

April 22, 2009

Reply to: Fred Gerhart
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UNCONFIRMED MINUTES from the
SEQUENCE VIII SURVEILLANCE PANEL

**Held in San Antonio, Texas
May 06, 2008**

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Welcome

Chairman Fred Gerhart called the meeting to order at 3:00 PM. The agenda was accepted and is included as Attachment 1.

Membership Changes

A quorum composed of eleven voting members out of a possible fourteen was present. Fourteen non-voting members and guests were also present. The attendance roster of the voting membership is included as Attachment 2. No changes were noted to the voting membership of this panel.

Motion and Action Items

Bill Buscher III recorded the motion and action items of this meeting, which are included as Attachment 3.

Review bearing batch task force report.

The bearing batch task force presented their report and plan for the production of a new bearing batch. Their revised plan for production of a new bearing batch was unanimously approved by the Surveillance Panel. Attachment 4 contains the bearing batch task force report.

Plan for introducing new bearing batch.

Per the Sequence VIII LTMS rules, the new bearing batch requires a minimum of two (2) operationally valid calibration tests with no stand Shewhart alarms per laboratory.

New Business

The chairman called for new business. The following topics were brought forth before the panel and discussed.

1. Lead continues to leach from the bearings and some believe that because of the lead leaching, the test has shifted mild to the point where the 0306 bearings are no longer giving the correct results. Discussion ensued about declaring the Sequence VIII test out of control. A motion was made to recommend to the PCEOCP chair Thom Smith that the Sequence VIII be declared out of control and unavailable for testing until a new bearing batch could be introduced. The motion passed (4 for, 4 Waive, and 3 Against). The chair will draft an email to Thom Smith requesting the Sequence VIII test be declared out of control and to cease testing until a new bearing batch can be introduced. Attachment 5 contains a copy of the Sequence VIII SP Chairs email to Thom Smith.
2. The panel would like the assessment of the unified engine build that took place earlier this year included in today's minutes which can be found in Attachment 6.
3. As part of the unified engine build connecting rods were examined in detail and brought to light that one laboratory has been reconditioning connecting rods. This is permitted by the procedure (section 9.4.11 page 13 of ASTM D6709-07). However the panel felt that this could possibly contribute to industry precision issues. An action item was made for the piston and pin, connecting rod bearing, connecting rod and pin bushing to be used as received for all Sequence VIII testing. Laboratories are to return connecting rods to the CPD for reconditioning when required.
4. The connecting rod is a critical part but has an inherent design flaw of relying solely on an interference fit between the connecting rod bolt shoulders and rod bolt holes in the cap and rod to properly align the connecting rod mating surfaces. As rods are reused from one test to the next, some wear and tear does occur which eventually results in the alignment gradually changing with time. Eventually the connecting rod becomes misaligned and must either be replaced or reconditioned. The CPD concerns are that while rods can sometimes be reconditioned sooner or later they will need complete replacement and only a few forgings are available to produce new rods. A potential supply problem could occur in the future. The panel then reviewed a sample of a potential replacement rod from Carrillo which features aligning dowels built into the rod. An action item arose for the CPD to investigate having replacement rods produced by Carrillo.
5. The panel then discussed a procedural review of the test method. The panel would like a task force to be formed to do a word by word review of the procedure and recommend potential revisions to the test method in order to reduce variability, increase precision, and eliminate any ambiguous wording in the procedure.
6. The CPD requested that they be allowed to discard unusable bearings from their inventory. The CPD is still holding 11-93 bearings and 0306 bearings stored in

- PAO8. The panel agreed unanimously to allow the CPD to dispose of all bearings stored in PAO8.
7. Other panels have been removed the “Test Stand / Power Section Reference History “ table from the formal report forms and from the Sequence VIII data dictionary because this data is available from other data sources (LTMS) and is not pertinent to the candidate test results. The panel agreed unanimously to remove the Test Stand / Power Section Reference History “ table from the formal report forms and the Sequence VIII data dictionary.

Review of Scope and Objectives

The panel reviewed the Scope and Objectives. The Scope and Objectives are attached as Attachment 7.

Adjournment

By General Consent, the meeting adjourned at 5:20 PM. The next meeting of this panel will be at call of the chair.

Attachment 1

Sequence VIII Surveillance Panel Agenda
SwRI in Building 209, Conference Room 103

Tuesday May 6, 2008 3:00 PM – 5:00 PM

1. Call to Order by Chairman – Fred Gerhart
 - a. Acceptance of Agenda
2. Membership Changes
3. Attendance Sign-in
4. Motion and Action Items Recorder
5. Review of Bearing Batch Task Force Report
6. Plan for introducing new bearing batch
7. Any other issues?
8. Review Scope and Objectives
9. Next Meeting – At the call of the chairman
10. Adjournment

Attachment 2

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

Knight, Clayton	Test Engineering Inc. 12718 Cimarron Path San Antonio, TX 78249-3423	Phone: 210-690-1958 Fax: 210-690-1959 cknight@tei-net.com	Present
Caudill, Timothy	Valvoline 21st and Front Streets Ashland, KY 41101	Phone: 606-329-1960 ext 5708 Fax: 606-329-2044 Tlcaudill@ashland.com	Present
Bowden, Dwight	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039	Phone: 440-354-7007 Fax: 440-354-7080 dhbowden@ohtech.com	Present
Buscher, Jr., Bill	Buscher Consulting Services P.O. Box 112 Hopewell Jct., NY 12533	Phone: 845-897-8069 Fax: 845-897-8069 BuschWA@aol.com	
Clark, Sid	GM Powertrain Engine Engineering Building 823 Joslyn Rd. MC 483-730-322 Pontiac, MI 48340-2920	Phone: 248-977-9819 Fax: sidney.l.clark@gm.com	Present
Ritchie, Andy	Infineum P.O. Box 735 1900 East Linden Ave. Linden, NJ 07036-0735	Phone: Fax:	Present
Gerhart, Fred	Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228-0510	Phone: 210-522-3842 Fax: 210-684-7523 fgerhart@swri.org	Present
Glaenzer, David	Afton Chemical 500 Spring Street P.O. Box 2158 Richmond, VA 23218	Phone: 804-788-5214 Fax: 804-788-6358 Dave.Glaenzer@aftonchemical.com	Present
Ramono, Ron	FCSD, Service Product Development, SEO Diagnostic Service Center II Room 410 1800 Fairlane Drive Allen Park, MI 48101	Phone: Fax:	
Grundza, Rich	ASTM/TMC 6555 Penn Ave Pittsburgh, PA 15206-4489	Phone: 412-365-1031 Fax: 412-365-1047 reg@astmtmc.cmu.edu	Present
Leverett, Charlie	Intertek 5404 Bandera Road San Antonio, TX 78238	Phone: 210-647-9422 Fax: 210-523-4607 charlie.leverett@perkinelmer.com	Present
Miranda, Timothy	BP Lubricants USA 1500 Valley Rd Wayne, NJ 07470	Phone: 973-305-3334 Fax: 973-686-4039 Timothy.Miranda@BP.com	Present
Szappanos, George	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092	Phone: 440-347-2631 Fax: 440-347-4096 George.Szappanos@lubrizol.com	Present
Sutherland, Mark	Chevron Oronite Company LLC 4502 Centerview Ste. 210 San Antonio, TX 78228	Phone: 210-731-5605 Fax: 210-731-5621 MSUT@chevrontexaco.com	Present

Attachment 3

Motions and Action Items As Recorded at the Meeting by Bill Buscher

1. Motion – Accept the Bearing Batch Task Force’s revised plan for production of a new bearing batch. See attachment in today’s meeting minutes for details.

Dwight Bowden / Charlie Leverett / Passed Unanimously

2. Action Item – TEI to ask Federal Mogul what are the required connecting rod and crankshaft dimensions to meet Federal Mogul’s LABECO connecting rod bearing print tolerances. Then verify that these dimensions meet the dimensions on the connecting rod and crankshaft prints.
3. Action Item – Include the assessment of the unified engine build in today’s meeting minutes.
4. Action Item – Piston and pin, connecting rod bearing, connecting rod and pin bushing to be used as received for all Sequence VIII testing.
5. Action Item – TEI to investigate a replacement billet connecting rod from Carrillo.
6. Action Item – Form a task force to perform a word-by-word review of the current Sequence VIII test procedure and recommend any necessary revisions.
7. Motion – Recommend to PCEOCP to cease all Sequence VIII testing until the introduction of the new bearing batch.

Charlie Leverett / Sid Clark / 4 For, 4 Waive, 3 Against

8. Action Item – Chairman to send recommendation from above motion to PCEOCP chairman by Friday, May 9, 2008.
9. Motion – TEI will discard all 11-93 bearings and all 03-06 bearings still stored in PAO-8.

Zack Bishop / Dwight Bowden / Passed Unanimously

10. Motion – Remove “Test Stand/Power Section Reference History” table from Form 4 of the Sequence VIII test report and associated data from the Sequence VIII data dictionary. Note that this data is still available from other data sources. Phil Scinto / Rich Grundza / Passed Unanimously

Attachment 4

Sequence VIII Bearing Batch Task Force (BBTF) Report

On Wednesday, April 16, 2008, members of the Surveillance Panel (Sid Clark, Clayton Knight and Zack Bishop) met with Federal Mogul representatives (Paul Ovares, Bob Weathermax, Jim Toth and Raul Sanchez) to discuss problems discovered with the 03-06 batch of bearings manufactured at the Federal Mogul facility in Puebla, Mexico and determine how to improve the process for the next planned batch production.

Sid Clark and Zack Bishop gave a joint PowerPoint presentation providing background information on the bearing batch history dating back to 1960. We pointed out the problems with lead carbonate issues on batches of bearings that preceded the 11-93 batch and the studies on determining our current decision to use containers filled with oil for storage and long term preservation.

Sid had included several slides in our presentation that described our current problem of lead leaching from the bearing surface into the preservative oil. Bob Weathermax has many years of experience as a tribologist at Federal Mogul and had a theory as to why this reaction was occurring – basically the compound bearing alloys submersed in the oil react much like a battery with the copper acting as the Cathode and the lead acting as an Anode. The conductivity of the two oils that have been used EF-411 and PAO8, could explain why the PAO8 caused the reactions to occur more rapidly with the 03-06 batch of bearings than the slower reaction that occurred with the 11-93 batch stored in EF-411.

We then proceeded to review the questions and concerns that were generated by the Surveillance Panel during our last teleconference meeting. Each item was gone over in detail and we asked for recommendations to implement and use to prevent the above mentioned situations from occurring in the production of future bearing batches. Here are the seven items presented along with recommendations from Federal Mogul:

- 1.) Specify process that assures corrosion free steel backing material for use during production of next batch. Steel backing will be sanded and wire brushed prior to the sintering process. After sintering, the finished strip will be placed in a volatile corrosion inhibitor (VCI) bag to prevent rusting prior to stamping and broaching operations.
- 2.) Investigate alternative broaching. Dual broaching method is recommended over a single pass broach. Dual broach is a more technically sound approach that is currently used by Federal Mogul as it provides for a better surface finish as well as increases the tool life. In the dual broach process, the first pass removes approximately 0.008 inches of material and the 2nd pass removes approximately 0.002 inches of material.
- 3.) Investigate improved storage methods. Federal Mogul recommends getting away from “wet” storage method. Their experience with VCI paper has been very good with respect to preventing rusting and/or corrosion. It is recommended that shelf life not be extended beyond a reasonable timeframe (probably about 2 years). It would seem reasonable that with use of our Argon storage cabinet in addition to the VCI paper that 2+ years of preservation could be expected.

Attachment 4

4.) Define size of next batch. Raul commented that he could produce 1,000 pieces in a shift at his facility in Puebla. He proposes mixing the powder mix on the first day of the process, do the sintering on day two, perform the bearing stamping on day three, initial broach on day four and the final broach on day five. The batch of material will be requested to be put into VCI bags after each phase of the operation.

5.) Necessity of post production cleaning process. During our discussions it was decided that the best approach for performing this process would be to ship the finished pieces wrapped in VCI paper to TEI for cleaning and re-wrapping in fresh VCI paper. TEI would use the panel's recommended cleaning procedure to remove any broaching debris for the bearing surfaces.

6.) Review of production tolerances and process routing. Paul is currently updating the bearing print. He will incorporate all the necessary items spelled out on the print that was used during production of the 11-93 and 03-06 bearing batches.

7.) Define a statistically based sampling process during production with periodic follow up checks during the life of the batch. The powder mix will be analyzed at Puebla to assure that proper portions of Copper, Lead and Tin exist. Federal Mogul, Puebla will ship one of the initial bearings produced to Bob Weathermax at Federal Mogul in Plymouth, MI for SEM analysis to assure proper bonding and surface uniformity. TEI will forward a sample bearing from storage every six months for future checks. We plan to save any rejected bearing pieces for use in the periodic analysis. These sacrificial pieces will be labeled as reject and stored with the acceptable pieces. We will also ask for a sample vial of the powder mix and store it in the Argon cabinet at TEI along with the bearings.

8.) When can we expect to start a new batch? Federal Mogul in Puebla suggests the week of May 18, 2008: Powder mix on 5/18, Sinter on 5/19, Shape on 5/20, Initial Broach on 5/21 and final Broach on 5/22. TEI has issued a P.O. to begin the process. We will await the panel's decision on going forward with the Federal Mogul or any modifications to the process deemed necessary before actually producing the bearings. Any changes can easily be implemented without slowing down the time frame that Federal Mogul proposes. I propose that our inspection group plan on being at Puebla for the Initial and Final Broach process. We can inspect the finished bearings on 5/22 and package them in VCI paper and place into a VCI bag for shipment to TEI for cleaning and re-packaging.

By:
Zack Bishop
Sid Clark
Clayton Knight

Attachment 5
Copy of Email to Chair of PCEOCP

From: Fred Gerhart [fgerhart@swri.org]
To: Tom Smith
Cc: Ben Weber; John Zalar; Rich Grundza; William A Buscher III
Subject: Surveillance Panel Recommendation to Suspend Sequence VIII testing

Sent: Mon 5/12/2008 2:17 PM

Thom,

On May 6, 2008 the Sequence VIII Surveillance Panel passed a motion recommending to PCEOCP to cease all Sequence VIII testing until the introduction of the new bearing batch. This motion was heavily contested during discussion and the resulting vote was 4 Yes, 4 Waive, and 3 No. Supporting the motion was GM, OHT, Intertek, and Afton Chemical. Against the motion were SwRI, Infineum, and Oronite. Waives were Lubrizol, TMC, Valvoline, and BP lubricants.

The motion only carried by one vote; however, it did receive a simple majority vote and hence a passing motion by SP rules. Therefore, I am forwarding the panels recommendation on to you for consideration and action by the PCEOCP. Please note that this may all be a moot point because we are in the process of manufacturing a new batch of connecting rod bearings and hope to have at least one reference result on the new bearings by the June ASTM meetings.

Candidate success rate has remained at historic levels.

Regards,

Fred Gerhart
Sequence VIII SP Chair
Southwest Research Institute
Office: (210) 522-3842
Mobile: (210) 317-8303

Attachment 6 Assessment of Unified Engine Build

On February 29, 2008 a unified engine build was conducted at Southwest Research Institute. Participating laboratories were Southwest Research Institute and Intertek. GM and TMC were observers.

Each laboratory provided a cleaned engine with cleaned reusable's, one set of new parts, and one reconditioned cylinder head for the build workshop. Three sets of test bearings were provided by TEI. Prior to the engine build workshop the storage oil of the test bearings was evaluated for Pb leaching by ICP and found to be acceptable.

The following tasks were evaluated during the engine build workshop. The finding for each task is listed beside it.

Crankcase

- Crankshaft polishing – the Intertek crankshaft had one small groove that would catch a fingernail and would not polish out of the journal. A replacement crankshaft was not readily available so the group consensus was to continue with the engine build workshop.
- Measurement of crankshaft journals – no findings noted.
- Measurement of crankshaft main bearing bores with bearings installed – no findings noted.
- Connecting rod bearing inspection – no findings noted.
- Connecting rod inspection
 - Parting line check – both connecting rod measured acceptable.
 - Bend and twist – SwRI connecting rod acceptable. The connecting rod from Intertek's engine was at the upper end of SwRI's internal limits but acceptable.
 - Piston pin bushing – both connecting rods had loose pin bushings. Pin bushings were replaced in both connecting rods and honed to size by SwRI.
- Measurement of connecting rod bearing bores with bearings installed – no findings noted.
- Determination of main bearing clearances – no findings noted.
- Crankshaft installation – measuring crankshaft end play - no findings noted.
- Installation of camshaft bearing – no findings noted.
- Determination of camshaft bearing clearance – no findings noted.
- Camshaft installation – measuring camshaft end play – no findings noted.
- Camshaft timing – no findings noted.

Cylinder barrel

- Honing / Glaze breaking of cylinder liner – Intertek uses a three bladed hone. SwRI uses a ball hone. Both cylinder liners were deglazed using the SwRI ball hone. The test method leaves hone selection up to the laboratories discretion.
- Piston measurement – SwRI is using the current piston from TEI. Intertek is using an older piston from an approved batch. Both pistons are different in appearance. The piston pin supplied with each piston is also different.
- Piston end gap measurement – no findings noted.

Attachment 6
Assessment of Unified Engine Build

- Installation of piston rings – no findings noted.
- Installation of cylinder head – no findings noted.
- Cylinder liner inside diameter measurements – no findings noted.
- Determination of piston to cylinder liner wall clearances – no findings noted.
- Installing piston onto connecting rod – no findings noted.
- Installing piston assembly into cylinder liner – no findings noted.

Power section assembly

- Installing cylinder barrel assembly onto crankcase – no findings noted.
- Oil pump checks using SwRI oil pump flow checker – both engine oil pumps flowed the same on the test rig.
- Assembly of distributor side plate (installation of oil pump, oil pressure adjuster, distributor) – External plumbing connections are different between the labs. This is due to methods used to prevent accidental reversal of external oil lines by SwRI and oil adder connections by Intertek. The test method leaves oil adder design and implementation up to the laboratories. The test method does not specify external oil line size or length of external lines.
- Installation of valve train components – no findings noted.
- Installation of connecting rod test bearings – no findings noted.
- Install side plates – no findings noted.

Following completion of the engine build workshop each laboratory then swapped engines with the other and ran a test on decoded reference oil 1006-2. The SwRI engine that ran in the Intertek laboratory produced acceptable results. The Intertek engine that ran in the SwRI laboratory produced severe results that were outside acceptance bands for reference oil 1006-2.

SEQUENCE VIII SURVEILLANCE PANEL SCOPE AND OBJECTIVES

SCOPE

The Sequence VIII Surveillance Panel is responsible for the surveillance of the Sequence VIII test procedure (ASTM D 6709-01). This panel works in conjunction with Test Engineering Inc. (TEI) who supplies the test hardware. Improvements in the test operation, test monitoring, and test validation will be accomplished through continual communications with the test hardware supplier, the ASTM Test Monitoring Center, the Technical Guidance Committee, and the ACC Monitoring Agency.

The panel will maintain an up-to-date evaluation of the precision of the VIII reference oils and will report this precision and test severity levels to D02.BO.01 Oil Classification Panel and section.

These combined efforts will help to assure that the Sequence VIII test method will continue to provide the industry with a precise method for evaluating a lubricant's ability to protect against copper-lead bearing weight loss and to evaluate the viscosity stability of multi-viscosity-grade oils.

OBJECTIVES

CPD to contact Federal Mogul on an annual basis about viability of continued bearing production and report back to SP chair.	Ongoing
Continue monitoring of lead leaching rate in storage oil	Ongoing
Request reference oils with performance close to 26 mg TBWL	Ongoing
Continue to look at improved bearing storage methods	Ongoing