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

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January 3<sup>rd</sup>, 2014

Reply to:  
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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:

- **November 06th, 2013 S.P. Meeting, Automation Alley, Detroit MI**

Please direct any corrections or comments to my attention.

Sincerely,

Chris Prengaman, Chairman  
L-37 Surveillance Panel

**Report of Meeting**  
**L-37 Surveillance Panel Meeting**  
**Automation Alley, Detroit, MI**  
***November 06th, 2013 Meeting***

**Attendees:**

Voting Members in **BOLD**

**Gottwald, Thomas – Afton Chemical**

Boschert, Tom – Afton Chemical

Keisler, Marc – Afton Chemical

Kearney, Bill – Afton Chemical

Bell, Don – Afton Chemical

**Parke, Scott – ASTM TMC**

**Guzikoski, Joe – Dana**

Fett, Greg – Dana

**Marougy, Thelma – Eaton**

Mosher, Donna – Eaton

**Smith, Dale – Intertek Automotive Research**

Trader, Angela – Intertek Automotive Research

Barrera, Tony – Intertek Automotive Research

**Chambers, Harold - Linamar**

**Prengaman, Chris – Lubrizol**

Hamilton, Larry – Lubrizol

Umerley, Matt – Lubrizol

Gropp, Jerry – Lubrizol

Osterley, Karen – Lubrizol

**McGlone, Bruce – Meritor**

Muransky, Troy – Meritor

**Koehler, Brian – Southwest Research Institute**

**Comfort, Allen – US Army RDECOM/TARDEC**

Dwornick, Bridget – US Army RDECOM/TARDEC

The meeting was called to order at 13:35 EST.

**1.0 & 2.0 Membership and Agenda Review**

No change in voting membership.

**3.0 Approval of Meeting Minutes**

**Motion:** Motion to approve prior minutes that have been posted for review on the TMC website.

1. 8/14/13 – Surveillance Panel Meeting

Approved by voice vote unanimously.

**4.0 Rebuilt Hardware Update**

No representation was available from Dana to comment on axle builds. C. Prengaman will contact Dana offline and provide an update to the group.

B. Koehler stated he would like to switch the remaining allotment of axles due to Southwest Research Institute to all of one type (non-lubrited/lubrited). The group had no objections to this. B. Koehler will contact Dana and arrange for shipment of additional gearsets to facilitate this.

### **5.0 Rusty Housing Discussion**

No representation was available from Dana to comment on the status of rusty housings waiting for rebuild. This topic will be addressed at a later meeting.

### **6.0 Lab Built Hardware Discussion**

C. Prengaman shared 4 test results from lab built axles run at 2 labs compared to the matrix data for the gear batch. Results were not in line with expectations. See attachment.

Lab A and B will discuss offline regarding trading built axles and additional runs.

C. Prengaman shared potential language changes to the procedure to allow lab built axles to be used for candidate/reference testing. See attachment.

### **6.0 Dana Presentation**

G. Fett presented remotely a presentation (see attachment) regarding the current pass / fail, correction factors for this hardware batch.

G. Fett proposed three topic points for discussion:

1. Run Non Lubrited and Lubrited standard test with no correction factor. Rate only Rippling and Ridging
2. Run Non Lubrited Canadian test with no correction factor. Rate only Rippling and Ridging
3. Disregard Lubrited Canadian

Discussion was had by the group on this topic.

C. Prengaman and J. Guzikowski will work to create wording proposals for the different motions.

The topic was postponed to a future meeting to allow for time to draft language proposals.

### **7.0 New Business**

### **8.0 Adjournment**

Motion to adjourn .

Respectfully Submitted

Chris Prengaman

# **D6121 (L-37) ASTM Surveillance Panel Meeting**

November 06th, 2013  
1:30 pm –2:30 pm EST  
Automation Alley - Detroit, MI

## **Agenda**

- 1) Call to order/Agenda review
- 2) Membership Review
- 3) Approval of Meeting Minutes
  1. 8/14/13 – Surveillance Panel Meeting
- 4) Rebuilt Hardware Update – Dana
- 5) Rusty Housing Discussion
- 6) Lab Rebuilt Hardware
- 7) Dana Presentation
- 8) New business
- 9) Adjournment

Call in number → **216-706-7052 code 324160**

## Current Procedure & Proposed Changes

### 8.2 Preparation of Axle:

8.2.X As an alternative to a complete, newly manufactured axle assembly, a lab may assemble a new V1L528/P4T883A gear set into a reused axle housing. Complete this assembly using a new V1L528/P4T883A gear set, components from the Dana rebuild parts list given in appendix X and the Dana Model 60 Maintenance Manual.

8.2.Y When using an axle assembly re-built per 8.2.X or an assembly from an older approved hardware batch that was not marked with contact pattern information by the manufacturer, apply gear contact pattern grease on the drive and coast side of the ring gear. Turn the input of the axle assembly while applying a resisting force to the ring sufficient to require an axle input torque of approximately 30 lbf-ft (40.7 N•m). Rotate ring and pinion through the gear contact pattern grease on the drive and coast side and verify that the patterns for both sides are acceptable. Record the drive side contact pattern length and flank values in the test report.

8.2.1 If the axle assembly is a newly manufactured assembly received from Dana Corporation<sup>10</sup>, the drive side contact pattern length and flank values will be marked on the axle housing. Record these drive side contact pattern values in the test report. Record the "as received" drive side contact pattern length and flank values as noted on the axle housing from Dana Corp.<sup>40</sup>

8.2.Z Use only axle assemblies having a length value of L<sup>2</sup> or L<sup>3</sup> and a flank value of F<sup>-1</sup>, F<sup>0</sup>, or F<sup>+1</sup>. are considered acceptable. Note any adjustments that are made to the axle prior to testing in the comments section of the test report. Test labs pattern and report, in the test report, axle housings from prior gear batches that do not have contact pattern markings. ~~For lab-built V1L528/P4T883A units, determine and record values for the pattern length and flank. Only Length values of L2 and L3 and flank values of F-1, F0 and F+1 are considered acceptable.~~

8.2.2 Break and Turn Torque Measurements—Determine and record the breakaway and turning torques required to break and to turn the pinion shaft of the completely assembled test unit.

8.2.3 Backlash Measurements—Record the backlash marked on the axle by the manufacturer. ~~on the test axle reported from the manufacturer.~~ Use only axle assemblies having a manufacturer-reported backlash measurement from 0.004 to 0.012 in. (0.102 mm to 0.305 mm). ~~To be acceptable, the backlash reported by the manufacturer shall be between 0.004 to 0.012 in. (0.102 mm to 0.305 mm).~~

8.2.3.1 If the test axle ~~does not have a~~ is not marked with a manufacturer-reported backlash measurement from the manufacturer, the average backlash, as measured in 8.2.3.2, shall be between 0.004 and 0.009 in. (0.102 mm to 0.229 mm)., remove the cover plate and measure the backlash at four equally spaced locations. Record these four measurements and their average in the test report. Use only axle assemblies with an average backlash from 0.004 to 0.009 in. (0.102 mm to 0.229 mm).

~~8.2.3.2 Remove the cover plate. Measure and record backlash at four equally spaced locations. Report the average and the four readings.~~

~~*8.2.X If the axle is built at the test lab, Follow Dana Model 60 Maintenance Manual if contact pattern or backlash needs to be adjusted.*~~

IND	RINGBAT	LTMSLAB	TESTKEY	LTMSDATE	WEAR	RIDG	RIPP	SPIT	SCOR	WEARR	RIDGR	RIPPR	SPITR	SCORR	COM1	COM2	COM3	COM4
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**Non-lubrited (24 Hour Test)**

**Hardware Approval Matrix Results (155)**

155	P4T883A	G	89042-L37	20120904	6	9	8	7	10	7	10	8	9	10	NONLUBR	STANDARD		
155	P4T883A	A	89035-L37	20120915	6	8	8	9.9	10	8	9	9	9.9	10	NONLUBR	STANDARD		
155	P4T883A	D	73555-L37	20120921	7	7	7	9.9	10	7	9	10	10	10	NONLUBR	STANDARD		
155	P4T883A	B	89954-L37	20121014	7	9	10	9.9	10	9	10	10	9.9	10	NONLUBR	STANDARD		
155	P4T883A	G	89045-L37	20121014	7	9	8	9.9	10	8	10	8	9.9	10	NONLUBR	STANDARD		
155	P4T883A	A	89036-L37	20121014	7	8	8	9	10	7	10	9	9.7	10	NONLUBR	STANDARD		
155	P4T883A	G	89046-L37	20121015	7	9	8	6	10	7	10	9	9.9	10	NONLUBR	STANDARD		
155	P4T883A	B	89029-L37	20121016	7	10	10	9.7	10	9	10	10	9.9	10	NONLUBR	STANDARD		
155	P4T883A	D	89574-L37	20121102	7	8	9	7	10	8	10	10	9.9	10	NONLUBR	STANDARD		

Lab Built Axle Results

155	P4T883A	B	89955	20130813	7	9	10	9.9	10	9	10	10	9.9	10	NONLUBR	STANDARD		
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**Hardware Approval Matrix Results (134)**

134	P4T883A	G	89040-L37	20120831	6	8	8	4	10	7	8	8	9.9	10	NONLUBR	STANDARD		
134	P4T883A	B	83430-L37	20120910	4	4	9	2	10	5	5	9	9.6	10	NONLUBR	STANDARD		
134	P4T883A	D	83421-L37	20121002	6	6	9	4	10	6	7	9	9.9	10	NONLUBR	STANDARD		
134	P4T883A	A	89571-L37	20121013	6	8	9	6	10	7	10	10	9.9	10	NONLUBR	STANDARD		
134	P4T883A	A	89569-L37	20121019	6	6	7	3	10	7	8	9	9.9	10	NONLUBR	STANDARD		

Lab Built Axle Results

134	P4T883A	A	89570	20130912	7	9	9	9.9	10	7	9	10	9.9	10	NONLUBR	STANDARD		
134	P4T883A	A	94161	20131026	7	9	9	9.9	10	7	9	10	9.9	10	NONLUBR	STANDARD		
134	P4T883A	B	89950	20131101	6	6	9	3	10	6	6	9	10	10	NONLUBR	STANDARD		

# ASTM L37 Pass Fail Criteria

Greg Fett

Dana Holding Corp.

November 7, 2013



# Fatigue Testing

- Considerable variability in life.
- Long term on any part 10:1 from high life to low life on many lots produced over time.
- Can be as much as 4:1 on six parts from same lot.
- Most of the time there is no assignable cause.

# Fatigue Testing

- Weibull analysis normally used to quantify the data.
- B10, B50, and B90 life used.
- Weibull confidence limits used to determine long term variability. However this assumes the data is centered in the grand overall population which it will not be.
- Not possible to predict long term life by running one group of samples.

# Automotive Fatigue Testing

- Primary tool used to validate new designs and changes to existing designs.
- Test 5-6 samples of new and old and compare using Weibull.
- Expectation is that B50 (average) life and B10 life of new will be the same or better than the old.

# Example

- Old Process B10 = 115,000, B50 = 337,000 cycles on 6 samples.
- New process B10 = 94,000, B50 = 288,000 cycles on 6 samples. Not OK.
- New process B10 = 120,000, B50 345,000 cycles on 6 samples. OK.
- If one or two samples are tested expectation is life must be equal or better than B50.

# ASTM L37 Test

- Fatigue test.
- Run below yield strength, damage occurs over time.
- Low speed, high torque test to look at the load carrying capacity of the lubricant.
- Expected failure mode is rippling/ ridging.
- Expectation at end of test is gear will appear normal with moderate wear only and very little rippling/ridging.

# ASTM L37 Ratings

- Wear: Difficult to measure by visual appearance, unless physical wear step present. Could be oil or hardware related.
- Rippling/Ridging: Easy to see. Oil related.
- Pitting/Spalling: Easy to see. Usually hardware related, can also be oil.

# Original L37 Test Protocol

- Test is run at fixed speed, torque, temperature, and time.
- Gears rated on physical appearance, primarily looking for rippling/ridging.
- No reference oils used.
- Rating scale was added later, 8 or better required to pass.
- Candidate normally a singular test, sometimes more tests needed to pass.

# Current L37 Test Protocol

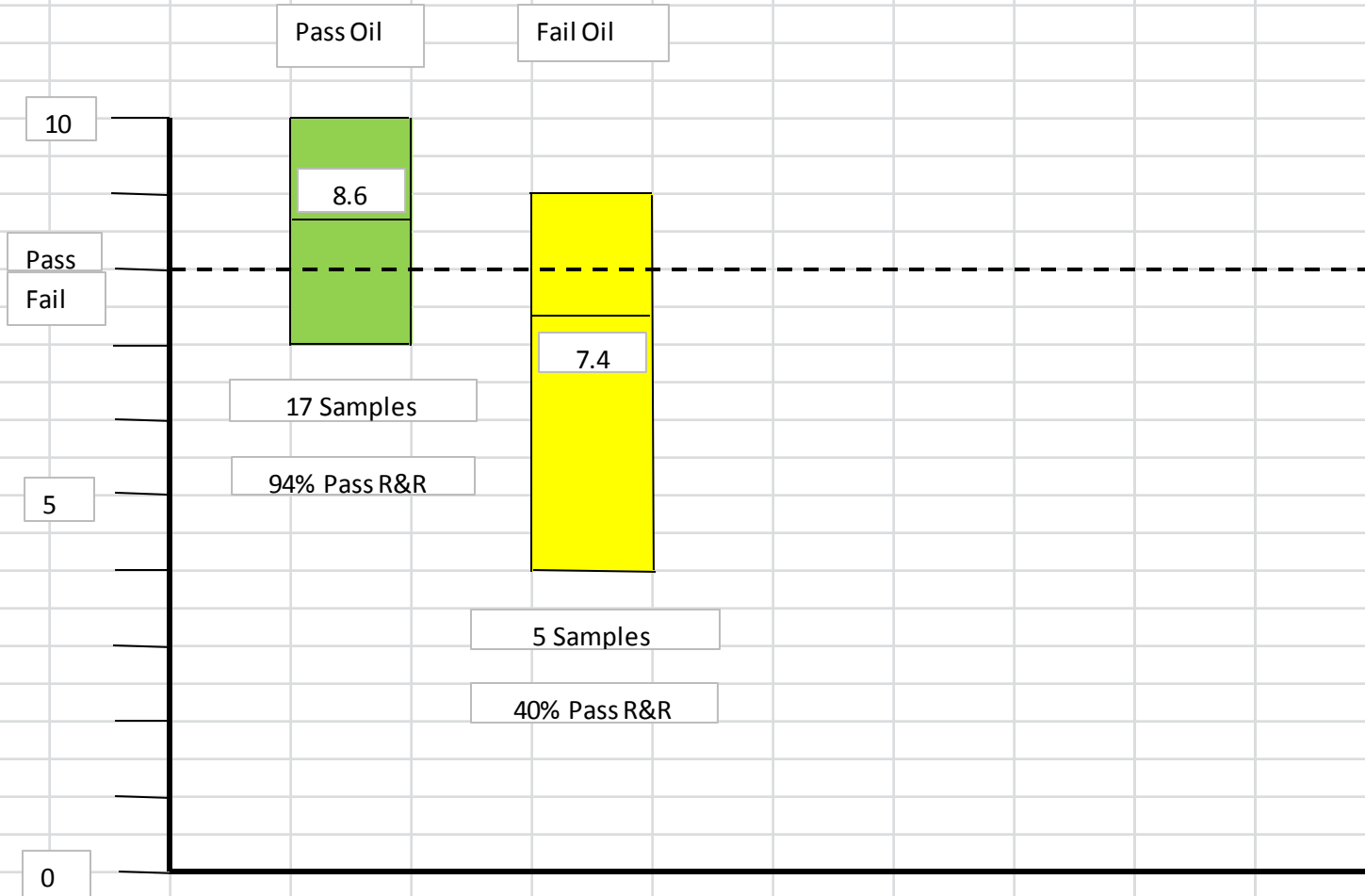
- New gear batch is validated with multiple tests run at different laboratories.
- Data is used to determine correction factor to be applied to pass/fail limits for candidates.
- Candidate is normally a singular test.
- Because correction factor only moves in negative direction this has potential to allow lower quality oils to be approved.



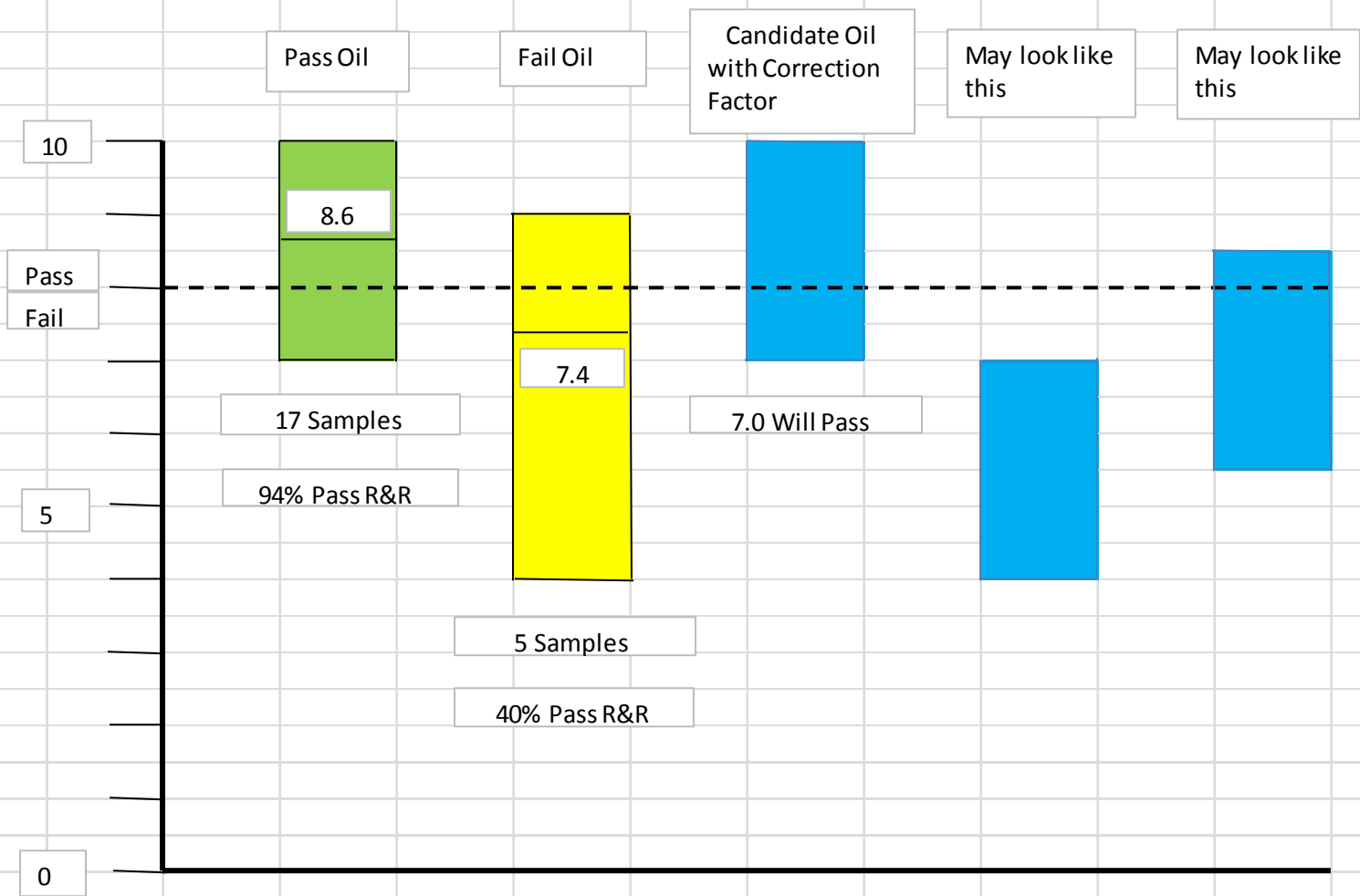
# Requested ASTM Correction Factor

- Allow candidate to pass if equal to pass reference oil results (min-max). Minimum rating of 5.
- This has potential to allow lower quality lubes to be approved.
- Not reasonable to expect a candidate oil which is below the baseline average to provide same results when only one sample is run.

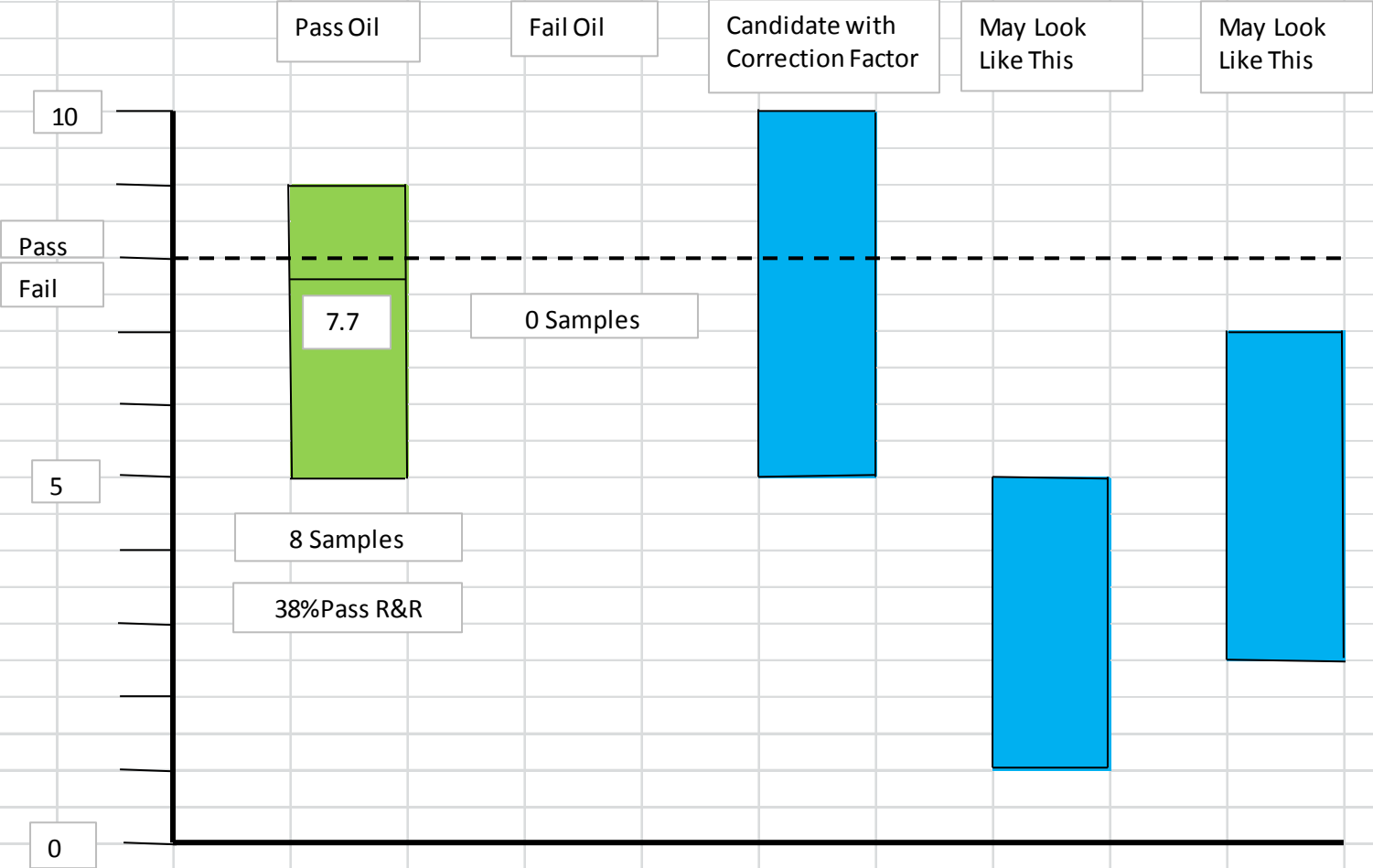
Non-Lubrited Hardware, Rippling and Ridging Ratings Combined



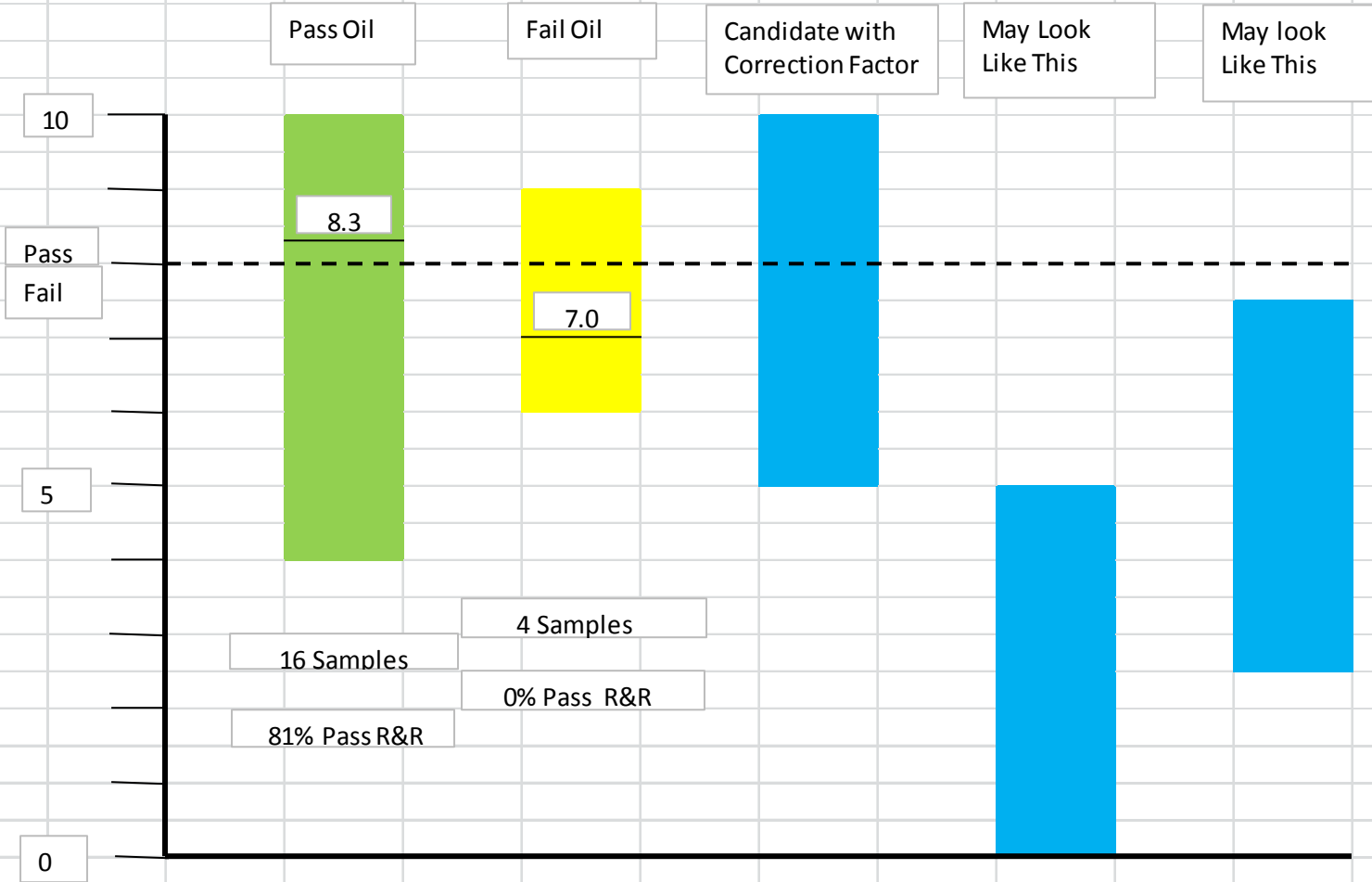
### Non-Lubrited Hardware, Rippling and Ridging Ratings Combined



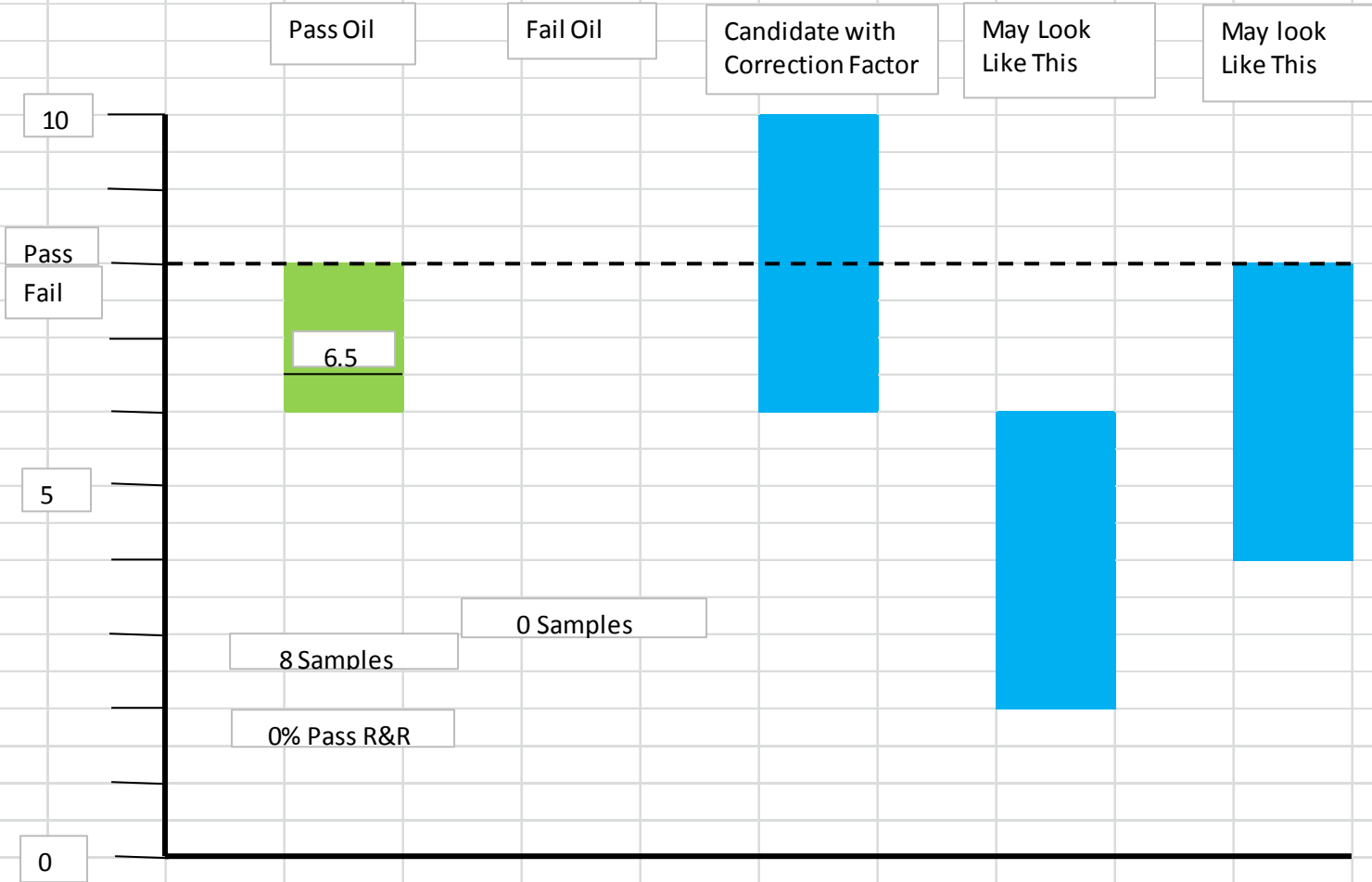
Canadian Non-Lubrited Hardware, Rippling and Ridging Ratings Combined



### Lubrited Hardware, Rippling and Ridging Ratings Combined



Canadian Lubrited Hardware, Rippling and Ridging Ratings Combined



# Recommendation

- Run non-Lubrited and Lubrited standard test with no correction factor. Rate only rippling and ridging.
- Run non-Lubrited Canadian test with pass/fail limit of 7 on rippling and ridging. Rate only rippling and ridging.
- Waive Lubrited Canadian test.

ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: November 6th, 2013





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Meeting Date: November 6th, 2013

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				Phone: Fax: E-Mail:
				Phone: Fax: E-Mail:

\* Initial to indicate attendance at subject meeting

ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: November 6th, 2013

Initials*	Name	Voting Status	Company Name & Address	Phone/Email Info
Teb	Tony BARRERA N		Intertek	Phone: Fax: E-Mail:
				Phone: Fax: E-Mail:
				Phone: Fax: E-Mail:
				Phone: Fax: E-Mail:
				Phone: Fax: E-Mail:

\* Initial to indicate attendance at subject meeting