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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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April 29th, 2013

Reply to:
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ASTM D02.B0.03 L-37-1 Next Generation Hardware Task Force
Members and Guests:

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

- **April 24th , 2013 Next Generation Hardware Task Force Meeting (Teleconference)**

Please direct any corrections or comments to my attention.

Sincerely,

Chris Prengaman, Chairman
L-37-1 Hardware Taskforce Chairman

Report of Meeting
L-37-1 Hardware Task Force Meeting
Teleconference
April 24th, 2013

Attendees:

Voting Members in **BOLD**

Gottwald, Thomas – Afton Chemical

Gropp, Jerry – Lubrizol

Umerley, Matt – Lubrizol

Hamilton, Larry - Lubrizol

Guzikowski, Joe – Dana

Koehler, Brian – Southwest Research Institute

Prengaman, Chris – Lubrizol

Suresh, Arunya – BASF

Parke, Scott - TMC

The meeting was called to order at 10:10 am EST.

1.0 Agenda Review

2.0 Review Break-In Proposal

C. Prengaman reviewed with the group the data from the 1-B run at SwRI and the TMC 134 run at Lubrizol on the modified break-in.

J. Gropp shared some concerns that he would like to see a longer test still. He still has concerns that we are only separating only on ridging. Can we do something to make the test a little more sever and see better separation?

T. Gottwald & B. Koehler are generally in agreement with Jerry's thoughts.

J. Guzikowski things we are moving in the correct direction with the distresses we're seeing.

The group agreed that the next run should be:

SwRI Modified Break In, TMC 134, 950ml, 16.5 hour length.

T. Gottwald volunteered to donate a run, but needed to check with scheduling on rig availability.

B. Koehler volunteered to donate a run.

B. Koehler shared that it will be good to see a Canadian version to see if that works under the modified break-in conditions currently under review.

3.0 New Business

C. Prengaman asked the group to think about how we might do Interrupts , QI / Deviation % during the long linear ramps.

J. Gropp shared some concerns over Interrupts during a ramp in – to ensure that this doesn't allow a borderline oil / poor oil to pass, by adding additional break-in.

Current approximate inventories across the labs are as follows:

Afton 20 NL / 30 L

SwRI 2 NL / 12 L

Lubrizol 5 NL / 17 L

Parc ?

4.0 Adjournment

Motion to adjourn .

Respectfully Submitted

Chris Prengaman

L-37-1 Task Force Meeting

April 24th, 2013
10:00 am – 11:00 pm EST
Teleconference

Agenda

- 1) Call to order/Agenda review
- 2) Discuss Test Progress
 - a) 2 tests completed on Modified Break-In 1-B and TMC 134
 - b) Next steps?
- 3) New business
- 4) Adjournment

Call in number → **216-706-7052 code 324160**

| Industry Oil Code (TMC Oil) | Test Version (Standard or Canadian) | Hardware Identification | Lab | Stand | Test Hardware | EOT Date | Pinion Rating | | | | | Ring Rating | | | | | Free-form Comment |
|-------------------------------------|-------------------------------------|-------------------------|---------|---------|---------------|----------|---------------|------|------|------|------|-------------|-------|-------|-------|-------|--|
| | | | | | | | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | |
| IND | TVERSION | SERIALNO | LTMSLAB | LTMSAPP | TESTHARD | LTMSDATE | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | COMMENT |
| 16.5 hour, 1650 lb-ft torque | | | | | | | | | | | | | | | | | |
| 134 | STANDARD | GGAD12063130725 | D | 3 | LUBRITED | 20120505 | 7 | 6 | 9 | 9.9 | 10 | 7 | 7 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. 7 spat on inner cone of head bearing. |
| 134 | STANDARD | GGAD12063122708 | A | 5 | LUBRITED | 20120720 | 6 | 5 | 10 | 10 | 10 | 6 | 6 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 134 | STANDARD | | G | | LUBRITED | 20120804 | 6 | 5 | 9 | 9.9 | 10 | 7 | 6 | 8 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD12063132945 | B | | LUBRITED | 20120406 | 7 | 7 | 9 | 9.9 | 10 | 7 | 8 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD12063124110 | A | 5 | LUBRITED | 20120425 | 7 | 8 | 9 | 9.9 | 10 | 8 | 9 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD12063140809 | D | 3 | LUBRITED | 20120517 | 7 | 7 | 10 | 9.9 | 10 | 7 | 8 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD120631- - - - | D | 3 | LUBRITED | 20120518 | 7 | 8 | 10 | 9.9 | 10 | 7 | 8 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Last 5 digits of serial number missing. |

| Industry Oil Code (TMC Oil) | Test Version (Standard or Canadian) | Hardware Identification | Lab | Stand | Test Hardware | EOT Date | Pinion Rating | | | | | Ring Rating | | | | | Free-form Comment |
|-------------------------------------|-------------------------------------|-------------------------|---------|---------|---------------|----------|---------------|------|------|------|------|-------------|-------|-------|-------|-------|--|
| | | | | | | | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | |
| IND | TVERSION | SERIALNO | LTMSLAB | LTMSAPP | TESTHARD | LTMSDATE | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | COMMENT |
| 16.5 hour, 1650 lb-ft torque | | | | | | | | | | | | | | | | | |
| 134 | STANDARD | GGAD120036- - - - | B | | NONLUBRITED | 20120413 | | | | | | | | | | | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Test ran for 11hrs. - all teeth broken, catastrophic failure. Last 5 digits of serial number missing. |
| 134 | STANDARD | GGAD12063093932 | A | 5 | NONLUBRITED | 20120414 | 6 | 6 | 8 | 9.9 | 10 | 6 | 6 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 134 | STANDARD | GGAD12063092414 | B | | NONLUBRITED | 20120427 | | | | | | 5 | 6 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Test ran for 11.25hrs. - all teeth broken, pinion unrateable. |
| 134 | STANDARD | GGAD12047090125 | D | 3 | NONLUBRITED | 20120515 | 7 | 7 | 7 | 9.9 | 10 | 7 | 8 | 9 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Broken teeth on pinion. Damage to ring. Shut down due to vibration at 15 hrs 37 min (on test). |
| 134 | STANDARD | GGAD12063112723 | D | 3 | NONLUBRITED | 20120519 | 7 | 7 | 9 | 9.9 | 10 | 7 | 7 | 9 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 134 | STANDARD | GGAD12063134922 | B | | NONLUBRITED | 20120521 | 6 | 4 | 7 | 5 | 10 | 6 | 4 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. High vibration at 8.5hrs. - pinion teeth cracked. |
| 134 | STANDARD | GGAD12047081449 | D | 3 | NONLUBRITED | 20120524 | 7 | 7 | 10 | 9.9 | 10 | 7 | 8 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Shutdown due to excessive vibration at 5:01 test hours. |
| 134 | STANDARD | | G | | NONLUBRITED | 20120822 | 7 | 5 | 9 | 9.9 | 10 | 7 | 5 | 9 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Light coast side scoring observed |
| 152-1 | STANDARD | | B | | NONLUBRITED | 20121101 | 7 | 10 | 10 | 9.9 | 10 | 7 | 10 | 10 | 9.9 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 152-1 | CANADIAN | | B | | NONLUBRITED | 20121103 | 7 | 10 | 10 | 9.9 | 10 | 7 | 10 | 10 | 9.9 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD12047090210 | D | 3 | NONLUBRITED | 20120504 | 7 | 7 | 10 | 10 | 10 | 7 | 7 | 10 | 10 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Cracked tooth on ring gear |
| 155 | STANDARD | GGAD12063093332 | B | | NONLUBRITED | 20120621 | 8 | 9 | 10 | 9.9 | 9 | 8 | 9 | 10 | 9.9 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 155 | STANDARD | GGAD12063092600 | A | 5 | NONLUBRITED | 20120721 | 7 | 8 | 10 | 9.9 | 10 | 7 | 8 | 10 | 9.9 | 10 | This is a non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 1-A | STANDARD | | A | 5 | NONLUBRITED | 20120804 | 6 | 6 | 8 | 9.9 | 10 | 6 | 7 | 9 | 9.9 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 1-A | STANDARD | | G | | NONLUBRITED | 20120830 | | | | | | 6 | 6 | 8 | | | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. Non-interprettable. Distress - Heavy to Catastrophic. Broken teeth on pinion and ring. |
| 1-B | STANDARD | | A | 5 | NONLUBRITED | 20120807 | 3 | 6 | 7 | 9.9 | 10 | 5 | 6 | 9 | 10 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 1-B | STANDARD | | G | | NONLUBRITED | 20120905 | 5 | 3 | 9 | 9.8 | 10 | 6 | 5 | 8 | 9 | 10 | Non-lubrited AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. |
| 16.5 hour, 1350 lb-ft torque | | | | | | | | | | | | | | | | | |
| 134 | STANDARD | GGAD12063093015 | A | 5 | NONLUBRITED | 20120830 | 6 | 6 | 8 | 9.9 | 10 | 7 | 7 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran at 1350 lb-ft torque. |
| 134 | STANDARD | GGAD12063093135 | B | | NONLUBRITED | 20120830 | 7 | 10 | 9 | 9.9 | 10 | 7 | 10 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran at 1350 lb-ft torque. |

| Industry Oil Code (TMC Oil) | Test Version (Standard or Canadian) | Hardware Identification | Lab | Stand | Test Hardware | EOT Date | Pinion Rating | | | | | Ring Rating | | | | | Free-form Comment |
|-------------------------------------|-------------------------------------|-------------------------|---------|---------|---------------|----------|---------------|------|------|------|------|-------------|-------|-------|-------|-------|---|
| | | | | | | | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | |
| IND | TVERSION | SERIALNO | LTMSLAB | LTMSAPP | TESTHARD | LTMSDATE | WEAR | RIDG | RIPP | SPIT | SCOR | WEARR | RIDGR | RIPPR | SPITR | SCORR | COMMENT |
| 16.5 hour, 1500 lb-ft torque | | | | | | | | | | | | | | | | | |
| 134 | STANDARD | GGAS22928327218 | A | 5 | NONLUBRITED | 20120831 | 6 | 5 | 9 | 9.9 | 10 | 6 | 6 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran at 1500 lb-ft torque. |
| 152-1 | STANDARD | GGAD12063113036 | G | | NONLUBRITED | 20120827 | 7 | 8 | 9 | 9.9 | 10 | 7 | 10 | 9 | 9.9 | 10 | 1500 torque, 16.5 hours. This was supposed to be 134 but we had a mix up during oil assignment and 152-1 was ran instead. |
| 11 hour, 1650 lb-ft torque | | | | | | | | | | | | | | | | | |
| 134 | STANDARD | GGAD12063111151 | G | | NONLUBRITED | 20120912 | 6 | 4 | 8 | 9.9 | 10 | 7 | 5 | 9 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran at 1650 lb-ft torque for 11hrs. |
| 134 | STANDARD | GGAD12063094027 | A | 5 | NONLUBRITED | 20120912 | 7 | 5 | 8 | 9.9 | 10 | 7 | 6 | 9 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran a special test length of 11 hours. |
| 152-1 | STANDARD | GGAD12063112939 | G | | NONLUBRITED | 20120915 | 8 | 9 | 9 | 9.9 | 10 | 8 | 9 | 8 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran a special test length of 11 hours. |
| 152-1 | STANDARD | GGAD12063123814 | A | 5 | NONLUBRITED | 20120917 | 7 | 7 | 10 | 10 | 10 | 7 | 10 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. This ran a special test length of 11 hours. |
| 152-1 | CANADIAN | GGAD12063112848 | G | | NONLUBRITED | 20120921 | 7 | 9 | 10 | 9.9 | 10 | 7 | 10 | 9 | 9.9 | 10 | 1650 torque, 11 hours, Problems controlling to Canadian conditions with current valve setup (3 nozzles @ 100% on) |
| 152-1 | CANADIAN | GGAD12063110037 | B | | NONLUBRITED | 20120925 | 7 | 10 | 10 | 9.9 | 10 | 7 | 10 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. 11 hr test length, 1650 lb-ft torque. |
| 152-1 | CANADIAN | GGAD12063113138 | G | | NONLUBRITED | 20121009 | 7 | 9 | 8 | 9.9 | 10 | 8 | 10 | 9 | 9.9 | 10 | 1650 torque, 11 hours, Problems controlling to Canadian conditions with current valve setup (3 nozzles @ 100% on) |
| 155 | STANDARD | GGAD12063111331 | G | | NONLUBRITED | 20120922 | 7 | 8 | 9 | 9.9 | 10 | 7 | 9 | 9 | 9.9 | 10 | 1650 torque, 11 hours |
| 155 | STANDARD | GGAD12063094334 | B | | NONLUBRITED | 20120925 | 7 | 7 | 9 | 9.9 | 10 | 7 | 9 | 10 | 9.9 | 10 | AAM Zeta axle - Batch 2012. 11 hr test length, 1650 lb-ft torque. |
| 1-A | STANDARD | GGAD12063092127 | A | 5 | NONLUBRITED | 20120926 | 6 | 5 | 5 | 10 | 10 | 7 | 7 | 9 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. 11 hrs. |
| 1-A | STANDARD | GGAD12063111115 | G | | NONLUBRITED | 20121006 | 7 | 7 | 8 | 9.9 | 10 | 7 | 7 | 8 | 9.9 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. 11 hrs. |
| 1-A | CANADIAN | GGAD12063093512 | A | 5 | NONLUBRITED | 20121130 | 7 | 9 | 9 | 9.9 | 10 | 8 | 9 | 9 | 9.9 | 10 | Ran Lubrizol recommended test conditions except ran oil set points as L-37 Canadian. Used Oil 1-A. Non-lubricated AAM Zeta axle - Batch 2012. |
| 1-B | STANDARD | GGAD12063093822 | A | 5 | NONLUBRITED | 20120927 | 6 | 6 | 7 | 9.9 | 10 | 6 | 7 | 10 | 10 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. 11 hrs. |
| 1-B | STANDARD | GGAD12063103742 | G | | NONLUBRITED | 20121005 | 5 | 4 | 9 | 9.7 | 10 | 6 | 5 | 9 | 9.7 | 10 | AAM Zeta axle - Batch 2012. Conducted per Lubrizol proposed procedure. 11 hrs. |
| 1-B | CANADIAN | GGAD12063093242 | A | 5 | NONLUBRITED | 20121214 | 7 | 9 | 9 | 9.9 | 10 | 7 | 9 | 9 | 9.9 | 10 | Ran Lubrizol recommended test conditions except ran oil set points as L-37 Canadian. Used Oil 1-B. Non-lubricated AAM Zeta axle - Batch 2012. |

| Industry Oil Code (TMC Oil) | Test Version (Standard or Canadian) | Hardware Identification | Lab | Stand | Test Hardware | EOT Date | Pinion Rating | | | | | Ring Rating | | | | | Free-form Comment |
|---|-------------------------------------|-------------------------|-----|-------|---------------|----------|---------------|----------|----------|---------|---------|-------------|----------|------|------|------|--------------------------------------|
| | | | | | | | IND | TVERSION | SERIALNO | LTMSLAB | LTMSAPP | TESTHARD | LTMSDATE | WEAR | RIDG | RIPP | |
| 11 hour, 1650 lb-ft torque, Overfilled (1450ml) | | | | | | | | | | | | | | | | | |
| 1-A | STANDARD | GGAD12063091633 | G | | NONLUBRITED | 20121126 | 7 | 9 | 9 | 9.9 | 10 | 7 | 9 | 10 | 9.9 | 10 | 1650 torque, 11 hours - 1450 ml fill |
| 1-B | STANDARD | N/A | G | | NONLUBRITED | 20121128 | 7 | 10 | 9 | 9.9 | 10 | 7 | 10 | 9 | 9.9 | 10 | 1650 torque, 11 hours - 1450 ml fill |
| 134 | STANDARD | N/A | G | | NONLUBRITED | 20121206 | 7 | 8 | 8 | 9.9 | 10 | 7 | 10 | 9 | 9.9 | 10 | 1650 torque, 11 hours - 1450 ml fill |
| 11 hour, 1650 lb-ft torque, Highly Modified Break-In | | | | | | | | | | | | | | | | | |
| 1-B | STANDARD | | A | | NONLUBRITED | 20130403 | 7 | 9 | 9 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | Highly Modified Break-In Run |
| 134 | STANDARD | GGAD12063112 | B | | NONLUBRITED | 20130411 | 6 | 5 | 10 | 9.9 | 10 | 7 | 6 | 10 | 9.9 | 10 | Highly Modified Break-In Run |