ASTM INTERNATIONAL
Helping our world work better

100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA
19428-2959 USA

tel +1.610.832.9500
fax +1.610.832.9666
www.astm.org

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 – sfenwick@biodiesel.org

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 – gmiiller@savantgroup.com

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 – simnicjj@bp.com

MEMBERSHIP SECRETARY – Ian P Mylrea, Stanhope-Seta, 70 Bramley Drive, Hampshire, RG27 8ZF, United Kingdom (193) 2 5-4589, e-mail – im@stanhope-seta.co.uk

STAFF MANAGER – Alyson Fick, (610) 832-9710, e-mail – afick@astm.org

SEQUENCE VI SURVELLANCE PANEL

Date – 2 Dec 22

ATTENDANCE

SWRI	Dan Engstrom, Christine Eickstead, Pat Lang, Travis Kostan
INTERTEK	Adrian Alfonso
LUBRIZOL	Andrew Stevens, George Szappanos
AFTON	Bob Campbell, Ben Maddock, Amanda Stone
ORONITE	Robert Stockwell, Ricardo Affinito, Jo Martinez
INFINEUM	Andy Ritchie
TMC	Rich Grundza
GM	
TOYOTA	Satoshi Hirano
OHT	
TEI	
FORD	
VALVOLINE	Amol Savant
HALTERMAN	
GAGE PRODUCTS	Jim Carter
BP	
EXXONMOBIL	
SHELL	
IMTS	

MEETING –

1. **Attendance. See table above.**

2. **Approve minutes from 7/14 and 11/17 meetings**
   Motion to approve – Andrew Stevens
   Seconded – Rich Grundza
   Motion passes unanimously

3. **New business**
   3.1 Introduction of BL6
   Rich recapped BL6 approval presentation, 8g of additional BL fuel consumed equates to about 1.5 sigma difference in the mild direction. BL6 total fuel consumed is a lot higher than BL2.

   Ritchie – What does total unweighted fuel difference equate to percentage wise?
   Dan – Total unweighted fuel consumption is around 10.5-10.6 kg
   Stockwell – So that's 41 g out of 10000 g.
   Ritchie – 1.5 sigma makes it look really bad, but is it really that bad?
   Campbell – This is a comparison test, the candidate performance going forward is not going to shift. Whatever fuel the candidate oil burns on BL5 is now compared to BL6. Replacing BL5 with BL6 is like 0.3 – 0.4% FEI, which is huge.
   Stockwell – Agree that it's a huge difference and we have to deal with it, but it's close enough that we can deal with it.
   Rich – We already have an ICF moving the test up by a standard deviation. Agree it looks like it can be huge, but we have a 5 sigma band for calibration purposes. Have some thoughts on how to do this that might work out okay but will require some gyrations. Agree it's a big difference, but not much bigger than what we're currently adding to test results

   Adrian – BL6 was only tested at 2 labs. If there's a little more data maybe the performance improves a little? Or possibly remove outliers from data?
   Rich – Didn't want to start throwing out data. Besides the data with rich AFR, there was another set of data that looked suspicious as well that would bring total fuel consumed difference to around 30g. Still looks different even when you do that. May have enough BL2 oil left for two replicate runs. If the results are still somewhat different, we'll have to deal with it.
   Stevens – Agree with Rich. Question is how truly different is it?
   Travis – We looked at data generated at SwRI with and without outliers. Whether or not have outliers are included, the difference still shows up. Just two engines, but we see a very similar shift on both of these engines. Likely a real difference since in both. Knowing that this test has differences engine to engine, likely need to do more iterations on more engines and come up with a correction factor.

   Bob – There are only a couple tests of BL2 left?
   Rich – About 20 gallons of BL2 are left, maybe as many as 4 tests
   Bob – How long have we been on BL5? Either request a new blend or we have to generate more data. Obviously don't have enough BL2 to generate enough data to calculate proper ICF. Maybe compare to BL5?
   Rich – Yes, same suggestion. Use BL5 to generate more data instead of BL2.
   Bob – Was BL2 used in the Seq. VI precision matrix?
   Rich – No, we used BL3 and BL4.
   Bob – We should tie our data back to matrix testing, but we likely don't have BL3 or BL4, correct?

Rich – Will check inventory on BL3, but no inventory of BL4
Bob – So the likely path on generating data is testing BL5 compared to BL6
Rich – BL5 was brought in late 2018 or 2019?

Andy – How much time do we have on BL5?
Rich – For the most part, we don't need to do this until summer. 4 of 6 labs are good until at least summer. One lab has enough BL5 to see them through their engines, one lab was able to procure additional quantities of BL5 and good through roughly the end of first quarter. Not in a huge time crunch, and there is anticipation that things are slower at beginning of next year
Andy – Not convinced that there will be a testing slowdown, but instead an uptick in testing. We need to approve BL6 in the next 3-6 months. A new BL batch is not feasible due to time.
Rich – Yes, blending a new BL batch takes 12-18 mo.
Andrew – A new BL blend is not an option; we need to use BL6. Need to figure out what data we're going to collect to use BL6.

Andy – This is not the first time this has happened, sometime in the 1980's there was a similar requirement. We have some case history on this kind of thing. How much more data do we need? We have two engines worth of data, and this is an important issue. It's not acceptable to not move quickly here. Any guidance as to what we should do in next 3 months to collect an adequate amount of data to make better decision by April 1st?
Adrian – The amount of time to collect data is not time consuming once we decide where to run.

Andy – How many labs have calibration status?
Rich – 4
Andy – 4 labs are running calibrated VIE tests at the moment. Those labs should be put on standby to run BL6
Bob – We can't forget about VIF since there is a bias there too. We need to generate data for both test types, but who pays for the data and who generates the data? What does it look like?
Rich – Ultimately, you'll pay for the data. TMC has not authorized paying for x number of additional runs. Not budgeted for in BL6 blends.
Bob – Suggesting that someone must pay for it (not TMC), and we should treat BL like we treat fuel batches with a contract.
Andrew – We're too far down the path of where we are now, we need to get some data generated.
Bob – Not convinced that the burden falls solely on test labs since something we purchased isn't on spec.
Stockwell – What would be a fair path forward? Could we get BL5/BL6 comparison from each of the 4 labs by mid-January and then discuss data?

Andy – Travis, what data do you need to make a better decision than the data we have?
Travis – My initial thought is to do similar to what we do in fuel batch approvals. Two data sets from independent labs each and 1 set from dependent labs each. We know engines are different, so what number do we need to get to before we have a good hold on the average? 2-2-1-1 type of situation. Two data points we have on BL2 aren't good since we don't have enough oil to run rest of matrix.

Bob – Are there any lab inventories of BL2?
Rich – Suspect not, we were scrounging around the last couple times we did this. Can ask but doubt there is any left.
Andy – Don't think we want to use BL2 anyways, want to use BL5 since that's what currently being used?
Travis – That's not necessarily true, the test can creep over time if always comparing the last BL to the new BL batch
Lochte – Couldn't find in our system when BL2 came about, but BL3 received in 2010. BL3 is 12 years old.
Andy – So the assumption is that BL6 is not doing its job, but it could be that BL2 shifted?

Adrian – Rich did a comparison of BL2 performance over years, and it's not changing.
Rich – BL2 was received in Dec. 2008, 14 years old.
Mike – The oil has been stored in ambient air, but not out in the sun.
Rich – BL2 came from TMC, not labs
Adrian – Rich looked at the numbers for every iteration of BL, BL2 didn't change much.
Lochte – Did the TMC go back and check vis before sending out?
Rich – Believe it's part of the QC process, so checked at least on an annual basis. Probably more variable due to engine than due to anything else. If it's close to BL5, then that will give us a warm fuzzy that it will perform similar. If not, then we can believe the difference is real.

Travis – Rather than rolling out 6 engines to start new testing, should we complete 2 engines of testing on BL5-BL6 before continuing?
Adrian – Since we have 2-3 runs of BL2 left, would that not be enough to give confidence to set a correction factor?
Travis – The territory we're in is not really statistics yet. We will be coming up with an average for the correction, are we comfortable coming up with correction based on that data?

Adrian – That would be a total of 4-5 engines, two first ones plus two to three more
Travis – My initial number in mind was 6 engines, but we could do it with 4 or 5. The group has to decide if that's sufficient
Adrian – That's just something that I wanted to mention to group so that we don't just discard BL2. Two or three extra runs on BL2 is something that we might take a look at

Rich – The quantity of BL2 remaining is roughly 26 gals. Half a drum is probably reasonably accurate. We need 6 gallons per each iteration. We don't have enough to do one complete set of iterations, just four runs on BL2.
Adrian – Correct, every charge is 3.9L.

Andy – What about running the matrix on the VIF test?
Rich – We've never done this with VIF
Adrian – If we put VIF in the mix, then BL2 is out of the question
Rich – Showing 26 gal left of BL2, shipped in 5 gal cans last time.
Adrian – 5 gals for each iteration

Rich – We have enough for 5 total BSFC runs on BL2
Adrian – So we don't have enough to do even one complete check. BL2 is out of the equation.
Andy – We shouldn't be basing this off of the BL2 run, it could be that BL2 went bad. We should be basing this off of BL5 vs BL6. We want to know the difference between what we've been using the last 3-4 years and what we'll be using in the future. Might not be the ideal way to proceed, but we can live with it.
Adrian – I don't have a problem with that. The performance of BL2 for this round of checking was not different than the performance of BL2 in previous BL approvals. I think that it's more valuable because we thought BL2 was an option, but there's not enough oil. Our time is better invested in understanding BL5 vs BL6 testing.

Andrew – I understand the technical difference between BL2 and BL5 if BL5 is the new baseline, but we don't have enough oil to practically do that. Same spot with BL2-BL5.
Adrian – We don't have a choice; we need to move to BL5.
Andrew – If we're going to compare BL5 to BL6, what does that actually look like? How is this going to potentially hit engine runs and engine life? Should we consider early or late engine life to include in the mix?

George – Will an abbreviated test impact engine life if we're talking about donated tests? If we can get these tests in without losing candidate slots, it makes it a lot more palatable.
Bob – It has to count against engine hours and there's a finite amount allowed.
Adrian – Unfortunately for this hardware, there is too much risk on crediting hours or giving an extended run to an engine. We can't go past 900-1000 hours without losing discrimination.
Andy – If we're not getting an extension, is this close to a full-length test?
Amol – If the matrix pushes the engine hours by 30-40 hrs and we're not able to squeeze in the last candidate, then we're losing a candidate essentially.
Andy – Okay, so it's a full test. Looking at about 6 full tests as the approximate cost of this exercise.

Amol – Is there a consideration to run these paired comparisons at different engine hour conditions?
Adrian – This has been historically done on engines currently calibrated, but it doesn't matter if it is the first run or the last run.
Rich – It might be better at the beginning of engine life since that's what we'll be living with as far as calibration purposes.
General consensus.

Bob – There are three other candidates that follow along, so I'm more concerned about that.
Amol – My point is that it'll be good to have feel for how it pans out at lower or higher engine hours.
Adrian – At least for the two runs completed already, I think we ran it on last run?
Rich – I think that's correct. We had that conversation .
Adrian – Yes, run on the last slot for candidate, run 4. But the problem is now we're talking about BL5 to BL6 instead of BL2 to BL6. First runs now would be interesting to see. Only problem I see with picking first run on engine is that it might delay data collection a bit.
Rich – If in both cases these data were generated on the last run, I suspect that all these BL4 vs BL2 were run near the end of engine life, likely same with BL5.
Andrew – If we run on the first run, it may delay the time a little bit. That's not a problem. The time frame thrown out was mid-January, which should be enough time to break in engines and do testing.

Bob – All the data we're talking about was run within allowable calibration of engine?
Adrian – That is correct. These were fully calibrated runs well within the time and hours requirements.
Bob – How much testing do we need? It has to be BL5. Who is going to pay for it? We have to do something pronto when everyone has lots of things on their plate. This has to be fit in somehow somewhere.

Andrew – First thing to do is nail down what exactly this panel is stating that we intend to do. Comparing BL5 vs BL6 is pretty clear at this point. How many tests? Late engine life, early engine life? Independent labs run a set of 4 first?
Bob – We need to nail down the actual protocol since dependent labs never participated in this.
Andrew – Both labs followed same protocol and can easily communicate it to the dependents?
Rich – I send a spreadsheet and labs run it accordingly. Run BL2 first then two runs BL6, then two runs BL2, etc. This is to try to minimize carryover effects.
Adrian – Just regular 3 flushes going from BLB1 to BLB2. The only tricky part is when switching from one BL to the other BL. You have to remember what tanks the oils are in. We can put something in writing and share with everyone so that we have a step-by-step procedure.

Andrew – Unless there are any questions, we understand that we'll all be able to run same protocol?
Adrian – This isn't intricate, and we're not doing any FO flushes. The important items are making sure you pay attention when going from one batch to another and making sure everything is clean so that you don't get contamination.

Andrew – If there aren't any more discussions about that, then who's doing what and when? Who's doing runs and are we going to try to do an engine life mix? Who will do what?
Adrian – One maybe easy decision, what point in the engine's life? If it's first run, when is everyone able to provide that?

Travis – The test has an engine hour correction in place because differences in oils change over time. If we're trying to estimate the difference between oils, why wouldn't we want to mix that over time to get a good estimate? We couldn't do any engine hour correction with this, but I'm thinking that we want to mix it over engine life or at least have 1st runs and 4th runs.
Andrew – Is everyone capable of doing that currently? If we're doing first runs, that's easy. For fourth runs, we may have wait for engines in industry to run their second or third run. We have to know that that's possible before we sign up for that.
Adrian – Intertek has two calibrated VIEs, one would be the third run on the engine and the other one is currently calibrating.
Andrew – That's at least an opportunity for different engine life conditions, but we have a mix that we want of what's potentially available. The funding question keeps coming up, can that be answered in the surveillance panel? If we don't do this, then we have to use this data that we currently have.

Mike – Would the TMC be willing to give us the oil and review fee to get this going? We'd have to reference a stand to do it.
Rich – I would have to talk to Jeff for that.
Andy – That is not a major part of the expenditure and won't change the optics of what's going on.
Mike – With the end of the year approaching, we are hoping to run candidates instead of stuff like this.

Andy – I suggest that this gets done in early January because we know that there's a surge expected. I think that it's reasonable that this is done in early January. That gives us time to address issues.
Rich – TMC is on record that we shouldn't be involved in this, but we got involved because suppliers suffered these situations and wanted to get away from it. It is frustrating and time consuming.
Andy – I agree with that, this is in the category of a no-good deed. If the contract should account for this, then next time we should put it in the contract. But there isn't a contract right now, so we move on and do that next time.

Andrew – We need to decide who's doing what and how many tests. We may need to have a separate conversation about the funding piece of it. The SP is supposed to be only the technical side.
Andy – This is a technical group. We need to stick to technical aspects of responsibility.
Andrew – I'm not downplaying the importance of money, but what we need to nail down today is what we're asking people to do. Then we take that info to meetings about funding. We can't talk about funding until we understand what we're being asked to do. 6 tests are being requested, so who's doing what? Independent labs run a test at the beginning and end of engine life, dependent labs run a test based on best availability?

Travis – If we can get commitment from all labs, when we get close to kicking it off we can see what's out there and balance engine life based on the current situation
Adrian – There are only 4 active labs, so we're not going to be able to get only one from each lab. A couple labs will have to do two.
Andrew – 4 labs that can potentially participate, 2 labs will have to run 2
Adrian – So we have to pitch in two tests? That's a bit harder sell.
Andrew – That's a valid point and understand what we're running into. I would like to run at least 1 at every lab, is that something that's on the table currently? Then, could we ask that two runs be at least a consideration for discussion? That way we can guarantee that we have at least one run per lab with potential for more

Adrian – How about we run 4 tests, sense check, then regroup and decide if we need an extra 2?

Travis – We have two data points that we're looking at already, and we introduced BL5 saying it's not different from BL2. If we see all 4 engines across 4 labs give consistent differences, and those differences are similar to the BL2-BL6 difference, that may be enough comfort to develop the ICF from that data.

Andrew – That seems like the most equitable path forward. Now that we know what people are asking, financing is a separate topic. Not sure that I am the right person to set up financing meetings. We want to have a timeframe for having those discussions and making those decisions to bring back to the panel.
Mike – For the fuel contract, lab managers got together and worked it out and presented to supplier. In this case, TMC is the supplier. This is really hard to do after the fact. Some people want more data but don't have labs and are not paying for it. TMC is not exactly flush and neither are the labs, so I'm not sure who will pay for it. We could potentially have a meeting with lab managers and the TMC and see what could work out.
Stevens – Mike, can you organize that meeting? Should we put a timeframe on that?
Mike – Yes, that's fine. We can potentially meet the week after ASTM, but don't know what the other lab managers availability is. I will work to set that up.
Stevens – I don't think it's proper for me to set that up and have that discussion
Rich – Correct, this needs to be handled outside of ASTM.

Travis – Those meetings should talk about how to fund 6 tests since that's the ideal case. We don't want to get 4 runs in, see that the data doesn't look good and wish we had 6, but there are no plans on how to fund 6.
Mike – The hard part about doing variable thing like that is that two people won't' have to run a test if we stop at 4. Hard to leave things open ended.
Rich – Only have 4 labs are active right now and will participate.
Mike – Is every lab able to do this? If they only have one stand, can they do this?
Andrew – If we can't do 6 with the funding, can that at least be part of the discussion for the funding? Each lab runs 1. If labs run a second run, we need to make sure that potential is part of the discussion. If the answer if no, then at least it was discussed.

Bob – Lab participation discussion belongs in this group. Afton will participate, but will likely be mid-January
Andrew – Lubrizol will participate too
Mike – That takes care of the lab participation issue.
Andrew – Thank you everyone for the discussion; we have a good next step. Anything else to bring up regarding this topic?
Adrian – To recap: we will make this happen early next year in January, and there will be a separate group to discuss funding for this effort.
Bob – I have a protocol question since I'm not familiar. Since the distribution of BL5 is not equitable, labs will transition to BL6 when they have depleted BL5. How do we handle the BL6 ICF? Is it deployed when labs transition from BL5 to BL6?
Rich – Correct, just like any other hardware type situation.
Bob – So there's no expectation that everyone moves at same time?
Rich – Correct, almost impossible even with a redistribution that everyone will switch at same time.

3.4 Reblends of reference oils

- Status of 1011-1

- 543-1, 1010-2, and 542-5 introductions

Rich – We have a lab that all they'll have is reblends. Not much choice in moving forward with introducing new reblends. TMC has been telling the SP that this is coming for a year and we've put it on the backburner. Now it's here. I don't see any easy way to do this other than going live with them and see where they fall.
Andy – Then we're assuming the reblends perform the same right?
Rich – If we can't grant calibration status until the SP reviews targets, that could take months. What we've done in other places can't be done here.
Andy – Have there been other reblends introduced in VIE/F?
Rich – We have in VIF, 1011-1 looks a little milder in FEI2 but 1011 was going milder when introduced 1011-1. Doesn't appear to be very different. We had three different blends of 542 already in VIE/VIF.
Andy – How have they been introduced?
Rich – They were just introduced. One was part of the precision matrix because we didn't have enough 542-3 to get through the matrix.
Andy – So the assumption is that they're the same. We'll do what we've done in the past.

Travis – If we do that, we need to make a note to keep an eye on it and come back and look at it. After a handful of tests, we then decide if we need to update targets.
Rich – We will be on top of this, agree with Travis.

Jo – Can we apply a band for introducing limits? Ei2
Rich – We pretty much use a Shewhart calibration with a severity adjustment. VIF is a two test calibration with the average falling within +/-2 sigma and a delta between them falling within a certain range.
Travis – We use 60% reference, 40% stand history.
Rich – Before we put the stand based system in for SAs, the SA was 60% of the Yi value. We kept that as the lambda moving forward.
Andrew – Meeting has reached time. Do we need to discuss this in more detail rather than in few minutes at end of this call?
Andy – Yes, the group should come back in two weeks' time.
Rich – Can't live with that, I may have to introduce one of these oils.
Travis – We should have a discussion of when we go back and look at data on reblends.
Andrew – Is having another call right after ASTM okay? Paul Rubas keeps getting bumped, so we still need to get to him. Action – set meeting after ASTM week.
Bob – Rich, you might have to assign a reblend between now and then?
Rich – Correct, no other choice. What we've done in other tests is not practical here.
Andrew – It's worth getting back together to understand where we're going and wrap up last action item.

3.5 HF 20003 update

- Off-spec

- Shipping delays

Discussion tabled until next meeting.

4. **Next meeting**
   Week of 12 Dec 2022

5. **Meeting adjourned.**