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### Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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August 18, 2008

Reply to:

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ASTM D02.B0.03 L-37 Surveillance Panel  
Members and Guests:

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

- **August 13, 2008 L-37 Surveillance Panel Meeting conducted at the PRI Headquarters, Apollo Room, Warrendale, PA.**

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  
Warrendale, PA  
PRI Apollo Room**

**August 13, 2008**

**Sign-in/Review of Agenda & Membership:** The meeting was called to order at 08:00 a.m. The sign-in sheet is included as **Attachment # 1**. Joining via teleconference were, from Dana; Mr. Guzikowski, Fett, Ottley, from Afton; Mr. Koglin. **Attachment # 2** is the PowerPoint presentation handout provided prior to the meeting. The chairman led the panel through an agenda review (slide 2). There were no changes.

The membership list was reviewed with no requests for additions (slide 3).

**Approval of Minutes:** The chairman reported that he had previously received comments for corrections and posted them to the May and July 31 meeting minutes.

- **February 13, 2008 SP Meeting**
- **May 7, 2008 SP Meeting**
- **July 10, 2008 SP Teleconference Meeting**
- **July 17, 2008 SP Teleconference Meeting**
- **July 31, 2008 SP Teleconference Meeting**

**Motion # 1** ⇒ Mr. Koehler /seconded by Mr. Rea to approve all 5 sets of minutes as presented. Motion was unanimously approved with a vote of 6 for, 0 opposed, and 0 abstentions.

**Summary of Meeting Discussions**

**2008 Retrofit Lubrited, New Lubrited, and New Non-Lubrited Hardware Update – Refer to Attachment # 2** PowerPoint presentation the chairman used for the meeting.

- **Slides 5 through 12** details the hardware order information, the respective hardware approval matrix requirements for the three types of hardware, and status of progress to date.
- **Mr. Bartlett** discussed the fact that there is only three gallons of TMC 127 discrimination oil remaining (1 gallon each at TMC, Lubrizol, and Intertek-Parc). Consensus of the panel was that we will move forward with replacing TMC 127 with TMC 134 from this point forward. TMC 127 will be kept for a possible emergency run confirmation should the need arise in the future.
- **Mr. Lind** provided handouts detailing results of all hardware approval matrix testing to date. -
  - **Attachment # 3** summarizes the V1L500/P4L870A New **Lubrited Retrofit** Matrix Results.
  - **Attachment # 4** summarizes the V1L500/P4L870A **New Lubrited** Matrix Results.
  - **Attachment # 5** summarizes the V1L500/P4L870A **Non- Lubrited** Matrix Results.
- **The panel agreed** at this point to focus only on the two Lubrited hardware types. General comments were;
  - Mr. Lind stated spalls were showing up in the middle of the tooth and not at the heel where was historically found.

- There were 18 tests across two build types.
  - Mr. Gropp - 8 of 12 are unacceptable, we are seeing more unfavorable results on pass oils and better results on the fail oils
  - Mr. Gropp mentioned the option of using correction factors. Mr. Lind disagreed, a correction factor would make fail oil pass, thus losing discrimination, no way to apply correction factor.
  - Mr. Miller stated that the pre test patterns looked acceptable and as desired. The contact mesh point sometime moves to an unfavorable position and we get the variable results.
- **Action Item # 1** ⇒ The four labs are to visit the TMC website and confirm/validate that the respective lab photos for the three hardware types are all displayed correctly and viewable and if not, work with Mr. Lind to correct. Also confirm that the same photo documentation resides with Mr. Miller and Mr. Guzikowski.
- **Lubrited Consensus agreement by the panel:**
  1. That correction factors cannot be used.
  2. We, as a panel, do not support or recommend dropping the pitting/spalling requirement for pass/fail criteria. Comments were:
    - Mr. Smith stated there is still an issue beyond pit spall.
    - Mr. Koglin mentioned we really only have two options change test or reject hardware, pit spall/broken teeth can be hard on equipment
    - Mr. Rea agreed with Cory, thinks pit/spall is an important part of the test
    - Mr. Koehler agrees that we cannot ignore.
    - Mr. Bartlett, important to insure that future failing oils do not inadvertently get approved because we ignore the pitting/spalling requirement.
    - Mr. Miller agreed.
    - Mr. Lind also agrees, is leery of changing test conditions, but up to panel to make that decision.
- **Non Lubrited comments:**
  - We discussed the data and agree that there is a similar trend with respect to the two Lubrited types.
  - Mr. Gropp mentioned Lab D seems to be breaking teeth more so than others. Mr. Lind explained this is why we run on a calibrated stand. Also, lab D reference control charts show that the lab has no severity issue.

**Mr. Miller Presentation - - Attachment # 6** summarizes the L37 reversed FEA contact stress models. Please note that the pre and posttest analysis work is such a large file that the chairman choose to not include as an attachment. Instead, the respective PDF files have been placed instead in a Dana Photo folder on the TMC website under the respective gear batch type for your viewing pleasure.

Mr. Miller shared that the Dana Holding Corporation has completed evaluation of (4) L37. The method of evaluation employed was coordinate measurement of the tooth geometry of (4) actual gear sets and creation of FEA models using the CMM measured data. The data presented was one each of incremental torque load plots and contact stress pressure plots for:

- Non-Lubrited V1L417 / P4L732 (baseline "good" from 2005)
- Lubrited B6L566 / P4L816 (rejected lot from 2006)
- Non-Lubrited V1L500 / P4T813 (current plain)
- Lubrited V1L500 / P4L870A (current Lubrited)

The summary of findings entails the following. The relative contact pressure magnitudes of current lot (Lubrited and non-Lubrited) were favorable when compared to the baseline. The current FEA models for each example correctly identified the zones of highest pressure related to failure/distress initiation zones from test results. A conclusion that the model may not be sufficiently depicting magnitudes of stress could be due to the shortcomings of the FEA generic composite axle modeler for composite axle deflections.

- Possible actions:
  - **Miller options**
    - Reject hardware back to Dana
      - Curved blade option
      - Difficult sell to internal Dana people
    - Change test conditions based on miners rule and have less peak stress
      - He would use an S/N curve for pitting, but it may negatively affect ridging and rippling.
    - Consider changing the test to 22-hour length.
    - Not sure if we should change the build contact pattern
  - **Mr. Fett options**
    - Try to change pattern (move the contact on ring tooth more to the crown to change the heel dedendum loading during the test) and see what happens using the 153-1 oil because of poorer results.
    - Consider rejecting hardware and copy older successful hardware.
- **After much discussion** it was determined that we would explore other modifications to the hardware build or test operating conditions. The following action items were adopted through panel consensus:
  - **Action Item # 2 ⇒ Maumee & Afton**
    - a) Maumee to build 6 retrofit axles with modified pattern changes at direction by Miller/Fett. Expect axles to ship week of August 19.
    - b) Afton volunteered to run 4 tests by end of August.
      - Two tests on TMC 153-1.
      - If promising run 1 test on TMC 134 and 1 test on TMC 155.

- **Action Item # 3 ⇒ Maumee & SwRI**
  - a) Maumee to build 10 retrofit axles per normal build pattern as previously approved by the panel for this batch. Expect axles to ship during the week of August 19.
  - b) SwRI volunteered to run 4 or 5 tests by end of August.
  - c) SwRI will run tests with same wheel speed, a reduced torque load and a longer test length at direction by Mr. Miller based on S-n curve/miners rule.
    - Two tests on TMC 153-1.
    - One test on TMC 134. If results look promising, proceed with other testing on TMC 155 and/or 152-1.

- **Action Item # 4 ⇒ SwRI & Intertek-Parc**
  - a) Intertek-Parc currently has two axles left from the initial 16-axle build (4 axles to each lab). Note that Lubrizol and Afton have consumed their 4 axles in matrix testing.
  - b) SwRI has one axle left and is to ship it to Intertek-Parc. Intertek-Parc has two axles left. Total axles at Intertek-Parc would be 3.
  - c) Intertek-Parc volunteered to run 3 tests, same L-37 test conditions, but change Phase 2 test length to 20 hours.
    - Two tests on TMC 153-1. If results look promising, proceed with one test on TMC 134.

**Note:** With respect to lab testing efforts for action items 2, 3, or 4 only, it was a consensus agreement by the panel that should one of the three options work/be used to qualify the hardware, that the respective lab would receive credit for tests already conducted for their respective oil /test commitment part of the final hardware approval matrix.

- **Action Item # 5 ⇒ Labs, Dana, Panel**
  - Labs agreed to target having testing done by 1<sup>st</sup> of September or sooner.
  - All tests must be run on a referenced stand.
  - **Next teleconferences are:**
    - Thursday, August 21, 10:00 a.m., Hardware Task Force and Dana.
    - Thursday, August 28<sup>th</sup>, 10:00 a.m., L-37 Surveillance Panel.
    - **Call in information for both teleconferences ⇒ 608-250-0194, code 324160.**

- **The next two attachments** were provided by the TMC as a previously requested action item from the July 31 Panel meeting.

- **Attachments # 7** is the Lubrited Reference Oil TMC 127 Test Results by gear batch code.
- **Attachments # 8** is the Non-Lubrited Reference Oil TMC 127 Test Results by gear batch code.

- **July 2008 Gear Rating Workshop** - There was no time to review the information.
  - **Attachment # 9** represents the Pinion and Ring results by the industry raters. Comments by Mr. Lind were:
    - Data is improving
    - Ring data is looking better than it's ever looked.
    - RCMS is working as desired and the raters are working together.

**Motion # 2** ⇒ Mr. Lind, second ⇒ Mr. Smith. Move to adjourn the meeting at 11:23.

Respectfully submitted,



Donald T. Bartlett  
L-37 Surveillance Panel Chairman

August 18, 2008  
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Attached for your review and comment are the unconfirmed minutes of the:

- **August 13, 2008 L-37 Surveillance Panel Meeting conducted at the PRI Headquarters, Apollo Room, Warrendale, PA.**

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Sincerely,

Donald T. Bartlett, Chairman

Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS  
L-37 Surveillance Panel

Attachments

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ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 13, 2008

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Attachment 1  
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8-13-08

\* Initial to indicate attendance at subject meeting



ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 13, 2008


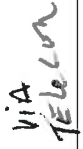

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Attachment /  
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\* Initial to indicate attendance at subject meeting

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Meeting Date: August 13, 2008

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\* Initial to indicate attendance at subject meeting

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## ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 13, 2008

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\* Initial to indicate attendance at subject meeting

Attachment	/
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## ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 13, 2008

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				Phone: Fax: E-Mail:

\* Initial to indicate attendance at subject meeting

Attachment	<i>1</i>
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Reference	<i>L-37</i> <i>Q-15-06</i>

**Lubrizol**

**L-37 Surveillance Panel**  
 PRI Headquarters,  
 Warrendale, Pa.  
 August 13, 2008

Donald Bartlett

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**Lubrizol**

**L-37 SP Agenda**

I. Call to Order, Agenda, & Membership Review

II. SP Minutes to Approve

- ✓ February 13, 2008 SP Meeting
- ✓ May 7, 2008 SP Meeting
- ✓ July 10, 2008 SP Teleconference Meeting
- ✓ July 17, 2008 SP Teleconference Meeting
- ✓ July 31, 2008 SP Teleconference Meeting

III. 2008 Hardware Gear Batch Review & Discussion

- Retrofit Lubrited P4L870A/V1L500 Matrix - TMC
- New Lubrited P4L870A/V1L500 Matrix - TMC
- Non-Lubrited P4T813/V1L500 Matrix - TMC

IV. GRTF Calibration Workshop Review - TMC

V. Old Business

VI. New Business

VII. Adjournment

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**Lubrizol**

**L-37 Surveillance Panel Voting Members**

Donald Bartlett	The Lubrizol Corporation (Chairman)
Tom Bryson	Volvo Power Train Corporation
Juan Buitrago	Chevron Oronite Company
Allen Comfort	AMSTA-TR-D/210 US Army Tacom-Tardec
John Dharte	American Axle & Manufacturing
Brian Koehler	Southwest Research Institute
Cory Koglin	Afton Chemical Company
Kenny Miller	Dana Corporation
Don Lind	ASTM Test Monitoring Center
Jim Linden	GMR Research and Development
Thelma Marougy	Eaton Corporation
Bruce McGlone	ArvinMeritor Materials Engineering
Salvatore Rea	Infineum
Dale Smith	Intertek-PARC Technical Services
Paula Vettel	D.A. Stuart Company

Total 15 Voting Members

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**Attachment** 2

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8-13-08

Lubrizol

**L-37 SP Agenda**

SP Minutes to Approve

- ✓ February 13, 2008 SP Meeting
- ✓ May 7, 2008 SP Meeting
- ✓ July 10, 2008 SP Teleconference Meeting
- ✓ July 17, 2008 SP Teleconference Meeting
- ✓ July 31, 2008 SP Teleconference Meeting

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Lubrizol

**L-37 SP Agenda**

2008 Hardware Gear Batch Review & Discussion

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Lubrizol

**2008 Hardware Order Information**

<u>Axle Type</u>	<u>Total Order</u>	<u>Ring Code</u>	<u>Pinion Code</u>	<u>Labs</u>
Lub - Retrofit	974	P4L870A	V1L500	4
Lub - New	234	P4L870A	V1L500	2
Plain	1084*	P4T813	V1L500	3
<b>Total</b>	<b>2292</b>			

\* Additional order of Plain Axles made

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Attachment 2  
 Page 2 of 5  
 Reference L-37  
8/13/08

Lubrizol

**Hardware Approval Matrix as modified 2/23/2008**

- ✓ Lubrited Retrofit V1L500/P4L870A Hardware Matrix – 4 Labs
- ✓ Conduct the standard 44- test approval matrix
- ✓ Afton, Lubrizol, Intertek, SwRI participating as follows:
  - » 4 Standard tests on TMC 127
  - » 8 Standard tests on TMC 155
  - » 8 Standard tests on TMC 152
  - » 8 Standard tests on TMC 153
  - » 8 Canadian tests on TMC 152
  - » 8 Canadian tests on TMC 153
  - \* No TMC 134 per SP 2/13/2008

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Lubrizol

**Hardware Approval Matrix as modified 2/23/2008**

- ✓ New Lubrited V1L500/P4L870A Hardware Matrix – 2 Labs
- ✓ Conduct only a 14- test approval matrix
- ✓ Consensus was the retrofit plus new lubrited axle assemblies would be of the same heat of steel
- ✓ Afton and Lubrizol participating as follows, 1 test each/lab:
  - » 1 Standard tests on TMC 127
  - » 1 Standard tests on TMC 155
  - » 1 Standard tests on TMC 152
  - » 1 Standard tests on TMC 153
  - » 1 Canadian tests on TMC 152
  - » 1 Canadian tests on TMC 153
  - » 1 Standard tests on TMC 134

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Lubrizol

**Hardware Approval Matrix as modified 2/23/2008**

- ✓ Non-Lubrited V1L500/P4T813 Hardware Matrix – 3 Labs
- ✓ Conduct a modified 47- test approval matrix
- ✓ Afton, Lubrizol, SwRI participating as follows:
  - » 3 Standard tests on TMC 127 \*
  - » 8 Standard tests on TMC 155
  - » 8 Standard tests on TMC 152
  - » 8 Standard tests on TMC 153
  - » 8 Canadian tests on TMC 152
  - » 8 Canadian tests on TMC 153
  - » 4 Standard tests on TMC 134\*
  - \* Run TMC 134 spread out in matrix after TMC 127

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Attachment	<u>2</u>
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Reference	<u>L-37</u>
	8/13/08

**Lubrizol**

**L-37 SP Agenda**

2008 Hardware Gear Batch Review & Discussion

- Retrofit Lubrited P4L870A/V1L500 Matrix – TMC
- New Lubrited P4L870A/V1L500 Matrix – TMC
- Non-Lubrited P4T813/V1L500 Matrix - TMC

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**Lubrizol**

**What we Have Done Through Today !**

- With respect to Non-Lubrited and new Lubrited hardware, all Labs have received their hardware.
- Retrofit Lubrited Axle Assembly placed on hold after 16 builds
- Labs have conducted 29 donated matrix tests across 3 hardware types
- All Matrix test ring, pinion and bearings were sent to Dana for observation, comment, and destructive analysis.
- Pre test photos of DS and CS contact patterns posted & available on TMC website and shared with Dana Reps
- Post test photos of ring and pinion distress posted & available on TMC website and shared with Dana Reps
- All 3 Hardware Matrix Testing is now on hold

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**Lubrizol**

**What do we Know ?**

- Dana Presentation and Comments –
  - Ken Miller
  - Dana Maumee comments
  - Dana Ft. Wayne comments
  - Dana Lugoff comments

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Attachment 2  
 Page 4 of 5  
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**Lubrizol**

**What Does the Panel Want to do Next ?**

- Door # 1 - Reject all the hardware and make new ?
- Door # 2 - Modify test conditions, length, or both ?

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**Lubrizol**

**L-37 SP Agenda**

GRTF Calibration Workshop Review - TMC

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**Lubrizol**

**Since the May SP Meeting**

- 10 HTF Teleconference Calls
- 1 HTF Facility Visit to Lugoff
- 3 SP Teleconference Calls
- Dana
- TMC
- Labs

Thank You !

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Attachment 2  
 Page 5 of 5  
 Reference L-37  
8/13/08

V1L500/P4L870A NEW LUBRITED RETROFIT MATRIX RESULTS

Testkey Lab STD Run Oil VAL Pinbat DTCOMP Pwear Pridg Pripp Pspit Rwear Rridg Rripp Rspit fpcratlpcrat B/Lash Mfg. Min KUSA COM1

63271	B	191	2658	155	AG	V1L500	20080801	7	9	8	9.5	7	10	10	9.8	0	2	0.005	ASTM-0002	
58906	D	3A	945	155	AG	V1L500	20080805	7	8	10	9.9	8	10	10	9.9	1	2	0.005	ASTM-0007	
58912	A	4	225	155	MG	V1L500	20080803	6	9	8	2	8	10	9	9.9	0	2	0.008	ASTM-0009	Broken Tooth
61857	E	1	912	155	MG	V1L500	20080808	7	9	9	2	7	9	9	9.9	1	2	0.006	ASTM-0016	Broken Teeth
63638	B	191	2659	127	AG	V1L500	20080802	6	5	9	9.9	7	6	10	9.9	1	2	0.006	ASTM-0010	
59291	D	3A	944	127	AG	V1L500	20080803	7	8	7	9.9	8	10	10	9.9	1	2	0.005	ASTM-0003	
49193	E	1	910	127	LG	V1L500	20080801	7	9	7	9.9	7	9	9	9.9	1	2	0.004	ASTM-0012	Stand Not Calibrated
67366	A	4	224	127	AG	V1L500	20080801	7	8	5	9.9	8	9	8	9.9	1	2	0.006	ASTM-0013	
67304	B	191	2662	152-1	AG	V1L500	20080806	7	8	8	2	8	9	10	9.9	0	2	0.005	ASTM-0006	
63260	D	3A	946	152-1	MG	V1L500	20080806	7	8	9	2	8	10	9	9.9	1	2	0.005	ASTM-0011	Broken Tooth
67385	A	4	227	153-1	AG	V1L500	20080805	7	8	7	3	7	10	10	9.9	0	2	0.005	ASTM-0001	
67314	B	191	2663	153-1	AG	V1L500	20080807	6	5	8	4	6	5	9	9.9	1	2	0.006	ASTM0014	
64143	D	3A	948	153-1	AG	V1L500	20080811	7	8	9	9.9	8	9	10	9.9	1	2	0.007	ASTM-0015	

Attachment 3  
 Page 1 of 1  
 Reference L-57  
8/13/08

V1L500/P4L870A NEW LUBRITED MATRIX RESULTS

Mfg. Min

Testkey	Lab	STD	Run	Oil	VAL	Pinbat	DTCOMP	Pwear	Pridg	Pripp	Pspit	Rwear	Rridg	Rripp	Rspit	fpcrat	lpcrat	B/Lash	KUSA	COM1
58905	D	3A	934	155	AG	V1L500	20080723	7	9	10	3	7	8	10	9.8	0	2	0.006	7322	
61849	B	191	2652	155	AG	V1L500	20080723	7	9	9	9	7	10	10	9.9	0	2	0.007	7367	Fracture Crack/Pitch Line
67325	D	3A	935	127	MG	V1L500	20080724	7	8	7	2	8	10	9	9.9	0	2	0.005	7320	Broken Tooth
63637	B	191	2653	127	AG	V1L500	20080724	6	5	8	9	6	6	9	9.9	0	2	0.008	7169	
67303	B	191	2655	152-1	AG	V1L500	20080729	8	9	8	9.9	9	10	10	10	0	2	0.004	7271	

Attachment	<u>4</u>
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Reference	<u>1-37</u> <u>8/13/08</u>

V1L500/P4T813 NON-LUBRITED MATRIX RESULTS

Testkey Lab STD Run Oil VAL Pinbat DTCOMP Pwear Pridg Pripp Pspit Rwear Rridg Rripp Rspit fpcrat Ipccrat B/Lash KUSA COM1 Mfg. Min

59315	A	4	215	127	MG	V1L500	20080628	7	8	7	8	7	9	9	9.9	0	2	0.008	4625	Broken Tooth
59293	B	191	2636	127	AG	V1L500	20080701	6	7	8	9.6	6	7	9	9.9	0	2	0.008	4593	
59290	D	3A	924	127	AG	V1L500	20080708	7	7	8	9.9	7	7	10	9.8	0	2	0.006	4930	

67290	B	191	2640	134	AG	V1L500	20080706	6	5	7	7	5	4	9	9.8	1	2	0.004	4692	
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58911	A	4	214	155	AG	V1L500	20080628	7	9	9	9.6	8	10	9	9.9	0	2	0.008	4913	
61848	B	191	2637	155	AG	V1L500	20080702	7	9	9	9.6	8	10	10	9.9	0	2	0.008	5143	
58891	D	3A	923	155	MG	V1L500	20080706	7	8	9	2	7	9	8	2	0	2	0.008	4927	Broken Tooth
58892	D	3A	926	155	MG	V1L500	20080710	7	8	10	2	8	9	10	9.8	0	2	0.004	4933	Broken Tooth

63270	B	191	2642	153-1	MG	V1L500	20080708	6	4	8	2	5	4	9	9.8	1	2	0.007	5401	Broken Tooth
64181	A	4	219	153-1	AG	V1L500	20090709	6	7	7	9.8	7	9	10	9.9	0	2	0.006	4925	

Attachment 5  
 Page 141  
 Reference 6-27  
8/13/08

# L-37 reversed-measured FEA comparisons

ASTM SP meeting August 13, 2008

	V1L417 / P4L792	B6L566 / P4L816	V1L500 / P4T813	V1L500 / P4L870A
Contact stress @ torque	313,434 psi (baseline)	344,140 psi	308,530 psi	309,291 psi
Percentage	100%	109.8%	98.4%	98.7%
	<i>2005 Good</i>	<i>2006 Not Good</i>	<i>2008 Current NON lub</i>	<i>2008 current hub</i>

VIL417 / P4L792

INPUT FILE: S060586-7H  
 OUTPUT FILE: S060586-7Hout  
 GEAR TORQUE: 3480.000 lb-ft  
 08/11/2008 VERSION 8.07 time:04:26pm  
 LAPPING FACTOR 1.000  
 TOPREM FACTOR 1.000  
 V= 0.0000 in  
 H= 0.0060 in  
 G= 0.0000 in  
 Gmf= 1.0000 in  
 Separation factor= 0.00025  
 FLANK  
 TOE **GEAR CONVEX** HEEL  
 TIP  
 = PATH OF CONTACT  
 = MAXIMUM CONTACT STRESS

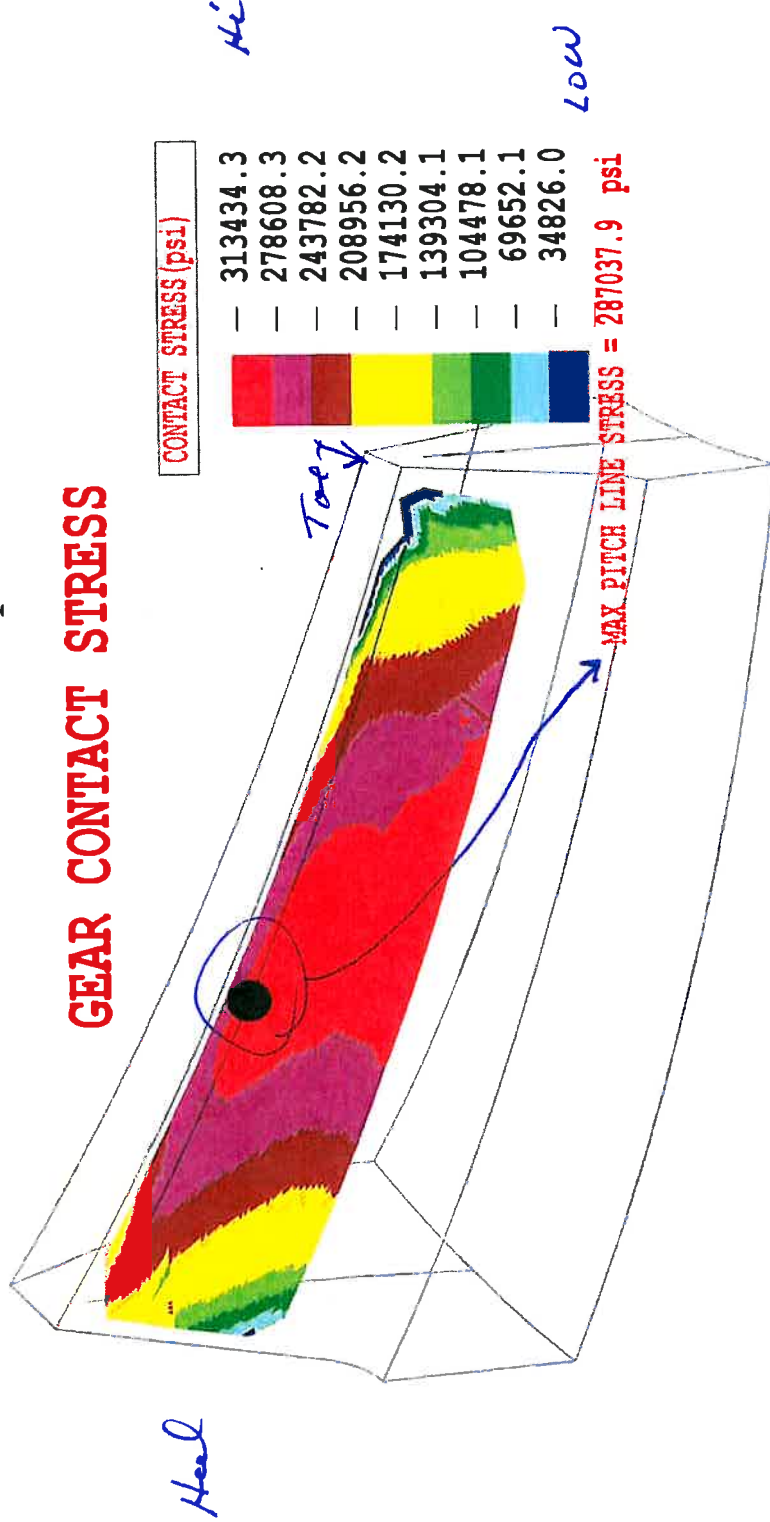
<p>50% Load</p>	<p>75% Load</p>
<p>GEAR TORQUE = 1740.01b-ft</p>	<p>GEAR TORQUE = 3480.01b-ft</p>
<p>BENCH CONTACT</p>	<p>GEAR TORQUE = 2610.01b-ft</p>

Attachment 6  
 Page 14/8  
 Reference 08/13/08

VIL 417 / P4L792

INPUT FILE: S060586-7H  
OUTPUT FILE: S060586-7Hout  
GEAR TORQUE: 3480.000 lb-ft  
08/11/2008 VERSION 8.07 time:04:20pmcmf= 1.0000  
V= 0.0000 in E= -0.01295 in  
H= -0.0060 in P= 0.00907 in  
G= 0.0000 in G= 0.00392 in  
Separation factor= 0.00025 A= 0.00071 ra

### GEAR CONTACT STRESS



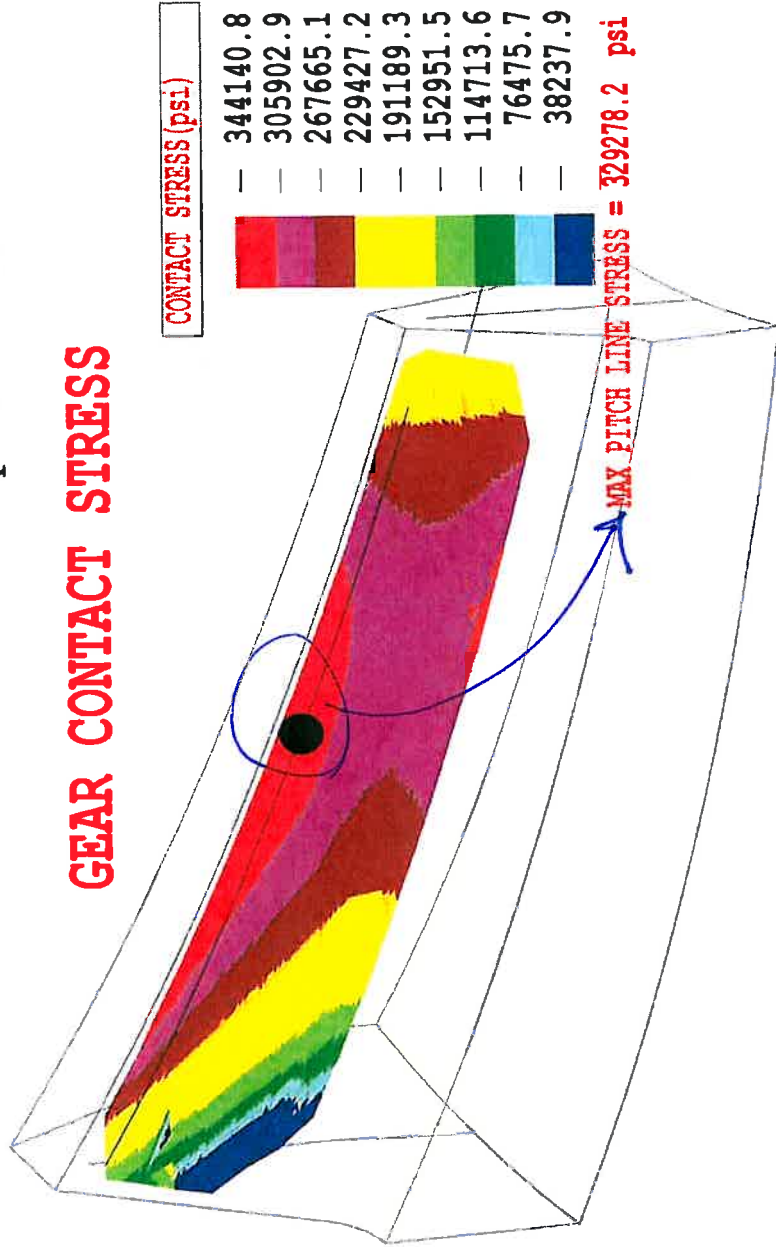
Bias in Contact

Attachment	←
Page	2 of 8
Reference	08/13/08

B6L566 / P4L816

INPUT FILE: S060586-7L  
OUTPUT FILE: S060586-7Lout  
GEAR TORQUE: 3480.000 lb-ft  
08\11\2008 VERSION 8.07 time:04:23pm  
V= 0.0000 in E= -0.1295 in  
H= -0.0080 in P= 0.00907 in  
G= 0.00000 in G= 0.00392 in  
A= 0.00071 ra  
Separation factor= 0.00025

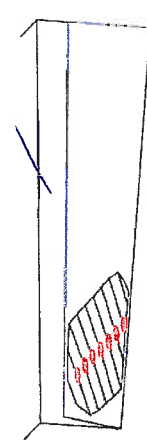
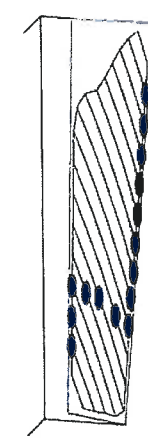
### GEAR CONTACT STRESS



Attachment	6
Page	248
Reference	18/13/08



B6L566 / P4L816 - More Biased in Than Previous Gear Set

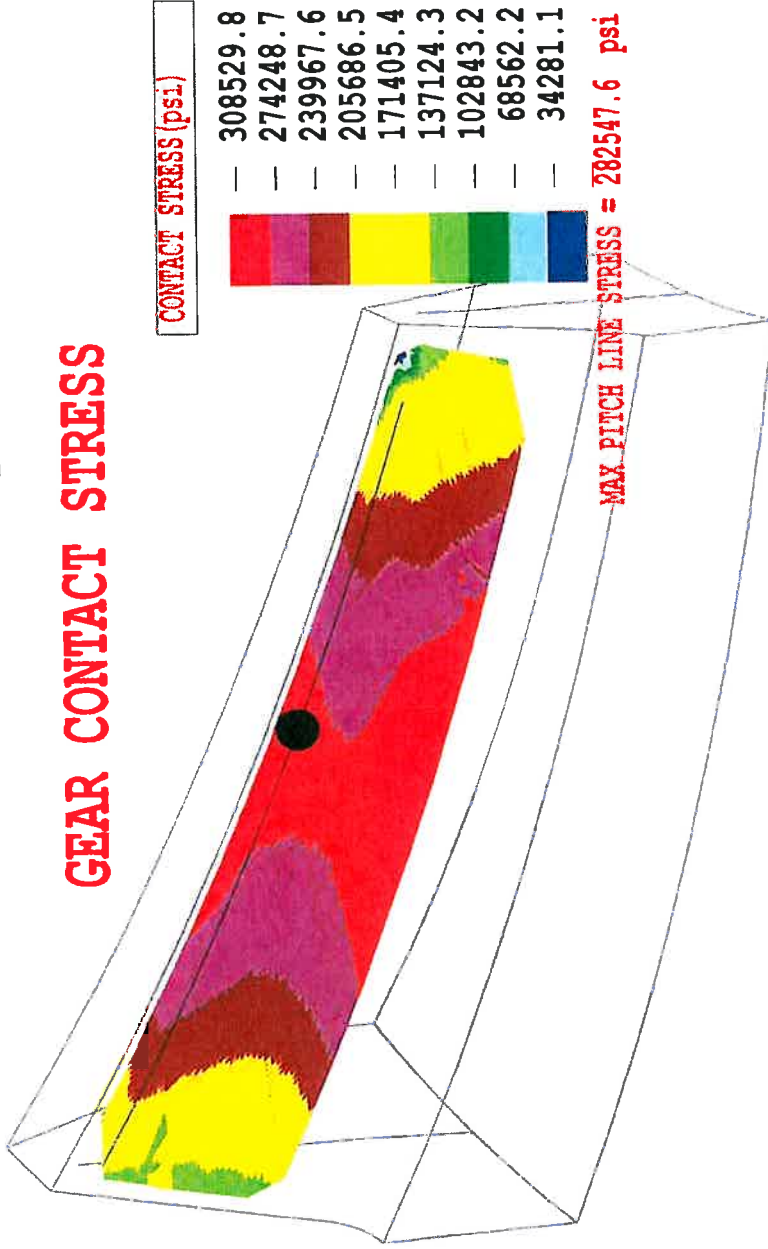
<p> <b>INPUT FILE:</b> S060586-7L  <b>OUTPUT FILE:</b> S060586-7Lout  <b>GEAR TORQUE:</b> 3480.000 lb-ft              08\11\2008 VERSION 8.07 time:04:22pm  <b>LAPPING FACTOR</b> 1.000  <b>TOPREM FACTOR</b> 1.000         </p> <p> <b>V=</b> 0.0000 in  <b>H=</b> -0.0080 in  <b>G=</b> 0.0000 in  <b>pmf=</b> 1.0000  <b>Separation factor=</b> 0.00025         </p> <p> <b>TOE</b> <b>GEAR CONVEX</b> <b>HEEL</b>  <b>FLANK</b> <b>TIP</b> </p> <p> <b>= PATH OF CONTACT</b>  <b>= MAXIMUM CONTACT STRESS</b> </p>	 <p style="text-align: center;"><b>BENCH CONTACT</b></p> <p style="text-align: center;"><b>GEAR TORQUE = 1740.01b-ft</b></p>	 <p style="text-align: center;"><b>GEAR TORQUE = 2610.01b-ft</b></p> <p style="text-align: center;"><b>GEAR TORQUE = 3480.01b-ft</b></p>
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Attachment	6
Page	4 of 8
Reference	08/13/08

VIL500 / P4T813

INPUT FILE: S060586B-7N.SPA  
OUTPUT FILE: S060586B-7N.out  
GEAR TORQUE: 3480.000 lb-ft  
08/11/2008 VERSION 8.19 time:04:04pm  
V= -0.050 in E= -0.1295 in  
H= -0.110 in P= 0.00907 in  
G= 0.0000 in G= 0.00392 in  
cmf= 0.9500 A= 0.00071 ra  
Separation factor= 0.00025

### GEAR CONTACT STRESS



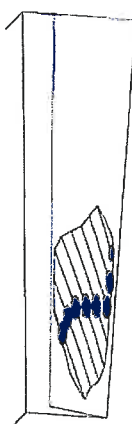
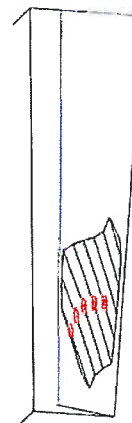
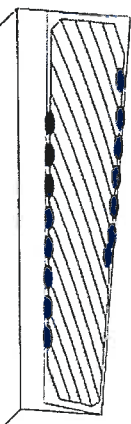
Attachment	<u>6</u>
Page	<u>506</u>
Reference	<u>08/15/08</u>

VIL500 / P4T813

INPUT FILE: S060586B-7N.SPA  
 OUTPUT FILE: S060586B-7N.out  
 GEAR TORQUE: 3480.000 lb-ft  
 08/11/2008 VERSION 8.19 time:04:03pm  
 LAPPING FACTOR 0.950  
 TOPREM FACTOR 1.000

= PATH OF CONTACT  
 = MAXIMUM CONTACT STRESS  
 TOE **GEAR CONVEX** HEEL  
 TIP


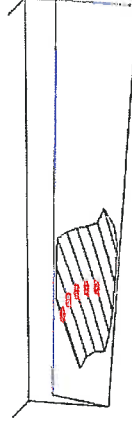
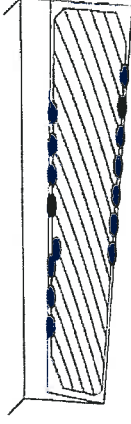
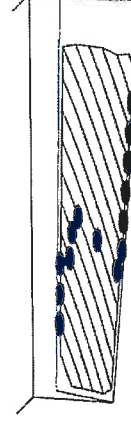
V= -.0050 in  
 H= -.0110 in  
 G= 0.0000 in  
 A= 0.00071 in  
 Separation factor= 0.00025

	
<p>BENCH CONTACT</p>	<p>GEAR TORQUE = 12.51b-ft</p>
	<p>GEAR TORQUE = 1740.01b-ft</p>
<p>GEAR TORQUE = 3480.01b-ft</p>	<p>GEAR TORQUE = 3480.01b-ft</p>

Attachment	6
Page	248
Reference	08/11/08

VIL500 / P4L870A

INPUT FILE: S060586B-5V.SPA  
 OUTPUT FILE: S060586B-5V.SPAout  
 GEAR TORQUE: 3480.000 lb-ft  
 08\11\2008 VERSION 8.19 time:04:08pm  
 SLIPPING FACTOR 0.950  
 TOPREMIUM FACTOR 1.000  
 V = -0.0040 in  
 H = -0.0080 in  
 G = 0.00000 in  
 cmf = 0.9500  
 Separation factor = 0.00025  
 = PATH OF CONTACT TOE **GEAR CONVEX** HEEL  
 = MAXIMUM CONTACT STRESS TIP

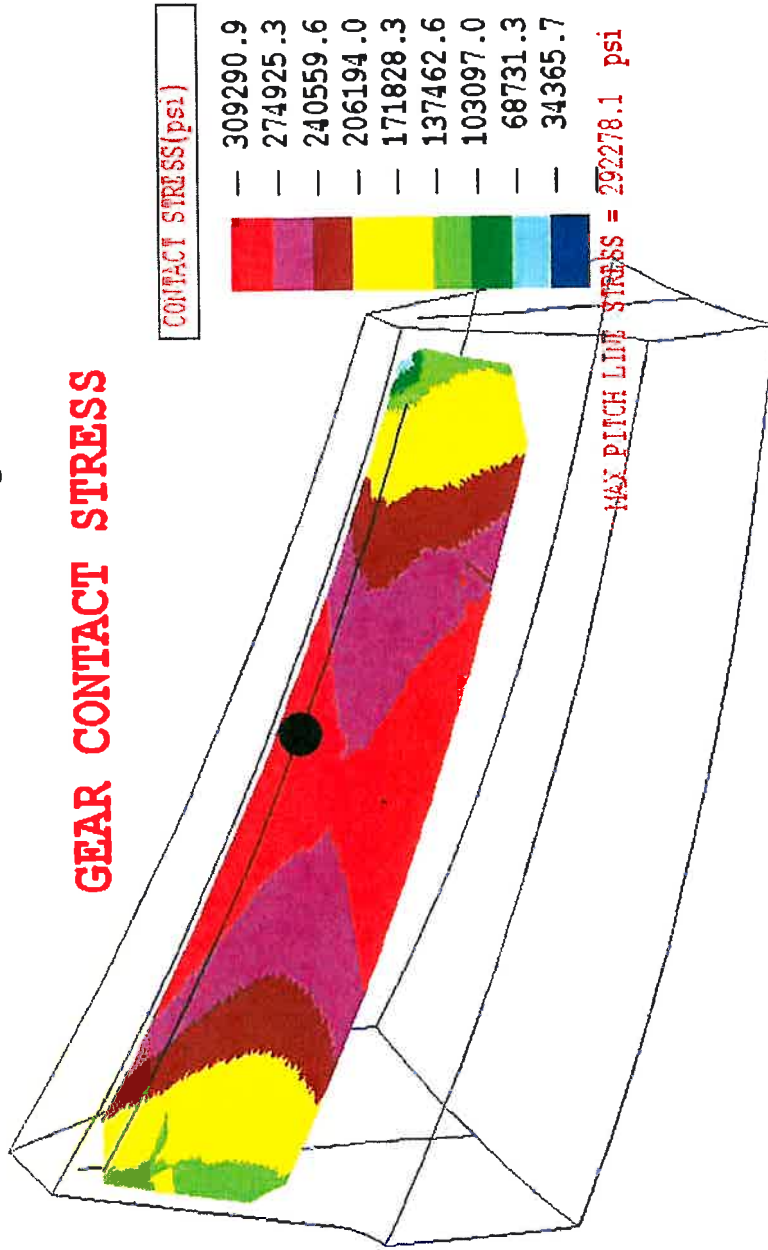
	
<p>BENCH CONTACT</p> <p>GEAR TORQUE = 12.51b-ft</p>	<p>GEAR TORQUE = 1740.01b-ft</p>
	
<p>GEAR TORQUE = 3480.01b-ft</p>	<p>GEAR TORQUE = 3480.01b-ft</p>

Attachment 6  
 Page 2/8  
 Reference 02/3/08

V1L500 / P4L 870A

INPUT FILE: S060586B-5V.SPA  
OUTPUT FILE: S060586B-5V.SPAout  
GEAR TORQUE: 3480.000 lb-ft  
08/11/2008 VERSION 8.19 time:04:08pm  
V= -.0040 in E= -.01295 in  
H= -.0080 in P= 0.00907 in  
G= 0.0000 in G= 0.00392 in  
cmf= 0.9500 A= 0.00071 ra  
Separation factor= 0.00025

### GEAR CONTACT STRESS



Attachment	<u>6</u>
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Reference	<u>08/13/08</u>

# LUBRITED REFERENCE OIL 127 TEST RESULTS

TESTHARD	IND	PINBAT	RINGBAT	DTCOMP	WEAR	RIDG	RIPP	SPIT	%SPALL
LUBRITED	127	B6L566	P4L816	20070501	6.0	4.0	9.0	1.0	
LUBRITED	127	B6L566	P4L816	20070506	5.0	5.0	6.0	2.0	
LUBRITED	127	B6L566	P4L816	20070503	3.0	7.0	9.0	3.0	60%
LUBRITED	127	B6L566	P4L816	20070623	6.0	7.0	9.0	9.9	
LUBRITED	127	B6L566	P4L816	20070503	7.0	8.0	4.0	10.0	
LUBRITED	127	C1L308	P4L309R	19950130	3.0	7.0	10.0	2.0	
LUBRITED	127	C1L308	P4L309R	19950203	4.0	5.0	9.0	2.0	
LUBRITED	127	C1L308	P4L309R	19950214	5.0	3.0	9.0	3.0	66%
LUBRITED	127	C1L308	P4L309R	19950225	3.0	3.0	10.0	3.0	
LUBRITED	127	C1L308	P4L309R	19950220	3.0	3.0	7.0	9.7	
LUBRITED	127	C1L308	P4L309R	19950325	5.0	5.0	7.0	9.7	
LUBRITED	127	C1L426	P4L404A	19960416	3.0	3.0	7.0	3.0	
LUBRITED	127	C1L426	P4L404A	19960430	6.0	5.0	7.0	8.0	100%
LUBRITED	127	C1L426	P4L404A	19960510	6.0	7.0	9.0	8.0	
LUBRITED	127	V1L303	P4L514A	19980720	5.0	5.0	8.5	5.0	
LUBRITED	127	V1L303	P4L514A	19980724	6.0	5.0	8.0	8.0	
LUBRITED	127	V1L303	P4L514A	19980501	5.0	7.0	7.0	9.0	100%
LUBRITED	127	V1L303	P4L514A	19980506	3.0	3.0	10.0	9.0	
LUBRITED	127	V1L303	P4L514A	19980512	5.0	7.0	6.0	9.0	
LUBRITED	127	V1L303	P4L514A	19980715	6.0	6.0	8.5	9.0	
LUBRITED	127	V1L500	P4L870A	20080724	6.0	5.0	8.0	9.0	
LUBRITED	127	V1L500R	P4L870A	20080801	7.0	8.0	5.0	9.9	
LUBRITED	127	V1L500R	P4L870A	20080802	6.0	5.0	9.0	9.9	
LUBRITED	127	V1L500R	P4L870A	20080803	7.0	8.0	7.0	9.9	
LUBRITED	127	V1L500R	P4L870A	20080805	7.0	9.0	7.0	9.9	
LUBRITED	127	V1L686	P4L626A	20000602	6.0	5.0	8.0	9.9	

**Attachment** 7

**Page** 14/2

**Reference** 8/13/08

NON\_LUBRITED REFERENCE OIL 127 TEST RESULTS

TESTHARD	IND	PINBAT	RINGBAT	DTCOMP	WEAR	RIDG	RIPP	SPIT	%SPALL
NONLUBRITED	127	C1L308	P4L318R	19960305	4.0	3.0	5.0	8.0	
NONLUBRITED	127	C1L308	P4L318R	19950207	3.0	7.0	9.0	9.3	
NONLUBRITED	127	C1L308	P4L318R	19950404	5.0	3.0	3.0	9.3	
NONLUBRITED	127	C1L308	P4L318R	19950420	5.0	3.0	5.0	9.3	
NONLUBRITED	127	C1L308	P4L318R	19950505	5.0	5.0	9.0	9.5	
NONLUBRITED	127	C1L308	P4L318R	19960327	7.0	7.0	5.0	9.5	
NONLUBRITED	127	C1L308	P4L318R	19970401	9.0	8.0	5.0	9.5	
NONLUBRITED	127	C1L308	P4L318R	19980723	7.0	5.0	5.0	9.6	
NONLUBRITED	127	C1L308	P4L318R	19960416	7.0	6.0	7.0	9.7	6%
NONLUBRITED	127	C1L308	P4L318R	19960823	6.0	8.0	9.0	9.7	
NONLUBRITED	127	C1L308	P4L318R	19980815	9.0	9.0	4.0	9.7	
NONLUBRITED	127	C1L308	P4L318R	19991228	9.0	9.0	7.0	9.7	
NONLUBRITED	127	C1L308	P4L318R	19950219	5.0	7.0	7.0	9.8	
NONLUBRITED	127	C1L308	P4L318R	19951001	8.0	6.0	5.0	9.9	
NONLUBRITED	127	C1L308	P4L318R	19951008	9.0	7.0	5.0	9.9	
NONLUBRITED	127	C1L308	P4L318R	19960413	9.0	9.0	7.0	9.9	
NONLUBRITED	127	C1L308	P4L318R	19980416	9.0	7.0	6.0	9.9	
NONLUBRITED	127	C1L426	P4L415A	19980925	5.0	7.0	7.0	6.0	
NONLUBRITED	127	C1L426	P4L415A	19960322	5.0	5.0	10.0	7.0	
NONLUBRITED	127	C1L426	P4L415A	19980307	6.0	6.0	9.0	7.0	
NONLUBRITED	127	C1L426	P4L415A	19980714	6.0	4.0	9.0	8.0	
NONLUBRITED	127	C1L426	P4L415A	19960522	4.0	5.0	7.0	9.0	
NONLUBRITED	127	C1L426	P4L415A	19960320	5.0	7.0	9.0	9.3	
NONLUBRITED	127	C1L426	P4L415A	19960328	5.0	8.0	6.0	9.3	31%
NONLUBRITED	127	C1L426	P4L415A	19960418	6.0	6.0	7.0	9.5	
NONLUBRITED	127	C1L426	P4L415A	20030429	6.0	7.0	9.0	9.5	
NONLUBRITED	127	C1L426	P4L415A	19980702	6.0	5.5	9.0	9.8	
NONLUBRITED	127	C1L426	P4L415A	19980716	7.0	9.0	5.0	9.9	
NONLUBRITED	127	C1L426	P4L415A	19980915	6.0	7.0	9.0	9.9	
NONLUBRITED	127	C1L426	P4L415A	19980918	6.0	8.0	9.0	9.9	
NONLUBRITED	127	C1L426	P4L415A	19970319	7.0	8.0	9.0	10.0	
NONLUBRITED	127	C1L426	P4L415A	19980717	6.0	8.0	5.0	10.0	
NONLUBRITED	127	C1L426	P4L415A	19980718	9.0	10.0	10.0	10.0	
NONLUBRITED	127	V1L176	P4L741A	20030710	5.0	5.0	8.0	3.0	
NONLUBRITED	127	V1L176	P4L741A	20020712	5.0	5.0	9.0	6.0	
NONLUBRITED	127	V1L176	P4L741A	20020503	6.0	6.0	9.0	9.3	
NONLUBRITED	127	V1L176	P4L741A	20020502	5.0	3.0	7.0	9.8	
NONLUBRITED	127	V1L176	P4L741A	20020503	5.0	5.0	8.0	9.9	20%
NONLUBRITED	127	V1L176	P4L741A	20020614	6.0	8.0	5.0	9.9	
NONLUBRITED	127	V1L176	P4L741A	20020703	7.0	10.0	10.0	9.9	
NONLUBRITED	127	V1L176	P4L741A	20030717	7.0	9.0	8.0	9.9	
NONLUBRITED	127	V1L176	P4L741A	20020511	7.0	7.0	8.0	10.0	
NONLUBRITED	127	V1L176	P4L741A	20020723	9.0	8.0	8.0	10.0	
NONLUBRITED	127	V1L303	P4L514A	19980726	5.0	5.0	8.0	7.0	
NONLUBRITED	127	V1L303	P4L514A	19980723	6.0	5.0	7.5	8.0	
NONLUBRITED	127	V1L303	P4L514A	19980513	5.0	8.0	7.0	9.0	
NONLUBRITED	127	V1L303	P4L514A	19980604	7.0	7.0	5.0	9.0	40%
NONLUBRITED	127	V1L303	P4L514A	19980514	5.0	7.0	7.0	9.5	
NONLUBRITED	127	V1L303	P4L514A	20001031	6.0	8.0	6.0	9.6	
NONLUBRITED	127	V1L303	P4L514A	19990731	6.0	6.0	5.0	9.9	
NONLUBRITED	127	V1L303	P4L514A	19990805	6.0	6.0	9.0	9.9	

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TESTHARD	IND	PINBAT	RINGBAT	DTCOMP	WEAR	RIDG	RIPP	SPIT	%SPALL
NONLUBRITED	127	V1L351	P4T771	20040919	7.0	6.0	5.0	9.8	
NONLUBRITED	127	V1L351	P4T771	20040905	6.0	6.0	9.0	9.9	
NONLUBRITED	127	V1L351	P4T771	20040909	5.0	3.0	7.0	9.9	0%
NONLUBRITED	127	V1L351	P4T771	20040917	6.0	7.0	7.0	9.9	
NONLUBRITED	127	V1L351	P4T771	20050111	6.0	4.0	6.0	9.9	
NONLUBRITED	127	V1L417	P4L792	20060107	6.0	4.0	8.0	9.5	
NONLUBRITED	127	V1L417	P4L792	20060112	8.0	9.0	7.0	9.7	0%
NONLUBRITED	127	V1L417	P4L792	20060113	7.0	9.0	5.0	9.7	
NONLUBRITED	127	V1L417	P4L792	20060114	8.0	9.0	8.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	19991001	4.0	4.0	9.0	3.0	
NONLUBRITED	127	V1L686	P4L626A	19991014	5.0	5.0	8.0	3.0	
NONLUBRITED	127	V1L686	P4L626A	19991016	6.0	5.0	8.0	3.0	
NONLUBRITED	127	V1L686	P4L626A	19991017	3.0	5.0	7.0	3.0	
NONLUBRITED	127	V1L686	P4L626A	19991001	5.0	7.0	8.0	8.0	
NONLUBRITED	127	V1L686	P4L626A	19991015	5.0	7.0	7.0	8.0	
NONLUBRITED	127	V1L686	P4L626A	20001129	6.0	4.0	8.0	8.0	
NONLUBRITED	127	V1L686	P4L626A	19991007	7.0	9.0	10.0	9.8	
NONLUBRITED	127	V1L686	P4L626A	19991005	5.0	7.0	6.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20000216	7.0	7.0	7.0	9.9	32%
NONLUBRITED	127	V1L686	P4L626A	20000217	5.0	6.0	9.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20000217	6.0	7.0	7.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20010207	7.0	9.0	9.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20011202	6.0	5.0	8.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20020312	7.0	9.0	7.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20020319	7.0	8.0	7.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20020913	6.0	5.0	10.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20020919	7.0	6.0	9.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20030820	7.0	9.0	8.0	9.9	
NONLUBRITED	127	V1L686	P4L626A	20000219	7.0	7.0	6.0	10.0	
NONLUBRITED	127	V1L686	P4L626A	20001220	6.0	5.0	5.0	10.0	
NONLUBRITED	127	V1L686	P4L626A	20020216	7.0	8.0	7.0	10.0	
NONLUBRITED	127	V1L500	P4T813	20080629	7.0	8.0	7.0	8.0	
NONLUBRITED	127	V1L500	P4T813	20080701	6.0	7.0	8.0	9.6	33%
NONLUBRITED	127	V1L500	P4T813	20080708	7.0	7.0	8.0	9.9	

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**L-37 PINION GEARS**

SET #	DISTRESS	4	6	7	10	11	22	25	27	28	29	30	31	32	33	MAX	MIN	AVG	Std Dev	RCMS Pinion #	RCMS Mean
10	Ridging	10.0		8.0	10.0	9.0		9.0	10.0		9.0	9.0	9.0		9.0	10.0	8.0	9.20	0.632	53	9.20
10	Rippling	9.0		9.0	8.0	9.0		9.0	9.0		9.0	9.0	8.0		9.0	9.0	8.0	8.80	0.422		8.30
10	Wear	7.0		7.0	7.0	6.0		6.0	6.0		8.0	7.0	7.0		6.0	8.0	6.0	6.70	0.675		6.80
10	Spitting	9.9		9.9	9.9	9.9		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.90	0.000		9.90
10	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		
11	Ridging	9.0		8.0	9.0	9.0		9.0	9.0		9.0	9.0	9.0		9.0	9.0	8.0	8.90	0.316	57	8.80
11	Rippling	8.0		9.0	7.0	9.0		9.0	9.0		8.0	9.0	9.0		9.0	9.0	7.0	8.60	0.699		8.20
11	Wear	5.0		6.0	6.0	6.0		6.0	6.0		6.0	6.0	6.0		6.0	6.0	5.0	5.90	0.316		5.90
11	Spitting	9.5		9.3	9.6	9.6		9.6	9.7		9.7	9.6	9.7		9.5	9.7	9.3	9.58	0.123		9.61
11	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		
12	Ridging	10.0		8.0	9.0	9.0		9.0	10.0		9.0	9.0	9.0		9.0	10.0	8.0	9.10	0.568	60	9.10
12	Rippling	9.0		9.0	8.0	9.0		9.0	10.0		9.0	9.0	9.0		9.0	10.0	8.0	9.00	0.471		8.70
12	Wear	8.0		7.0	8.0	8.0		8.0	8.0		8.0	7.0	7.0		9.0	9.0	7.0	7.80	0.632		7.90
12	Spitting	9.8		9.9	9.9	9.9		9.9	9.9		9.9	9.8	9.9		9.9	9.9	9.8	9.88	0.042		9.90
12	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		
<b>RERATE</b>																					
R1/5	Ridging	8.0		8.0	8.0	8.0		8.0	9.0		8.0	6.0	8.0		8.0	9.0	6.0	7.90	0.738	17	8.10
R1/5	Rippling	8.0		8.0	9.0	9.0		9.0	9.0		8.0	9.0	9.0		9.0	9.0	8.0	8.70	0.483		9.00
R1/5	Wear	6.0		6.0	6.0	6.0		7.0	6.0		6.0	6.0	6.0		6.0	7.0	6.0	6.10	0.316		5.70
R1/5	Spitting	5.0		6.0	6.0	6.0		7.0	7.0		6.0	6.0	6.0		5.0	7.0	5.0	6.00	0.667		6.10
R1/5	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		
R2/7	Ridging	5.0		6.0	5.0	5.0		7.0	7.0		6.0	6.0	8.0		6.0	8.0	5.0	6.10	0.994	27	5.30
R2/7	Rippling	9.0		9.0	10.0	10.0		9.0	9.0		9.0	8.0	9.0		9.0	10.0	8.0	9.10	0.568		8.40
R2/7	Wear	5.0		5.0	6.0	5.0		6.0	6.0		5.0	6.0	6.0		6.0	6.0	5.0	5.60	0.516		5.60
R2/7	Spitting	9.6		9.8	9.9	9.9		9.8	9.8		9.8	9.6	9.7		9.7	9.9	9.6	9.76	0.107		9.66
R2/7	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		

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**L-37 PINION GEARS**

SET #	DISTRESS	4	6	7	10	11	22	25	27	28	29	30	31	32	33	MAX	MIN	AVG	Std Dev	RCMS Pinion #	RCMS Mean
R3/9	Ridging	10.0		9.0	9.0	9.0		9.0	10.0		10.0	9.0	9.0		9.0	10.0	9.0	9.30	0.483	48	9.70
R3/9	Rippling	9.0		9.0	9.0	10.0		9.0	9.0		9.0	9.0	9.0		8.0	10.0	8.0	9.00	0.471		9.20
R3/9	Wear	6.0		6.0	6.0	6.0		7.0	5.0		7.0	6.0	7.0		6.0	7.0	5.0	6.20	0.632		6.50
R3/9	Spitting	9.9		9.9	9.9	9.9		9.9	9.9		9.9	9.8	9.9		9.9	9.9	9.8	9.89	0.032		9.88
R3/9	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		
R4/10	Ridging	9.0		9.0	9.0	9.0		9.0	10.0		9.0	9.0	9.0		10	10.0	9.0	9.20	0.422	53	9.20
R4/10	Rippling	9.0		9.0	8.0	9.0		9.0	9.0		9.0	9.0	9.0		8	9.0	8.0	8.80	0.422		8.30
R4/10	Wear	7.0		7.0	7.0	7.0		6.0	6.0		8.0	6.0	7.0		7	8.0	6.0	6.80	0.632		6.80
R4/10	Spitting	9.9		9.9	9.9	9.9		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.90	0.000		9.90
R4/10	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000		

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**L-37 RING GEARS**

SET #	DISTRESS	4	6	7	10	11	22	25	27	28	29	30	31	32	33	MAX	MIN	AVG	Std Dev
5	Ridging	10.0		10.0	9.0	10.0		10.0	10.0		10.0	10.0	9.0		10.0	10.0	9.0	9.80	0.422
5	Rippling	10.0		10.0	9.0	10.0		9.0	9.0		9.0	10.0	9.0		10.0	9.0	9.0	9.50	0.527
5	Wear	8.0		8.0	8.0	9.0		8.0	7.0		9.0	9.0	9.0		8.0	7.0	8.0	8.30	0.675
5	Spitting	10.0		9.9	9.9	10.0		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.92	0.042
5	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
6	Ridging	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	9.0		10.0	9.0	9.0	9.90	0.316
6	Rippling	10.0		10.0	10.0	10.0		9.0	10.0		9.0	10.0	9.0		9.0	9.0	9.0	9.60	0.516
6	Wear	7.0		8.0	8.0	8.0		8.0	7.0		7.0	7.0	8.0		8.0	7.0	7.0	7.60	0.516
6	Spitting	9.9		9.9	9.9	10.0		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.91	0.032
6	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
7	Ridging	8.0		7.0	8.0	8.0		7.0	8.0		9.0	7.0	8.0		9.0	7.0	7.0	7.90	0.738
7	Rippling	9.0		9.0	10.0	10.0		9.0	9.0		9.0	10.0	9.0		9.0	9.0	9.0	9.30	0.483
7	Wear	7.0		8.0	6.0	6.0		7.0	7.0		7.0	7.0	7.0		7.0	6.0	6.0	6.90	0.568
7	Spitting	9.8		9.9	9.9	9.9		9.9	9.9		9.9	9.8	9.9		9.9	9.8	9.8	9.88	0.042
7	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
8	Ridging	9.0		9.0	10.0	10.0		10.0	10.0		10.0	9.0	9.0		10.0	9.0	9.0	9.60	0.516
8	Rippling	10.0		10.0	10.0	10.0		9.0	9.0		10.0	10.0	9.0		9.0	9.0	9.0	9.60	0.516
8	Wear	7.0		7.0	8.0	7.0		7.0	7.0		7.0	7.0	8.0		8.0	7.0	7.0	7.30	0.483
8	Spitting	10.0		9.9	9.9	10.0		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.92	0.042
8	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
9	Ridging	9.0		8.0	10.0	9.0		10.0	9.0		10.0	9.0	8.0		10.0	8.0	8.0	9.20	0.789
9	Rippling	10.0		10.0	10.0	9.0		9.0	9.0		9.0	10.0	9.0		10.0	9.0	9.0	9.50	0.527
9	Wear	7.0		7.0	8.0	7.0		7.0	7.0		7.0	7.0	8.0		7.0	7.0	7.0	7.20	0.422
9	Spitting	10.0		9.9	9.9	9.9		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.91	0.032
9	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
10	Ridging	9.0		8.0	9.0	9.0		9.0	9.0		10.0	9.0	9.0		9.0	8.0	8.0	9.00	0.471
10	Rippling	9.0		10.0	10.0	9.0		9.0	9.0		9.0	10.0	9.0		9.0	9.0	9.0	9.30	0.483
10	Wear	7.0		8.0	8.0	8.0		7.0	7.0		7.0	7.0	7.0		8.0	7.0	7.0	7.40	0.516
10	Spitting	9.9		9.9	9.9	9.9		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.90	0.000
10	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000

**Attachment** 7  
**Page** 4 of 5  
**Reference** 08/13/08

**ASTM Gear Calibration Workshop  
Cleveland, OH July 29, 30, 31 & Aug 1, 2008**

**L-37 RING GEARS**

SET #	DISTRESS	4	6	7	10	11	22	25	27	28	29	30	31	32	33	MAX	MIN	AVG	Std Dev
<b>RERATE</b>																			
R1/5	Ridging	10.0		9.0	9.0	10.0		10.0	10.0		10.0	10.0	9.0		10.0	10.0	9.0	9.70	0.483
R1/5	Rippling	10.0		10.0	9.0	10.0		9.0	9.0		9.0	10.0	9.0		9.0	10.0	9.0	9.40	0.516
R1/5	Wear	8.0		8.0	8.0	9.0		8.0	7.0		9.0	9.0	8.0		8.0	9.0	7.0	8.20	0.632
R1/5	Spitting	9.9		9.9	9.9	10.0		9.9	9.9		9.9	9.9	9.9		9.9	10.0	9.9	9.91	0.032
R1/5	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
R2/7	Ridging	8.0		7.0	8.0	8.0		7.0	8.0		9.0	7.0	8.0		9.0	9.0	7.0	7.90	0.738
R2/7	Rippling	9.0		9.0	10.0	10.0		9.0	9.0		9.0	10.0	9.0		9.0	10.0	9.0	9.30	0.483
R2/7	Wear	7.0		7.0	6.0	6.0		7.0	7.0		7.0	7.0	7.0		7.0	7.0	6.0	6.80	0.422
R2/7	Spitting	9.8		9.9	9.9	9.9		9.9	9.9		9.9	9.8	9.9		9.9	9.9	9.8	9.88	0.042
R2/7	Scoring	10.0		10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0		10.0	10.0	10.0	10.00	0.000
R3/9	Ridging	9.0		8.0	10.0	9.0		9.0	10.0		10.0	9.0	9.0		9.0	10.0	8.0	9.20	0.632
R3/9	Rippling	9.0		10.0	10.0	9.0		9.0	9.0		9.0	10.0	9.0		9.0	10.0	9.0	9.30	0.483
R3/9	Wear	7.0		7.0	8.0	8.0		7.0	7.0		7.0	7.0	7.0		8.0	8.0	7.0	7.30	0.483
R3/9	Spitting	9.9		9.9	9.9	9.9		9.9	9.9		9.9	9.9	9.9		9.9	9.9	9.9	9.90	0.000
R3/9	Scoring	10.0		8.0	10.0	10.0		7.0	10.0		10.0	10.0	10.0		10.0	7.0	9.50	1.080	

**Attachment** 9  
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**Reference** 08/13/08