

Daimler Surveillance Panel Meeting Minutes

September 3, 2020

9:30 AM – 11:00 AM CST

Call Participants:

Lubrizol - Andrew Stevens (Chairman), Kris Meekins, Patrick Joyce
Southwest Research Institute – Jose Starling (Secretary), Travis Kostan, Robert Warden
Intertek – Andrew Smith
Daimler - Suzanne Neal, Mesfin Belay
Afton – Cory Koglin
Infineum - David Brass, Elisa Santos, James Gutzwiller
Chevron Oronite – Mark Cooper, David Lee
TEI – Derek Grosch
TMC – Sean Moyer
Haltermann Solutions – Prasad Tumati
Exxon Mobil – Ashley Montufar, Ray Burns

Agenda Items

Alternative Fuel Requirements Discussion (Continued from last meeting) – Surveillance Panel

Suzanne looked into the availability of Oil D and looks like it is available for supply if the panel is interested in using this. This would be mainly utilized for the alternative fuel supplier runs. However David Brass also mentioned that Oil D could be useful when bringing in new hardware as well when the regular reference oil doesn't provide sufficient data.

Travis asked if the results from the prove out tests on Oil D are available and where would they be located. Sean mentioned that the Oil D data should be available on the TMC site and other forms of the data with results should be available. Travis to review the results to be able to establish some limits around the data. Elisa and Suzanne to see if they can provide Travis with the Data.

Jose presented some data regarding torque differences from engine to engine based on reference data (see attached). Travis mentioned that there doesn't seem to be a large reduction in just choosing one engine. The coolant delta for the engine and coolant jacket temperature was also provided for all reference tests. It was asked if we could tie back the reference data to the candidate runs to see how much they have shifted. Jose to look into this data and provide for next meeting.

Travis presented some updates to the "Example of DD13 Acceptance Testing" document. Currently document is stating 2 tests on the current fuel and 2 tests on the new fuel. It was mentioned that we have seen 864-1 reference results vary so the question was asked if only one test on 864-1 using the alternative fuel is sufficient. Travis mentioned that there could be some additional criteria setup to decide if additional testing is necessary if results of first test are outside certain limits. Travis can explore these areas once we have some of the previously discussed decisions made. Travis included some example calculations in the attached document showing how some results would fair. Bob W. mentioned that having some Yi limit would be favorable to use in this situation as they have worked well for years in the past on testing.

Labs are to continue looking at differences between engine and differences between candidate/reference testing. Travis looking into the potential run order and what some potential Zi limits may look like.

Next Meeting:

Next meeting is expected to be in two to three weeks, but Andrew will send out a poll to establish exact meeting date. Week of September 21st is currently being looked at for this.

Example of DD13 Acceptance Testing

- Single test stand
- Conduct 1 calibration test using oil 864-1
 - Test must meet all LTMS calibration acceptance requirements
 - Calculate new Zi value
- **Conduct 1 test using oil D on current fuel?**
 - Test must meet all operation validity requirements
 - **What requirements do we put on results?**
- **Conduct 2 tests on the alternate fuel, one with oil 864-1 and one with oil D?**
 - For the 1st test on oil 864-1, calculate Yi and Ei for this test. Use the Zi which was calculated immediate following the calibration test on the current fuel
 - The first test must meet the following criteria
 - For Hours to Scuff parameter, $E_i < 1.734$
 - Average stage 1 torque should be 800 ± 25 Nm
 - Average stage 2 torque should be 1840 ± 40 Nm
 - Average stage 1 exhaust pipe temp should be $325 \pm 15^\circ\text{C}$
 - Average stage 2 exhaust pipe temp should be $440 \pm 15^\circ\text{C}$
 - Tests must be operationally valid with no negative QIs

Hours to Scuff
Unit of Measure: Hrs

Reference Oil	Mean	Standard Deviation
864 (OIL X)	48	26
864-1	48	26

Example

Current Stand Zi for each parameter listed below for the stand chosen.

Parameter	Current Lab Zi
Hours to Scuff	1.50

The stand runs a new calibration test on 864-1 using the current fuel. Based on the results, the following are the Yi and new Stand Zi values for each parameter.

Parameter	Result	Yi	New Lab Zi
Hours to Scuff	100	2.0	$(0.3*2)+(0.7*1.5) = 1.65$

The same stand now runs a test on Oil D. What requirements do we put on results?

The same stand now runs another test on oil 864-1, but using the alternative fuel. The Y_i and E_i results for this first alternative fuel test are shown below.

Parameter	Result	Y_i for Alt. Fuel Test #1	$E_i = Y_i - Z(i-1)$
Hours to Scuff	130	3.15	$3.15 - (1.65) = -1.50$

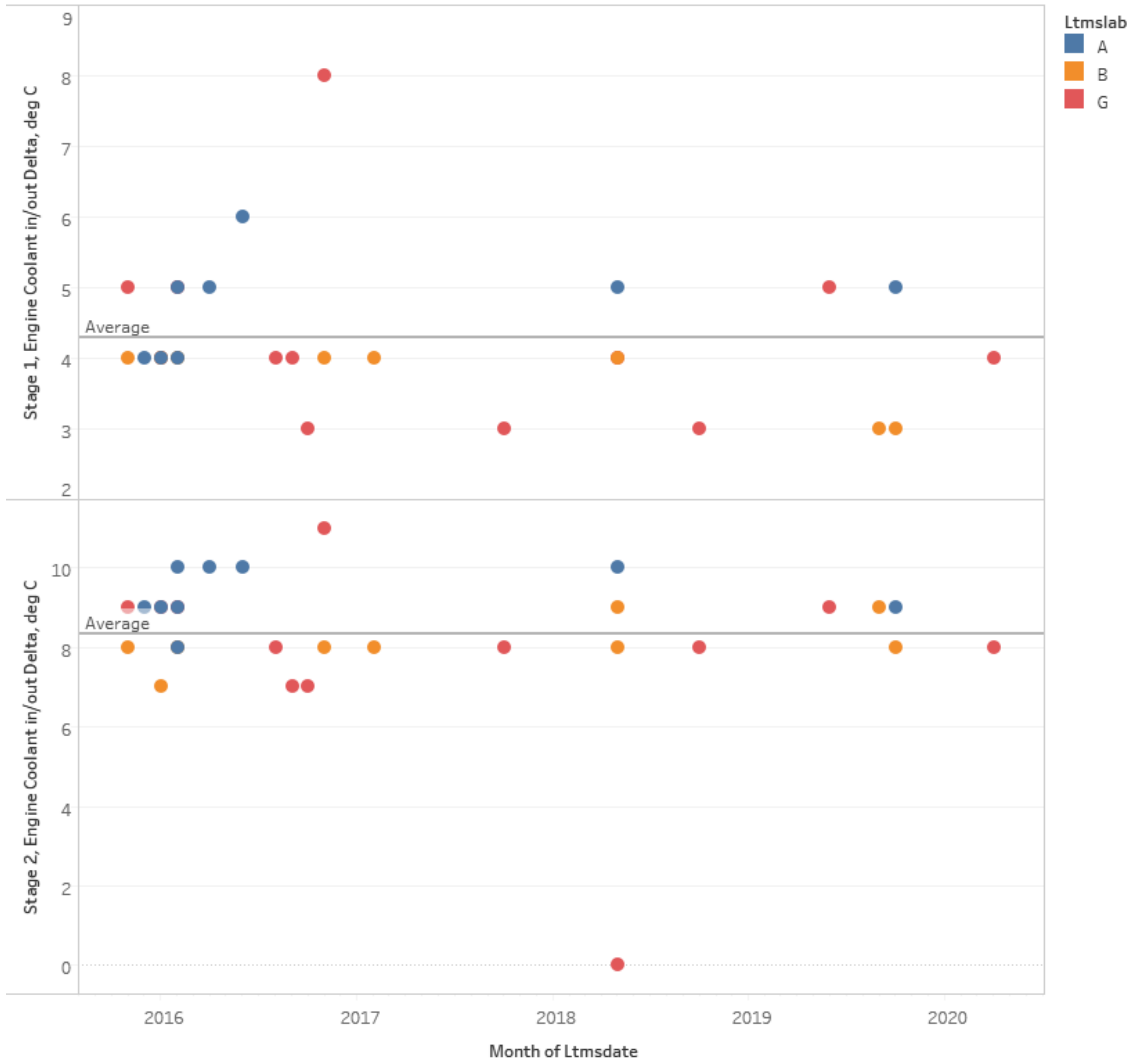
Assuming all operational data was acceptable, this first round of tests passes the statistical criteria, since all E_i values are less than 1.734.

Discussion: This example is intended to start discussion on whether a severity limit on Y_i is needed. The prediction error (E_i) only ensures the stand is reasonably close to recent historical performance, but does not directly check that the performance is close to target.

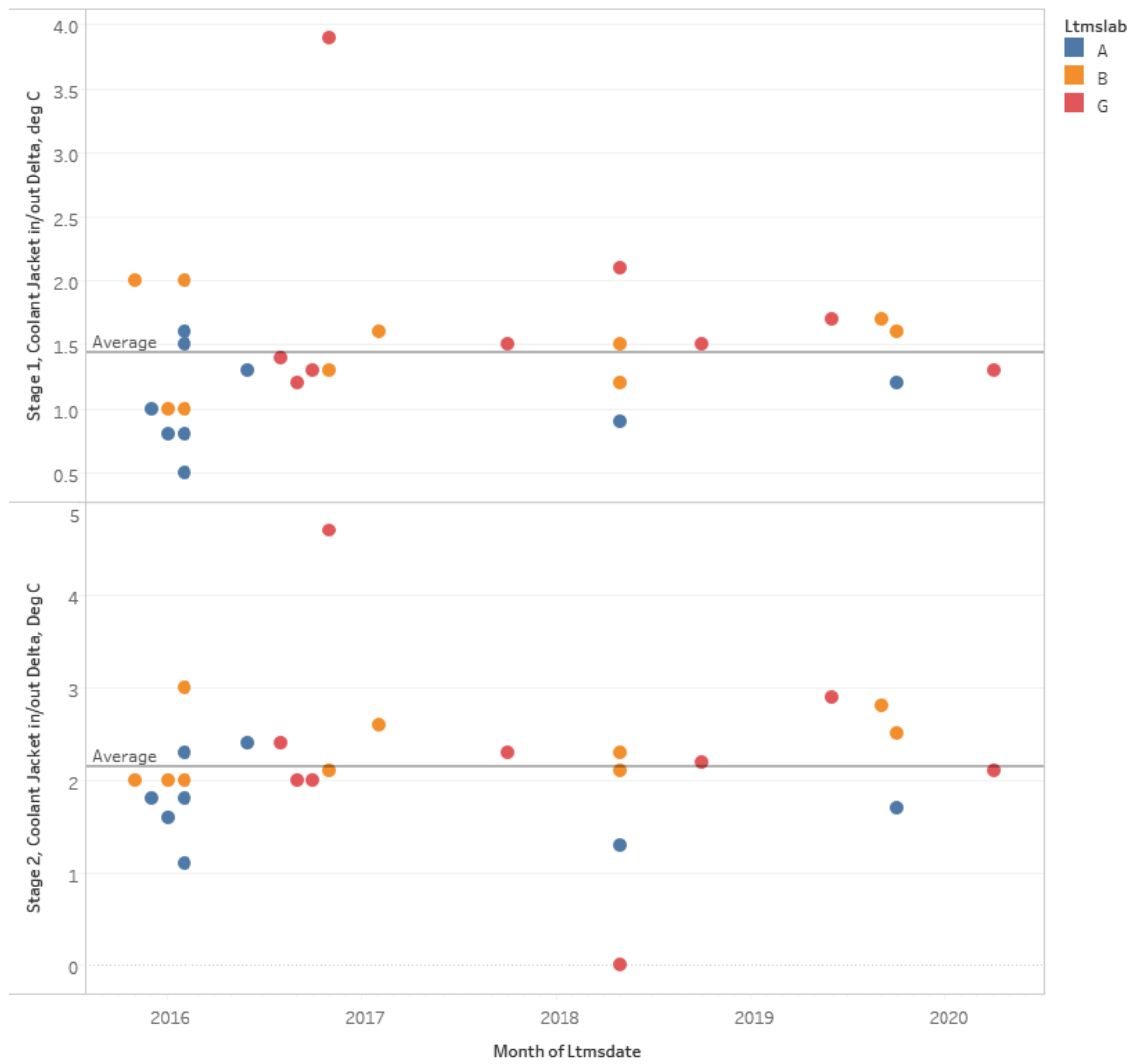
The same stand now runs a test on Oil D. What requirements do we put on results?

DD13 REFERENCE TEST OPERATIONAL DATA PLOTS TO REVIEW COOLANT TEMPERATURE DELTA – PRESENTED TO PANEL DURING THIS MEETING.

Engine Coolant Temp



Coolant Jacket Temp



SwRI Engines, Average Load by Reference Test

