

100 Barr Harbor Drivetel +1.610.832.PO Box C700fax +1.610.832West Conshohocken, PAwww.astm.org 19428-2959 USA

tel +1.610.832.9500 fax +1.610.832.9666

#### COMMITTEE D02 on PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

CHAIRMAN – Scott Fenwick, National Biodiesel Board, PO Box 104848, Jefferson City, MO 65110-4898, United States (800) 841-5849, Fax – (537) 635-7913, e-mail – <u>sfenwick@biodiesel.org</u>
FIRST VICE CHAIRMAN – Gregory C Miiller, Tannas Co, 4800 James Savage Rd, Midland, MI 48642, United States (989) 496- 2309, Fax – (989) 496-3438, e-mail – <u>gmiiller@savantgroup.com</u>
SECOND VICE CHAIRMAN – James J Simnick, Bp Global Fuels Technology, 150 Warrenville Rd, BP Technology Center Mail Stop 603-2W, Naperville, IL 60563, United States (331) 702-4071, Fax – (630) 420-4831, e-mail – <u>simnicjj@bp.com</u>
MEMBERSHIP SECRETARY – Ian P Mylrea, Stanhope-Seta, 70 Bramley Drive, Hampshire, RG27 8ZF, United Kingdom (193) 2 5- 4589, e-mail – <u>im@stanhope-seta.co.uk</u>
STAFF MANAGER – Alyson Fick, (610) 832-9710, e-mail – afick@astm.org

# SEQUENCE VI SURVELLANCE PANEL

#### Date - 03 May 2023

ATTENDANCE	
SWRI	Dan Engstrom, Christine Eickstead, Pat Lang, Travis Kostan
INTERTEK	Adrian Alfonso, Al Lopez, Bill Buscher
LUBRIZOL	Andrew Stevens, George Szappanos, Tony Catanese
AFTON	Bob Campbell, Ben Maddock, Amanda Stone, Andrew Rohlfing, Jason Lekarich
ORONITE	Robert Stockwell, Ricardo Affinito
INFINEUM	Andy Ritchie, Todd Dvorak
тмс	Rich Grundza
GM	Frank Cooney
ΤΟΥΟΤΑ	
ОНТ	Matt Bowden
TEI	Dan Lanctot
FORD	Mike Deegan
VALVOLINE	Amol Savant
HALTERMAN	William Hairston
GAGE PRODUCTS	Jim Carter
HALTERMANN CARLESS	Izabela Gabrel
BP	
EXXONMOBIL	Paul Rubas
SHELL	Jeff Hsu, Seth Demel
IMTS	Dave Passmore
CHRYSLER	Haiying Tang

#### 1. Attendance. See table above.

#### 2. Approve minutes from 2/8 and 2/27 meeting

Motion to approve minutes: Andrew Stevens, Second: Robert Stockwell Motion passes unanimously.

#### 3. New business

## 3.1 Additional coolant flow calibration discussion (see Appendix)

Paul – How should we actually handle the calibration for coolant flow? Does it have to be another mass flow meter or can you calibrate with a mass flow meter and orifice plate?

George - Should calibrate flow with flow meter, not pressure.

Ben – Same.

Paul – Should we specify that in the procedure?

Bob – Think that's implied - don't need any fluid in the system to calibrate a transducer. Procedure is telling you that you have to use a certain fluid and by implication you have to flow it.

Paul – So it's implied. I'm okay with that. Also a list of the calibrations for every 6 months. In that list is the oil sump temperature (circulation temp). Propose to clean up that wording?

Rich – I'd agree to issue an information letter to update that. Editorial should be fine, no need for a motion.

## 3.2 FEI evaluation stage procedure discussion (see Appendix)

Tony – We are looking at the procedure and find it interesting that you're allowed to restart a stage as long as the sixth reading has not been completed. Requires a tech to be at the stand full-time during those stages in case a parameter goes out of spec in those stages. Could lead to a lost test because parameter runs away in the 6th measurement. Proposing a change to allow a restart after the stage is complete; hold after that stage for engineering approval instead of having a tech sit there full time. Don't see it as a way to cherry pick data because can always audit the data and will have the data to show that a parameter is out.

George – Can abandon a stage even seconds before it finishes based on the premise that some control issue is out. All this proposal changes is that if the lab runs all 6 of the evaluation stages, it can re-run the stage. No difference between stopping halfway through, seconds before it finishes, or after. Why lose the test? Adrian – Also have to add a comment that you've rerun a stage, lost very few tests where the last reading pushes the average out. This is not going to change anything on my side, but I don't have a problem with completing the reading.

Ben – This is better than shutting the stand down and restarting it back up in that stage. How did you land on 4 stages?

Tony – It's in the procedure. Basically, just remove the yellow parts and add the new verbiage. Not a big change, but it allows a little less manpower and is a little more forgiving.

Andrew – Don't have to have people captive at the stand.

Ben – Is the intent to re-run whole stage including the 1.5 hr stabilization?

All – Yes.

Adrian – Run check on 5th data point; if something is out on the 5th unlikely to recover by the 6th.

Andrew – Other consideration - this brings it in line with the M366. Can run whole thing, stop it, and re-run if needed.

Bob – How do you document this in the comments section? Andrew – Document it with reason in the comments section. Adrian – The stage will be double length, so it will show up in the data. Comment serves as a red flag, and must be documented.

Andrew – Everyone okay with it? Didn't sound like there's much opposition.

Robert – Wouldn't be hard to program it if something was out of spec even two seconds before the end.

George – Easier said than done....

Deegan – Not as familiar with this test, think GM needs to speak up if this is acceptable.

Andrew – They were invited, Frank Cooney was tentative but don't see him attending.

Deegan – Not familiar with this part of the cycle....

Robert – Think that it's safer to do an email ballot?

Frank joined call.

Andrew – (to Frank) We were just reviewing something that we wanted your input on.

Tony – 11.6.5.1 in VIE procedure where specifies that can restart the stage as long as the 6th reading has not been completed. Feel like we can align this more with the M366 and make decision on whether a parameter is outside of specified range and allow a restart.

Andrew – Frank, any questions or concerns?

Adrian – Restart has to be documented and put a reason why just like we are doing now.

Frank – What is the rationale or purpose?

Tony – Purpose is to reduce technicians needed to look at this during the test and lost tests that go out of spec due to the 6th reading.

Frank - Unmanned stage, if goes out of spec, you want to restart and collect data?

Tony – Correct.

Frank – Think we'd have to think about that; don't know if that was the original intent. Do you have any data? Andrew – Per the rules right now, can stop the stage 1 sec before the end of the 30 min stage and re-run and that would be valid.

Frank – That would be someone actually stopping the test, this would be leaving the rig and letting it go down. What are the standards for that?

Adrian – We may want to walk him through how that works.

Andrew – It's broken up into 5 min stages for the 30 mins FEI evaluation. Average out over each 5 minute segment to look at what average is for each one and what plus/minus is for each parameter. Way that it is right now, look at stage 5 and if you think you're going to be out, stop stage and re-run it. If close, this is somewhat guess work. This would allow you to run it out and see where it's at vs. having to guess.

Frank – Have to think about that - concern becomes more of roll of the dice rather than actual measurement of the FEI. Is it intended to prevent people from ending a test that's not in favorable results?

Andrew – Have to make evaluation of if you rerun it or not, if one parameter of one stage is out, invalidates entire test. More about what is the most effective way that we can think of to manage the test. Running through the entire thing you have the complete data set. This is also the procedure for the M366.

Adrian – Focused on making sure that you ran in specs instead of trying to influence results.

Tony – Still limited to one restart per stage and four restarts per step.

George – Removes some subjectivity on when and how you restart. Either abandon test or rerun the test; have data and ends up in test comments. No guess work and very black and white.

Frank – If have a parameter out on a stage, still have to finish the test?

Andrew – Yes, but if you finish it, it will be an invalid test.

Frank – A lot of implications, could attribute to more incomplete tests.

Andrew – How?

Frank – Similar to what you described earlier, when you have stage when not meeting limits, more apt to shut it down. How will this affect how the test is actually run?

Andrew – We're making a judgement at end of last measurement. May currently be re-running things that didn't need to be re-run. Would have entire set to make decision on instead of incomplete data set. Frank – Looking at data and calling it good or not good at the end of test. Could have been run numerous times and cut short on the 6th stage. This opens things up considerably and think about the locations and wide range of implications. See it as setting test up as screener and making decision about whether to continue or now. Not ready to provide definitive feedback today.

Andrew – What data is needed to make decision? Frank – What percentage tests would not be run to completion? Andrew – How many stage reruns? Unless you rerun a whole bunch more times or found some actual mechanical problem, probably 0. Frank – Say that it goes to stage 5 and test not run to completion.

Andrew – Don't have to dedicate someone to the entire test to watch.

Tony – Biggest intent on this is to reduce manpower needed during these stages. Not trying to cherry pick data, eliminate manpower needs.

Frank – Not saying there are any nefarious intents, but worried about unintended consequences.

Andrew - Frank, want to write out in detail your concerns and send back to panel to address?

Frank – Yes, can do that. Preserving test history comes down not just to checking data.

George – Operator not making decision based on test severity, but if test happens to run full 30 min evaluation period and something is out, can still rerun the stage.

Frank – Why is the focus on the 6th stage?

Andrew – Not talking about only Stage 6. We're talking about for each stage 1-6, broken down into 6 5-min steps. At step 5 of every stage, need to make decision about whether we need to re-run that currently. Finish entire 30 min eval for every stage and then make a decision about rerun or not.

Adrian – Not pertaining to result, only to whether in or out of spec.

Travis – If we actually rewrote it this way, can only restart in case of parameter being out of spec. Not allowed to restart under any circumstances unless parameter is out of spec. Rule is discrete, same for everyone, no judgement needed.

George – Adding provision to rerun at end, can choose to abandon before it goes full-length. Don't need to run it the full 30 mins. Don't want to remove that flexibility.

Frank – We don't have any data on how many tests start and are not completed due to operating parameters being out?

Andrew – Not readily available, but we can mine it.

Bob – This happens 30 times a test. What this does is helps the manpower/labor situation not having to babysit the test. Not going to show in the stats, but also not in the stats is the person who has to sit there and make a decision.

Frank – Obviously in the lab's interest in to not have to run step or stage again. Very infrequent. Not wanting to monitor the test, then have to re-run. Isn't it in the interest of the lab to monitor test to ensure that rerun doesn't have to occur?

Andrew – It is always in the interest of the labs to monitor the tests and we do. This is the only test that for 12 hrs during stages 1-6 you have to have a dedicated technician assigned to the stands. Technical value for doing the current rule vs. the proposed rule – really isn't any because you can stop it one second before you complete stage 6.

Frank – I understand the reason, but we don't have any data to support that. I think I know where we are and where panel wants to go, but don't think that there's an obvious need for this in sense that we have a lot of tests being invalidated. If 30% of the tests, that's a cost the lab wants to try to avoid.

Andrew – We are not talking about invalidating the test, we are talking about making decisions about stage reruns to be able to still monitor test but not have to dedicate so many resources to a single test.

Frank – Am I misreading the third bullet? About test invalidation.

Tony – Looking at the current wording. This is what we trying to put in, taking out the yellow. Stage can run to completion and then invalidate it.

Robert – How long until re-run stage? Test still running.

Amol – Immediately, clear implication on how procedure has to be run and can be automated by computer calculation. Computer can throw a flag - parameter was not in spec and hold for engineering decision.

Robert – You could make the decision at 29 mins and 5 seconds and do same thing.

Amol – 6th step is not totalized if there's any time remaining.

Bob – It is unlikely that one more data point will impact average.

Andrew – Can hold the test regardless of if run the stage runs to completion or not.

Robert – If you make the decision to restart it 5-10 mins later, can still rerun it. Think needs more comprehensive decision.

George – At the end of the evaluation phase, computer makes a decision on whether to move to next step speed load combo. If anything is out of spec, test being held at that point in the sequence and let operator make a decision.

Bob – If there's a problem because a parameter is out, is there a building problem that's the issue, etc.

Robert – Need a lot more detail here, if computer sees that something was out of spec in that cycle, has to shut down for someone to fix.

Bob – Don't want it to go to the next stage. If enter next stage, sucks for you and it's done.

Amol – Can have a one or two second check stage.

Andrew – Holds if doesn't meet requirements.

Rich – In case where it holds, do you report this as off test time? Not downtime since engine is still running? Robert – Maybe we need a 5 sec check stage as off test time.

Adrian – In 30 mins, cannot hold test during BSFC stages.

Robert – Talking about when that ends though.

Rich – Only go to stage 6, start next step in series of BSFC. At that point, you rerun that stage and go back to stabilization.

Adrian – In stable, allowed to hold it for up to two hours at a time.

Amol – We're not reporting that hold time anywhere.

Adrian – No difference in calculating up to one second before stage ends and at the end of a stage.

Frank – Heard bits and pieces, sounds to me like it's a combination of things. Optimization of good code for the test, but I'm trying to understand the difference. Sounds like a lab coding issue rather than procedure issue. Think it could be solved without adding a provision to invalidate the test.

Andrew – Please put your thoughts down and send out so panel can respond to your concerns.

Bob – Good to illustrate the cycle and time savings, automation, etc. Makes it very simple to automate, draw it out and make sure everyone is on the same page.

Frank – Perceived procedural benefit, what impact does that have on how the data is treated and post-test review of all data and anything out on op parameters, looking at whole test being invalid. Understand resource side, what's the proposal on how data will be handled.

Andrew – If you could write that down, we'll put more detail around it and hopefully get concerns addressed.

### Additional item: Reference oil assignment

Travis – Most people have seen a version of this, originally shared in Pittsburgh. Average of reference oils, one ref oil could be severe and one could be mild but looks okay on the control charts. Control chart by reference oil; just updated with data as of Monday. For FEI1, 542 1 sigma severe; 1011 1 sigma mild. Recently 543 moving mild as well. If Rich happens to assign 543 and 1011, expectation is that you'll end up mild of target and have a negative SA. If have 542, end up severe and with a positive SA. Can lead to a not level playing field when SAs become reference oil dependent. FEI2 similar story with 543. Understand if any reference oil's giving problems in each panel.

Rich – Don't have it overlaid but have individual plots by oil for VIE. Similar behaviors.

Travis – Going back to the matrix, we acknowledged some different behavior in different runs. Expanded repeatability limit due to some of these issues. Possible solutions, put on stats group to do list for what to do. Reference oil dependency for SAs. Test looks good on average but granularity is important. Rich – If look at industry control charts for VIF, don't see anything of concern. Important to consider granularity. Bob – Also agree, figure out what to do with granularity.

Andrew – There are two avenues to explore; what to do about it now and what to do coming out of PM.

Travis – Balance out the reference oil assignments without having a mathematical fix.

Andy – Principle of equal weighting says you're not going to get these targets right. I don't think there's a PM coming up anytime soon but address whole principle of equal weighting and do it better next time.

Al – Common in most tests, take calculations from data in matrix. Why is it impossible for us to reset targets? Travis – Never took time to reevaluate the test in a short time after matrix.

Al – Want to request TMC to order reference oils?

Travis – Maybe, I don't think can come up with mathematical correction that doesn't influence candidate tests unfairly.

Andrew – Make sure that we get to the BL5/6 discussion, have stats group take look at options.

Make sure that we're pursuing options that are feasible. Is changing targets an option?

Other than changing reference oil assignment, what can we do?

Rich – May be getting lost, is it a change in the SA or an actual change in the lab/stand/engine? Is it the oil itself or is it the entity testing it?

Amanda – Way past point of changing targets, but can we still go back and look at data where we were supposed to reevaluate?

Travis – It would be good to learn from and diagnose why it went wrong. If we can do things better, still have to find a way to solve it.

Robert – Don't like saying that we got it wrong, but never going to get it quite right. Fact that we're a bit farther off on a few reference oils shouldn't surprise anyone.

Bob – While in principle that makes sense, to update after 10, 20, 30, that's under assumption that everything is stable during that time. If reference oil run order predisposes a test to perform well or poorly, that's bad and we need to address that.

Rich – The run order was once specified in VID. Had to run three reference oils. Not unprecedented and have done it before. 542 is severe, ICF caught it up a bit but went back to same behavior. 1010 blends had been going severe and now possibly leveling; 544 going mild but only 20% of the data per assignment rules.

Robert – With old OEM hat on, stable before category started and look to be stable now, let's not screw with it. Rich – In the process of introducing 542-5, 542-4 is significantly different than 542-3 and 542-5; 542-5 looks a lot like 542-3 for FEI1 and FEI2. Andrew – Travis, do you have direction from SP group in which way to go with this? Different potential approach when we design a PM?

Travis – We have most stats group members here; we'll remember this as one of the things to add to the list.

## 3.3 BL5/BL6 analysis and discussion

Andrew – Last item: BL5 BL6 comparison results across multiple labs. Stats group has not had a chance to review this. Go through and if we have direction for stats group, provide during this meeting.

Rich – Reviewed BL5 BL6 presentation.

Bottom line, showing about 13g difference in total fuel consumed and 2g in weighted fuel consumed. 1:1 plots of actual fuel consumption data. First set of data BL2, couple things with BL5 vs BL6 data. Lab data identified. Range of data is about the same or sightly tighter than original results from 2 vs. 6 across a number of engines. Some difference in fuel consumed with each BL blend by engine.

Some difference in fuel consumption, total fuel consumed varies from 4g to 23g. In terms of weighted fuel consumed, Lab D showed almost no difference, Lab F showed 4g different. About 11% on average for FEI1 difference. ¼ of what we saw when comparing to BL2.

Where we go from here, I don't know.

Bob – On previous introductions when data generated at 2-3 labs, how closely aligned historically would we have expected those to be? Lab D showed no difference and Lab F showed 4g different.

What's normal?

Rich – Hard to say with such small snapshots.

Bob – Is there anything we can learn from the history to say that's normal? Just have 4 or 5 engines now instead of 2.

Travis – Makes you wonder if there's anything with the BL2 that we were comparing with. Larger difference over time?

Amol – Compared to BL5, it's significant. One of the options is possibly having a correction factor for this BL.

Rich – Not comfortable making correction factor based on average of weighted fuel consumption.

Travis – Some stages more impacted than others.

Robert – Bigger difference than we're used to but not that big.

Bob – That could be 0.1% on FEI1 or FEI2, 0.2% on FEI sum. That seems large.

Rich – If it's truly 3g, that would probably negate the severity. Given level of variability in each stage, just don't know what the right answer is.

Paul – Some scatter in fuel economy of results. Is that because of lab differences?

Bob – Probably an engine difference, labs did everything right. Tendency towards the line.

Rich – All possible candidate runs are represented in data.

(2) 2<sup>nd</sup> runs

(2) 3<sup>rd</sup> runs

(1) 4<sup>th</sup> run

Travis – 1:1 line plotted. If plot line of fit, where does it land and is offset (if exists), is it constant? Bit of mix of run order, so look at where run 2 vs. run 3 fall along line.

Need to look at the data and determine options. Put on list of what to do about it and come back with a proposal.

Andrew – Yes, that's what it seems like to me. Potentially significant difference that we need to determine how to handle. That's what I see moving forward from here.

Ben – How is all that data handled and fed in? Make sure to spot check data since it was just an Excel document tossed around between labs.

Andrew – Labs resend data out to other labs?

Adrian – I didn't exactly follow the template, copy and pasted the data.

Rich – Did a spot check, all data is up on the website. Think we should put spreadsheet out where data was compiled for plotting. Should be available for stats group as well.

Bob – What sort of timing pressure do we have? What are we looking at?

Adrian – A lot of time, they have until Monday! Mainly driven by IAR, who is out of BL5 continuously buying BL5 when bought a huge batch of BL6. Would like it sooner rather than later.

Rich – Panel has to accept results before they can be paid.

Bob – Acceptable in terms of validity, did the labs do what they were supposed to do?

Adrian – Don't think there's a question of whether the data is useful or not.

Rich – Need the panel to say this data is useful.

Andrew – Is there any process to getting to that? Labs provided valid data.

Bob – Labs provided op data, did we look at that and what did we do with it? Intent of that was to validate the testing to make sure the tests were run properly.

Rich – I looked at OP parameters, data posted.

Andrew – Anyone who has any concerns about the data that's posted?

Paul - Can any labs speak to data quality from other labs?

Andrew – Do we need some time for people to potentially review and present concerns? Or just labs stating that they're confident in the way the tests were run and that their data is good?

Adrian – Run like a normal test, so normal OPs checks in place and trust it.

Andrew – People making a statement about the confidence in own data is sufficient for today.

Motion (Robert Stockwell):

## Motion that BL6 and BL5 comparison data is acceptable for its intended purpose.

Second – Adrian

Discussion:

Paul – Did every lab do a reasonableness check? Use right oil in right tank? Consistent results for all 6 pairings? George – OP differences between oil batches in things like oil pressure?

Waives – Jeff, Amol Negative – None Approve, all else, **motion passes.** 

Andrew – Just to be sure, Travis and stats group – do you have the right information and direction for panel to move forward now? BL5 vs. BL6 analysis. Rich has conducted preliminary analysis, stats group to continue that analysis and if they feel there is significant difference between oil batches, come up with recommendations. Todd – Can take care of operational data, are there vis. differences? Analytical data? Can certainly look at engine op data and if there's something there that's glaring - fine. We can look at that.

Amanda – The combined data is not truly combined and not all labs started at same BL. Some started on BL5 and some started on BL6. All on one sheet but not combined in one analysis.

Rich – Will post that on the website too. Have spreadsheet used to plot that data.

Andrew – Further analysis of potential effects with OP data; as long as all base level analysis doesn't show any causal effects, conduct analysis of how to handle it mathematically.

Adrian – One jump from one blend to another (0.003 to negative something). The magnitude of that jump; how does that compare with what we're seeing now?

Travis – Mostly been triple 0 something or double 0 something. If it results in a tenth of an FEI for FEI1 and FEI2, it's something we should do something about.

## 4. Next meeting

5. Meeting adjourned

## APPENDIX

## Flow Cal Discussion:

From Paul Rubas (ExxonMobil):

- 1) For the paragraph we are considering the update for on the coolant flow meter calibration, I suggest we carefully consider the wording to provide clarity what exactly is expected to be used for the calibration standard. I assume that the primary flow meter used by most labs is an orifice plate with taps for a differential pressure sensor. To calibrate this, you could consider using another flow meter (such as a Coriolis flow meter), or you could focus on calibrating the differential pressure sensor and assume that the orifice plate/pressure taps are static devices and therefore don't need to be considered. If the intent is that a second flow meter MUST be used, then I would like to see the wording reflect that. If calibrating the differential pressure sensor is considered adequate, then the wording should specifically mention that as well.
- 2) For the list of required calibrations every 6 months (see Table 6 in either the VIE or the V-F test method, the oil sump temperature is listed. This is most likely an error since the oil sump temperature is not used for any calculation, there is no mention of needing to have an oil sump temperature measurement in the standard, and it does not appear in the test report. In discussion with Rich, the most likely intention is that this should have been the oil circulation temperature (just outside the oil pan).

### **FEI Evaluation Discussion:**

This is my (Andrew Stevens') summary of some discussion around this topic:

George Szappanos and Tony Catanese from Lubrizol expressed an interest in changing the procedure regarding the rules around the FEI Evaluation Stages. Currently, the procedure states that a stage run to completion will be invalid if one of the controlled parameters is out of limits. The desire is to move to a procedure similar to the Toyota M366 where the stage can be run to completion, halted for evaluation of conformance to limits, and rerun if necessary. This would remove the requirement to "babysit" every evaluation stage to ensure validity and would allow more flexibility while operating the test. The currently expressed reason for not allowing this type of procedure would be to prevent stage reruns for "non-technical" issues and manipulating the results. The counter to this is that we could stop the stage 5 seconds before its end (which is effectively running the entire stage), estimate the stage BSFC, then rerun anyway. The panel discussion will be centered around deciding how to handle these concerns. The currently proposed procedure change from George Szappanos is:

11.6.5.1 During the BSFC measurement cycle of a test, a stage restart may be conducted for any stage provided the average of any critical parameter, as detailed in Table 3, is projected to be out of the specified range for that stage, and provided the sixth reading of that stage has not been completed. If the sixth reading of any stage is completed, do not conduct a stage restart for that stage. Additionally, If the sixth reading of any stage is completed and a critical parameter average is out of the specified range for that stage, the stage may be repeated. the test is considered invalid. Only one stage restart per stage as shown in Table 4 and no more than 4 stage restarts within a test are allowed. Document each stage restart in the comments section.