
Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

Chairman: W. JAMES BOVER, ExxonMobil Biomedical Sciences, 1545 Route 22 East, PO Box 971, Annandale, NJ 08801-0971, (908) 730-1048, Fax: (908) 730-1151, e-mail: w.j.bover@exxonmobil.com
First Vice Chairman: KENNETH O. HENDERSON, Cannon Instrument Co., 30 Doe Dr., Port Matilda, PA 16870, (814) 353-8000, Fax: (814) 353-8007, e-mail: kenohenderson@worldnet.att.net
Second Vice Chairman: SALVATORE J. RAND, 1299 Middle Gulf Dr., Sanibel Island, FL 33957, (239) 481-4729, Fax: (239) 481-4729, e-mail: sairand@earthlink.net
Secretary: MICHAEL A. COLLIER, Petroleum Analyzer Co. LP, PO Box 206, Wilmington, IL 60481, (815) 458-0216, Fax: (815) 458-0217, e-mail: macvarlen@aol.com
Assistant Secretary: JANET L. LANE, ExxonMobil Research & Engineering, 600 Billingsport Rd., PO Box 480, Paulsboro, NJ 08066-0480, (856) 224-3302, Fax: (856) 224-3616, e-mail: janet.l.lane@exxonmobil.com
Staff Manager: DAVID R. BRADLEY, (610) 832-9681, Fax: (610) 832-9668, e-mail: dbradley@astm.org

September 27, 2007

Reply to:

Donald T. Bartlett

The Lubrizol Corporation

29400 Lakeland Blvd.

Wickliffe, OH 44092

(440) 347-2388

(440) 347-2878 (FAX)

ASTM D02.B0.03 L-37 Surveillance Panel

Members and Guests:

Attached for your review and comment are the unconfirmed minutes of the:

- o **September 19, 2007 L-37 Surveillance Panel Teleconference Meeting**

Please direct any corrections or comments to my attention.

Sincerely,



Donald T. Bartlett, Chairman

L-37 Surveillance Panel

Attachments

Report of Meeting
L-37 Surveillance Panel Teleconference
September 19, 2007, 10:00 a.m. EDT

I. Attendees:

ASTM TMC:	Don Lind	Afton Corp:	Cory Koglin
Lubrizol Corp:	Don Bartlett	Lubrizol Corp:	Jerry Gropp
Infineum:	Sal Rea	SwRI:	Brian Koehler
PARC:	Dale Smith	Lubrizol Corp:	Chris Prengaman
Dana Corp:	Don Kreinbring	Dana Corp:	Steve Bird
SwRI:	Steve Marty	Afton Corp:	Marty Rose

II. Agenda:

- Approve the August 8, 2007 Surveillance Panel Meeting minutes
- Rating Task Force Mold Board Proposal
- Motion from the Hardware TF to Reject the B6L566 hardware batch and other motions

III. Summary of Panel Discussion, Consensus Actions, and Motions:

- 1) **Minutes of the August 8, 2007 meeting:** Motion # 1: Mr Rea, second by Mr. Koglin, the minutes are approved as written with no corrections. The vote was unanimous, 7-0-0.
- 2) **Rating Task Force Mold Board Proposal** - below is a 'straw man' proposal to consider implementing to replace the original Panel Motion # 3 from the August 8, 2007 meeting:
 - Upon receipt of the 4 wear (white board, bright teeth) and 4 Riding (grey board, bright teeth) molds from Astro the chairman will send one set each to each of the four labs.
 - If the raters desire, all raters will collectively meet somewhere and practice, familiarize, gain experience, compare notes, etc. using both boards on some pinions.
 - After the raters initial meeting, the TMC is to send selected RCMS pinions around for all raters to 'round robin rate'.
 - Raters to rate pinions using all tools, i.e., the photos, moldboards, and definitions.
Note: see attachment 10, 8/8/2007 Panel minutes detailing GO RTF proposal to modify the wear definition as follows: - **Light (7)** - Absence of tool marks at the heel or toe, which may or may not include the presence of a barely discernible wear step. - **Light Medium (6)** - presence of a discernible wear step.
 - The complete moldboard exercise is to be completed by May 1st, 2008. We would like the raters & TMC to make a recommendation to the Surveillance Panel (June 2008 meeting) that the use of the molds either be adopted (because variability has been reduced) or rejected (because variability has not been reduced).
 - **Note:** The understanding would be that the new Wear definition proposal and both Mold Boards are **not to be used** to rate reference and candidate tests in the labs until addressed officially by the L-37SP.

After much discussion, full consensus, and slight modifications, Motion # 2 was made by Mr. Gropp and a second by Mr. Koehler adopt Motion # 2 as written. The chairman was instructed to pass the motion on to Mr. Sanchez, GORTF chairman and let him notify the rating group and coordinate the discussion and planning accordingly. The motion passed with a vote of 5-0-2.

3) Motion from the Hardware TF to reject the B6L566 hardware batch and other proposed motions: Mr. Gropp made a motion during the September 6, 2007 HTF meeting, second by Mr. Lind (second for discussion and will vote to abstain) to present the following motion to the Panel:

- Based upon the data developed to date, the Task Force has determined that the B6L566/P4L816 batch of lubrited hardware is not acceptable for use in the L-37 test ~~and is recommending that it be rejected~~ as the test procedure is currently written and is recommending that it be rejected. We also recommend that the supplier of this hardware immediately begin the process of manufacturing a new/replacement batch of lubrited hardware. This new/replacement batch is to be manufactured using all new components (that is, not by merely replacing the pinion and the ring in the B6L566/P4L816 batch of hardware), and is to be lubrited using the "supplier recommended" process method. Anyone wishing to purchase a portion of this new/replacement batch of hardware must give the supplier an indication of ~~advise the supplier of~~ the quantity of axles that they anticipate ordering no later than 5:00 pm on Friday, September 21. Dana is to provide to the industry with a formal written quote in a timely manner.

Note, after much discussion the chairman was directed to modify the initial HTF motion (strike through) and add (underlined) for further clarification.

The intent of this motion is not to suggest that we discontinue the "modified testing" options with this gear batch. Rather, once we reach the point of diminishing returns and decide the procedure modification is no longer a viable option, we will stop. At least we are moving forward with plan B to get the next heat of steel ordered and in the system.

Motion # 3: Mr. Gropp, second Mr. Koehler; that we support the recommendation from the Hardware Task Force for the B6L566 hardware batch as modified above.

Much discussion and comments:

Mr. Marty - Stated that he feels that limited testing shows that there is a high degree of potential for success with the modified procedure with the B6L566 gear batch. His intent was for us to keep moving forward.

Mr. Lind was asked to update the spreadsheet (add the second SwRI results and the first Afton results) for the Thursday, September 20 HTF teleconference call.

Mr. Kreinbring was asked many questions and shared his comments:

- Mr. Marty asked the status of the internal Dana discussion of going into a contractual agreement with the industry labs that the payment for future hardware, in some way, be tied with some form of ASTM reference oil performance expectation. Dana comment was no.
- The account manager, Marko Ojanen will be on the Thursday, September 19, HTF teleconference call to discuss performance specification, questions on a quote for new material, and would address any other actions and questions relating to hardware rejection and options.
- Mr Gropp asked, what would be the industries jeopardy if we asked Dana to go ahead and find the steel? What if, in the meantime, we find we can make this batch of hardware work? Would we have any expense or could Dana use the steel elsewhere? Dana commented that the steel is exclusive (8625) to ASTM only and the rest of the industry is moving forward with other steels.
- Mr. Koglin commented that he would like Kenny Miller input to looking over the BI pictures versus end of test ratings.

Motion # 3 carried by a vote of 4-0-3.

Motion # 4 by Mr. Koglin, second Mr. Lind; Labs are to place a non-lubrited hardware order so that the heat of steel/code will be the same as the lubrited hardware being ordered. Anyone wishing to purchase a portion of this new/replacement batch of hardware must give the supplier an indication of the quantity of axles that they anticipate ordering no later than 5:00 pm on Friday, September 21. Dana is to provide to the industry with a formal written quote in a timely manner.

It was also stated that the hardware orders to be considered a 2-year order for both hardware types.

Motion # 4 carried by a vote of 5-0-2.

Motion # 5 by Mr. Koglin, second Mr. Smith; We add a new specification on the Dana ASTM L-37 drawings specifying the number of pits allowed prior to Dana starting pinion ring manufacturing.

The motion # 5 carried by a vote of 6-0-1.

Intertek- Parc was asked and confirmed that their lab is now in the L-37 mode. They are running a stand reference and will run the two alternate lubrited hardware runs once the stand is deemed acceptable. They are also ready to run some extra support testing for the modified procedure.

Attachments # 1, 2, 3, 4, 5 and 6 represent the respective six L-37 HTF meeting summary notes for disclosure and documentation (August 23 through September 27). Attachments # 7 and 8 are the 'alternate lubrited' and 'modified test procedure' summary of results' received to date.

The meeting was adjourned at 11:41 am.

Respectfully submitted:

A handwritten signature in black ink that reads "Donald T. Bartlett". The signature is written in a cursive style with a large, prominent initial "D".

Donald T. Bartlett
L-37 Surveillance Panel Chairman

Bartlett, Donald

Attachment	<u>1</u>
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Reference	<u>L-37</u>

From: Bartlett, Donald

Sent: Thursday, August 23, 2007 1:24 PM

To: bkoehler@swri.org; Koglin, Cory; Don Lind; Dale Smith CBW-Pittsburgh PARC; Don.Kreinbring@dana.com; Greg.Fett@dana.com; Joe.Guzikowski@dana.com; Kenny.Miller@dana.com; Steve.Bird@dana.com; Prengaman, Christopher; Greene, Galen; Gropp, Jerrold

Cc: Bartlett, Donald

Subject: Next L-37 TC Call and highlights of August 23rd call

Gentlemen;

As we agreed, please set aside 10:00 am EDT on Wednesday August 29th for our next teleconference call.

Call in 608-250-0194, participation code 324160

Highlights from today's conference call:

Modified Test Procedure to run the B6L566 Lubricated Hardware:

- Parc indicates that they will be ready to run next week. LZ and SwRI are ready, Afton to be asked on Monday.

- Mr. Miller – Thinks that a modified break-in might be the best route to get the dispersion of results. Kenny thinks we're not far off to shift the results to see separation. He will make a recommendation using the finite model to help pick break in conditions to help load across the tooth. He also feels that the failure location starting point is not where the current procedure stress is located. It was suggested that Mr. Miller purchase a standard from ASTM, but did receive the current test spec information.

- Initial consensus is that the labs should share in the process starting with some TMC 153 runs and confirm with a TMC 127 to confirm discrimination before proceeding in the major matrix. Need an organized matrix and defined direction.

TMC 153 testing on alternate lubricated processes:

- We reviewed the data from 2 labs. TMC is concerned that the results we see are now very good – quite the opposite from the B6L566 batch that is not acceptable for testing.

- Mr. Fett mentions that with respect to the lubricating process, there is some variability that has been seen with the Ft. Wayne process "day to day"

- Mr. Gropp requests Dana to look at the hardware to see if etching is comparable to the B6L566 batch – then we should be able to correlate the results.

- Mr. Bartlett reminded the labs that the SP Action Item is for everyone to send their ring and pinions to Joe for analysis.

- Mr. Miller mentioned that there is a large range of backlash on the units. That appears to be the variability of the labs processes.

- Mr. Lind will call Mr. Koglin on Friday 8/24/07 and find out Afton status.

- There are approximately 15 tests left in the industry that can be run on TMC 127. We need a discrimination oil.

Rating Templates:

- Mr. Bartlett discussed the options offered by CRC.

- Mr. Koehler reports that Art sent out the email to as wide of a distribution as possible for a quick audit of the labs templates..

Bartlett, Donald

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From: Bartlett, Donald
Sent: Thursday, August 30, 2007 7:31 AM
To: Bartlett, Donald; bkoehler@swri.org; Koglin, Cory; Dale Smith CBW-Pittsburgh PARC; Don Lind; Greg.Fett@dana.com; Don.Kreinbring@dana.com; Steve.Bird@dana.com; Kenny.Miller@dana.com; Joe.Guzikowski@dana.com
Cc: Bob.Brazeau@dana.com; Lou.Pappademos@dana.com; Gary.Schmalbach@dana.com; Gropp, Jerrold; Prengaman, Christopher; Greene, Galen
Subject: L-36 lab TF teleconference call notes from 8/29/2007

Gentlemen,

Thank you for your time and efforts during yesterdays teleconference call; Here is a quick summary of our discussion, decisions and actions:

1) Modified test procedure:

- SwRI and Afton agreed to run one test at each lab on the B6L566 (axle modified to receive bore scope (spalling test) on TMC 153 using the below BI conditions. We agreed that both tests should be conducted on the axles with L2FO contact patters.

Modified break-in

Speed	Torque	Duration	Comments
440 RPM	395 ft-lbs	50 mins	Stop test, wipe one pinion tooth and digital photo DS ring and pinion, restart test.
80 RPM	1,000 ft-lbs	50 mins	at end of BI, wipe one pinion tooth and digital photo DS ring and pinion,

- Axle temperature to be controlled at 250 F for both BI segments.
- Labs to run the "test phase" portion of test per the standard test conditions.

2) Contact pattern documentation for the procedure - proposal by Ken Miller:

- Ken is modifying the drawings and will also provide a proposed document for inclusion in the standard detailing L1, L2 & L3, and Flanks of F+1, F0, & F-1 positioning for clarity - request of SP.

3) Testing status/update on the alternate lubriting process testing -

- Parc still in L42 mode
- Afton running their two tests this week
- SwRI completed their two tests and ring and pinion on the way to Dana
- LZ completed their two tests, Greg confirmed that Dana has both ring and pinion sets.
- Discussion and some concern on hardware production differences with respect to case depth differences between the P4L792/V1L417 non lubrited hardware and the P4L816/B6L566 lubrited hardware. Is their a difference vs. what the drawings document, i.e., changes in the Ft. Wayne furnaces/process over time, etc. Greg and Joe will answer these questions after their analysis of the ring and pinions from the alternate lubriting series of testing.

4) Rating templates and discussions with CRC - Chairman discussed the options and other discussions had with CRC. The group agreed that a 20 mm scale bar should be added to all templates so that if cut out, the validation of templates could still be performed. Chairman will provide documents for the group to validate and chairman of L-42, L-37 and L-60-1 will draft letter to CRC for final enhancements.

5) Next Teleconference call is Thursday, September 6, 10:00 am. Call in number 606-250-0194, code 324160,

Don

Office Phone: 440-347-2388 Mobile: 440-220-0843 E-mail to: dtb@lubrizol.com

09/19/2007

From: Bartlett, Donald
Sent: Thursday, September 06, 2007 4:11 PM
To: Bartlett, Donald; bkoehler@swri.org; Don Lind; Koglin, Cory; Dale Smith CBW-Pittsburgh PARC; Don.Kreinbring@dana.com; Greg.Fett@dana.com; Joe.Guzikowski@dana.com; Kenny.Miller@dana.com; Steve.Bird@dana.com; Greene, Galen; Gropp, Jerrold
Cc: Prengaman, Christopher; Bartlett, Donald
Subject: RE: September 6, 2007 Hardware TF Teleconference Today at 2:00 and Agenda - Discussion Summary by DTB

Note to all;

Thank you for your time and efforts during the 9/6/07 TF telecom; We agreed that our next Teleconference would be Thursday, 9/13/2007. Here is a quick summary of our discussions, decisions, and action items:

Attendees in the TO: email addresses attended this teleconference.

• **P4L792/V1L417 Hardware gear batch alternate testing update -**

- Reviewed the 5 tests currently reported to date. Afton will complete their second test and report early next week. Parc is in the L-37 qualification mode and plans to run their two alternate tests commencing next week.
- Dana will report the 'pitting' analysis information to TMC by the gear Match NO so that the information can be added to the spreadsheet.
- Ken Miller was asked to contact Mark Basset at Ft. Wayne to determine if there were any non-lubrited left over pieces (batch B6L566) that could then be lubrited for further/similar metallurgical analysis for a comparison.
- Dana working on further clarification in the drawings and/or PO specs that could further guarantee that the next lubrited batch would meet the industry need/specification.

• **Modified testing on B6L566 hardware -**

- There is a modified spreadsheet on the TMC website.
- Some concern with pinion trace scoring during Cond 1 and further scoring after cond 2 on pinion. EOT rating for score was a 10. Ken Miller stated that "the conjugate action is being upset, distress is occurring, this is not good. Yet, what Ken sees, the intent of what we wanted to do, we got the distribution for the pattern of BI compares well the the desired effect of the FEA. There is a pattern inside the pattern. That is good.
- Afton will run their test after completing the second alternate test that is currently running. Same conditions will be used as the SwRI test
- Mr. Gropp commented: All is moving forward and everyone should be commended and applauds this activity that has been going on for a long time. He still questions, when are we going to place the next order? Mr. Koglin wants to insure that the alternate supplier information be added to the drawings. Could Dana quote the specification for lubriting, not fully sure. Much discussion. Ft. Wayne may not be able to meet the "Volvo" requirement, recommends that we go ahead with the alternate process spec. Mr. Miller indicated that we need more discussion and if we could all agree, we could get the spec on the drawing.
- After we decide what lubriting process we will use, Mr. Koehler commented that we should make new lubrited ring and pinions to retrofit the current B6L566 hardware that the industry has received and paid for. Mr. Miller does believe that we can full fill what we need using the new alternate lubrited process and does not see why we could not proceed with another order.

Action Item: to Steve Bird: Ask Dana to have the discussion internally of going into a contractual agree ment with the industry labs that the payment for future hardware, in some way, be tied with some form of ASTM reference oil performance expectation. Need couple of weeks.

Proposed Motion by Mr. Gropp to be discussed and voted on at our next Thursday, September 13 TF meeting. Labs are to come prepared to vote and are encouraged to discuss with management and be prepared.

"Based upon the data developed to date, the Task Force has determined that the B6L566/P4L816 batch of lubrited hardware is not acceptable for use in the L-37 test, and is recommending that it be rejected. We recommend that the supplier of this hardware immediately begin the process of manufacturing a new/replacement batch of lubrited hardware.

Anyone wishing to purchase a portion of this new/replacement batch of hardware must advise the supplier of the quantity of axles they wish to purchase no later than 5:00 pm on Friday, September 14." It was agreed that an email ballot or SP meeting be held.

- **Surveillance Panel Teleconference Meeting-** The chairman shared with the group that the TMC has requested a Panel teleconference to discuss the Wear and Ridging Molds and actions from the August 8th SP outcomes. Wednesday September 19 is the date, time at either 10:00 or 2:00. Mr. Smith will confirm his preference (he was out of the office) on Monday.

- **CRC Template, final document mods -**

- All agreed that the template discussions and documents shared earlier this week are acceptable. The L-37, L-60, and L-42 chairman are instructed to send the final document to CRC.

Thanks,

Don

Office Phone: 440-347-2388 **Mobile:** 440-220-0843 **E-mail to:** dtb@lubrizol.com

From: Bartlett, Donald
Sent: Thursday, September 06, 2007 12:15 PM
To: bkoehler@swri.org; 'Don Lind'; 'Koglin, Cory'; 'Dale Smith CBW-Pittsburgh PARC'; Don.Kreinbring@dana.com; Greg.Fett@dana.com; Joe.Guzikowski@dana.com; Kenny.Miller@dana.com; Steve.Bird@dana.com; Prengaman, Christopher; Greene, Galen; Gropp, Jerrold
Subject: September 6, 2007 Hardware TF Teleconference Today at 2:00 and Agenda
Importance: High

Note to all:

A reminder, todays L-37 TF teleconference call is at 2:00. The call in information is 608-250-0194, participation code is 324160.

Agenda;

- P4L792/V1L417 Hardware gear batch alternate testing update
- Modified testing on B6L566 hardware. here is the link
ftp://ftp.astmtmc.cmu.edu/refdata/gear/l37/data/Lubrited_Process_Comparison/
- CRC Template, final document mods

Please pass on to others in your respective lab that have been participating in the recent TF calls that I may have missed in this distribution.

Best Regards,

Donald T. Bartlett

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L-37 HTF Teleconference Call Minutes, 9/13/2007

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Attendees;

Dana - Kreinbring, Miller, Fett, Guzikowski, Bird
Intertek-Parc – Smith
SwRI – Koehler,
TMC – Lind
Lubrizol – Bartlett, Gropp

Summary:

1) **The next L-37 HTF meeting is Thursday, August 20, 2007.** Call in number is 608-250-0194, participation code is 324160.

2) P4L792/V1L417 Hardware gear batch alternate lubrited testing update -

- The link to the TMC website spreadsheet:

ftp://ftp.astmtmc.cmu.edu/refdata/gear/l37/data/Lubrited_Process_Comparison/

- Note that the sheet has the Dana pitting information added, thanks Joe and Don.

Discussion & consensus was that the distress and two-process lubriting/pitting information are comparable.

- SwRI, Lubrizol, and Afton have completed their 2-test commitment.
- Parc testing status will run their two tests text week. They are converting this week to L-37 mode. They were asked to expedite sending their EOT hardware to Dana for analysis to aid in our discussions.

3) Modified testing on B6L566 hardware -

- The link to TMC website spreadsheet:

ftp://ftp.astmtmc.cmu.edu/refdata/gear/l37/data/Modified_Lubrited_Tests/

- Afton testing status - test stated on 9/13/2007.

- SwRI starting a second test on 9.13.2007.

- Lubrizol has already completed three runs earlier in the summer.

- There was much discussion on the effect of the lubriting process and possible scoring seen during the SwRI Break In. Ken Miller asked, should we take the time to look at the Break-in effect on the P4L792/V1L417 non-lubrited batch to see if the scoring phenomena are repeatable? Do latter?? It was decided to ask both Afton (1st test) and SwRI (second test) of the modified procedure to document as SwRI did with their first test.

4) Next hardware order(s)-

- There was much discussion on the two types of lubriting processes now available through Dana. One process is more consistent than the standard process that is currently being used. The newer process addresses improving the etching and pitting concerns, has reduced variability, and is statistically more consistent. Dana appears to be moving in this direction for the future.

- **Motion 1** by Mr. Gropp and second by Mr. Lind (second for discussion and will vote to abstain): Based upon the data developed to date, the Task Force has determined that the B6L566/P4L816 batch of lubrited hardware is not acceptable for use in the L-37 test and is recommending that it be rejected. We also recommend that the supplier of this hardware immediately begin the process of manufacturing a new/replacement batch of lubrited hardware. This new/replacement batch is to be manufactured using all new components (that is, not by merely replacing the pinion and the ring in the B6L566/P4L816 batch of hardware), and is to be lubrited using the "supplier recommended" process' method. Anyone wishing to purchase a portion of this new/replacement batch of hardware must advise the supplier of the quantity of axles they wish to purchase no later than 5:00 pm on Friday, September 21.

SRI – Abstain Parc – No TMC – Abstain Dana -Yes
 Afton - Yes, noting a request for drawing specification added for pits.
 Lubrizol – Yes
 Vote was, 3, 1, 2

- **Motion 2** by Mr. Koglin, second Mr. Smith; We add a new specification on the Dana ASTM L-37 drawings specifying the number of pits allowed prior to Dana starting pinion ring manufacturing.

SRI - Yes, Parc – Yes TMC – Abstain Dana -Yes
 Afton - Yes Lubrizol – Yes
 Vote was, 5, 0, 1

- **Motion 3** by Mr. Koglin, second Mr. Lind; Labs come prepared to place a non-lubrited hardware order so that the steel heat code will be the same as the lubrited hardware.

SRI - Yes, Parc – Yes TMC – Abstain Dana -Abstain
 Afton - Yes Lubrizol – Yes
 Vote was, 4, 0, 2

Donald T. Bartlett
 The Lubrizol Corporation
 29400 Lakeland Blvd, Mail Drop 121C
 Wickliffe, Ohio 44092

Phone (440) 347-2388
Mobile (440) 220-0843
E-mail dtb@lubrizol.com
Fax (440) 347-2878

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L-37 HTF Teleconference Call Minutes, 9/20/2007

Attendees:

Dana - Kreinbring, Miller, Fett, Guzikowski, Bird
Intertek-Parc – Smith
SwRI – Koehler, Marty
TMC – Lind
Lubrizol – Bartlett, Gropp

Next meeting: September 27, 10:00 a.m. EDT

- **P4L792/V1L417 Hardware gear batch alternate lubrified testing update**

- Afton - Please send the hardware from your two tests to Dana for analysis.
- Parc - is qualifying their stand and will run their two tests back to back after successful completion of their stand reference.

- **Modified testing on B6L566 hardware:** there was much discussion

Mr. Marty - based on the intermediate inspections and any results presented to date, is there anything that you might tweak a little differently, more or less? Are we at the optimum conditions before marching off with a full-blown matrix?

Mr. Lind - initial concern is that a correction factors would allow the fail oil to pass.

Mr. Miller - We know we have an anomaly with this modified BI, scoring concerns (seeing trace scoring after both BI parts. It is not normal. He wants to do some more work with FEA and maybe propose a third break I condition. We need to get out of the woods with scoring concerns. Have an initial period of lighter loading? Maintaining speed allows us to get the load down pretty low. Another proposal, probably take in a couple of days.

Mr. Marty - Can we have a plan A and plan B set of conditions just in case one of the conditions did not work for control options at a lab?

Mr. Koehler - we do have some limitations on how low we can go on torque and keep load synced up. Could look at speed?

Mr. Miller - pictures taken to date is lining up with expectations from the FEA.

Mr. Miller - If we come up with a better break-in schedule, how would we see moving this forward /how could we qualify and make the hardware work?

Mr. Gropp - One of the proofs of performance is that we have to discriminate between the good and poor oils. No one has ever looked at what the hardware looked like after the BI. Should use the 153 oil to confirm but the next step should be to conduct some testing on TMC 127 to make sure that our ability to discriminate is still present.

Mr. Miller - is there any merit with checking the TMC 127 on the 2-part break-in before moving forward.

General consensus was to tweak the BI one more time, run the good oil again, and then run the TMC 127.

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We need to get the LRI to buy into the modified procedure and Dana rep to LRI needs to be present at LRI and help persuade the LRI. That group will want supporting and appropriate data.

Mr. Koehler - asked if we need to give any look at the axle temperature.

Mr. Miller - He wants to see a photo of the SwRI 2nd run that had the one tooth spall just to confirm some other options for modified BI.

Labs appear to be willing to fully participate with the modified BI, needing probably about six runs?

Mr. Miller - If the two condition BI gave us a result, and we look at it again with relationship to the one-tooth spall. What do we think about putting in, say, a four-part BI? What would he logistically be doing to the labs? General comments were, we have a manual transition, depending on how we put the BI conditions together; we would prefer to limit the number of gearshifts and ramp ups and downs. We think it would be prudent to keep the conditions on the same transmission speed ratio. The first 50 minutes is the same (4th gear). The second WRPM is the same, but goes down into 1st gear. Because of the borescope inspection, there is an extra shut down period. Keeping the proposal to be in 1st and 4th transmission gear would be a goal?

SwRI asked Mr. Miller to send calculations and they would install a utility axle to confirm and share with the panel.

Mr. Bartlett - Reminded the group that even the good oil occasionally fails once in a while. Do not take away the anomaly.

Mr. Miller - the first 44-test matrix had every aspect of failure and concerns. He feels that all too often that the one-tooth spall could have a potential to occur frequently. Expressed continued concerns that this is more than a one off occurrence.

- **Next hardware order(s)** –

Mr. Ojanen's phone number is - 704-878-5790.

Comments shared:

- Dana is note interested in tying the next order in to some performance acceptance criteria.
- How do we make sure that the next axle batch order is not junk.
- Mr. Miller is working on ECO to take the loose ends out of the equation.
- The steel heat treat was very close to drawing spec. Hardness was on spec.
- Dana needs to provide some reasonable proof of performance; labs are at a quandary as how to sell the purchase to management.

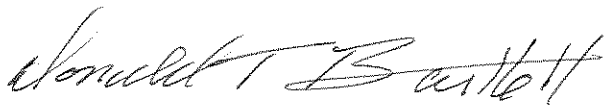
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some form of pre-analysis to analyze the hardware before hardening and heat treating (in place for steel coming in so that there is no adjustment necessary. (2) Dana has to come up with a new process for lubrifying that will prevent/limit the amount and number/size of the pitting on the surface. (3) Pitting on the surface that occurred during the last lubrifying process is unacceptable and we understand Dana is working with a revised process that would numerically put rating and performance limits that would control the pitting. (4) All said and done, the labs need some financial guarantee before paying for the axles.

- Mr. Miller - There is a pitting Spec now developed, put it on the drawings. Full expectation is that the parts being inspected must adhere to the spec.
- Mr. Pappademos - we knew there was a problem when the gears went through. Need to confirm to that spec.
- There was much discussion with the alternate lubrifying options and many questions. Dana must meet the spec.
- During the last ASTM visit to Ft. Wayne, Dana had the lubrified chemical suppliers on hand, we appreciated that, but unfortunately, the problem still exists.
- Mr. Bartlett commented that in the future we are going to hold Dana accountable & responsible for the manufacturing of the hardware.
- Mr. Bartlett asked, confirmed by Mr. Bird, that the Lugoff capacity to build the axles was OK.
- Mr. Bartlett confirmed that it would be Mr. Miller in charge of communicating with the HTF as the steel is purchased and update for each step of the process.

The meeting was adjourn at 11:30

Respectfully submitted,



Donald T. Bartlett
L-37 SP Chairman

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L-37 HTF Teleconference Call Minutes, 9/27/2007

Attendees;

Dana - Kreinbring, Miller, Fett, Guzikowski, Bird
Intertek-Parc – Smith
SwRI – Koehler
TMC – Lind
Lubrizol – Bartlett, Gropp
TMC - Lind

It was unanimously confirmed that the next L-37 HTF teleconference is scheduled for Thursday, October 4, 2007 at 10:00 a.m., EDT. **Call in number will be 608-250-0194, participation code is 324160.**

1. P4L792/V1L417 Hardware gear batch alternate lubrified testing update:

- Three of the foul labs have previously completed their testing commitment;
- Intertek had their first test shut down early due to vibration (21 hours). Was running on an axle with the FTW lubrifying. Upon disassembly, found no problem. Instead, it was a transmission bearing failure, requiring the transmission be changed out. EOT results looked super clear. Note: the two alternate lubrifying tests being conducted by Intertek were of a different lubrifying date. See previous panel meeting notes. Intertek was reminded to send the EOT hardware to Dana for analysis.
- Dana has received the hardware from the two Afton runs. The Lubrizol and SwRI analysis has previously been reported.
- Status to date: We need to complete this phase of testing, looking for the data and analysis of the last two tests for final review.

2. P4L792/V1L417 Hardware gear batch alternate lubrified testing update

- Mr. Miller collaboration with Mr. Okamuro. They referenced the handbook of practical Gear Design. Looking to determine if it is possibly too much pitch line or too much temperature. They decided to change the speed.

Procedure modification proposed by Ken Miller for the 3-part BI: The new break in procedure for the L37 axle is now in three parts, but same 100-minute total. This scheme is an attempt to address the initial trace scoring and the one pinion heel spall encountered. If need be, we could probably move things around a bit to better accommodate.

	<u>Speed (RPM out)</u>	<u>Torque (ft-lbs / axle)</u>	<u>Duration (mins)</u>	<u>Temp (°F)</u>
1)	190	395	40	250
2)	80	1,000	40	250
3)	80	1,200	20	250

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Mr. Koehler's responses received to date:

1. SwRI still uses the SM465 transmission. For the first test condition we will need to run 3,986 engine rpm in 2nd gear or 1748 engine rpm in 3rd gear. Hp will be about 31 or so at the engine. I may be able to do this in 3rd gear. I will try.

- Those using the NV4500 can just use 2nd gear since the ratios are a little more favorable.

- Lets use these values though. If SwRI has to purchase a different transmission that would be acceptable. It is more important that we get the correct conditions.

2. SwRI just completed some experiments on our L-37 test stand. Only the first new break-in condition needed to be looked at. The other conditions have been run at SwRI. I was able to run our stand in 3rd gear for the first break-in condition. Engine vacuum was about 15 in. Hg. Engine rpm was about 1800. Load control was good at +/- 1 ft-lbs each. Wheel speed control was about +/-2 rpm with some excursions slightly below that range and some hunting. The wheels were able to stay in sync for speed. It was just that my pinion rpm was hunting some. We may be able to improve that with tuning in the future if needed. My conclusion though is that SwRI could run this special break-in condition.

Mr. Lind asked how many different transmissions are currently being used in the labs.

Answer - It appears that there are two transmissions types, some labs standardizing on the NV4500 required for the L-42, some the older style used from the 1970/1980 area. All labs reported that they are using 4th gear for the Gear Condition Phase and 1st gear for the Gear Test Phase.

Action Item: All labs email to the TMC their respective transmission information with ratios.

Action Item: SwRI to proceed with running one test starting on Monday and run with the test conditions as proposed. Labs are to let SwRI know if there is any concern that they may have with respect to transmission gearing and engine speeds.

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Borescope direction: Mr. Koehler asked, are extra shutdowns detrimental to the evaluation? We do want to determine if scoring is present. To promote the efficiency of the experiment, it was decided to take a picture after each one of the 3 BI conditions.

SwRI indicated that they could run/report 1 test by next Thursday. Lubrizol offered to sponsor a second test at SwRI to get more data and to keep the lab variation to a minimum. Once we get a good handle on the final version, the rest of the labs would want to jump in. It was decided to run just one test and re-group on the next teleconference call. If it looks favorable next Thursday, we would move forward. TMC is to decode and test to run on TMC 153.

3. **Next hardware order status** - The chairman asked if all labs had placed an order per the SP direction. The labs made the following comments:
- Afton - via voice mail - ordered both hardware types.
 - SwRI - via email - ordered both hardware types.
 - LZ - via voice and email, ordered both hardware types.
 - Parc - via voice mail, ordered no non-lubrited and no lubrited.

The chairman reported that during an earlier conversation this week, Mr. Miller asked verbally if the panel would possibly consider ordering some hardware of the parallel cut (toe and heel, face hobing) that cuts all the slots simultaneously. Automotive is adopting face hobing for the future. It would be nice and preferred by Dana that somehow, some day, that the industry consider adopting the new cutting process, preferable, for all gear type testing needs. Some gearing ratio's readily available are the 355 373, 410, 683 ratio's.

- Afton and Lubrizol were somewhat interested, needing more detail.
- SwRI requested that we sit down as a panel and discuss future techniques for axle batches in the industry. We need to find a way of equitably funding across all users of the test.
- It was decided that this was an item to think about and address at a later date. Just too many things in our evaluation process at this moment.

Being no other business, the meeting was adjourned at 11:04 am.

Respectfully submitted,

Donald T. Bartlett
L-37 SP Chairman

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ALTERNATE LABRITE PROCESSED
As of 9/27/07

Testkey	Lab	STD	Oil	VAL	PinBat	RingBat	DTCOMP	Pwear	Priddg	Pripp	Pspit	Rwear	Rridg	Rripp	Rspit	BKAVG	Iperat	Ipcrat	COM1	COM2	Match #	Pinion Pitting		Ring Pitting	
																						10-30 microns	>30 microns	10-30 microns	>30 microns
61864	A	4	153	NN	V1L417	P4L792	20070808	7	8	8	9.9	8	9	9	9.9	0.008	0	2	Ft Wayne	Process	5V	16	0	3	0
61847	B	191	153	NN	V1L417	P4L792	20070814	8	8	9	9.9	7	9	10	9.9	0.005	0	2	Ft Wayne	Process	5H	14	0	5	0
61852	D	3A	153	LN	V1L417	P4L792	20070908	7	9	9	9.9	8	10	9	9.9	0.011	0	3	Ft Wayne	Process	7J				
63285	A	4	153-1	LN	V1L417	P4L792	20070809	8	9	8	9.9	8	10	10	9.9	0.01	0	2	Alternate	Process	1X	1	0	0	0
61846	B	191	153	LN	V1L417	P4L792	20070812	7	8	9	9.9	7	8	10	9.7	0.01	0	2	Alternate	Process	1V	0	0	1	0
59289	D	3A	153	LN	V1L417	P4L792	20070830	7	9	9	9.9	8	10	10	9.9	0.012	0	2	Alternate	Process	7X				

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MODIFIED TEST PROCEDURE RESULTS

AS OF 9/27/07

Testkey	Lab	STD	Oil	VAL	PinBat	RingBat	DTCOMP	Pwear	Priddg	Pripp	Pspit	Rwear	Rriddg	Rripp	Rspit	BKLAVG	Ipcrat	Ipcrat	Modified Procedure	Match #	Pinion Pitting			Ring Pitting
																					10-30 microns	>30 microns	>30 microns	
61845	B	191	152-1	LN	B6L566	P4L816	20070615	6	8	9	5	8	7	9	10	0.004	0	2	A	2L				
63265	B	191	152-1	NN	B6L566	P4L816	20070619	7	10	8	9.9	8	9	9	9.9	0.006	0	2	B	7H				
59292	B	191	127	LN	B6L566	P4L816	20070623	6	9	7	9.9	7	10	7	9.9	0.009	0	2	B	7HA				
63286	A	4	153-1	NN	B6L566	P4L816	20070905	6	7	7	9.9	6	6	9	9.9	0.005	0	2	C	5A				
63287	A	4	153-1	NN	B6L566	P4L816	20070914	6	8	7	8	8	9	10	9.9	0.009	0	2	C	0J				
63263	D	3A	153-1	NN	B6L566	P4L816	20070914	7	7	9	9.9	8	9	10	10	0.006	0	2	C	2C				

Short length test. Test phase of the test was stopped after 20 hours

Test phase of the test was run at reduced speed and torque (1588 rpm / 73 lb-ft)

Test was run with a Modified break-in procedure.

First 50 minute breakin run at standard L-37 speed and torque conditions and at 250 degree F oil temperature.

A second 50 minute break-in period was run at 80 rpm and 1000 lb-ft and 250 degree F oil temperature.

The test phase of the test was run at standard L-37 test conditions.

