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### **Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS**

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March 31<sup>st</sup>, 2010

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ASTM D02.B0.03 L-37 Surveillance Panel  
Members and Guests:

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

- **March 29<sup>th</sup>, 2010 L-37 Surveillance Panel Meeting**

Please direct any corrections or comments to my attention.

Sincerely,

Galen Greene, Chairman  
L-37 Surveillance Panel

**Report of Meeting**  
**L-37 Surveillance Panel Teleconference Meeting**

*March 29<sup>th</sup>, 2010*

Attendees:

Dana -	<b>Miller</b> , Horvath, Guzikowski
SwRI -	<b>Koehler</b>
Lubrizol -	<b>Greene</b> , Gropp, Graziano, Hamilton, Fier
Afton -	<b>Koglin</b> , Bell
Intertek-Parc -	<b>Smith</b>
TMC -	<b>Lind</b> , Parke
Chevron -	<b>Haire</b>
AAM -	<b>Dharte</b>
Primargy Consultants -	<b>Vettel</b>

Voting Members in **BOLD**

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

**1.0 Summary of Meeting Discussions**

**1.1 Review of Survey Results**

At the last meeting, the chairman was directed to prepare and distribute a survey for the industry inquiring about the value of the lubrited test. Specifically this survey asked for data that either supported or did not support the future use of the test. The deadline for submittal to the survey was March 18<sup>th</sup>.

The survey received very little response and only received one data response. A letter from Greg Fett was also submitted. The panel reviewed these responses and determined there was not enough data to move forward with possible elimination of the lubrited test at this time. There were also requests that the test should remain as a large amount of hardware in the field is lubrited.

**1.2 Discussion on How to Proceed with the Lubrited Test**

The panel then held a discussion on how to proceed with obtaining an approved batch of lubrited hardware. Several options were discussed:

**1. Convert lubrited axles to non-lubrited axles**

This option includes finishing the manufacture of the new heat of steel. The all gears would remain non-lubrited and be retrofitted into the existing lubrited axles. The gears would then either be run at full torque or reduced torque to qualify the batch. This option does not solve the lubrited test, but it would potentially save the investment in the axles and the new heat of steel.

**2. Look at lubriting the ring only**

Mr. Miller asked whether this test was representative of field applications by lubriting of both ring and pinion. In other words, what is lubrited in most field applications? Mr. Guzikowski mentioned at Dana many of its passenger vehicle axles have only the ring gear Lubrited. By just lubriting the ring, it would possibly reduce the instance of pitting/spalling on the pinion while still subjecting the lubricant to lubrited axles. After further discussion it was decided that a survey should be generated.

**ACTION ITEM (Mr. Greene):** The Chairman is to create a survey for the industry which asks how lubriting is used at axle manufacturers. Specifically the panel is looking to find out whether the ring only, pinion only, or both are commonly lubrited throughout the industry.

**3. Explore differences in shot peening**

Mr. Koglin supplied some photos that showed some visual differences between the successful 2005 non-lubrited batch (V1L417/P4L792) and the 2008 non-lubrited batch (V1L500/P4T813). Mr. Miller and Mr. Guzikowski commented that there does appear to be some visual differences between the two. The panel continued a long discussion on the shot peening of the gears. It was decided to further explore the shot peening:

**ACTION ITEM: (Mr. Guzikowski/Mr. Smith/Mr. Koglin):** Mr. Smith is to provide Mr. Guzikowski with a new and used 2005 V1L417/P4L792 gear set. Mr. Koglin is to provide Mr. Guzikowski with a new 2008 V1L500/P4T813 gear set. Shipping should be expedited (overnight) to ensure fast arrival. Mr. Guzikowski is to review these two different gear batches and comment on the differences. From this point, the panel will discuss whether any actions should be pursued.

**4. Explore changing gear geometry with the focus on lower peak stress**

Mr. Miller commented that he could look at lowering contact stress by making changes in micro-geometry. The focus in the past has been to make the gear the same as the 2005 master. Mr. Miller could focus on changing the micro geometry to lower the peak stress. There was some discussion on whether this would help since we have explored lowering the stress via lowering load.

**ACTION ITEM (Mr. Miller):** Explore changes in micro geometry and make recommendation on the likelihood of this improving the gear performance. The panel will review and make a decision at the next meeting.

**5. Declare the lubrited test is out of control**

The group then discussed the possibility of declaring the lubrited test as out of control. Mr. Gropp mentioned that there has been some discussion in the past on this topic on the crankcase side. Several main things would have to happen. The panel would need to decide that it was not possible to calibrate test stands. They would have to work up through SAE/ASTM and put together a plan/timeline for a solution. The plan/timeline would likely be developing a new test and it would take 1-2 years. This would mean that there would be no lubrited test for this period of time.

**6. Develop a high speed, lower torque test**

In Mr. Fett's response he mentioned possibly changing the test such that the contact stresses are lowered by using a higher speed and lower torque. He mentions that he has seen ridging and ripping in field applications with much higher speeds and lower torques. The group discussed pursuing this option. It was decided that this may be something to pursue, but it is essentially developing a new test from scratch and it would take a large commitment of time, resources, and money.

**7. Develop new test**

Another option would be to develop a new test from scratch. Some options for a new test were briefly discussed such as electric motored test stand, using ground gears, using a gear set test apparatus instead of an axle, etc. Mr. Miller mentioned that there are other challenges with ground gears, but you could likely achieve extraordinary repeatability with this method. The group discussed whether ground gears would be representative of field applications and decided they were unsure. Mr. Koehler mentioned that a gear set fixture device is available from Strama. It was agreed that even if the current situation gets resolved, a newer test with today's gear technology would need to be developed in the future:

**ACTION ITEM (Mr. Greene):** Create a task force focusing on developing a new generation of the current test

It was decided to immediately proceed with items 2, 3, 4 and table the other items for future discussion.

## **2.0 Adjournment**

The meeting was well past its scheduled time therefore, it was decided to continue the discussion in the near future.

Meeting Adjourned at 1:45 pm EST

Respectfully submitted,

Galen Greene  
L-37 Surveillance Panel Chairman

**Letter from Greg Fett:**

As a manufacturer of axles I can not support eliminating the Lubrized L37 test. The Lubrited and non-Lubrited L37 test have been a part of the Mil Spec since before I joined LRI in 1983. Without any doubt the Lubrited test has always been more difficult test to pass than the non-Lubrited test. Unfortunately it is also the Lubrited test that is representative of the actual hardware in the field, not the non-Lubrited test. Some manufacturers Lubrite the ring only while others coat both members. As a result if I had to eliminate one test it would be the non-Lubrited test. In order to be valid our tests should be at least as demanding as the actual field conditions or more so as in the case of the L42 test which is run without Lubrizing. In the case of the L37 test, with Lubrizing is the most severe condition while in the case of the L42 test without Lubrizing is the most severe condition.

The recent problems with the L37 test are due to the inability to obtain axles that will make it through the test without failure. I realize this is an extreme hardship for the industry. It would appear that this is a hardware problem and not a problem with the test. I believe there are some other options to eliminating the Lubrized L37 test. First the test matrix still does show a difference between the marginal fail oil and the pass oils, in that all of the fail oil samples failed and most of the pass oil samples passed. So even though there may be a statistical problem with these gears I would be willing to consider reviewing an L37 candidate even if it took two tests to get it to pass. This is basically how it used to be done in the old days prior to the TMC. Even though it may take more than one sample to produce a pass result, the test is severe enough that if you can pass it only once it is considered to be OK. The Canadian test would have to be run as a standard test.

A second option would be changing the test. The L37 load is realistic for a full throttle low gear acceleration. However, this load can only be maintained for a few seconds at a time because as the transmission is shifted upward the available torque to the axle decreases. So this test is 24 hours of continuous full throttle acceleration in low gear which is a whole boatload of individual full throttle accelerations. Our actual field experience has shown that rippling and ridging is actually more likely to be produced by trailer tow conditions rather than the low gear accelerations. It is the high speed trailer tow that produces the elevated temperatures which is necessary for rippling and ridging. We have actual experience with a fleet where rippling and ridging occurred at extended running at 700 wheel rpm (60 mph) at 345 F. This was constant full throttle condition only in high gear. The trailer tow load would be .24/.70 of the current load. This test could be substituted for the current test. Dana does have the original oil which failed in this test as well as the oil which was used to eliminate the issue.

I would view these as temporary measures to be used only until the current parts are exhausted and we can find a way to procure parts that will pass the normal tests.

Greg