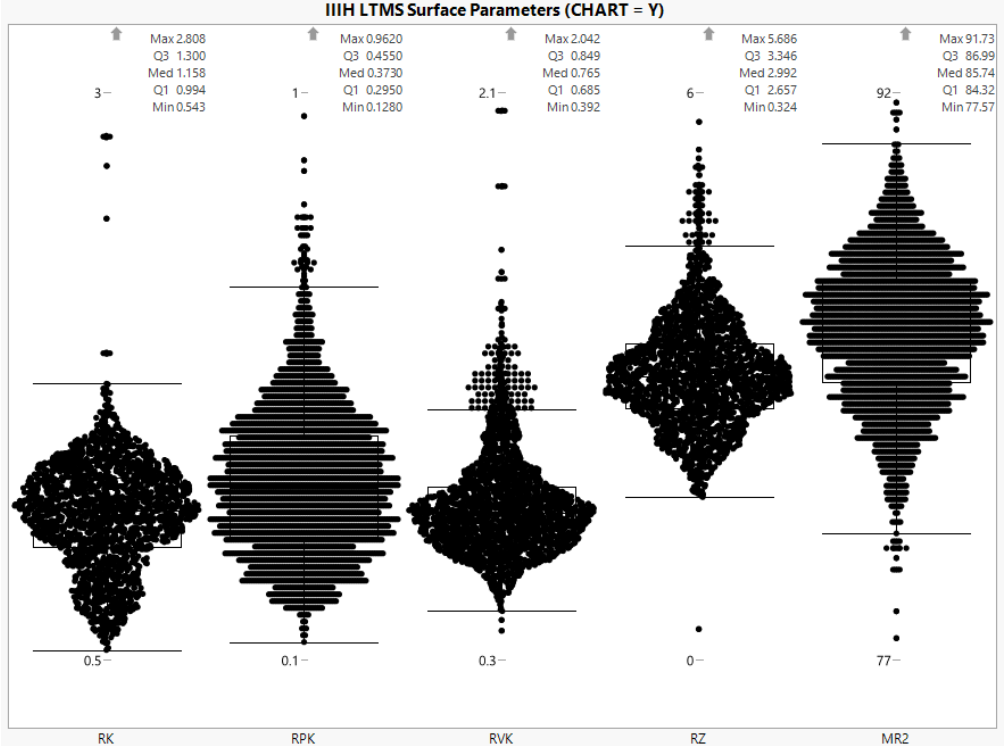
Sequence VH Surface Finish – 2/25/25

- IIIH build specification versus LTMS data
  - All cylinders represented
  - n = 2328 or 388 tests

	IIIH Specs (µm)		IIIH LTMS (µm)	
Parameter	Min	Max	Q1	Q3
Rpk	0.12	0.74	0.29	0.45
Rk	0.51	2.03	0.99	1.3
Rvk	0.43	1.34	0.68	0.85
Rz	1.71	5.17	2.65	3.35
MR2	70% min		84%	87%



- Labs build within ~20% of spec range

Sequence VH Surface Finish – 2/25/25

- Convert the IIIH spec range into microinch
- Calculate the actual range usage observed in IIIH
- Apply that range to the median in Seq VH

	Sequence IIIH		
Parameter	Spec Range (µin)	Range Use %	LTMS Range (µin)
Rpk	24	26%	6
Rk	60	20%	12
Rvk	36	19%	7
Rz	136	20%	28
MR2	70% min		

	Sequence VH		
	Nominal	Proposed Range	
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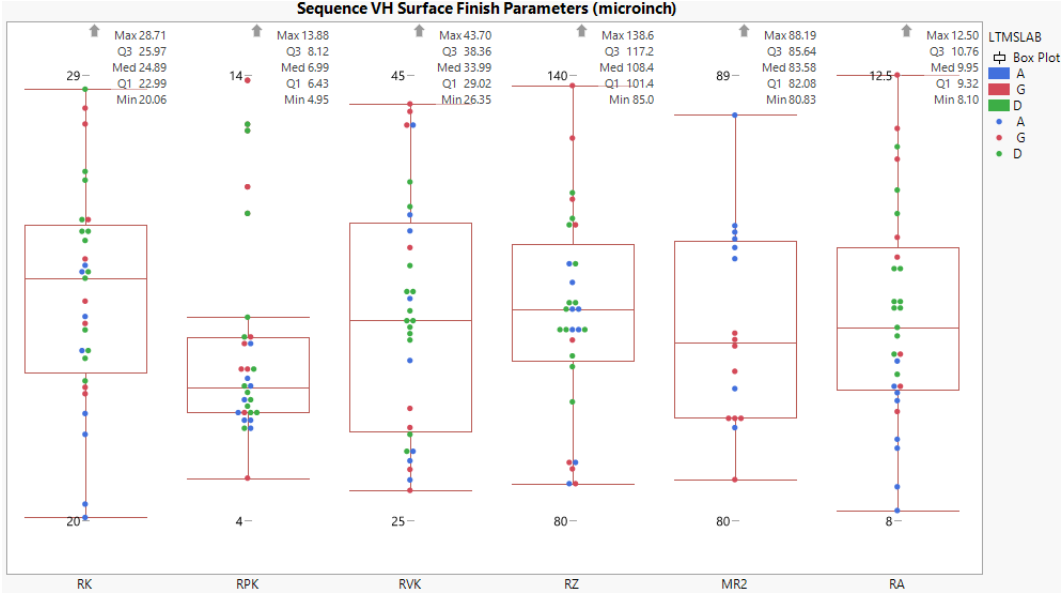

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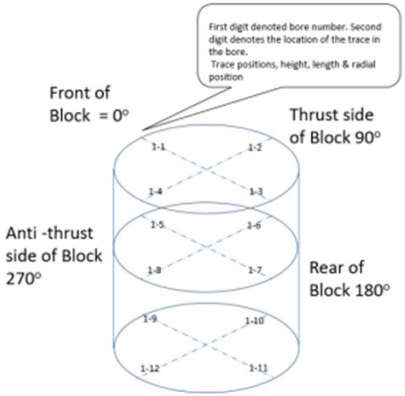
Sequence VH Surface Finish – 2/25/25

Ford's Guidance:

- Cross-hatched honing pattern shall be uniformly cut in two directions having an included angle of 30 ± 10 degrees to a plane perpendicular to the bore axis

- Surface Finish measurement locations at 4 angles inline with the bore (12 total)
  - 25mm down from top of bore
  - 75mm down from bottom of bore
  - 10mm up from the bottom of the bore

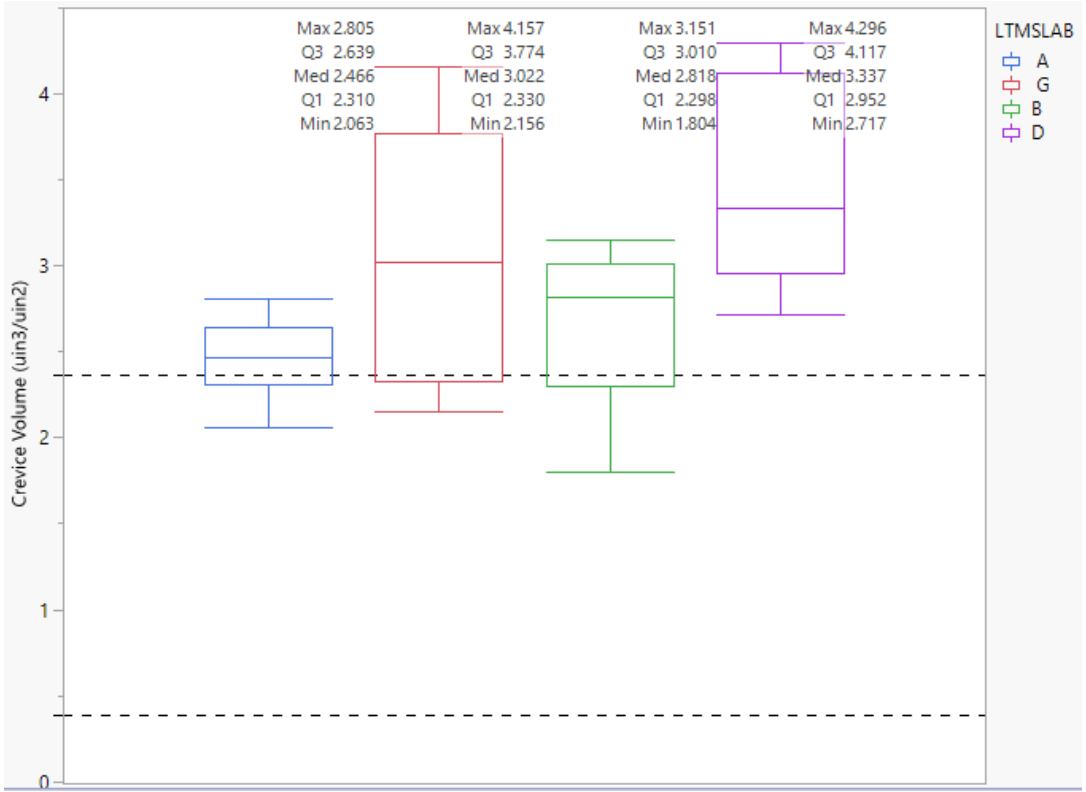


- Ra = 0.15 - 0.50 µm (5.9 to 19.7 µin)
- CV = 0.10 µm3/µm2 max (each individual reading)
- CV = 0.010 – 0.060 µm3/µm2, average for each bore.
- CV = 3.94 µin3/µin2 max (each individual reading)
- CV = 0.39 – 2.36 µin3/µin2, average for each bore

- Crevice Volume (CV) = (100%-MR2) x Rvk / 200 (µm3/µm2)

Sequence VH Surface Finish – 2/25/25

- Updated add-on



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