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Feb. 11th, 2013

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ASTM D02.B0.03 L-42 Surveillance Panel
Members and Guests:

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

Feb. 6th, 2013 Surveillance Panel Meeting (Automation Alley – Troy, MI)

Please direct any corrections or comments to my attention.

Very Respectfully,

Thomas Gottwald, Chairman
L-42 Surveillance Panel

L-42 Surveillance Panel Meeting Minutes

Automation Alley

Troy, MI

Nov. 7, 2012

Attendees: voting members in **bold**

B. Koehler (SwRI)	K. Hobson (Afton)	B. McGlone (Meritor)	T. Muransky (Meritor)
D. Smith (Intertek)	L. Hamilton (LZ)	B. Bubonic (LZ)	M. Keisler (Afton)
S. Parke (TMC)	W. Venhoff (LZ)	B. Dwornick (US Army)	C. Koglin (Afton)
T. Gottwald (Afton/C)	A. Trader (Intertek)	A. Comfort (US Army)	C. Prengaman (LZ)
J. Dharte (AAM)	B. Kearney (Afton)	K. Zreik (GM)	T. Marougy (Eaton)
D. Bell (Afton)	R. Banas (XOM)		T. Barrera (Intertek)
J. Gropp (LZ)	M. Umerly (LZ)		

Call to Order

The meeting PowerPoint presentation is attached.

Review of Membership

The sign-in sheet is attached and up-to-date.

Review of Agenda

The meeting agenda is attached (slide 2 of attached PowerPoint presentation).

Approval of Meeting Minutes

Meeting minutes from the Nov. 7, 2012 L-42 Surveillance Panel meeting, held at Automation Alley in Troy, MI.

Task Force meeting minutes from teleconferences on Nov. 15, 2012 and Dec. 4, 2012.

MOTION by Mr. Koehler, second by Mr. Hamilton, to approve the meeting minutes as presented. Motion passed unanimously (verbal).

Hardware Update

The hardware update consisted of a summary of the validation matrix process:

This information can be found in the Nov. 15, 2012 TF call meeting minutes [[20121115 SP.pdf](#)]

Testing was delayed due to an error in the builds of the pilot batch axles:

This information can be found in the Dec. 4, 2012 TF call meeting minutes [[20121204 SP.pdf](#)]

Further investigation revealed that the material used in the production pinions (pinion batch C1L691, 5424 steel) was what caused the drive-side scoring problems in the pilot batch.

The Task Force reached an agreement with supplier to reimburse the labs for the incorrectly built axles and also any properly built axles run using settings from the pilot batch. [Determined in a call on Dec. 11, 2012 with Dana Ft. Wayne]. The distribution for reimbursement qualifying axles is: 7 Afton, 6 Lubrizol, and 9 Southwest Research Institute. Dana did not require labs to return the used gear sets. Affected labs are working independently with Dana Ft. Wayne to complete the reimbursement process.

All validation matrix testing was completed during the week of Jan. 28, 2013.

Hardware Approval

The Surveillance Panel reviewed the completed validation matrix results (spreadsheet attached; summary found on slide 6 of attached PowerPoint presentation). There was discussion that the results may have too much variability from run to run, however when comparing current data [C1L680-P8T025A] set to the validation data from the previous industry order [C1L446-P8L119] (spreadsheet attached) this was no longer a concern. Further discussion about test variability revealed that the axle is not the only variable and that it would be nice to have no axle variability or stand setup variability. The Surveillance Panel took all information into consideration and ultimately agreed that the data was acceptable.

MOTION by Mr. Gottwald, second by Mr. Koehler, to approve the axles for test use; ring/pinion numbers C1L680-P8T025A.

Motion passed unanimously (verbal).

MOTION by Mr. Koehler, second by Mr. Hamilton, for approved axles C1L680-P8T025A run on TMC oil 116-1, the EOT pinion rating target will be the same target and standard deviation used for the previous industry hardware C1L446-P8L119. This target is 23% pinion scoring with a standard deviation of 5.49, creating a band of 14%-32% pinion scoring.

Motion passed unanimously (verbal).

MOTION by Mr. Koehler, second by Mr. Smith, to allow the information runs, completed in the hardware validation matrix, if valid and meeting procedural specifications, to be used to retroactively

generate a new calibration/reference period. A onetime allowance will also be made for this reference period timing to start on Feb. 6, 2013.

Motion passed unanimously (verbal).

L-42-1 Preliminary Discussions

To properly begin the L-42-1 discussions, the Surveillance Panel was briefed with a summary of the current L-42 test configuration (as found on slide 7 of the attached PowerPoint presentation). The labs expressed concern that the Dana model 44 gear geometry is outdated and (as noted in the hardware approval discussion) that the current stand configuration and hardware create too much variability within the test, therefore there is a need to update the stand configuration and test hardware.

NOTE: As per the question of why are the gears in the Dana model 44 not tempered, Mr. Smith indicated that at one point investigation revealed that tempered gears may not score appropriately.

The Chairman indicated that there are three possible options for L-42-1. (All options can be found in the attached PowerPoint presentation, slides 8-11.) All options were briefly discussed; there are pros and cons to all three options. The Surveillance Panel agreed that the most important need for the L-42-1 configuration is that for custom made test specific hardware (i.e. need to move away from modified production parts used for testing). Members also agreed that the best long term approach would be Option 3, if properly investigated and with 100% confidence that a bench-type stand could run L-42 gears and could create comparable (no change in severity) results.

Further investigation and L-42-1 talks will be handled by an L-42-1 development task group.

ACTION: The Chairman will call for volunteers from the Panel to make up this working group and set up a meeting/call for the group.

Reference Oil 116-1 Replacement

Time did not allow for any replacement oil discussions/review during the meeting.

ACTION: The Chairman will hold a Surveillance Panel call/meeting to discuss this at a later time. (Chairman to keep in contact with TMC to track 116-1 supply and to determine urgency).

New/Open Issues

No new/open issues.

Adjournment

Motion to adjourn by Mr. Smith, second by Mr. Koehler.

Motion passed unanimously (verbal).

Respectfully submitted,

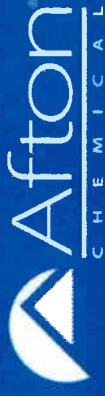
A handwritten signature in black ink, appearing to read 'T. Gottwald', written in a cursive style.

Thomas Gottwald

L-42 Surveillance Panel Chairman

Validation Matrix for L-42 Hardware
C1L680-P8T025A

Lab	Run #	CMIR	TMC Oil Code	EOT Date	Coast Side Torque (lbf-ft)			Drive Side Scoring (%)			Coast Side Scoring (%)			Comments
					Shock 1 Avg.	Shock 2 Avg.	Shock 3 Avg.	EOT Pinion	EOT Ring	EOT Ring	EOT Pinion	EOT Ring	EOT Ring	
A	03A-0091	87656	116-1	12/21/2012	-84.3	-331.9		0	0	0	16	11		
A	03A-0093	87657	116-1	1/8/2013	-89.1	-343.2		0	0	0	20	14		
A	03A-0094	88341	116-1	1/9/2013	-82.2	-358.4		0	0	0	27	17		
B	286-655	89657	116-1	1/29/2013	-88.6	-420.3		0	0	0	26	16		
B	286-656	89658	116-1	1/30/2013	-97.4	-387.9		0	0	0	16	9		
B	286-658	89659	116-1	2/1/2013	-90.8	-404.2		0	0	0	25	18	pinion has 13% primary and 12% secondary score	
D	2A-900	88630	116-1	12/11/2012	-78.2	-355.6		0	0	0	21	10		
D	2A-902	88631	116-1	12/13/2012	-76.8	-348.9		0	0	0	21	11		
D	2A-903	88632	116-1	12/13/2012	-86.3	-349.7		0	0	0	19	10		
A	03A-0092	88361	113	1/4/2013	-86.3	-337.4		0	0	0	56	54	9% polishing on the coast side pinion, 1% polishing on the coast side ring.	
B	286-657	87866	113	1/30/2013	-91.3	-392.3		0	0	0	67	49		
D	2A-901	88639	113	12/12/2012	-85.0	-350.8		0	0	0	53	34		
AVG Shocks					-86.4	-365.1		113 AVG			59	46		
								116-1 AVG			21	13		



L-42 Surveillance Panel Meeting

Automation Alley

Troy, MI

February 6, 2013

10am-11am EST

Passion for Solutions™

Agenda

- ▲ Call to Order
- ▲ Membership/Agenda Review
- ▲ Approval of Meeting Minutes
- ▲ Hardware Update
 - ▲ Approval matrix and drive-side scoring
- ▲ L-42-1 Preliminary Discussions
- ▲ Reference oil 116-1 replacement (TMC)
- ▲ New/Open Issues
- ▲ Adjournment



Passion for Solutions™

Approval of Meeting Minutes

SP Meeting Minutes

- ▲ Nov 7, 2012 – Troy, MI
- Posted to TMC website on 12/06/12
- File name “[20121107 SP.pdf](#)”

TF Meeting Minutes

- ▲ Nov 15, 2012 – Call
- Posted to TMC website on 12/04/12
- File name “[20121115 SP.pdf](#)”
- ▲ Dec 4, 2012 – Call
- Posted to TMC website on 12/04/12
- File name “[20121204 SP.pdf](#)”



Passion for Solutions™

Hardware Update

Proposed Approval Matrix

- ▶ 3 pass runs (TMC oil 116-1)
- ▶ 1 discrimination run (TMC oil 113)

Testing Window

- ▶ OK to start validation runs as of Nov. 15, 2013, determined via TF call



Passion for Solutions™

Hardware Update

Testing delayed due to heat code differences

- ▶ Wrong pinions used for Pilot Batch [C1L691]
- ▶ Summary found on TMC website: "[20121204 SP.pdf](#)"
- ▶ Drive-side scoring eliminated with proper pinions [C1L680]

C1L691 Resolution

- ▶ Task Force reached agreement for supplier on reimbursement for parts (22 axles); call on Dec. 11, 2012 with Dana Ft. Wayne
 - 7 Afton, 6 LZ, 9 SwRI
- ▶ Return of used gear sets is not required
- ▶ Affected labs working independently to complete reimbursement

Completed Testing week of Jan. 28, 2013



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Validation Matrix Data

6

Attached Spreadsheet

Summary for C1L680-P8T025A hardware

- ▲ TMC 116-1: Average scoring of 21% pinion, 13% ring
- ▲ TMC 113: Average scoring of 59% pinion, 46% ring

Currently approved C1L446-P8L119 hardware

- ▲ TMC 116/116-1: Average scoring of 23% pinion, 15% ring
- ▲ TMC 113: Average scoring of 46% pinion, 44% ring



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Current Test to Next Generation (L-42-1)

Current test: Full scale gear test stand

- ▶ Engine & large inertia dynamometers
- ▶ Dana model 44 axle housing
 - Production housing, axle tubes and spring pad placement not ideal for test stand use
 - Specifications for automotive use not always ideal for consistent testing use (carrier tolerances, R/P offset tolerances)

Gear design

- ▶ Coast side design circa 1953 (per Kenny Miller)
- ▶ Drive side design updated 2006 (or 2008) to reduce drive side scoring (Kenny Miller)
- ▶ Ring/Pinion **not tempered** during HT – WHY?
- ▶ Ring/Pinion not lubricated

Summary

- ▶ Very specific gear geometry with **custom manufacturing**

L-42-1 Options

 **Note: Will solicit L-42-1 Task Force members via email following today's meeting**

3 Possible Paths

- ▶ Option 1: Current setup w/ updated OEM production hardware
- ▶ Option 2: Electric full scale stand w/ custom test parts and gear box
- ▶ Option 3: Bench test rig w/ custom gears



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Option 1: Continue current stand & style axle

- ▶ Engine w/ large inertia dynos
- ▶ Continue use of OEM manufactured R/P and housing-TBD
- ▶ **Advantage**
 - ▶ Test method established
- ▶ **Disadvantage**
 - ▶ Continue to ask OEM to make custom made gear with production equipment and process
 - ▶ Resource heavily loaded by all parties

Option 2: Full scale electric stand, custom gears and gear box

- ▶ Swap electric motor for gas fired engine
- ▶ Use custom gear box and custom R/P
- ▶ **Advantage:**
 - ▶ Electric motor consistency and reduced energy cost
 - ▶ Testing, replacing, and storing ring/pinion only
 - ▶ Custom parts for ASTM
 - ▶ Reduces manufacturing issues that effect consistency of test
 - Spring pad placement, carrier offset
- ▶ **Disadvantage**
 - ▶ Electric motor cost/control strategy
 - ▶ Development time and cost

Option 3: Bench/hybrid type rig

Strama/FZG style Hypoid rig

- ▶ Similar to FZG spur gear rig

Advantage

- ▶ Testing, replacing, and storing ring/pinion only
- ▶ R/P flexibility (Strama, OEM, custom)
- ▶ Reduces manufacturing issues that effect consistency of test
 - Spring pad placement, carrier offset
- ▶ Opens door for future L37 style durability testing
- ▶ Best long term solution?

Disadvantage

- ▶ High initial rig cost
- ▶ Development time and cost



Reference Oil 116-1 Replacement

-  Review of Data for Submitted Oil
-  Correction Factor vs. Acceptance Bands



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New/Open Issues

 Anything?







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Thanks!



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L-42 Surveillance Panel Membership/Attendance
Automation Alley - Troy, MI
February 6, 2013




Initials	Name	Voting Non-Voting	Company Name Company Address	Phone:	Contact information
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L-42 Surveillance Panel Membership/Attendance
Automation Alley - Troy, MI
February 6, 2013

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Automation Alley - Troy, MI
February 6, 2013**

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February 6, 2013

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