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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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June 8, 2005

Reply to:
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ASTM D02.B0.03 L-60-1 Surveillance Panel
Members and Guests:

Attached for your review and comment are the unconfirmed minutes of the April 6, 2005 L-60-1 Surveillance Panel meetings held at the PRI Headquarters, Warrendale, PA. Please direct any corrections or comments to my attention.

Sincerely,

Chris Schenkenberger, Chairman
L-60-1 Surveillance Panel

Attachments

Report of Meeting
L-60-1 Surveillance Panel
PRI Headquarters, Apollo Room, Warrendale, Pa.
April 6th 2005

Sign-in/Review of Membership: The meeting was called to order at 8:09 am. The sign-in sheet is *Attachment 1*.

Meeting Agenda

The meeting agenda (*Attachment 2*) was focused on:

1. PRI Request for Significant Digit Precision Reporting
2. TGC Proposal for Test Precision Reporting Guidelines
3. New Business

Summary of Meeting Discussions

PRI Request for Significant Digit Precision Reporting

Based on a request from the LRI, an open action item for the L-60-1 Surveillance Panel was to review the level of precision for the reported results in SAE J2360 versus the data dictionary for ASTM D5704. The fields to be reviewed included pentane insolubles, toluene insolubles, viscosity increase, large gear average carbon varnish, and sludge. The chairman provided the group a summary of his interpretation of the LRI request which included the following:

- Reviewed the thermal and oxidative stability section 3.4.6 from SAE J2360 (*see Attachment 3*)
- Reviewed the TMC data dictionary and D5704 report Form 1, Form 2, and Form 5 for reporting results.
- Reviewed the process used in CRC manual 21 rating calculations and breakdowns and the challenge that comes from rating carbon that is to .xx.
- Reviewed the D5704 report Form 1, Form 2, and Form 5.

To summarize the precision differences, the ASTM Method had a higher level of precision than the SAE Standard in all categories by one to two decimal places. The chairman felt that the precision for the D5704 falsely represents the accuracy of measurement. He felt that the issue can be resolved by determining how fine the results could be measured and making sure the reporting lines up with that level of precision.

As an example, he shared a couple rating forms that show how merit ratings are calculated for large gear average carbon varnish (*see Attachment 4*). The rater assigns a varnish merit rating to a percentage of the gear and can have multiple area breakdowns if varnish is not uniform. In talking with some raters, the initial varnish merit ratings are only measured to the tenths of whole numbers (XX.X). However when the total merit rating is calculated, it allows for hundredths of a whole number (XX.XX). The chairman felt that similar reasoning could be applied to the precision for the other categories and recommended that the panel consider changing the ASTM data dictionary to be inline with SAE J2360.

In the case of carbon/varnish and sludge, Mr. Farber commented that we could continue to carry the existing significant digits from the calculations all the way to the final reported values. Using ASTM E29, rounding could be used to the same level of precision required in SAE J2360.

There were many comments on the true accuracy in measuring the critical parameters (C/V, sludge, viscosity increase, and pentane/toluene insolubles) and the variability in the test process. There was also concern about the chance of changing reference oil targets and acceptance bands by the rounding. Mr. Sullivan pointed out that, as compared to other test methods which have a coarse rating scale, the L-60-1 is very fine and the effect of rounding is likely not to be felt.

The panel decided that the precision level for L-60-1 results in SAE J2360 provides a more accurate reflection of how fine the parameters can be measured. Frank Farber recommended we make some changes in the D5704 data dictionary to match SAE J2360.

Motion 1 (Motion \Rightarrow Mr. Bartlett, Second \Rightarrow Mr. Farber)

Effective for all tests completing on or after June 1, 2005, round the final original unit results on D5704 form 1 and 2 to the following level of precision:

- Kinematic Viscosity increase to whole number
- Pentane and Toluene Insolubles to a tenth.
- Caron/Varnish and Sludge to a tenth.

Brian Koehler questioned the effect this motion would have on the historical results in the LTMS reference database. Mr. Farber indicated that normal practice does not involve changing the past data. However it is possible to go back and request the data be rounded so that future analysis of data is using the same rounded data for the analysis. General feeling was that analyzing data would not be significantly different because the scale is so fine and the panel should leave the historical data as is.

Motion Results: Passed Unanimously

In favor: 5

Opposed: 0

Abstain: 0

TGC Proposal for Test Precision Reporting Guidelines.

The chairman presented a handout containing the ballot request from the TGC chairman on Test Precision Reporting Guidelines. This initiative began in the November Passenger Car panel meetings. Its purpose was to make sure the oils used for setting the LTMS test precision SA standard deviation were the same as those used in the respective test method. The TGC ballot was a unanimous consent ballot and had an effective date of March 1st, 2005.

It was noted that the TGC Chairman's distribution list was not current with respective B.03 Surveillance Panel Chairman and did not include some committee members from Original Equipment Manufactures and the Lubricant Review Institute. The comments submitted as a reason for the negatives was to allow for each surveillance panel to separately address this issue. Several surveillance panel members were just seeing this ballot request for the first time today.

Mr. Frank Farber presented the TMC's proposal for addressing the TGC request and is included as (*see Attachment 5*). The presentation highlighted the current differences between the D5704 test method and the LTMS system for each parameters SA standard deviation. The following highlighted items are from Mr. Farber's presentation to the L-60-1 Surveillance Panel:

- TMC Recommendation for Test Method and LTMS SA standard deviation would be to use TMC 151-2 and reblends (98 chartable tests, 3/29/05). While TMC 148 is currently assigned at a rate of 50% for stand referencing, it was agreed to focus on TMC 151-2. The reason for using TMC 151-2 is because the fluid is representative of current commercial fluid technology. The SA's could be reviewed at the call of the panel, which may be annually or, at the very least, when the targets are changed.
- Precision has improved through time for Pentane and Toluene insolubles. This probably was due to the industry laboratory visits in 2002 to review and improve the analytical process.
- Mr. Farber is comfortable with this proposal and is consistent with the action of the passenger car surveillance panels.

Motion 2 (Motion ⇒ Mr. Bartlett, Second ⇒ Mr. Sullivan)

Accept the TMC recommendation to update the Test Method and TMC LTMS severity adjustment standard deviations using oil TMC 151-2 only. The TMC is tasked with reviewing and making recommendations to the panel no less than on an annual basis. The motion is effective April 11th, 2005 but laboratories will not use these numbers until the next stand reference.

Motion Results: Passed Unanimously

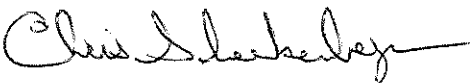
In favor: 5

Opposed: 0

Abstain: 1

The meeting was adjourned at 9:46 (Smith/Koglin).

Respectfully submitted,



Chris Schenkenberger

L-60-1 Surveillance Panel Chairman

ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: April 6, 2005

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
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Meeting Date: April 6, 2005

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ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: April 6, 2005

Noting from this meeting only.

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ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: April 6, 2005

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L-60-1 Surveillance Panel

April 6, 2005
PRI Apollo Room – Warrendale, PA

Agenda

- I. Call to order/Review Membership
- II. Review agenda
- III. LRI Request for Significant Digit Precision Reporting
- IV. TGC Proposal for Test Precision Reporting Guidelines
- V. New Business
- VI. Adjournment

- 3.4.7.2 *Gear Distress and Deposits*—Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, Table 3 (ASTM D 6121, L-37 Test) using untreated and phosphate-treated gear assemblies and prevents gear-tooth ridging, rippling, pitting, welding, spalling, and excessive wear or other surface distress and objectionable deposits and does not produce excessive wear, pitting or corrosion of bearing rollers, or races under conditions of high-speed, low-torque and low-speed, high-torque and meets the criteria in Table 5.

TABLE 5—ASTM D 6121, L-37 TEST LIMITS

Category	ASTM Rating	Comments
Ridging	8 or greater	Compare overall appearance to closest gear on rating board
Rippling	8 or greater	Same as above
Wear	5 or greater	Same as above
Spalling/ Pitting	9.3 or greater	At heel end of pinion tooth only—elsewhere not allowed
Scoring	10	Not allowed

- 3.4.8 **COPPER CORROSION**—The oil shall minimize copper corrosion. Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, Table 3 (ASTM D 130) for 3-h at $121\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ and exhibits copper strip discoloration not exceeding ASTM No. 2a when compared to ASTM Copper Strip Corrosion Standard.
- 3.4.9 **CYCLIC DURABILITY**—Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, Table 3 (ASTM D 5579, Cyclic Durability). The number of tests conducted shall be in accordance with Section 6.3 of ASTM D 5760. The test evaluates the thermal stability of gear lubricants when subjected to cyclic operating conditions of high-low range and high temperature. The oil shall avoid deteriorating the synchronizer performance by preventing two unsynchronized shifts from occurring at cycles equal to or lower than the mean of the prior five passing reference oil results in the same test stand.
- 3.4.10 **ELASTOMER COMPATIBILITY**—The gear lubricants shall minimize deterioration of elastomer materials. Satisfactory performance shall be demonstrated when the oils are tested and rated in accordance with 4.6, Table 3 (ASTM D 5662, Elastomer Compatibility) and exhibit test results meeting the nominal criteria in Table 6 as adjusted to accommodate slight changes in individual elastomer batches:

TABLE 6—ASTM D 5662 ELASTOMER COMPATIBILITY TEST LIMITS

Parameters	Minimum	Maximum
Polyacrylate @ 150 °C, 240 h:		
Elongation Change, %	No limit	-60
Hardness Change, points	-35	+5.0
Volume Change, %	-5	+30
Fluoroelastomer @ 150 °C, 240 h		
Elongation Change, %	No limit	-75
Hardness Change, points	-5	+10
Volume Change, %	-5	+15

- 3.5 **Other Requirements and Tolerances for Quality Conformance Testing**—The following physical and chemical properties shall be tested in accordance with the appropriate methods listed in 4.6 to ensure that purchased products are of the same compositions as the respective qualification samples and to identify the products. No specific values or limits are assigned in qualification testing, except as otherwise specified in Table 2 and 3.4.1 through 3.4.10, but test results shall be reported for all properties listed. The qualifying activity (see 6.4) shall establish specific values and tolerances for subsequent quality conformance testing of the finished lubricant for these properties (see 6.3 and 6.4):

Example

Test Method D5704
(L-60-1)
Form 5

Gear Rating

Lab: ████████	Stand: ████████	Stand Run: ████████
Oil Code: ████████	Rated By: ████████	

Carbon/Varnish:

Large Gear						Small Gear					
Front			Rear			Front			Rear		
%	Rate	Merit	%	Rate	Merit	%	Rate	Merit	%	Rate	Merit
100	7.80	7.80	100	8.00	8.00	100	8.70	8.70	100	8.30	8.30
Total		7.80	Total		8.00	Total		8.70	Total		8.30

Large Gear Average of Carbon/Varnish Only 7.90

Sludge:

Small Gear Rating for Information Only

Large Gear						Small Gear					
Front			Rear			Front			Rear		
Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor
CL			CL			CL			CL		
1/4A	25	0.06	1/4A	50	0.12	1/4A	60	0.15	1/4A	50	0.12
1/2A	65	0.32	1/2A	50	0.25	1/2A	30	0.15	1/2A	50	0.25
3/4A	10	0.08	3/4A			3/4A	8	0.06	3/4A		
A			A			A	2	0.02	A		
AB			AB			AB			AB		
B			B			B			B		
BC			BC			BC			BC		
C			C			C			C		
D			D			D			D		
Total	100	0.46	Total	100	0.37	Total	100	0.38	Total	100	0.37
Merit Rating		9.54	Merit Rating		9.63	Merit Rating		9.62	Merit Rating		9.63

Four Side Average of Sludge 9.60

Large Gear Front – Stamped GA50
Rear – No Markings

Small Gear Front – Stamped GA34
Rear – No Markings

Sludge:
Rate total flat area excluding gear teeth, washer/nut area and 3/4" wide strip area using CRC Manual 20

Varnish/Carbon:
CRC Method – 3/4 in. Wide strip across gear excluding gear teeth and washer/nut area.
CRC Rust/Varnish color intensity factors 10.0 to 1.0

Carbon Rating: merit rating
Trace Carbon: 0.85
Light Carbon: 0.75
Medium Carbon: 0.50
Heavy Carbon: 0.0

Example

Test Method D5704 (L-60-1) Form 5

Gear Rating

Lab: ████████	Stand: ████████	Stand Run: ████████
Oil Code: ████████	Rated By: ████████	

Carbon/Varnish: 1.5*

Large Gear						Small Gear					
Front			Rear			Front			Rear		
%	Rate	Merit	%	Rate	Merit	%	Rate	Merit	%	Rate	Merit
40	6.70	2.68	5	8.00	0.40	100	7.50	7.50	100	7.10	7.10
60	7.30	4.38	10	6.80	0.68						
			85	7.40	6.29						
Total		7.06	Total		7.37	Total		7.50	Total		7.10

Large Gear Average of Carbon/Varnish Only 7.22

Sludge:

Small Gear Rating for Information Only

Large Gear						Small Gear					
Front			Rear			Front			Rear		
Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor	Depth	% Cover	Volume Factor
CL			CL			CL			CL		
1/4A			1/4A			1/4A			1/4A		
1/2A	75	0.38	1/2A	85	0.42	1/2A	15	0.08	1/2A	85	0.42
3/4A	25	0.19	3/4A	15	0.11	3/4A	60	0.45	3/4A	15	0.11
A			A			A	20	0.20	A		
AB			AB			AB			AB		
B			B			B	5	0.10	B		
BC			BC			BC			BC		
C			C			C			C		
D			D			D			D		
Total	100	0.57	Total	100	0.53	Total	100	0.83	Total	100	0.53
Merit Rating	9.43		Merit Rating	9.47		Merit Rating	9.17		Merit Rating	9.47	

Four Side Average of Sludge 9.38

Large Gear Front – Stamped GA50
Rear – No Markings

Small Gear Front – Stamped GA34
Rear – No Markings

Sludge:
Rate total flat area excluding gear teeth, washer/nut area and 3/4" wide strip area using CRC Manual 20

Varnish/Carbon:
CRC Method – 3/4 in. Wide strip across gear excluding gear teeth and washer/nut area.
CRC Rust/Varnish color intensity factors 10.0 to 1.0
Carbon Rating: merit rating
Trace Carbon: 0.85
Light Carbon: 0.75
Medium Carbon: 0.50
Heavy Carbon: 0.0

TGC Test Precision Ballot Review

April 2005

Ballot Issuance

- Technical Guidance Committee Chairman Gordon Farnsworth emailed TGC membership a unanimous consent ballot on 2/3/2005
 - TGC membership : Surveillance Panel Chairs
 - Close date of ballot was March 1, 2005
 - Negatives were received
 - Motion was not implemented

Ballot Subject

- Attached is a proposal from the TMC for "Test Precision Reporting Guidelines". As chairman of the ASTM TGC I will instruct the TMC to adopt this practice on March 1, 2005 unless I receive other input from any TGC member.
- The ASTM TMC has proposed a standard methodology for calculating and updating the test precision listed in the various Sequence test procedures (see attached). This proposal is complementary to the recently issued LTMS appendix G "Guidelines for developing Reference Oil Targets and Severity Adjustment Deviations - B.01 & B.02 Tests" that the TGC approved via e-mail.

Test Precision Reporting Guidelines

As test targets are updated or a need arises to update test method precision statements the TMC will be working with each surveillance panel to identify which reference oils should be used in the Severity Adjustment standard deviation calculation. The recommendation from the TMC is to use reference oil(s) that are as close to the pass limit as possible. In some test areas, only one oil may be used. Other test areas may use multiple oils depending on the available oils and number of pass fail parameters. As always it will be the surveillance panel who will ultimately decide the oil(s) selection.

To be consistent on the precision value that is provided to the industry, the TMC will be updating test method Intermediate Precision standard deviation with the same value that is used for the SA standard deviation. Data to be used for this calculation will be severity adjusted and pooled by oil and lab. The test method Reproducibility standard deviation will then be based on the same data set and pooled by oil.

The only time the test method precision values will be changed is when the SA std. dev. is updated. And this of course will occur according to the recently accepted LTMS guidelines. As mentioned above, the surveillance panels can always intervene and make changes as they see fit.

Background

- At the December 2004 ASTM meeting D02.B advised that test method precision statements are to be reviewed/updated on an annual basis
- The TMC was aware that inconsistencies existed in how test precision was being reported

Background (continued)

- TMC developed guidelines for updating test method precision values
- TMC forwarded the guidelines to the TGC Chairman for his review
- TGC ballot was subsequently released

Reproducibility

- Reproducibility will be calculated from same data set as Intermediate Precision.

L-60-1 Recommendation

	Test Method	LTMS SA Std. Dev.	Recommendation Test Method & SA
Oils	131-3, 131-4, 143 and 148	See Below	151-2 and reblends (98 chartable tests, 3/29/05)
Viscosity Increase	0.148 ¹	0.15 (148)	0.09
Pentane	0.396 ¹	0.73 (131)	0.18*
Toluene	0.512 ¹	0.75 (131)	0.33*
Carbon/ Varnish	0.360 ¹	0.45 (148)	0.39
Sludge	0.255 ¹	0.16 (148)	0.16

¹ Precision as of June 30, 1997