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**Sequence VIII Surveillance Panel Meeting Minutes
Monday April 17, 2023
Teams Meeting (Virtual)
1:00 - 2:00 PM CDT**

Minutes recorded by Patrick Lang

Direct any comments or corrections to: patrick.lang@swri.org

The attendance list can be found as Attachment #1.

There were no attendance changes brought to the attention of the panel.

Agenda:

The agenda can be found as Attachment #2.

Minutes Approval:

Pat Lang advised that the minutes from the November 15, 2022, in-person meeting and the March 1, 2023, virtual meeting are posted to the TMC website, and that approval of the minutes will be deferred to the next meeting to allow more time for review.

Sequence VIII Unavailable:

Pat advised that there is no change in the status of the Sequence VIII test. It is still unavailable at this time.

Updated Summary of Test Results:

Attachment #3 is a summary of the testing that SwRI and IAR conducted in attempts to understand the severity. The summary breaks the testing down into several metrics that have been known to influence test severity in the past. The major metrics that were investigated are as follows:

- 1) Test Fuel (KA24E Green Fuel is the test fuel)
 - a. Tested Batch S-000156
 - b. Tested Batch S-000309
 - c. Tested with EEE (not a valid test fuel but a check to see if a different fuel would change results).

- 2) Reference Oil
 - a. 1006-2
 - b. 1006-2 retains from a point in time when reference tests were passing
 - c. 704-1 on pooled retains from both labs
 - d. 1009-1 tested at both labs

- 3) Crankshafts
 - a. Multiple different crankshafts tested at both labs

- 4) Connecting Rods
 - a. Multiple different connecting rod combinations
 - b. A modified rod at SwRI (not “legal” for a valid test)

- 5) Bearing Batches
 - a. Testing done on the current 06-16 bearing batch
 - b. Testing done on the new bearing batch, 03-22

All of the testing on the various metrics outlined above are consistently yielding severe and failing results. In summary, results are consistently coming in two to three standard deviations severe based on the three oils that have been tested. Oil 1006-2 has a standard deviation of approximately 4 milligrams so this oil is more variable than 1009-1 and 704-1, which could help explain why it is the most severe.

SwRI made the recommendation to consider a possible industry correction factor for addressing the problem short term. Travis Kostan proposed the matrix as shown on the last page of Attachment #3. The matrix outline recommends using oil 1006-2 and oil 704-1 with the new bearing batch. It was brought to the attention of the group that both labs are very low on the 06-16 bearing batch (current batch). It is not the best timing, but it is probably best that we move to the new bath and establish the correction factor with the new bearings.

Andy Ritchie commented that oil 704-1 is essentially consumed and we should consider using oil 1009-1. The challenge with using oil 1009-1 is that we do not have Sequence VIII targets established for this reblend. The Sequence VIII test used oil 1009 about 15 years ago and had targets established for it. It was discontinued as a reference oil due to a severe trend associated with the oil at that time. The two tests that were run on 1009-1 shown in Attachment #3 are being gauged against the 1009 targets from many years ago so there is some concern here about not knowing the true performance of 1009-1. Rich Grundza advised that there are two tests worth of the original 1009 oil at SwRI if the panel is interested in determining how that oil would perform today.

Travis commented that he feels that 704-1 would be good to use in a matrix because it is an oil that has a target of approximately 8 milligrams which is closer to where candidate tests are performing today. This will help to establish a more relevant correction factor since the oils used will cover a bigger range of results.

Pat Lang advised that the goal of this meeting today is to provide a summary of all the testing that has been done to date. The proposal of considering a correction factor is one possible solution but the panel welcomes any other proposals. There will be an in-person surveillance panel meeting in May in San Antonio where the goal would be to consider all options and decide on how we should move forward.

The next meeting will be held in San Antonio on May 3, 2023, from 1:00 to 2:30 PM

Adjournment:

The meeting was adjourned at 2:00 PM CDT.

Attachment #1

Attendance List





Teams MTG

ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD




4/17/23
✓ = present on call

Name	Address	Attendance
Alfonso, Adrian	Intertek 5404 Bandera Road San Antonio, TX 78238 Phone: 210-647-9429 adrian.alfonso@intertek.com	✓
Bowden, Jason	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039 Phone: 440-354-7007 dhbowden@ohtech.com	
Savant, Amol	Valvoline 21st and Front Streets Ashland, KY 41101 Phone: 606-585-8982 acsavant@valvoline.com <i>global.com</i>	✓
Campbell, Bob Ben Mullock	Afton Chemical 500 Spring Street P.O. Box 2158 Richmond, VA 23218 Bob.Campbell@aftonchemical.com	✓
Grundza, Rich	ASTM/TMC Phone: 412-365-1031 reg@astmtmc.org	✓
Hsu, Jeff	Shell Projects and Technology-USA 3333 Hwy 6 Houston, TX 77082 Phone: 281-544-8619 J.Hsu@shell.com	
Hairston, William	Haltermann Solutions 15600 W. Hardy Road Houston, TX 77060 Phone No: 832-647-9264 whhairston@haltermann.com	
Riou, Joseph	Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228-0510 Phone: 210-522-6266 jriou@swri.org	✓

**ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD**

Name	Address	Attendance
Lanctot, Dan	Test Engineering Inc. 12718 Cimarron Path San Antonio, TX 78249-3423 Phone: 210-690-1958 dlanctot@tei-net.com	
Kowalski, Teri	Toyota Motor North America, Inc. 1555 Woodridge Ann Arbor, Mi 48105 Phone: 734-995-4032 Cell: 734-355-8082 teri.kowalski@tema.toyota.com	
Cosgrove, Bradley	GM Global Propulsion Systems Phone: 313-590-2186 Bradley.Cosgrove@gm.com	
Rubas, Paul	ExxonMobil Research and Engineering Company 600 Billingsport Rd. Paulsboro, NJ 08066 Email: paul.j.rubas@exxonmobil.com	
Tang, Haiying	Stellantis Phone: 248-512-0593 haiying.tang@stellantis.com	
Stockwell, Robert	Chevron Oronite Company LLC 4502 Centerview Drive Suite 210 San Antonio, TX 78228 Phone: 210-232-3188 Robert.stockwell@chevron.com	
Marks, Brian Jorge Agudelo	BP Lubricants USA 1500 Valley Rd Wayne, NJ 07470 Phone: Brian.Marks@BP.com	

**ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD**

Name	Address	Attendance
Deegan, Mike	Ford Motor Company 17228 Federal Drive Allen Park, MI 48101 Phone: 313-805-8942 mdeegan@ford.com	
Ritchie, Andy	Infineum P.O. Box 735 1900 East Linden Ave. Linden, NJ 07036-0735 Phone: 908-474-2097 andrew.ritchie@infineum.com	
Szappanos, George	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone: 440-347-2631 George.szappanos@lubrizol.com	

Attachment #2

Agenda

1. Welcome
2. Attendance/Membership Changes
3. Minutes from the November 15, 2022, and March 1, 2023, have been posted to TMC website. Will defer approval until next meeting.
4. Sequence VIII Test is still unavailable.
5. Update on Testing Results to Date (Pat Lang/ Adrian Alfonso)
 - a. Summary of all testing done to understand the severity issue.
6. Proposal for Moving Forward (Travis Kostan)
7. Next Meeting will be Wednesday May 3, 2023, at Intertek (PSA) from 1:00 to 2:30 PM.
8. Adjournment

Attachment # 3

Summary of Testing Results

Sequence VIII Chronology

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4/17/2023

A3-1



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Metrics

- Fuel
- Oil
- Crankshaft
- Connecting Rod
- Bearing Batches

Fuel

- SWRI

- Tried different fuel batches using 1006-2 reference oil

- KA24E Green

- S-000156 (Sourced from Lubrizol)

- S-000309

Fuel Batch	Bearing Weight Loss Average
S-000309	34.9 (multiple tests see next slide)
S-000156 (Sourced from Lubrizol)	35.9 (one test)

SwRI Fuel Results using oil 1006-2

Run #	Fuel Batch	BWL	Comment
52-S186-0-134	S-000309	37.3	S-000309
52-S186-0-134A	S-000309	42.8	
52-S186-0-134B	S-000309	36.5	
52-S186-0-134C	S-000309	27.9	
51-152A-0-573	S-000309	28.3	
51-152A-SWRI1	S-000309	33	
52-S186-0-134D	S-000309	32.5	
51-152A-0-574	S-000309	37.7	
52-S186-1-SWRI1	S-000309	36.2	
52-S186-0-134E	S-000309	36.7	
51-152A-0-573A	S-000156	35.9	

Note: Historical Average for 1006-2
 BWL: 17.5 STDev: 4.23 Upper Passing Limit: 25.79

Fuel

- IAR

- Tried different fuel batches using 1006-2 reference oil

- KA24E Green

- S-000156

- S-000156 → S-000309

- S-000309

- EEE

Fuel Batch	Bearing Weight Loss Average
S-000156	32.2
S-000156 → S-000309	26.7
S-000309	31.1
EEE	36.9

Fuel

IAR Fuel Results using oil 1006-2

Run #	Fuel Batch	BWL	Comment
2-238-0-206	S-000156	27.6	Original S-000156
2-238-0-206A	S-000156/S-000309	26.7	Switched fuels mid test
2-238-0-206SHKDWN	S-000309	31.5	S-000309 batch
1-252-0-579SHKDWN	S-000309	29.2	
2-238-0-206BSHKDWN	S-000156	34.9	S-000156 batch
2-238-0-206CSHKDWN	S-000156	36.9	
1-252-0-579ASHKDWN	S-000156	29.5	
2-238-0-206DSHKDWN	EEE	36.9	Ran non-KA24E fuel
1-252-0-579BSHKDWN	S-000309	24.8	S-000309 batch
1-252-0-579CSHKDWN	S-000309	35.3	
2-238-0-206FSHKDWN	S-000309	34.9	

Note: Historical Average for 1006-2
 BWL: 17.5 STDev: 4.23 Upper Passing Limit: 25.79

Oil

- SwRI
 - 1006-2
 - 1006-2 retains from last passed reference
 - 1009-1
- IAR
 - 1006-2
 - 704-1 retains
 - 1006-2 retains
 - 1009-1

Oil

■ SwRI Results from Oil

Run #	Oil	BWL	Average
52-S186-0-134	1006-2	28.3	33.6
52-S186-0-134A	1006-2	42.8	
52-S186-0-134B	1006-2	36.5	
52-S186-0-134C	1006-2	27.9	
51-152A-0-573	1006-2	28.3	
52-S186-0-134D	1006-2	32.5	
52-S186-0-134E	1006-2	36.7	
51-152A-0-573A	1006-2	35.9	
51-152A-SWRI1	1006-2 retains from last passed reference	33	
51-152A-0-RR3	1009-1	17.4	17.4

Note: 1009 Historical Average
 BWL: 13.8 STDev: 2.14 Upper Passing Limit: 17.99

Oil

■ IAR Results from Oil

Run #	Oil	BWL	Average
2-238-0-206	1006-2	27.6	31.7
2-238-0-206A	1006-2	26.7	
2-238-0-206SHKDWN	1006-2	31.5	
1-252-0-579SHKDWN	1006-2	29.2	
2-238-0-206BSHKDWN	1006-2	34.9	
2-238-0-206CSHKDWN	1006-2	36.9	
1-252-0-579ASHKDWN	1006-2	29.5	
2-238-0-206DSHKDWN	1006-2	36.9	
1-252-0-579BSHKDWN	1006-2	24.8	
1-252-0-579CSHKDWN	1006-2	35.3	
2-238-0-206FSHKDWN	1006-2	34.9	
2-238-0-206ASHKDWN	704-1	12.5	12.5
1-252-0-579ESHKDWN	1009-1	18.7	18.7

Note: 704-1 Historical Average
 BWL: 8.3 STDev: 2.32 Upper Passing Limit: 12.85

Note: 1009 Historical Average
 BWL: 13.8 STDev: 2.14 Upper Passing Limit: 17.99

Crankshaft

- SwRI

- Tried several different crankshafts on one engine/stand combination

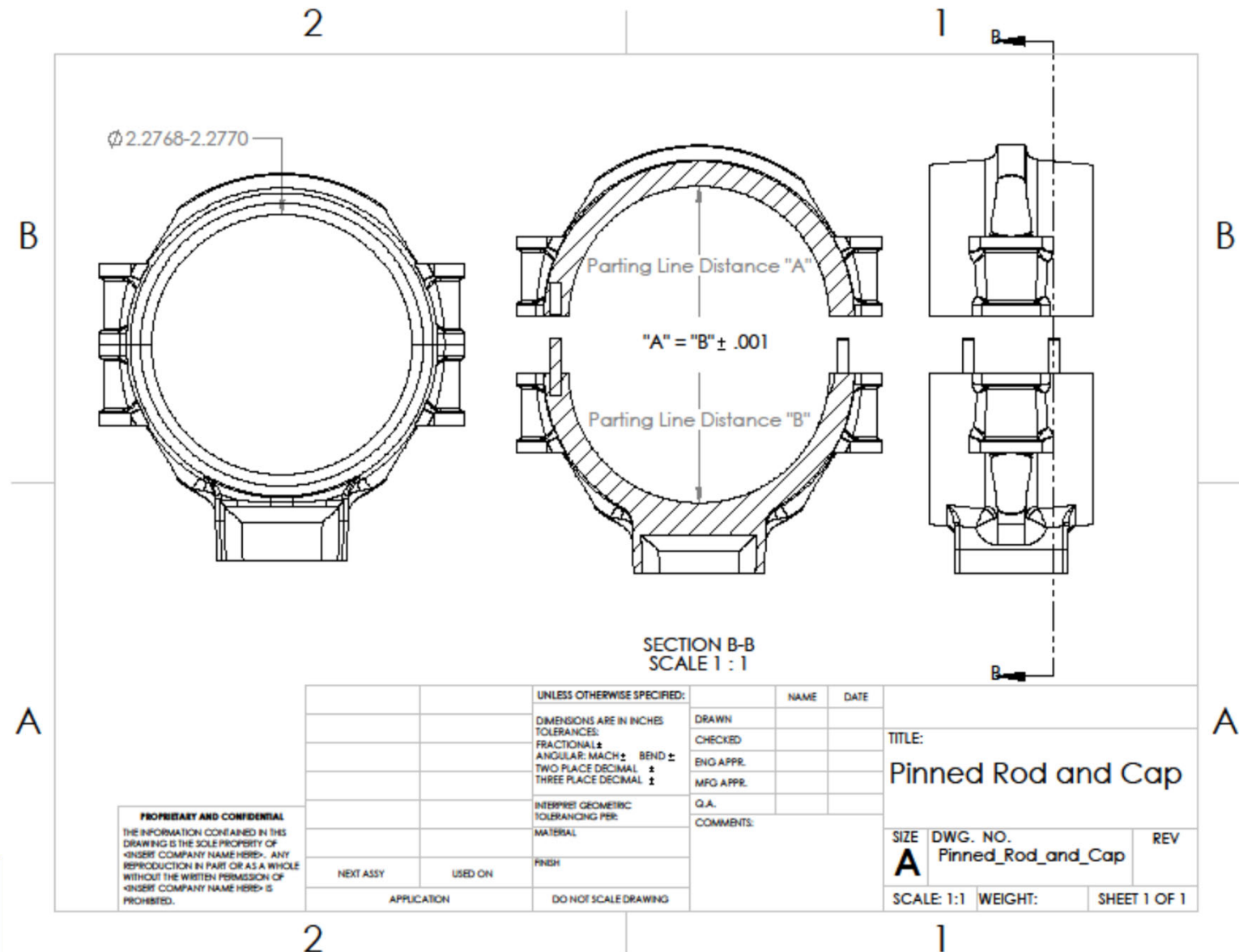
Run #	Crankshaft	BWL
52-S186-0-134	Original Crank (prior calibration success with this crankshaft)	28.3
52-S186-0-134A		42.8
52-S186-0-134B	New Crankshaft / Connecting rod	36.5
52-S186-0-134C	Same Crankshaft / New Connecting rod	27.9
52-S186-0-134D	Original Crankshaft / Connecting rod	32.5

Connecting Rods

- SwRI
 - Tried multiple different connecting rods including:
 - Existing rod used in last references
 - Older rods from storage
 - Modified rod, modified for better cap location (not a surveillance panel approved modification, for experiment only).

Modified Connecting Rod (SwRI)

- Rod pinned for location, then was honed out to big end bore specification



Connecting Rods

- SwRI Connecting Rod Results
 - Using 1006-2, S-000309 for all

Run #	Connecting rod	BWL
52-S186-0-134	Original connecting rod	28.3
52-S186-0-134A		42.8
52-S186-0-134B	New connecting rod	36.5
52-S186-0-134C	Different, existing connecting rod	27.9
52-S186-0-134D	Original connecting rod	32.5
52-S186-0-134E	4th rod from existing inventory	36.7
52-S186-1-RR1	Modified rod using pins for location	15.3
52-S186-2-RR2		21.4

Bearing Batches

- Between both labs
 - Used 06-16 for most tests
 - Tried 03-22 to see if there was severity shift

Bearing Batches

- SwRI Bearing batch results
 - Using 1006-2, no modified rods

Run #	Bearing Batch	Fuel	BWL	Average
52-S186-0-134	06-16	S-000309	28.3	33.5
52-S186-0-134A	06-16	S-000309	42.8	
52-S186-0-134B	06-16	S-000309	36.5	
52-S186-0-134C	06-16	S-000309	27.9	
51-152A-0-573	06-16	S-000309	28.3	
51-152A-SWRI1	06-16	S-000309	33.0	
52-S186-0-134D	06-16	S-000309	32.5	
52-S186-0-134E	06-16	S-000309	36.7	
51-152A-0-573A	06-16	S-000156	35.9	
51-152A-0-574	03-22	S-000309	37.7	

Bearing Batches

- IAR Bearing batch results
 - Using I006-2

Run #	Bearing Batch	Fuel Batch	BWL	Average
2-238-0-206	06-16	S-000156	27.6	31.6
2-238-0-206A	06-16	S-000156/S-000309	26.7	
2-238-0-206SHKDWN	06-16	S-000309	31.5	
1-252-0-579SHKDWN	06-16	S-000309	29.2	
2-238-0-206BSHKDWN	06-16	S-000156	34.9	
2-238-0-206CSHKDWN	06-16	S-000156	36.9	
1-252-0-579ASHKDWN	06-16	S-000156	29.5	
2-238-0-206DSHKDWN	06-16	EEE	36.9	
1-252-0-579BSHKDWN	03-22	S-000309	24.8	31.7
1-252-0-579CSHKDWN	03-22	S-000309	35.3	
2-238-0-206FSHKDWN	03-22	S-000309	34.9	

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Path Forward

- Much effort has been placed in finding an engineering fix, but it seems likely that a correction factor will be needed to return the test to traditional severity levels.
- Due to limited quantity of 704-I remaining, a separate correction factor matrix and new bearing batch approval matrix will not be possible.
- Recommend to run additional testing all on new bearing batch to develop a correction factor which accounts for industry severity and any potential bearing batch severity, though the effects will not be separable.

Path Forward

A minimum of eight tests are recommended by SwRI to develop a correction factor. Based on the testing to date, it seems likely that a linear correction factor would be developed (larger correction at larger BWL).

Stand A-1	Stand A-2	Stand G-1	Stand G-2
704-1	1006-2	704-1	1006-2
1006-2	704-1	1006-2	704-1

Upon completion of the testing and correction factor development, these stands could be granted calibration status.

Thank You