

Report of Meeting
L-37-1 Surveillance Panel Meeting

February 13th, 2019

Attendees:

SwRI -	Stevens
Lubrizol -	Venhoff , Drlja, Foecking, Bolaney
Afton -	Donovan , Bell, Kearney
Intertek -	Smith , Lange
TMC -	Clark, Beck
ExxonMobil -	Banas , Kanga
AAM -	Muransky
BASF -	Goyal
Dana -	Zyski
Gleason -	Dennis (phone), Heim (phone)
Army-	Comfort , Sattler

Voting Members in **BOLD**

The meeting was called to order at 1:00PM EST.

1.0 Membership Review

Motion #1 → W. Venhoff 1st/2nd A. Goyal to approve Troy Muransky as replacement for John Dharte as voting member for L-37/L-37-1 surveillance panel. Motion passed unanimously, 10-0-0 (for-against-abstain).

2.0 Gleason New Hardware Update

All four labs have received Gleason non-lubrited batch 06-2018 (55 gear sets/lab) as of the meeting date. It was recommended that each lab inventory the hardware they received and document the ring and pinion heat treat batch identifiers for each matched gear set. The initial hardware qualification matrix will be as follows:

- Each lab will run one TMC 134/134-1, one TMC 152-2 & one TMC 155-1 run. If all three runs come within current reference acceptance limits, 3rd run can be used as stand calibration

Regarding the 36-piece, non-lubrited experimental hardware batch (9 gear sets/lab), Gleason indicated those shipped week of 02/10/19 and that labs should be receiving if they have not already done so. Three processing options will be evaluated – case depth shift to 0.055” – 0.065” (option #1), 120 grit grinding wheel (option #2) & case depth shift + 120 grit grinding wheel (option #3). Three gear sets on each option were shipped to all four labs. The initial evaluation matrix will be as follows:

- Each lab to run one gear set from all three options, all on TMC152-2 @ Canadian test conditions
- Review/resume testing matrix on remaining experimental gear sets, again running TMC152-2 @ Canadian test conditions for all tests

B. Foecking distributed sectioned L-37-1 pinions distributing varying degrees of adhesive wear to all the labs for use as rating aides. This was an action item from the recent gear rating workshop.

3.0 Gleason Lubrited Standard Approval Matrix

The group reviewed and further discussed the current test results as part of the Gleason lubrited approval matrix (no changes from November 2018 meeting). Additional approval matrix tests agreed on are as follows:

- Lab D to run one TMC134, one TMC134-1, two TMC152-2 & two TMC155-1 runs
- Potential for Lab D to share TMC134 with lab G for repeat run at lab G
- Potential for lab B to run TMC134-1 & repeat TMC155-1

4.0 Meeting Minutes Approval

Motion #2 → D. Smith 1st/2nd M. Stevens to approve November 7, 2018 meeting minutes as currently written. Motion passed unanimously, 10-0-0 (for-against-abstain).

5.0 D8165 Procedure Discussion

The focus of this discussion was on gear test phase section 10.4 and appendix X1. The following motions were made:

Motion #3 → W. Venhoff 1st/2nd D. Smith for section 10.4.2, change the wording of the second sentence to read “Hold at this condition until the axle lubricant temperature is greater than or equal to 79°C” and for section 10.4.2.2, change the wording at the beginning of that sentence to read “Once the axle lubricant temperature is greater than or equal to 79°C, smoothly apply dynamometer load...” Motion passed unanimously, 10-0-0 (for-against-abstain).

Motion #4 → W. Venhoff 1st/2nd E. Donovan to remove section X1.1.1. Motion passed unanimously, 10-0-0 (for-against-abstain).

6.0 D6121 Procedure Discussion

The focus of this discussion was regarding the term “the builder” used in sections 8.2.1.1, 8.2.1.2 & 8.2.1.3. The following motion was made:

Motion #5 → W. Venhoff 1st/2nd E. Donovan to replace the term “the builder” with the term “the lab” in sections 8.2.1.1, 8.2.1.2 & 8.2.1.3. Motion passed unanimously, 10-0-0 (for-against-abstain).

7.0 Long Term Rebuild Solution

Intertek advised that they will soon be running TMC155-1 and TMC134-1 on Gleason non-lubrited hardware in the Strange axle housing as an initial validation of the aftermarket housing & setup.

It was also agreed that the current draft of the axle build procedure will be circulated to all labs for review prior to the May 2019 meeting in hopes of finalizing that document.

8.0 New Business

This discussion centered around Dana hardware approval on the electric rig. Given the fact that we have essentially deemed D6121 (Gasoline engine rig running Dana hardware) equivalent to D8165 (electric motor rig running Gleason hardware), we agreed that a “spot check” would suffice to formally approve Dana hardware for use in the electric motor rig. The following motion was made:

Motion #6 → W. Venhoff 1st/2nd E. Donovan for labs B & D to each run TMC152-2 & TMC134-1 on Dana lubrited hardware on the electric motor rig. Pending acceptable results of these four donated tests, the Dana hardware (both lubrited and non-lubrited) would be approved for industry testing on the electric motor rig. Motion passed unanimously, 10-0-0 (for-against-abstain).

9.0 Adjournment

Meeting Adjourned at 3:00pm EST

Motion #7 → M. Stevens 1st /2nd D. Smith to adjourn. Motion passed unanimously, 10-0-0 (Yes-No-Abstain).

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'W. Venhoff', written in a cursive style.

Wes Venhoff (for Robert Slocum)
L-37-1 Surveillance Panel Chairman



D02.B0.03

L-37-1 Surveillance Panel Meeting

02/13/2019

1:00 pm – 3:00 pm

Warrendale, PA

Wes Venhoff (for Robert Slocum)

Agenda

- Call to Order/Agenda Review
- Membership Review
- Gleason New Hardware
- Gleason Lubrited Standard Approval Matrix
- Meeting Minutes Approval
- D8165 Procedure Discussion
- D6121 Procedure Discussion
- Long Term Rebuild Solutions
- New Business
- Adjourn

Membership Review

Rob Banas	ExxonMobil
Allen Comfort	US Army
John Dharte	AAM
Eric Donovan	Afton
Arjun Goyal	BASF
Amy Zyski	Dana
Dylan Beck	TMC
Jule Rucker	Meritor
Dale Smith	Intertek
Wes Venhoff	Lubrizol
Mary Stevens	SwRI
Kaled Zreik	GM

Total Voting Members = 12

Gleason New Hardware

- 55 sets/lab – Received at all labs
 - Approval matrix discussion
- 9 experimental gear sets per lab – shipped this week
 - TMC 152-2 reference oil for all runs?
 - Hardware inspected by multiple raters
 - Grind temper



Gleason Lubrited Standard Matrix

LTMSLA	IND	PINBA	RINGBA	WEAR	RIDG	RIPP	SPIT	WEAR	RIDG	RIPPF	SPITF
A	134	2135610	2135607	6	4	9	9.6	6	5	9	9.6
B	134	2115428	2115429	6	4	7	9.9	8	7	10	9.9
G	134	2144989	2144988	7	4	6	9.9	7	7	9	9.9
A	134	2135609	2135606	7	9	7	9.9	8	10	10	9.9
B	134	2115428	2115429	7	5	7	9.9	9	10	10	9.9
G	134-1	2144989	2144988	8	10	9	9.9	8	10	9	9.9
G	134-1	2144989	2144988	8	9	9	9.9	8	9	10	9.9
G	134-1	2144989	2144988	8	9	9	9.9	9	9	9	9.9
A	152-2	2315610	2135607	8	10	9	9.9	8	10	10	9.9
B	152-2	2115428	2115429	9	10	10	8	9	10	10	9.9
B	152-2	2115438	2115429	9	10	10	9.9	9	10	10	9.9
G	152-2	2144989	2144988	8	10	9	9.9	9	10	9	9.9
A	152-2	2135609	2135606	8	10	9	9.9	8	10	9	9.9
G	152-2	2144989	214988	8	9	9	9.9	8	9	9	9.9
A	155-1	2135609	2135606	8	10	9	9.9	8	10	9	9.9
A	155-1	213609	2135606	8	10	9	9.9	8	10	9	9.9
B	155-1	2115428	2115429	9	9	9	9.9	9	10	10	9.9
B	155-1	2116441	2116444	8	10	7	9.9	9	10	10	9.9
G	155-1	2144989	2144989	8	7	9	9.9	8	8	9	9.9
G	155-1	2144989	2116446	8	9	9	7	8	9	9	9.9
G	155-1	2144989	2144988	7	10	9	9.9	8	10	10	9.9



Meeting Minutes Approval

- November 7th, 2018

D8165 Discussion

- Gear Cond, Phase sec. 10.3

10.3.1 Set the temperature control to maintain a lubricant temperature of $147^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

10.3.2 Smoothly ramp the input motor to (440 ± 5) wheel r/min and apply dynamometer load to achieve a torque of $535\text{N}\cdot\text{m} \pm 20\text{N}\cdot\text{m}$ on each wheel end.

10.3.2.1 The time required to accelerate to the test conditions of 440wheel r/min and 535N·m shall not exceed 5min.

10.3.3 When the required speed and torque conditions are reached record the time as start of the test.

10.3.4 After reaching speed and torque conditions, run the test for $100\text{min} \pm 1\text{min}$.

10.3.5 To ensure the test conditions are accurately maintained, record speed, torque, and lubricant temperature at least once every minute.

10.3.6 After $100\text{min} \pm 1\text{min}$:

10.3.6.1 Record end time, speed, torque, and lubricant temperature.

10.3.6.2 Start the torque and linear speed ramp-down, at the same time setting the axle lubricant temperature controller to a set point of $135^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

10.3.6.3 Ramp the input motor to 0 r/min and ensure the axles stop turning. The time required to decelerate to 0r/min shall not exceed 5min.

10.3.6.4 Shut off the cooling water when the axle lubricant temperature drops below the set point. Do not use cooling water after the axle is stopped.

10.3.7 If the test is stopped for any reason (for example, power outage or maintenance), restart the test as detailed in [10.5.1](#). Count this stoppage as one of the allowed shutdowns during the test. Do not calculate deviation percent values or report out of limit operational values until test conditions are again achieved. If the test is stopped at the start of the conditioning phase, before speed and torque conditions are reached, do not count the stoppage as one of the allowed shutdowns.

D8165 Discussion (continued)

- Gear Test Phase sec. 10.4

10.4.1 Ensure that the temperature control is still set to maintain a lubricant temperature of $135^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

NOTE 1: The transition from the end of the conditioning phase (see [10.3.6](#)) to the start of the gear test phase is approximately 10min.

10.4.2 Smoothly ramp the input motor to (80 ± 2) wheel r/min and apply dynamometer torque to achieve a torque of $1415\text{N}\cdot\text{m} \pm 47\text{N}\cdot\text{m}$ on each wheel end. Hold at this condition until the axle lubricant temperature reaches $79^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

10.4.2.1 The time required to accelerate to the test conditions of 80wheel r/min and 1415N·m shall not exceed 5min.

10.4.2.2 Once the axle lubricant temperature reaches $79^{\circ}\text{C} \pm 2^{\circ}\text{C}$ smoothly apply dynamometer load to achieve a torque load of $2359\text{N}\cdot\text{m} \pm 47\text{N}\cdot\text{m}$ on each wheel end.

10.4.3 When required speed, torque, and temperature conditions are reached, record the time as start of the test phase.

10.4.4 After reaching speed, torque, and temperature conditions, run the test for $24\text{h} \pm 0.2\text{h}$.

10.4.5 To ensure the test conditions are accurately maintained, record speed, torque, and temperature at least once every minute.

10.4.6 At the end of 24h, ramp the input motor to 0r/min, ensure the axles stop turning and record time and lubricant temperature.

10.4.7 Disconnect the drive shaft and axle shafts from the dynamometers, and remove the test unit from the test stand.

10.4.8 If the test is stopped for any reason (for example, power outage or maintenance), restart the test as detailed in [10.5.1](#). Count this stoppage as one of the allowed shutdowns during the test. Do not calculate deviation percent values or report out of limit operational values until test conditions are again achieved. If the test is stopped at the start of the test phase, before test conditions are reached (speed, load, and axle temperature), do not count the stoppage as one of the allowed shutdowns.

D8165 Discussion (continued)

- Restart sec. 10.5

10.5 **Unscheduled Downtime**—An unscheduled downtime event is defined as any time the gears stop turning during the steady-state gear conditioning or steady-state gear test phases after test conditions are achieved.

10.5.1 **Restart After Unscheduled Downtime**—Restart the test as outlined in [10.5.1.1](#) through [10.5.1.4](#) any time there is an unscheduled downtime event.

10.5.1.1 Set the temperature control to maintain the lubricant temperature at the set point condition when the shutdown occurred.

10.5.1.2 Smoothly ramp the input motor to the wheel r/min set point condition at the time of the shutdown. The time required to accelerate to the r/min set point shall not exceed 5min.

10.5.1.3 If the restart occurs following a shutdown during the test phase, apply a dynamometer load on each wheel to achieve a torque value of $1415N\cdot m \pm 47N\cdot m$ until the lubricant temperature reaches $79^{\circ}C \pm 2^{\circ}C$.

10.5.1.4 If the restart occurs following a shutdown during the conditioning phase, follow [10.3.1](#) through [10.3.3](#) to restart the test.

10.5.1.5 Once lubricant temperature reaches $79^{\circ}C \pm 2^{\circ}C$, smoothly apply dynamometer torque on each wheel to achieve the torque set point condition at the time of the shutdown.

D8165 Discussion (continued)

- Canadian conditions - X.1

X1.1 General.

X1.1.1 The Gleason Works gearset hardware has not yet been approved for the Canadian test.

X1.1.2 The Canadian test is typically used for evaluation of SAE 75W viscosity-grade lubricants.

X1.1.3 Sections [6](#) to [12](#) apply to the Canadian test except as otherwise stated in this appendix.

X1.2 Calibration Test Acceptance.

X1.2.1 Calibrate, as described in Section [9](#), any stand intended to run a Canadian test independently of any standard test calibration.

X1.3 Apparatus.

X1.3.1 Use the apparatus described in [6.2](#) and [6.3](#) except as follows:

X1.3.2 Use five spray nozzles to distribute water over the cover and axle housing, as shown in [Fig. A7.1](#), actuating the water control valves by a temperature PID control system.

X1.3.3 Use two control valves to control the cooling water supply. The control valves shall be a minimum of 12.7mm ($\frac{1}{2}$ in.) ID.

X1.4 Test Procedure.

X1.4.1 Operate the test as described in [10.3](#) through [10.5](#) except as follows:

X1.4.2 Set the temperature control to maintain a lubricant temperature of $104^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

X1.4.3 At the end of the 100 min (see [10.3.6](#)), set the temperature control to maintain a lubricant temperature of $93^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and record end time, speed, torque, and lubricant temperature.

X1.4.4 For the gear test phase, ensure that the axle temperature control is still set to maintain a lubricant temperature of $93^{\circ}\text{C} \pm 2^{\circ}\text{C}$ (see [10.4.1](#)).

X1.5 *Axle Post Test Measurements*—Carry out as described in Section [11](#) for the standard test.

X1.6 *Determination of Test Results*—Carry out as described in Section [12](#) for the standard test.

X1.7 *Report*—Carry out as described in Section [13](#) for the standard test.

D6121 Discussion

- Axle “builder” approval

8.2 Lab-built Axles:

8.2.1 To be approved to build axles acceptable for testing, obtain a separate approval for each of the two hardware types (lubricated and non-lubricated). Approval may be obtained for both hardware types by conducting three tests on each hardware type, or approval can be obtained with either hardware type independently by conducting just three tests on that type. To be approved to build axles acceptable for testing, assemble three axles in accordance with subsection [8.4](#) using a new V1L528/P4T883A pinion and ring set. Run these axles in tests using a blind mix of the following TMC-assigned oils: one TMC 152-2 and two TMC 134's (or approved re-blends of 134).

8.2.1.1 If all three of these tests are operationally valid and the 152-2 run meets the LTMS acceptance criteria for V1L528 hardware and both 134 run pinion results fail SAE J2360 acceptance criteria, the builder is approved to build axles for testing and the test stand is calibrated for the period described in [9.1](#).

8.2.1.2 If only the TMC 152-2 does not meet the LTMS acceptance criteria, rerun one TMC 152-2 fluid. If the repeat run meets LTMS acceptance criteria, the builder is approved to build axles for testing and the test stand is calibrated for the period described in [9.1](#).

8.2.1.3 If only one of the two TMC 134 pinion results does not fail SAE J2360 acceptance criteria, rerun two consecutive TMC 134's. If the pinion results for both repeats fail SAE J2360 acceptance criteria, the builder is approved to build axles for testing and the test stand is calibrated for the period described in [9.1](#).

8.2.1.4 If two of the three tests do not meet their designated acceptance criteria, or the required repeats described in [8.2.1.2](#) or [8.2.1.3](#) do not meet the designated acceptance criteria, repeat [8.2.1](#).

Long term Rebuild Solutions

- Intertek to possibly investigate running reference fluids using aftermarket housing/spool
 - Any Update?
- Build procedure review

New Business

- Dana lubrified hardware approval on electric rig?



D02.B0.03

L-37-1 Surveillance Panel Meeting

Adjourn

ASTM L-37/L-37-1 Surveillance Panel Membership / Sign In List
Meeting Date: 2/13/19

Initials*	Name	Voting Status	Company Name & Address	Phone/Email Info
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<i>DRB</i>	Beck, Dylan	Voting	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, Pennsylvania 15206	Phone: 412-365-1037 Fax: E-Mail: djb@astmtmc.cmu.edu
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<i>DRB</i>	Donovan, Eric	Voting	Afton Chemical 500 Spring Street Richmond, VA 23219	Phone: 804-788-5097 Fax: E-Mail: Eric.Donovan@aftonchemical.com
<i>DRB</i>	Drifa, Kristijan	Non-Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-2326 Fax: E-Mail: kristijan.drifa@lubrizol.com

* Initial to indicate attendance at subject meeting

ASTM L-37/L-37-1 Surveillance Panel Membership / Sign In List
Meeting Date:

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	Gao, Hong	Non-Voting	Conoco Phillips 100 s Pine St. Ponca City, OK 74602	Phone: 580-767-2126 Fax: 580-767-4534 E-Mail: hong.gao@conocophillips.com
<i>Jun</i>	Goyal, Arjun	Voting	BASF 500 White Plainses Rd Tarrytown NY	Phone: 914-785-2083 Fax: E-Mail: Arjun.Goyal@BASF.com
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	Stocum, Robert	Voting/ Chair	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-5102 Fax: E-Mail: robert.stocum@lubrizol.com
<i>SD</i>	Smith, Dale	Voting	Intertek Automotive Research 5404 Bandera Rd San Antonio, Texas	Phone: 412-855-6854 Fax: 210-684-6074 E-Mail: Dale.Smith@intertek.com

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ASTM L-37/L-37-1 Surveillance Panel Membership / Sign In List
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<i>JM.</i>	<i>Troy Muransky</i>	<i>V</i>	<i>AAAM</i>	Phone: <i>734 564-8406</i> Fax: E-Mail: <i>troy.muransky@aaam.com</i>

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Meeting Date:

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