

Sequence VH Build Workshop
April 16th & 17th, 2024 in San Antonio, TX

Attendees:

| Company | Name | Email |
|-----------|-------------------|--|
| Afton | Ben Maddock | Ben.Maddock@AftonChemical.com |
| Afton | Adam Wheeler | Adam.Wheeler@AftonChemical.com |
| Afton | Chris Dip | Christopher.Dip@AftonChemical.com |
| Ford | Mike Deegan | mdeegan@ford.com |
| Infineum | Joe Anthony | joseph.anthony@infineum.com |
| Intertek | Al Lopez | al.lopez@intertek.com |
| Intertek | Kenneth Rihn | |
| Intertek | Stuart Slater | |
| Intertek | Douglas Wentworth | |
| Lubrizol | Tony Catanese | Tony.Catanese@Lubrizol.com |
| Lubrizol | Kyler Daniel | Kyler.daniel@lubrizol.com |
| Lubrizol | Nate Jones | Nathaniel.jones@lubrizol.com |
| SwRI | Dan Engstrom | daniel.engstrom@swri.org |
| SwRI | Ray Rocha | ramon.rocha@swri.org |
| TMC | Rich Grundza | reg@astmtmc.org |
| Valvoline | Amol Savant | acsawant@valvolineglobal.com |
| Valvoline | Jonathan Cales | |
| Valvoline | David Caproni | |

Overview:

Tuesday, April 16th

8:00 AM to 12:00 PM – Sections 7.5, 7.6, 7.7

1:00 PM to 5:00 PM – Sections 7.8, 7.9

Wednesday, April 17th

9:00 AM – O&H Panel

12:00 PM – Closeout

Notes:

- Connecting rod notch orientation was discussed
 - o Most labs building engines with piston notch facing forward and connecting rod notch facing backwards per build manual
 - o Lab B building with both notches (piston and con rod) facing the front

- Ford clarified that piston notch must face forward but the con rod can be oriented either direction per Ford drawings
-
- Ring grinder bit part number SA-81 CYL S/C
- 7.6.2 Clarify that insulation from intake manifold should be removed
 - Also allow for modification to butterfly to be plugged for idle control
- 7.6.2 Allow timing cover to be cleaned in ultrasonic cleaner
- Remove verbiage around blocking coolant ports during the honing process
-
- Require an anaerobic sealant with Loctite found to be suitable (Red 518)
-
- JHU623 stones have been acknowledged but not investigated further
 - Only Afton is short on honing stones and will work with other labs to trade
- 7.8.4.1, Step 3: Correct the hone order to 1, 3, 2, and 4
- 7.8.4.1, Step 5: Change Ra units from μm to μin
-
- 7.8.4.1, Step 5: Require that torque plates remain in place when measuring surface
- 7.8.4.1, Step 5: Defines brushes and suggested use
 - How often are labs replacing
 - C30-PHT brush part number
- 7.8.4.1 The group to standardize on identical surface analyzer
 - Suggested Mitutoyo SJ-410 (IIIH)
 - Define stylus and probe diameter
 - Define analyzer settings and filters
 - Two measurements middle and top
- Investigate load calibration options with Sunnen machines
- 7.8.5.2, Step 2. Allow for file grinder to dress piston rings
 - "(2) After the rings are cut remove the ring from the cutting tool, deburr and wipe with a dry towel. A Sunnen soft stone^{22,13}
 - or needle file have been found suitable."
- Fuel temperature control
 - Labs to investigate on what's typical and where to land
 - Identify Fuel Rail temp location
 - Add to op data study to help guide

| Lab | How often are brushes changed? | Load | Stokes | Typical Ra (μin) | Piston to Bore (mm) | Top Ring (in) | Bottom Ring (in) | Typical Break-in Blowby (LPM) | Deburr Tool | Notes |
|-----------|--------------------------------|----------|--------|-------------------------------|---------------------|---------------|------------------|-------------------------------|-------------|---|
| Procedure | Undefined | 25 to 30 | 45 | 8 to 13 | 0.020 to 0.046 | Undefined | Larger than TR | Undefined | Soft stone | |
| A | ? | 20 to 25 | 45 | 10 to 12 | 0.025 | 0.034 | 0.036 | 70 to 72 | Needle file | Use piston chamfer to drive ring gap size |
| B | ? | 30 | 25 | 9 to 10 | 0.040 to 0.046 | 0.032 | 0.034 | ? | Soft stone | |
| D | With honing fluid, every 15h | 28 | 45 | 10 to 12 | 0.030 | 0.027 | 0.029 | 65 to 67 | Soft stone | Same ring gap all sizes |
| E | Never | 20 to 25 | 30 | 11 to 13 | 0.038 to 0.045 | 0.029 | 0.031 | 70 to 72 | Needle file | Ring gaps vary by size |
| G | Never | 20 | 10 | 9 to 10 | 0.030 to 0.038 | 0.026 | 0.028 | ? | Soft stone | Use piston chamfer to drive ring gap size |

- Taper and OOR are non-issues and comparable across labs
- Gaps vary with two groups of similar values
 - A & B closer to mid 30s

- Rest in mid 20s
 - Piston to bore clearance varies widely
 - Ra values are on the lower end but also vary
 - Strokes/Load to get to the same Ra value vary widely
- 7.6.3.2: Some labs noted they wet polish with Green Scotch Brite Pad #96 instead of dry polish
 - No action required
- 7.7.6.1 Allow for front covers to be cleaned in the ultrasonic cleaner. Remove the last sentence.
- Front cover part # F6AE6D080BC
 - Verify with Afton new cover
 - 96-97 Thunderbird
- 7.7.4 Add suggestion to use RYDLYME heat exchanger and dyno cleaner
 - <https://www.apexengineeringproducts.com/product/rydlyme-biodegradable-descaler/>
- 7.5.6.1, Step 4 for Automated Parts Washer and Ultrasonic set of instructions
 - Blockage of coolant passages is left to the discretion of the laboratory.
- 7.6.10 Add TEI as a supplier for oil separators to A12.6
 - *A12.6 Oil Separator:*
F47E- 6A785-AA Oil Separator
Supplier TBD

- Verify fuel injector prep requirement

| Lab | Fuel Injector Batch | Comment |
|------------------|---------------------|---|
| <i>Procedure</i> | <i>Undefined</i> | - |
| A | Purple/Brown | |
| B | Purple/Brown/Pink | |
| D | Purple | Have brown but just haven't introduced yet. |
| E | Purple/Brown | Primarily brown. |
| G | Purple/Brown | |

- Hot pink (latest superseded #) are regarded as lower quality
- PCV rejection rate
 - Labs observing high rejection rate on pretest screening (~50%)
- Blowby tree cleaning was questioned but not fully explored
 - Hose replacement frequency?
- Lab A applies 30 inHg of pressure for 10 minutes to the engine coolant circuit to check for leaks
- Observed Lab B's practice of installing two rear main seals to prevent oil leaks during test
- FCS Order
 - Mike believes supplier may have "leftovers" on-hand, 200 of each, per size
- Feedback: Adding more time for stand visits might have been helpful. Group may target stand visits pending op data study
- RAC system VFD option was proposed
- PW heater added to oil temperature control circuit
- Bore gauge tip diameter definition
 - Poll the labs to identify commonality that may already exist
- Fuel
 - Julie suggests 7525 might not be suitable for use
 - SwRI sent samples
 - Afton could send some too?
- Coordinated reference
 - Labs are receptive but timing and logistics could be challenging

- Pat Lang suggested

Procedural actions:

Actions that need further discussion:
See highlighted.