

HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL
OF
ASTM D02.B0.02
January 10, 2006
Southwest Research Institute – San Antonio, TX

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ACTION ITEMS

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|--------------------------------------------------|-----------------------|
| 1. Compile table of seals and pass limits | Dave Stehouwer |
| 2. Issue Exit Criteria Ballot for Seals | Jim McGeehan |
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MINUTES

- 1.0 Call to order
 - 1.1 The Heavy Duty Engine Oil Classification Panel (HDEOCP) was called to order by Chairman Jim McGeehan at 1:00 p.m. on Tuesday January 10, 2006, in Building 209 at Southwest Research Institute.
 - 1.2 There were 18 members present and 34 guests present. The attendance list is shown as Attachment **2**.
- 2.0 Agenda
 - 2.1 The agenda shown (included as Attachment **1**) had 2 additions for a seals update and a T-11 pumpability proposal.
- 3.0 Minutes
 - 3.1 The minutes from the December 6, 2005 meeting were approved with a comment that the limits for a Sequence IIIG test have been determined.
- 4.0 Membership
 - 4.1 There were no membership changes.
- 5.0 Delivering on time.
 - 5.1 See Attachment **3**. Chairman McGeehan showed a table of 10 engine tests and 6 bench tests. The oil oxidation as measured by a IIIG was corrected. The Elastomer compatibility test (seals) has been assigned an ASTM number of D7216. The Mack T-12 test limits were modified since the exit ballot. Greg Shank pointed out that the changes resolved most of the negatives. The ISB and ISM limits were also modified after their exit ballots, but there were still concerns. Two additive companies were to talk with Cummins. The C13 limits were shown with an exit ballot to be discussed. The T-11 limits were presented with the exit criteria ballot to be discussed.
- 6.0 Exit Criteria Ballot Results

- 6.1 The table of ballot results was shown. See Attachment 4. Steve Kennedy of ExxonMobil discussed their negative vote on the T-11. Any oil that passes the 6% limit will pass the 3.5% limit and feels that the 3.5% limit is meaningless. With 3 limits, they feel it makes more sense to express results as a viscosity increase at each of the 3 soot levels rather than minimum soot levels at set viscosity increases. As the only negative, ExxonMobil will "live with it". Lubrizol had a comment about what to do with the Correction Factor at 6.7% soot. Greg Shank suggests applying the 6% Correction Factor to the 6.7% data, but the Surveillance Panel will decide how to implement. Pat Fetterman said that since the 6.7% comes from the whole data set, it shouldn't have a correction applied at all. The Surveillance Panel will need to decide how to apply Severity Adjustments and Correction Factors to the test at the additional limits. Wim van Dam (chairman of the Mack Surveillance Panel) stated it will be on the Surveillance Panel agenda. The next meeting will be at the call of the chairman. Lubrizol also feels that the T-11 limits should be flipped using a maximum viscosity increase at a set soot level. Conventional thinking considers the T-11 as a 12 cSt maximum viscosity increase at 6% soot, not a 6% minimum soot at 12 cSt viscosity increase. Greg Shank **moved** to accept the T-11 at these limits for CJ-4. Lew Williams seconded. See Attachment 3. The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 6.2 The negative votes from the C-13 ballot were discussed. Concerns included inconsistencies relating to the second ring top carbon on the way the data was collected. The presentation announcing this parameter stated that the data was not generated with the same methodology at all labs. There has since been a rating workshop. Some of the affirmative votes had comments. More concern about 2nd ring top carbon. Data from the workshop indicates better rating precision, but a shift more severe. The parameter did not have clear instructions during the matrix. If the workshop addresses this concern, then the voter is "ok" with the parameter, but if not, then will have to consider how to vote on the final vote. Concern about the anchor and maximum values in the merit system and the effect on the pass rate. Concern that the pass rate will be low. Second ring carbon technically flawed and would like to review TLC and TGC merit limits.
- 6.3 Abdul Cassim addressed the exit ballot concerns. See Attachment 5. Abdul feels that the TLC and TGC carbon limits are already generous, so no room to move. Addressing concerns that the second ring parameter was not in the MOA and introduced late. The MOA required discrimination to be demonstrated on named parameters. After matrix completion, the parameters will be assigned by the Surveillance Panel. Second ring carbon was developed late to replace the Unweighted Deposits which was removed late in the process. Caterpillar had concerns over deposits lower than the top groove. Caterpillar has seen ring sticking and high levels of second ring carbon. A rating workshop was conducted recently to finalize rating methods. The rating workshop did improve the method but also indicated some difficulty rating the rings before the workshop. Limits were set liberally based on the matrix data and CAT's needs. 100% light carbon is undesirable. Rater comments were that these ratings were amongst the best they have rated, even better than more commonly accepted ratings.
- 6.4 Jim Gutzwiller showed the workshop data. See Attachment 6. The Surveillance Panel has not seen the data yet. Two additive suppliers and CAT supplied rings for the workshop. (6 engine sets). One set of rings were created from the 6 engine sets. This set was used as a preliminary set for rating before discussion of the rating method. Two engine sets were rated after the initial discussion. The second day, 5 sets were rated after the discussion with no breaks for data analysis. One engine set was rated again, but was labeled a new set. Analysis of the matrix data is forthcoming and the C13 Surveillance Panel will meet by conference call to discuss. The ratings improved as a result of the workshop. A question was asked why the ratings are more severe as a result of the workshop. The answer is a clarification of heavy carbon. Some were calling heavy carbon as light carbon due to the polishing nature of the carbon. The raters would like to see more rings to evaluate as a round robin so they can improve the rating method. The reason for the question is that the pass/fail limits were set from the matrix data, but if the ratings are more severe, then the limits should be adjusted to account for the increase. The apparent shift is about 2.5 demerits.

- 6.5 Jim Rutherford has performed some analysis of the data. See Attachment 7. Jim used ring sets A through G and preliminary set one. No real difference was evident between raters. This group of raters was able to see significant differences between the ring sets. Matrix only raters show better precision and may not have any outliers.
- 6.6 Chairman McGeehan went back to the table of C13 limits. Greg Shank **moved** to accept these limits for the C13 for CJ-4. Abdul Cassim seconded. Raising the limit of 22 from 17 and the cap from 28 to 33 is more than the shift of 2.5 from the raters as a result of the workshop. The rings CAT sent were the worst they have ever seen and were very caked with carbon. A standardized procedure is being adopted and appears to be improving the method. Abdul is happy with the work the raters have done and will not hold up the category. The voters who voted negative can "live with it". The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 7.0 Cummins ISM
- 7.1 Additive companies have had discussions with Cummins. The major issue was with the Injector Adjusting Screw Weight Loss (IASWL) maximum of 45 mg. Cummins can live with a maximum of 49 mg. The voters who voted negative are satisfied with 49 mg. Pat Fetterman **moved** to accept the ISM limits changing the maximum injector adjusting screw limit to 49 mg. Bill Kleiser seconded. See Page 3 of Attachment 8. The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 8.0 Cummins ISB
- 8.1 The Average Camshaft Wear (ACW) pass limit was 50 micrometers and Cummins will move to 55 micrometers. The Tappet Weight Loss (TWL) will stay at 100 mg. The voters who voted negative are satisfied. Bill Kleiser **moved** to accept the ISB at the new limits including the change to 55 micrometers for ACW. Pat Fetterman seconded. See Page 5 of Attachment 8. The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 9.0 Mack T-12
- 9.1 Greg Shank **moved** to accept the limits for the T-12 with the changes shown at the last meeting in Norfolk. Pat Fetterman seconded. See Attachment 3. The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 10.0 Mack T-11
- 10.1 Greg Shank gave a Low Temperature Pumpability proposal for CJ-4. See Attachment 9. The requirement would come from the 180 hour sample from the T-11, not the T-10A. The limits apply to 0W, 5W, 10W, and the 15W viscosity grades. For Yield Stress, use the Modified D4684 with a yield stress less than 35. Greg recommends that the BOI/VGRA Task Group use current T11 rules. For current read across, fresh oils would have a 20,000 cp maximum. No need for an exit criteria ballot, decide it here. Greg Shank **moved** to accept this proposal. Pat Fetterman seconded. The T-10A is not an alternative. The **motion passed** unanimously with 18 votes for, 0 against and 0 waives.
- 11.0 Seals
- 11.1 Becky Grinfield indicated that VAMAC material has been tested since 2003. There has been more variability in this material, but the Central Parts Distributor (CPD) talked with the manufacturer and the latest batch should be better. The method has a new ASTM number: D7216 for CI-4 seals. VAMAC is not in D7216. Batches of seal material are controlled between the CPD and the manufacturer. Every candidate has a reference run on it simultaneously. The EMA is proposing to continue comparing to the 1006 reference oil with new limits for CJ-4. This is similar to the 4 other elastomers in CI-4. Engine manufacturers are using VAMAC in their seals. This should be an exit criteria item. Greg Shank **moved** to issue an exit criteria ballot. Robert Stockwell seconded. Dave Stehouwer is developing a

complete table of all the limits for all the seals. There was a **unanimous** voice vote to issue an exit criteria ballot.

12.0 ACC Report

12.1 The ACC report is included as Attachment **10**. After the Norfolk meeting with CAT's announcement of ECF-2 and ECF-3, ACC met to discuss impacts on the timeline. The C13 is still the rate limiting test. The ACC counts 10 calibrated C13 stands in the industry. CAT has offered up to 4 uncalibrated stands at their facility. The ACC code states that all testing for product approval must be conducted on calibrated stands. It is unlikely that anyone will use stands at CAT unless they are calibrated. The ACC is assuming 10 tests per month and a 40%-50% pass rate, which is 4 to 5 passes per month. There could be reasons that all 10 stands may not be utilized all the time. For CJ-4 only, 31 passes are required if full BOI/VGRA is granted. This can be complete by October 15th. The ECF-2 requirements are not fully defined, so passing C13 limits are unknown. The best case with CJ-4 and ECF-2 requires 74 passes, 43 additional passes for ECF-2. This would take 15 to 19 months to complete. Without VGRA, 88 passes are needed. Without any BOI/VGRA, 161 passes are needed, running into 2008. All CJ-4 and OEM specs need to be finalized. C13 capacity constraints will make it impossible for ECF-2 and CJ-4 simultaneously. Going back to best case with CJ-4 and ECF-2, will take 15 to 19 months and run into 2007.

12.2 Abdul Cassim presented plans to modify ECF-2 in response to ACC's concerns. See Attachment **11**. Industry concerns appreciated and addressed. The ECF-2 implementation date will be extended to first quarter 2007. ECF-2 is required for a "leave behind" oil for the rest of the world and off highway. The C13 limits in ECF-2 could be aligned with the PC-10 limits for the C13. This relieves pressure on the PC-10 timeline which can not be impacted. In lieu of a C13 laboratory test, field data meeting certain requirements will be acceptable. ECF-3 is bringing half of PC-10 forward by a few months. CAT is moving away from the self-certification of ECF-1. The timeline for ECF-2 does not change except for pushing out the implementation. ECF-3 can be used before ECF-2. A C12 bridge engine field test would be looked at, but not automatically accepted.

13.0 Timeline

13.1 Bill Runkle showed the NCDT timeline. See Attachment **12**. This version takes into account recent ACC concerns, but now ACC indicated that October 15th can be met. Provided no new parameters and specs are introduced, ACC still agrees to October 15th.

14.0 Full Table of Tests and Limits

14.1 Chris Castanien compiled all the limits. See Attachment **13**. There could be a T-11A test to generate the 180 hour sample only. The Surveillance Panel will consider it.

14.2 Fresh oil MRV is for BOI. The tiered limits for the T-11 will need to be added. The C13 ring and liner scuffing is for test interpretability, so it should not be listed as a pass/fail.

15.0 AOB

15.1 Greg Shank thanked all participants for the spirit of the meeting and for their efforts. Encourages everyone to use this category as a real spec, not a niche spec.

15.2 Greg Shank wants to start the T-10 to T-12 correlation at the meeting on January 26th. The whole issue of CJ-4 licensing CI-4 or CI-4+ needs to be addressed. Chairman McGeehan stated it looks like the category will be delivered on time.

16.0 Next meetings

16.1 January 26, 2006. Chicago, IL. Embassy Suites O'Hare.

17.0 The meeting was adjourned at 3:55 pm.