ASTM L-60-1 (D5704) Surveillance Panel Meeting Minutes

Conference Call

06/20/2012

Attendees: voting member in **BOLD**

SwRI	B. **Koehler**, R Thorpe
Lubrizol	L. **Hamilton**, W. Venhoff, J. Gropp, M. Umerley
Afton	S. **Higuchi**
Intertek	D. **Smith**, A. Trader
TMC	S. **Parke**
Meritor	B. **McGlone**,
Dana	T. Maloney

Review of Agenda

New Gear Set Matrix Results

Alternator options (if time permits)

Explanation of the Number of Matrix Tests

The direction of the Surveillance Panel on n05/09/2012was to run a total of eight (8) tests on oil 148-1 and eight (8) test on 151-2 for a grand total of 16 test matrix. To complete the 16 tests; Lab's A and D were directed to run one (1) test each on RO 151-2 using Bars 03/36. Lab B was directed to run two (2) tests on RO 151-2 using Bars 03/36. After completing the required tests Lab B consulted with TMC and volunteered to run an additional two tests on RO 151-2 using Bars 03/32. This gives us a total of 18 matrix's tests.

Summary of Meeting Discussions

I. TMC reviewed the matrix results of the 18 tests (see attachments). After all six Scenarios were analyzed, a lengthy discussion followed. Although Lab B felt a correction factor was needed; the over whelming consensus was that none was needed at this time.

Motion: by S. Higuichi / 2nd D. Smith; to accept the New Hardware for Testing; effective immediately. Candidate tests must use the same hardware as used to calibrate test stand. Approved by unanimous vote; 6/0/0.

II. Alternator options were brought to the floor for discussion by SwRI. Discussion points were as follows:

- Remy offers an alternator with same specs as old
- We must keep variances out
- Need for Off shelf part
- GM part no for current alternator not available
- Need for alternator that is available for foreseeable future
- Remy designated part no. will be supplied in near future
- Will alternator come with exact same internals, or mechanically equivalent parts?

- LZ to send a Current Alternator for baseline testing to Intertek
- Experimental testing with current and potential replacement alternators

SwRI will make a technical presentation at the August Surveillance Panel Meeting concerning a replacement alternator for the L-60-1 test.

Adjournment

Motion: to adjourn by B. Koehler / 2nd S. Higuichi; Approved by unanimous vote; 6/0/0.

Respectfully submitted;

Larry Hamilton

Larry Hamilton
L-60-1 Surveillance Panel Chairman

L-60-1 New Hardware Analysis
June 20, 2012

Is NEW gear batch different from OLD gear batch?

Parameters:
1. Data only from 3 matrix stands
2. Data >= 20110101
3. 95% Confidence

Analysis Summary:

The additional data received since our last meeting does not appear to have changed anything from the original picture.

Conclusions:

Scenario	Analysis finds
1. only 3 mx stands, data>=20110101	no batch difference
2. only 3 mx stands, data>=20060101	batch*oil difference
3. all stands, data>=20100101	batch*oil difference
4. only 3 mx stands, data>=20060101, oil held constant	148-1=same 151-2=different
5. all stands, data>=20100101, oil held constant	148-1=same 151-2=different

6. removing either of the 2 original severe lab B results eliminates the differences reported under scenario 2. and 3.

Bar-to-Bar Difference?

I also conducted a new analysis to investigate if there is support for the hypothesis that we have a bar-to-bar difference. With the data on hand, there is no significant bar-to-bar difference. However, the data (18 tests) is very limited for spreading over four bars and two oils.

The details of the various analyses are included in the pages that follow.

L-60-1 New Hardware Batch Data

IND	COM1	RGEARBAT	TESTKEY	LTMSLAB	LTMSAPP	LTMSDATE	VISI	PEN	TOL	ACV	ASL	VISIyi	PENyi	TOLyi	ACVyi	ASLyi
148-1	BAR32	12-11-32	80056-L601	A	10A	20120326	40	0.6	0.4	7	9.4	0.526	1.126	0.906	-1.580	-1.311
148-1	BAR36	12-11-36	80057-L601	A	10A	20120329	40	0.5	0.4	8.8	9.4	0.526	0.659	0.906	0.856	-1.311
148-1	BAR36	12-11-36	87371-L601	A	10A	20120426	41	0.6	0.5	7.7	9.5	0.690	1.126	1.361	-0.812	-0.352
148-1	BAR36	12-11-36	87372-L601	A	10A	20120429	40	0.5	0.4	7.6	9.5	0.526	0.659	0.906	-0.930	-0.352
148-1	BAR32	12-11-32	86193-L601	B	5A	20120318	39	0.5	0.4	7.3	9.5	0.357	0.659	0.906	-1.267	-0.352
148-1	BAR34	12-11-34	86194-L601	B	5A	20120321	41	0.6	0.4	7.2	9.5	0.690	1.126	0.906	-1.373	-0.352
148-1	BAR32	12-11-32	85387-L601	D	3E	20120304	42	0.5	0.5	8	9.5	0.851	0.659	1.361	-0.433	-0.352
148-1	BAR38	12-11-38	85388-L601	D	3E	20120307	37	0.7	0.6	7.9	9.5	0.006	1.521	1.733	-0.564	-0.352
151-2	BAR32	12-11-32	86951-L601	A	10A	20120323	39	2.3	0.9	7.9	9.4	0.290	0.224	-0.731	-1.213	-0.127
151-2	BAR36		86952-L601	A	10A	20120520	38	2	1.1	8.1	9.4	0.117	-0.154	-0.329	-0.900	-0.127
151-2	BAR32	12-11-32	80046-L601	B	5A	20120315	36	1.8	1.1	7	9.3	-0.243	-0.438	-0.329	-2.407	-0.797
151-2	BAR32	12-11-32	86198-L601	B	5A	20120426	35	1.7	1	6.9	9.2	-0.431	-0.593	-0.520	-2.525	-1.378
151-2	BAR36	12-11-36	87591-L601	B	5A	20120517	37	1.7	1.1	7.7	9.5	-0.061	-0.593	-0.329	-1.504	0.666
151-2	BAR36	12-11-36	87592-L601	B	5A	20120520	38	1.8	1.2	7.7	9.4	0.117	-0.438	-0.155	-1.504	-0.127
151-2	BAR32	12-11-32	87593-L601	B	5A	20120524	36	1.7	1.1	6.8	9.3	-0.243	-0.593	-0.329	-2.641	-0.797
151-2	BAR32	12-11-32	87594-L601	B	5A	20120603	36	1.9	1.2	7.2	9.2	-0.243	-0.292	-0.155	-2.164	-1.378
151-2	BAR32	12-11-32	85391-L601	D	3E	20120229	33	2.2	1.8	8.3	9.4	-0.823	0.104	0.656	-0.561	-0.127
151-2	BAR36	12-00-36	86889-L601	D	3E	20120513	37	2.7	1.3	8.1	9.4	-0.061	0.657	0.005	-0.900	-0.127

Question: are ACVti results on the new gear batch different from results on the old gear batch? For the answer to be "Yes" with 95% confidence, Pr>F for GEAR*IND must be less than 0.05.

Data included:
Stands: A-10A, B-5A, and D-3E Date window: >=20110101

20120618 collected output.txt 6/18/2012

ACVti vs GEAR (only 3 mx stands, ltms >=20110101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	0.44983516	0.44983516	4.94	0.0323
IND	1	0.01450719	0.01450719	0.16	0.6920
GEAR*IND	1	0.12761231	0.12761231	1.40	0.2438

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	18	1.19021493	0.32074425
OLD	24	1.40420346	0.28510644

Level of IND	N	ACVTI Mean	ACVTI Std Dev
148-1	20	1.29023156	0.30519261
151-2	22	1.33273275	0.33100423

Level of GEAR	Level of IND	N	ACVTI Mean	ACVTI Std Dev
NEW	148-1	8	1.23137784	0.35947736
NEW	151-2	10	1.15728460	0.30183510
OLD	148-1	12	1.32946738	0.27285640
OLD	151-2	12	1.47893955	0.28865871

Discussion:
The panel's instructions were that the parameters of the investigation would be to use 1) only data from the 3 stands contributing new-batch matrix data, 2) compare against only data generated on or after 20110101, and 3) use a 95% confidence level for all statistical tests.

Under these criteria, ACVti results do not differ between the old and new gear batches.

However, the sample size for the old gears under these restrictions is 24 and may not adequately represent old-gear performance. We could either consider including older data or more stands. Since more data was available, this investigation made use of it.
The analysis was iteratively repeated testing both options (more stands, older data) adding a year at a time to the cutoff date.

Opening up the date window to 20100101 and using all stand data, the GEAR*IND difference becomes significant. Or, alternately, keeping the stand restriction and going back to 20060101, the GEAR*IND difference becomes significant.

20120618 collected output.txt 6/18/2012

ACVti vs GEAR (all stands, ltms >=20100101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	1.19298455	1.19298455	16.08	0.0001
IND	1	0.08100315	0.08100315	1.09	0.2983
GEAR*IND	1	0.32720897	0.32720897	4.41	0.0380

The GLM Procedure

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	18	1.19021493	0.32074425
OLD	98	1.47815837	0.28318179

Level of IND	N	ACVTI Mean	ACVTI Std Dev
148-1	56	1.34632865	0.23783121
151-2	60	1.51481641	0.34086306

Level of GEAR	Level of IND	N	ACVTI Mean	ACVTI Std Dev
NEW	148-1	8	1.23137784	0.35947736
NEW	151-2	10	1.15728460	0.30183510
OLD	148-1	48	1.36548712	0.21052655
OLD	151-2	50	1.58632278	0.30308556

20120618 collected output.txt 6/18/2012

ACVti vs GEAR (only 3 mx stands, ltms >=20060101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	0.57083083	0.57083083	8.56	0.0046
IND	1	0.08592375	0.08592375	1.29	0.2601
GEAR*IND	1	0.31951983	0.31951983	4.79	0.0319

The GLM Procedure

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	18	1.19021493	0.32074425
OLD	56	1.39586550	0.25953845

Level of IND	N	ACVTI Mean	ACVTI Std Dev
148-1	37	1.27198189	0.25394097
151-2	37	1.41970288	0.30297652

Level of GEAR	Level of IND	N	ACVTI Mean	ACVTI Std Dev
NEW	148-1	8	1.23137784	0.35947736
NEW	151-2	10	1.15728460	0.30183510
OLD	148-1	29	1.28318301	0.22361484
OLD	151-2	27	1.51689484	0.24345185

Because there is gear batch/oil interaction, the within-oil effect of the new hardware also needs to be investigated. Results repeating the analysis using the above 3-stand and all-stand datasets but isolating the oils are shown below.

20120618 collected output.txt 6/18/2012

ACVti vs GEAR (only 3 mx stands, 148-1 data ltms >=20060101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	0.01682800	0.01682800	0.26	0.6164

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	8	1.23137784	0.35947736
OLD	29	1.28318301	0.22361484

ACVti vs GEAR (only 3 mx stands, 151-2 data ltms >=20060101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	0.94368300	0.94368300	13.99	0.0007

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	10	1.15728460	0.30183510
OLD	27	1.51689484	0.24345185

20120618 collected output.txt 6/18/2012

ACVti vs GEAR (all stands, 148-1 data ltms >=20100101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	0.12332777	0.12332777	2.23	0.1413

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	8	1.23137784	0.35947736
OLD	48	1.36548712	0.21052655

ACVti vs GEAR (all stands, 151-2 data ltms >=20100101)

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GEAR	1	1.53394795	1.53394795	16.72	0.0001

Level of GEAR	N	ACVTI Mean	ACVTI Std Dev
NEW	10	1.15728460	0.30183510
OLD	50	1.58632278	0.30308556

For both the 3-stand and all-stand datasets, the new-vs-old difference for oil 148-1 is not significant. The 151-2 difference, however, is.

The current data does not indicate that there is any bar-to-bar difference, however spreading the data over four gear bars and two oils makes the analysis less rigorous than desirable.

20120618 collected output.txt 6/18/2012

ACVti vs BAR

Source	DF	Type III SS	Mean Square	F Value	Pr > F
BAR	3	0.50126128	0.16708709	1.64	0.2314
IND	1	0.02227738	0.02227738	0.22	0.6480
BAR*IND	1	0.00724751	0.00724751	0.07	0.7939

Level of BAR	N	ACVTI Mean	ACVTI Std Dev
BAR32	9	1.05382423	0.30041964
BAR34	1	0.94446161	.
BAR36	7	1.38143766	0.29579408
BAR38	1	1.32492541	.

Level of IND	N	ACVTI Mean	ACVTI Std Dev
148-1	8	1.23137784	0.35947736
151-2	10	1.15728460	0.30183510

Level of BAR	Level of IND	N	ACVTI Mean	ACVTI Std Dev
BAR32	148-1	3	1.07607160	0.27857632
BAR32	151-2	6	1.04270054	0.33602943
BAR34	148-1	1	0.94446161	.
BAR36	148-1	3	1.45114029	0.46959532
BAR36	151-2	4	1.32916069	0.13954497
BAR38	148-1	1	1.32492541	.

Correction factor considerations:

One reference oil indicates need for correction; one reference oil does not.

Should the correction correct new-gear data back to the old-gear performance or back to target?

If the same correction is applied to all oils, it may under-correct some oils and over-correct others.

Laboratory control charts indicate long-standing lab-to-lab differences.

If either of the 2 very severe 151-2 results go away, so do any of the new-vs-old differences in the above-analyses.