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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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June 14th, 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:

- **June 5th , 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 Next Generation Hardware Task Force Meeting
Teleconference
June 5th, 2013

Attendees:

Voting Members in **BOLD**

Gottwald, Thomas – Afton Chemical

Marsh, Greg – American Axle & Manufacturing

Parke, Scott – ASTM TMC

Guzikowski, Joe – Dana

Trader, Angela – Intertek

Smith, Dale - Intertek

Pregaman, Chris – Lubrizol

Umerley, Matt – Lubrizol

Gropp, Jerry – Lubrizol

Bubonic, Brad – Lubrizol

Oesterle, Karen – Lubrizol

Sherick, Pete - Lubrizol

McGlone, Bruce – Meritor

Kong, Sam – Southwest Research Institute

Koehler, Brian – Southwest Research Institute

The meeting was called to order at 10:00 am EST.

1.0 Agenda Review

The agenda was reviewed

2.0 Review & Discuss Test Progress

C. Pregaman and T. Gottwald both reviewed the matrix proposals supplied by their statisticians.

The group discussed these proposals at a high level. T. Gottwald asked the larger question of, how do we decide if a fail is a good enough fail? Is one failing parameter enough?

P. Sherick requested 1-B be run under the latest conditions first to verify we still have separation, then running a set of tests to verify the current conditions would be a good place to start. His evaluation of the data shows that load has an effect on the results, test length does not appear to have a strong correlation to the test results.

J. Guzikowski feels that ridging and rippling are key parameters to look at, and failing only one parameter may be acceptable. Both parameters are related to lube performance. B. McGlone agrees on this topic.

The group discussed the concept of eliminating some parameters, but the overall view was that this was not a desired move. J. Guzikowski and D. Smith agree that all parameters should remain in the test.

J. Gropp requested we have a clear definition of what we're looking for before running any tests in a proposed matrix. The group agreed with this request.

Motion: Develop a test matrix targeting 12-14 tests running the following test conditions.
16.5 hour / 1650 ft-lbs / Modified break in (20/60 min) / Nonlubrited / 950 ml / TMC 155, TMC 134, 1-B
(demonstration oils)

1st T. Gottwald 2nd C. Prengaman

Approved by Voice vote, 1 abstention – S. Parke

*This matrix was outlined and distributed following the teleconference and is attached in the 6/12/13 meeting minutes.

3.0 New Business

4.0 Adjournment

Motion to adjourn .

Respectfully Submitted
Chris Prengaman

L-37-1 Task Force Meeting

June 5th, 2013
10:00 am –11:00 am EST
Teleconference

Agenda

- 1) Call to order/Agenda review
- 2) Review & Discuss Test Progress
- 3) Next Steps
- 4) New business
- 5) Adjournment

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

Afton L-37-1 Matrix Proposal 6/5/13

	L37-1 test conditions #1		L37-1 test conditions #2		L37-1 test conditions #3		L37-1 test conditions #4		L37-1 test conditions #5		L37-1 test conditions #6	
	Break-in	Test	Break-in	Test	Break-in	Test	Break-in	Test	Break-in	Test	Break-in	Test
Pinion Torque (Nm)	294.4	1295.2	294.4	1295.2	294.4	1295.2	294.4	1295.2	294.4	1295.2	294.4	1295.2
Pinion speed (rpm)	2356	428.4	2356	428.4	2356	428.4	2356	428.4	2356	428.4	2356	428.4
Temperature (°F)	297	275	297	275	297	275	220	200	220	200	297	275
Time	65 min	16.5 hr	65 min	11 hr	65 min	11 hr	65 min	11 hr	65 min	11 hr	65 min	16.5 hr
Oil Level (mL)	950	950	950	950	1450	1450	950	950	1450	1450	950	950
	LZ proposed conditions: These are what we started with		First Iteration: Reduced time		Second Iteration: Intertek larger fill		Second Iteration: SwRI CAN conditions		Third Iteration: SwRI CAN conditions, larger fill		Fourth Iteration: Highly Modified Break In → 20 min ramp for load to break-in → 1 hr ramp for load to test	

Factor	Low	High
Break-in	Std	Highly Modified
Oil Level	950	1450
Time	11	16.5
Torque	1350	1650

Afton L-37-1 Matrix Proposal 6/5/13

Std	Run	Factor 1 A:BreakIn	Factor 2 B:Oil Level	Factor 3 C:Time	Factor 4 D:Torque
	7	1 Standard	1450	16.5	1350
	4	2 HighlyModified	1450	11	1350
	1	3 Standard	950	11	1350
	3	4 Standard	1450	11	1650
	5	5 Standard	950	16.5	1650
	2	6 HighlyModified	950	11	1650
	8	7 HighlyModified	1450	16.5	1650
	6	8 HighlyModified	950	16.5	1350

Afton L-37-1 Matrix Proposal 6/5/13

Std	Run	Factor 1 A:BreakIn	Factor 2 B:Oil Level	Factor 3 C:Time	Factor 4 D:Torque	Response 1 R1
	11	1 Standard	1450	11	1650	
	8	2 HighlyModified	1450	16.5	1350	
	5	3 Standard	950	16.5	1350	
	14	4 HighlyModified	950	16.5	1650	
	16	5 HighlyModified	1450	16.5	1650	
	13	6 Standard	950	16.5	1650	
	1	7 Standard	950	11	1350	
	15	8 Standard	1450	16.5	1650	
	2	9 HighlyModified	950	11	1350	
	10	10 HighlyModified	950	11	1650	
	3	11 Standard	1450	11	1350	
	6	12 HighlyModified	950	16.5	1350	
	12	13 HighlyModified	1450	11	1650	
	7	14 Standard	1450	16.5	1350	
	4	15 HighlyModified	1450	11	1350	
	9	16 Standard	950	11	1650	

Afton L-37-1 Matrix Proposal 6/5/13

Run	Factor 1 A:BreakIn	Factor 2 B:Oil Level	Factor 3 C:Time	Factor 4 D:Torque	Response 1 R1
1	HighlyModified	1450	16.5	1350	
2	HighlyModified	950	16.5	1650	
3	HighlyModified	1450	16.5	1650	
4	HighlyModified	950	11	1350	
5	HighlyModified	950	11	1650	
6	HighlyModified	950	16.5	1350	
7	HighlyModified	1450	11	1650	
8	HighlyModified	1450	11	1350	

Lubrizol L-37-1 Test Matrix Proposal 6/5/13

Current Results

			Labs			
			A	B	D	G
11.5 Modified Fill Volume In	16.5 Modified Break- In	TMC 134				X
		TMC 155				
	1-B				X	
	TMC 134		X			
	TMC 155					
	1-B	X				
	TMC 134			XX		
	TMC 155					
	1-B					

Proposed Test Plan

			Labs			
			A	B	D	G
16.5 Modified Break- In	16.5 Modified Break- In	TMC 134		+	XX	
		TMC 155	+	+	+	+
		1-B	+	+	+	+

This would establish a "baseline" and then a matrix of different test options from there.

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	GGAD1206311115	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
							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
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
16.5 hour, 1650 lb-ft torque, Highly Modified Break-In																	
134	STANDARD	GGAD12063111151	D		NONLUBRITED	20130511	7	6	9	9.9	10	7	7	10	10	10	Highly Modified Break-In Run
134	STANDARD	GGAD12063111151	D		NONLUBRITED	20130514	6	6	9	9.9	10	7	7	10	10	10	Highly Modified Break-In Run

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.