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COMMITTEE D02 on PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

Issued: 05.13.2020

Reply to: Dan Worcester
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These are the unapproved minutes of the 05.07.2020 Sequence VI Conference Call.

The meeting was called to order at 1:06 PM Central Time by Chair Andrew Stevens.

1.0 The Agenda is Attachment 1.

2.0 Roll Call. Attendance is Attachment 2. There were no member changes.

3.0 Old Business

MOTION: Approve minutes from the 04.23 and 04.30 conference calls.
Rich, Ben second. There was unanimous approval of the minutes.
3.1 There were changes to the 04.23 minutes.
3.2 The modified 04.23.2020 minutes are posted at:

http://www.astmtmc.cmu.edu/ftp/docs/gas/sequencevi/minutes/VIMinutes20200423ConferenceCall.pdf

3.3 The 04.30.2020 minutes are posted at:
http://www.astmtmc.cmu.edu/ftp/docs/gas/sequencevi/minutes/VIMinutes20200430ConferenceCall.pdf

4.0 New Business

4.1 There is an e-ballot for alternate fuel supplier procedure.

4.2 This meeting was called to continue discussion of the points for GM presented on this ballot. See Attachment 3.

- For Item # 4, the discussion was around why a 10%/90% mixture was chosen. There is no data on this blending practice. API 1525 does define the heel remaining in a tank. There should be analysis before the new load is mixed with the 10%. A concern is some labs use a break in stand that could have run on a different fuel or mixture, then move to another stand. This should be resolved by the practice of running a reference on the new fuel and running only that fuel on tests in the calibration period. This will become a Surveillance Panel issue.
- Item #5 considered a comparison of the VID to the VIE. The VID was based on vehicle data. The VIE has greater variation and different fuels may exasperate variation. This should be considered by the TGC Fuels Task Force.
- Item #6 was discussion of the new fuel batch approval criteria. Those were considered and defined in the SP Task Force.

- Item #7 was a concern on how MTAC would be handled. As a formulator can run a test, the averaged result of two tests is used even if the second test is run at another lab. The second test could be run at a later time where fuel batches may have changed.
- Item #8 pondered how often to reference an engine. This discussion moved to treat rate. There was discussion on the DCA additive used, and Haltermann may not have used the Lubrizol Top Tier product. This was discussed in the VIE Research Report and the Fuel Specification. The Surveillance Panel should approve blend changes.
- Item #9 voiced a concern about test variation. Test fuels do change over time. Each potential supplier would have to pass the approval matrix. Part of the issue is that a given chemistry may respond better to components of one fuel package compared to another. Even the fuel from the current supplier would pass about 80% of the time.

There were still items to cover on the GM presentation and further issues from these calls, so the meeting adjourned and another will be scheduled to continue discussion.

The meeting adjourned at 2:33 PM Central time.

Sequence VI Surveillance Panel Call Meeting Agenda
May 7, 2020 @ 2:00-3:30 EST

Webex Meeting Details Below Agenda

1. **Roll Call (start 2:05 EST)**

   1.1. SP Membership changes and additions

2. **Old Business**

2.1	Approve meeting minutes from 4/23/20, 4/30/20 call	Andrew Stevens

3. **New Business**

3.1	GM Concerns with Alternative Fuel Supplier Proposal	Panel

4. **Next Meeting**

   4.1. SP Meeting: TBD

5. **Meeting Adjourned**

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Jim Carter				
Aleise Gauer				
Prasad Tumati				
Andy Ritchie				
Adrian Alfonso				
Andrew Stevens				
Jason Bowden				
Jeff Hsu				
Dan Worcester				
Dan Lanctot				
Rich Grundza				
Teri Kowalski				
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April 30, 2020

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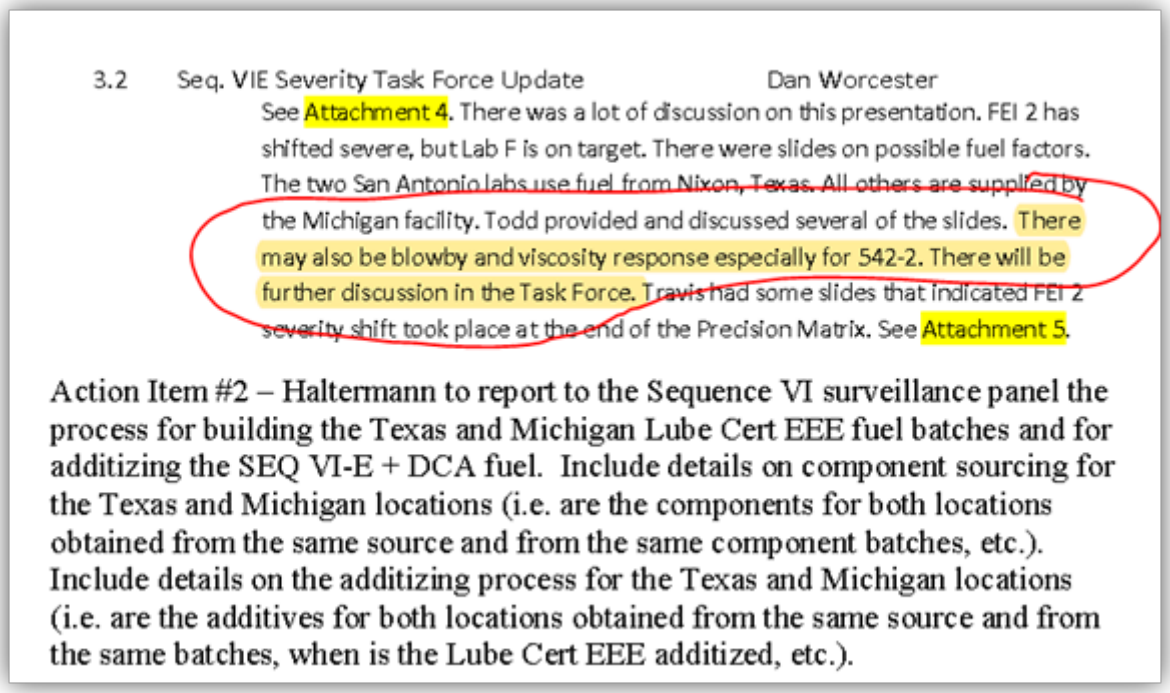
1. If the test is run against reference and there is no prohibition or limitations on changing fuels from a reference run to a candidate run, then the precision matrices for the test should have incorporated this variable (two fuels at the ends of largest DHA fuel property spec range(s)). There is no way to know what impact changing fuel has without this analysis. There is no way to know how this potential change in fuels will impact stand severity either without data.

2. If a fuel parameter data collection process was instituted at the onset of the new Seq VI test, we would have the ability right now to utilize that information today to: 1.) better determine what parameters do/do not contribute to test variation, 2.) validate the fuel deliveries are meeting the requirements (trust but verify). In the highlighted section below: what were the findings of this? Was it blowby and response or was it fuel?



3.2 Seq. VIE Severity Task Force Update — Dan Worcester

See Attachment 4. There was a lot of discussion on this presentation. FEI 2 has shifted severe, but Lab F is on target. There were slides on possible fuel factors. The two San Antonio labs use fuel from Nixon, Texas. All others are supplied by the Michigan facility. Todd provided and discussed several of the slides. There may also be blowby and viscosity response especially for 542-2. There will be further discussion in the Task Force. Travis had some slides that indicated FEI 2 severity shift took place at the end of the Precision Matrix. See Attachment 5.

Action Item #2 – Haltermann to report to the Sequence VI surveillance panel the process for building the Texas and Michigan Lube Cert EEE fuel batches and for additizing the SEQ VI-E + DCA fuel. Include details on component sourcing for the Texas and Michigan locations (i.e. are the components for both locations obtained from the same source and from the same component batches, etc.). Include details on the additizing process for the Texas and Michigan locations (i.e. are the additives for both locations obtained from the same source and from the same batches, when is the Lube Cert EEE additized, etc.).

3. VIE development suffered from fuel related deposits issues. Is there any data supporting deposit variation with current modified test fuel? Deposit control additive which was added to solve deposit issues has not been measured since VIE inception and needs to be understood before entertaining an alternate fuel. The unwashed gums test should be performed on the test fuel for a period of time in order to understand its stability in the test labs fuel storage systems. Previous studies of ASTM Sequence III piston deposit composition have indicated the test fuel as the major contributor. Industry standard deposit tests Sequence

III and GMOD should be conducted with Sequence VI altered fuels to assess the deposit forming tendencies of the current and proposed test fuels.

4. According to Annex A18.8, you can mix up to 10% of one fuel into another fuel. 90/10 was recently implemented and there is not any data on this blending practice. There should be statistical analysis performed before this blending ratio is implemented.

5. Test standard deviation in the VIE is higher than it is in VID. VID was based on 100s of hours of actual vehicle fuel efficiency analysis. Adding additional variation in fuel pushes the test even further away from its intent in vehicle correlation.

6. In section A18.4 of the latest ballot stating "A18.4 If the criteria in both A18.3.1 and A18.3.2 are not satisfied for both FEI1 and FEI2, then conduct an additional four tests on another engine, followed by another ANOVA model. Continue this process until both criteria have been satisfied for both parameters." What was the criteria?

7. Section A18.7 of the ballot it states, "Each laboratory can choose which approved fuel to use for individual stands." What is the criteria for MTAC?

8. Section A18.5 of the ballot states "Run all tests on the same fuel used to calibrate the stand." Once a 90/10 mix of fuel is mixed there should be a calibration done with the mixture. Once that mixture runs out another calibration should be performed using the new batch of fuel.

9. Replicating the fuel economy (FE) performance of an internal combustion engine (ICE) measured in a given lab to any other lab equipped with another engine of the same design is as you know an incredibly difficult task. The many interactions of the engine hardware, state of the engine (tolerances, wear, metallurgy, etc…), combustion and crankcase ventilation gases, test fluids, lab operation and measurement variability, to name a few, all interact to impact the empirical measurements. Therefore, by definition, controlling as many of these variables is necessary for precise measurements. And while the proposed "A18 Alternate Fuel Approval Requirements" try to minimize the test measurement variability at the time of testing, adding additional approved test fuel sources will likely increase the test variation over time. Here are a couple practical issues with approving second sources of test fuels in D8114-2019b.
    a. Test fuels inherently age over time and change their response in tests; they oxidize, they weather (lose volatile hydrocarbons), they change on the molecular level depending on how they are stored. What is approved today, will be different tomorrow. If anti-oxidants are added to control oxidation during storage stability, small differences in type and concentration from one formulation to another will impact the engine test differently.
    b. Test fuels are purchased with a Certificate of Analysis to assure some level of blending repeatability, however unfortunately there is no known correlation between any known CofA test and the measurement of FE in an engine. There are many first order relationships, such as a fuel's energy content to ICE engine heat release that correlate to FE, but none of these have the precision necessary to qualify small lubricant formulation differences.
    c. Seemingly small changes from one test fuel supplier recipe to the next can impact the lubricant response, potentially unintentionally biasing the result. This is true of basefuel hydrocarbon components, oxygenates, and additives. Even if two test fuels pass the proposed Fuel Approval Requirements, the interaction of the detailed lubricant chemistry with multiple fuel chemistries is

likely to be different. For example, one fuel chemistry may favor one type of lubricant oxidation inhibitor, while another test fuel would favor another type.

Test fuel batches made to the same blending recipe are known to potentially have different responses in test engines. For this reason and those outlined above keeping a single source of test fuel, common to all lubricant FE qualification tests, has been and shall be the best practice.

10. Upon completion of an alternate fuel supplier's successful prove out testing statistical data analysis, ASTM needs to provide documentation to support the ILSAC / EPA guidance letter.

11. GM disagrees with the proposal of adding an alternate fuel supplier without going through the necessary steps of verifying the fuel to see if it's suitable for VIE. We wouldn't have a choice but to take appropriate steps to protect ourselves if this proposal passes.