

**HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL**  
OF  
ASTM D02.B0.02  
December 8, 2015  
JW Marriott – Austin, TX

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**ACTION ITEMS**

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**MINUTES**

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- 1.0 Call to order
  - 1.1 The Heavy Duty Engine Oil Classification Panel (HDEOCP) was called to order by Chairman Shawn Whitacre at 1:30 p.m. on Tuesday, December 8, 2015, in the Lone Star A Room of the JW Marriott Hotel, Austin, TX.
  - 1.2 There were 17 members present and 70 guests present. The attendance list is included as **Attachment 2**.
- 2.0 Agenda
  - 2.1 The agenda circulated prior (included as **Attachment 1**) was not changed.
- 3.0 Minutes
  - 3.1 The minutes from June 2015 were approved as written.
- 4.0 Membership
  - 4.1 There were no membership changes. Roger Gault has a proxy for Heather DeBaun.
- 5.0 Ballot Item
  - 5.1 Small errors in the D02.B0 Ballot Item 16 to revise ASTM D4485-2015A were caught and reviewed. The errors were oversights and carryovers and not substantive. The intent was understood. **Attachment 3**.
  - 5.2 There was one negative vote from Oronite. All ballot responses are included as **Attachment 4**. Oronite gave a presentation explaining their negative. **Attachment 5**. Oronite supports the inclusion of CK-4 and FA-4, but wanted to make sure the comments were reviewed. A corrected ballot was issued almost immediately after the initial issue without notice which caused some confusion. The corrections were not significant or related to limits of tests. Annex 6 was suggested while the ballot was out which is slightly more significant. Annex 6 isolates the new category into a new Annex leaving Annex 5 alone. Some discussion on the issue of clarifying the MTAC rules which may not have been fully understood. Add a provision to 6.5.1 removing the provision MTAC and discard any valid test results and update the provision added to 6.5.2. There was general consensus that most understood and agreed to creating Annex 6.

- 5.3 Test method ballots should go out in January.
- 6.0 DD13 Scuffing Test Development
  - 6.1 Suzanne Neal of Daimler North America gave an update on the recent developments with the DD13 test. **Attachment 6.** Oil X scuffs around 35 hours and Oil C after 40 hours. BOI/VGRA is not in the plan at this time.
- 7.0 Existing Tests/Categories
  - 7.1 Mark Cooper gave a status of the carry-over tests and legacy categories. **Attachment 7.** EOAT Surveillance Panel has been transferred to CAT Surveillance Panel. A plan is being developed to create a correlation between the EOAT and COAT for equivalent limits in the COAT to use in place of the EOAT in older categories.
- 8.0 CLOG Task Force
  - 8.1 Thom Smith is Chairman of the Category Life Oversight Group (CLOG) is an API LG effort. **Attachment 8.** CLOG has 4 recommendations. Number 1: Discontinue API SH. EMA agreed that CH-4/SH is not needed, but CH-4 is needed. Number 2: Discontinue API SJ, SL/EC. Number 3: Discontinue API SL/EC. The Sequence VIB is no longer available. As such, API will obsolete API SL Energy Conserving. The Energy Conserving portion is what goes away, not the S Category. Number 4: Discontinue API SM/EC for the same reason that the Sequence VIB is no longer available. API will also obsolete the Energy Conserving portion from SM/EC.
- 9.0 Elastomer SP Request
  - 9.1 Dennis Gaal presented for the Elastomers SP. **Attachment 9.** The current elastomer reference oil is a very old technology and the current batch supply is very limited. A batch change will be needed. That batch is the final batch and may only last 2-3 years. A new oil will be needed and should be similar to 1006 in performance if possible.
- 10.0 Adjournment
  - 10.1 The meeting was adjourned at 2:55 pm.

**AGENDA**  
**D02.B0.02.1**  
**Heavy-Duty Engine Oil Classification Panel**  
**Tuesday, December 8, 2015 1:30pm CST**  
**JW Marriott – Lone Star A**  
**Austin, Texas, USA**

- 1) **Minutes** – Approval of Minutes from June 23, 2015 Meeting, Ft. Lauderdale, Florida, USA
- 2) **Membership**
  - a) Review current panel membership
- 3) **Ballot Item**
  - a) Review summary of responses to D02.B0 Ballot Item 16 (WK51955) to revise ASTM D4485-2015A to include API CK-4 and FA-4 categories
  - b) Membership supporting data/information
- 4) **New Business Item (moved up to accommodate schedule constraint)**
  - a) ASTM DD13 Scuffing Taskforce (Suzanne Neal, DTNA)
- 5) **Existing tests/categories**
  - a) Review of status of carry-over engine tests that support API CK-4, FA-4 and legacy categories (Mark Cooper, Chevron Oronite)
  - b) Update on CLOG Task Force – IIIF/IIIG replacement (Thom Smith, Valvoline)
  - c) Request from Elastomers SP for supply of reference oil for D7216 (Dennis Gaal, E-M)
- 6) **Old Business**
- 7) **HDEOCP Adjournment (transition to PC-11 NCDT, DEOAP)**

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D4485/WK51955  
D02.B0 Ballot Item  
Errors and Corrections

## Section 3.1.2

3.1.2 category, n—in engine oils, a designation such as SJ, SL, SM, SN, CH-4, CI-4, CJ-4, **CK-4**, **FA-4**, Energy Conserving, Resource Conserving, and so forth, for a given level of performance in specified engine and bench tests.

The red font addition indicates change; this one spotted by a voter

## Section 4.1.6

4.1.6 *CK-4 or FA-4*—Oil meeting the performance requirements measured in the following diesel ~~and gasoline~~ engine tests, and bench and chemical tests.

Several voters caught this one

# New Sections 4.1.6.1 and 4.1.6.2

Insert new sections with descriptions of the T-13 and COAT test methods

Correction of an obvious oversight error

## Section 4.1.6.2

4.1.6.2 Test Method D7422, the Mack T-12 diesel engine test is used to measure engine oil performance with respect to piston ring and cylinder liner wear, ~~bearing corrosion, and oil consumption~~, using an in-line six cylinder, four-stroke, direct injection, turbo-charged engine with exhaust gas recirculation at levels expected for 2007 emission control engines. This engine test uses fuel with ultra low sulfur content of 15 mg/kg.

Deletions recommended by one voter (?)

## Section 4.1.6.4

4.1.5.6.4 Test Method D7484, the Cummins ISB diesel engine test is used.....

Correction of a simple numbering error

## Section 4.1.6.7

4.1.6.7 ~~Test Method D6984, the Sequence III F test, is used to measure bulk oil viscosity increase, which indicates an oil's ability to withstand the higher temperatures found in modern diesel engines. (An alternative is Test Method D7320, the Sequence III G test.)~~

Several voters caught wrong inclusion of gasoline test methods

## Section 4.1.6.8

4.1.6.8 Test Method ~~D4684~~ D6896 (MRV TP-1) has been shown to predict field failures resulting from poor low temperature pumpability.

Need for improved test method noted by a voter



## Section 4.1.6.15

4.1.6.15 ~~Test Method D6894, the EOAT procedure, has been correlated with oil aeration in diesel engines equipped with HEUI used in medium-duty diesel engines.~~

Deletion needed of a previous CJ test method -  
noted by several voters

# Engine Test Summary Table

D7468 (ISM) Top Ring Mass Loss, mg, max    100    100    100

Omitted in original ballot item

# Footnotes and MTAC

- <sup>X</sup> MRV requirement listed as a bench test (Items 12/13)
- <sup>W</sup> MTAC accomplished by calculating merits based on average results
- <sup>Y</sup> MTAC determined with no option to exclude valid test results

Still some unresolved questions about handling MTAC and footnotes

## Section 6.9

6.9 For CK-4 or FA-4 test results to be valid from the following test types, they shall have been conducted in stands/equipment in current calibration by the TMC: Test Methods D874, D5800, D5966, D6594, D6750, ~~D6894~~, ~~D6984~~, D7156, D7216, ~~D7320~~, D7422, D7468, D7484, D7549, WK50204 (T-13), and WK51937 (COAT).

Inclusion of three wrong test methods noted by several

# Other recommended corrections/comments received

- Remove API SJ Energy Conserving and API SL Energy Conserving from D4485
- New Annex desired for API CK-4 and FA-4, dealing with outlier criteria, merit systems, and multiple testing
- Removal of T-12 Merit System
- API CK-4 and FA-4 have different T-12 from CJ-4

No comments

# Negative

Ballot Number: D02.B0 (15-09)                      Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
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Statement:

Section	Statement
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## BACKGROUND

- Oronite fully supports the inclusion of CK-4 and FA-4 tests and limits as depicted in the Work Item WK51955 into D4485.
- Our comments are directed to clarifying the Multiple Test Acceptance Criteria language around these new categories as well as pointing out errors in the other Sections
- We believe our comments to be editorial

## Proposed corrections

- Ballot Item 16 for D02.B0 (15-09) changed between when the ballot first came out on November 2 and the weekend before it closed on December 2.
- Our comments address both versions of the ballot
- Section 3.1Definitions
- The original ballot included 3.1.2 as needing to be updated to include CK-4 and FA-4. This needs to be put back into Item 16.
- Section 4.1.6 Performance Classification
- 4.1.6.2 remove “bearing corrosion and oil consumption” from the description of the T-12.
- The Cummins ISB should be listed as 4.1.6.4
- 4.1.6.7 should be removed as the Seq. IIIF is not part of these service categories
- If 4.1.6.9 is meant to describe the T-11A, that MRV method is D6896 for sooted oil; D4684 requirements are covered in SAE J300

- 4.1.6.15 needs to be removed as the EOAT is not part of these service categories
- The Caterpillar Oil Oxidation Test and the Volvo T-13 are missing
- The current 4.1.6 through 4.1.9 do not need to be renumbered but in fact can be removed as API SJ Energy Conserving and API SL Energy Conserving are no longer licensable.
- Oronite believes that API CK-4 and FA-4 should have their own Annex to detail the outlier criteria, merit systems and process for evaluating multiple tests.
- API CK-4 and FA-4 have a different T-12 from API CJ-4
- Precedence for other Heavy Duty Categories having their own Annex
- Propose leaving Annex A5 as it is and adding Annex A6
- Annex A6 is exactly like Annex A5 except for:
  - Adds T-13 Standard Deviations to the Table for determining outliers
  - Updates all of the Standard Deviations for the tests in this Table
  - Updated with current Industry values
  - Included the Standard Number for the Roller Follower Wear Test
  - Removes the T-12 Merit System
  - Adds the process for handling results from multiple COATs and API CK-4/API FA-4 T-12s.
- This language was modeled on what exists in Annex A1 but with API CK-4/API FA-4 restrictions.
- T-12 Top Ring Mass Loss and Cylinder Liner Wear have constant limits that apply to the average of the test results with NO provision for outlier removal
- COAT Average Aeration (40h-50h) have constant limits and can be MTACed.
- Removes the need for footnotes W and Y
- Table 3 CK-4 or FA-4
- Footnote X for the T-11 MRV includes a reference to (Items 12/13)
- What is this reference?
- Items 12 and 13 on the same ballot are for the Seq. IIIG and Elastomer slab thickness
- Remove footnote W and Y as they are not descriptions of MTAC; MTAC is handled in the Annexes and not as part of Table 3 Engine Oil Categories
- Assign footnote W instead of V by the C13 and ISM
- See Annex A6 for additional information

#### **A6. CK-4 or FA-4 MULTIPLE TEST PROGRAMS AND TEST METHOD **D7549** (C13) AND **D7468** (ISM) MERIT RATING SYSTEM APPLICATIONS**

A6.1 For the CK-4 or FA-4 test parameters on which outlier criteria apply (contained in **Table A6.1**), if three or more tests are run, one complete test can be discarded if the outlier criteria defined in Practice **E178** are met at a significance level of 5%.

A6.1.1 Section 8 (Recommended Criteria for Known Standard Deviations) of Practice **E178** is used to determine outliers. The standard deviation applied in the outlier determination for each parameter is shown in **Table A6.1**.

**TABLE A6.1 Outlier Test Determination Values**

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Test Parameter	Standard Deviation
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<b>WK50204</b> (T-13) IR Peak at EOT, A/cm		11.0
<b>WK50204</b> (T-13) Kinematic Viscosity Increase at 40°C,%	1.21 square root (KV40) transform	
D7156 (T-11) %Soot at 4.0mm2/sec increase		0.20
D7156 (T-11) %Soot at 12.0mm2/sec increase		0.50
D7156 (T-11) %Soot at 15.0mm2/sec increase		0.61
D7484 (ISB) Slider tappet mass loss, mg, average		14.8
D7484 (ISB) Cam Lobe Wear, microns		5.0
D6750(1N) Weighted demerits (WDN)		27.1
D6750(1N) Top groove fill (TGF), %	0.488165 ln(TGF+1) transform	
D6750(1N) Top land heavy carbon (TLHC), %	ln(TLHC+1) transform	0.9
D6750(1N) Average Oil consumption, g/kWh		0.045
<b>D5966</b> (RFWT) Roller Follower Pin Wear, mils, max		0.04

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A6.2 The C13 and ISM Merit Rating Systems calculation methodology is described in the corresponding test methods.

A6.3 Tables A6.2-A6.3 each contain *Maximum*, *Anchor* and *Minimum* values, as well as *Weight* values, for the specified tests and the test parameters.

A6.4 Application of the C13 and ISM Merit Rating Systems to single and multiple test results follows the guidelines provided below:

#### TABLE A6.2 Caterpillar C13 Merit System

#### TABLE A6.3 Cummins ISM Merit System

A6.4.1 If all of the test parameter results from a given test method are equal to or better than the *Anchor* values shown in the corresponding table, this is a passing merits result.

A6.4.2 If all of the test parameter results from a given test method exactly meet the *Anchor* values in the corresponding table, each test result receives merits equal to the *Weight* values and the total merit rating of 1000 is a passing merits result.

A6.4.3 If any of the test parameter results from a given test method are at the *Maximum* values shown in the corresponding table, zero merit points are earned for that parameter.

A6.4.4 If any of the test parameter results from a given test method are worse than the *Maximum* values shown in the corresponding table, this is a failing result.

A6.4.5 If results for all of the test parameters from a given test method are better than the corresponding *Maximum* values, but one or more results is worse than the corresponding *Anchor* values, the appropriate Merit Rating System applies a mathematical calculation methodology to determine whether marginal results worse than the *Anchor* values are compensated by better than *Anchor* values on other test parameters.

A6.4.6 If any of the test parameters from a given test method are at or better than the *Minimum* values shown in the corresponding table, merit points are received equal to twice the *Weight* values in the corresponding table for that parameter.



A6.4.7 Multiple test evaluation for a given test method consists of averaging the individual test parameter results across multiple tests. The C13 and ISM Merit Rating Systems are then applied to the averages of the test parameter results.

A6.5 Multiple Test Acceptance Criteria (MTAC) is one of several data-based approaches for evaluation of the quality and performance of a formulation where more than one test may be run. For a candidate tested once, test data for each criterion shall be a pass. For a candidate tested twice, the average value of each result shall be a pass. For a candidate tested three or more times, one test might be declared an outlier and thus discarded and the average value of retained test data for each result shall be a pass. Data are rounded in accordance with the procedures specified in Practice E29.

A6.5.1 For categories CK-4 and FA-4 WK51937 (COAT) Average Aeration (40 h-50 h), the following process shall be used to calculate the MTAC mean of test results for a formulation with two or more operationally valid test results.

A6.5.2 For categories CK-4 and FA-4 D7422(T-12) Top Ring Mass Loss, mg and D7422(T-12) Cylinder Liner Wear, microns, the following process shall be used to calculate the average of test results for a formulation with two or more operationally valid test results **without the MTAC provision to declare one test an outlier and discard.**

A6.5.3 Obtain severity adjusted (if applicable) test results for engine test of interest.

A6.5.4 Calculate the arithmetic average of the test results for each test criterion.

A6.5.5 Round each criterion average to the same number of decimal places as in the applicable criterion pass limit.

A6.5.6 Compare each rounded criterion average to its applicable pass limit to determine if performance criteria have been met.

- We move that the Class Panel accept our comments as Editorial to Ballot Item 16 Work Item 51955

## Affirmative with Comment

Ballot Number: D02.B0 (15-09)                      Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
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File Attachment:

Statement:

### **Section            Statement**

all

#### **BACKGROUND**

- Oronite fully supports the inclusion of CK-4 and FA-4 tests and limits as depicted in the Work Item WK51955 into D4485.
- Our comments are directed to clarifying the Multiple Test Acceptance Criteria language around these new categories as well as pointing out errors in the other Sections
- We believe our comments to be editorial

#### **Proposed corrections**

- Ballot Item 16 for D02.B0 (15-09) changed between when the ballot first came out on November 2 and the weekend before it closed on December 2.
- Our comments address both versions of the ballot
- Section 3.1Definitions
- The original ballot included 3.1.2 as needing to be updated to include CK-4 and FA-4. This needs to be put back into Item 16.
- Section 4.1.6 Performance Classification
- 4.1.6.2 remove “bearing corrosion and oil consumption” from the description of the T-12.
- The Cummins ISB should be listed as 4.1.6.4
- 4.1.6.7 should be removed as the Seq. IIIF is not part of these service categories

- If 4.1.6.9 is meant to describe the T-11A, that MRV method is D6896 for sooted oil; D4684 requirements are covered in SAE J300
- 4.1.6.15 needs to be removed as the EOAT is not part of these service categories
- The Caterpillar Oil Oxidation Test and the Volvo T-13 are missing
- The current 4.1.6 through 4.1.9 do not need to be renumbered but in fact can be removed as API SJ Energy Conserving and API SL Energy Conserving are no longer licensable.
- Oronite believes that API CK-4 and FA-4 should have their own Annex to detail the outlier criteria, merit systems and process for evaluating multiple tests.
- API CK-4 and FA-4 have a different T-12 from API CJ-4
- Precedence for other Heavy Duty Categories having their own Annex
- Propose leaving Annex A5 as it is and adding Annex A6
- Annex A6 is exactly like Annex A5 except for:
  - Adds T-13 Standard Deviations to the Table for determining outliers
  - Updates all of the Standard Deviations for the tests in this Table
  - Updated with current Industry values
  - Included the Standard Number for the Roller Follower Wear Test
  - Removes the T-12 Merit System
  - Adds the process for handling results from multiple COATs and API CK-4/API FA-4 T-12s.
  - This language was modeled on what exists in Annex A1 but with API CK-4/API FA-4 restrictions.
  - T-12 Top Ring Mass Loss and Cylinder Liner Wear have constant limits that apply to the average of the test results with NO provision for outlier removal
  - COAT Average Aeration (40h-50h) have constant limits and can be MTACed.
  - Removes the need for footnotes W and Y
  - Table 3 CK-4 or FA-4
  - Footnote X for the T-11 MRV includes a reference to (Items 12/13)
  - What is this reference?
  - Items 12 and 13 on the same ballot are for the Seq. IIIG and Elastomer slab thickness
  - Remove footnote W and Y as they are not descriptions of MTAC; MTAC is handled in the Annexes and not as part of Table 3 Engine Oil Categories
  - Assign footnote W instead of V by the C13 and ISM
  - W See Annex A6 for additional information

**A6. CK-4 or FA-4 MULTIPLE TEST PROGRAMS AND TEST METHOD D7549 (C13) AND D7468 (ISM) MERIT RATING SYSTEM APPLICATIONS**

A6.1 For the CK-4 or FA-4 test parameters on which outlier criteria apply (contained in [Table A6.1](#)), if three or more tests are run, one complete test can be discarded if the outlier criteria defined in Practice [E178](#) are met at a significance level of 5%.

A6.1.1 Section 8 (Recommended Criteria for Known Standard Deviations) of Practice [E178](#) is used to determine outliers. The standard deviation applied in the outlier determination for each parameter is shown in [Table A6.1](#).

**TABLE A6.1 Outlier Test Determination Values**

---

Test Parameter	Standard Deviation
<b>WK50204</b> (T-13) IR Peak at EOT, A/cm	11.0
<b>WK50204</b> (T-13) Kinematic Viscosity Increase at 40°C,% form	1.21 square root (KV40) transform
D7156 (T-11) %Soot at 4.0mm <sup>2</sup> /sec increase	0.20
D7156 (T-11) %Soot at 12.0mm <sup>2</sup> /sec increase	0.50
D7156 (T-11) %Soot at 15.0mm <sup>2</sup> /sec increase	0.61
D7484 (ISB) Slider tappet mass loss, mg, average	14.8
D7484 (ISB) Cam Lobe Wear, microns	5.0
D6750(1N) Weighted demerits (WDN)	27.1
D6750(1N) Top groove fill (TGF), % 0.488165 ln(TGF+1) transform	
D6750(1N) Top land heavy carbon (TLHC), % ln(TLHC+1) transform	0.9
D6750(1N) Average Oil consumption, g/kWh	0.045
<b>D5966</b> (RFWT) Roller Follower Pin Wear, mils, max	0.04

A6.2 The C13 and ISM Merit Rating Systems calculation methodology is described in the corresponding test methods.

A6.3 Tables A6.2-A6.3 each contain *Maximum*, *Anchor* and *Minimum* values, as well as *Weight* values, for the specified tests and the test parameters.

A6.4 Application of the C13 and ISM Merit Rating Systems to single and multiple test results follows the guidelines provided below:

#### TABLE A6.2 Caterpillar C13 Merit System

#### TABLE A6.3 Cummins ISM Merit System

A6.4.1 If all of the test parameter results from a given test method are equal to or better than the *Anchor* values shown in the corresponding table, this is a passing merits result.

A6.4.2 If all of the test parameter results from a given test method exactly meet the *Anchor* values in the corresponding table, each test result receives merits equal to the *Weight* values and the total merit rating of 1000 is a passing merits result.

A6.4.3 If any of the test parameter results from a given test method are at the *Maximum* values shown in the corresponding table, zero merit points are earned for that parameter.

A6.4.4 If any of the test parameter results from a given test method are worse than the *Maximum* values shown in the corresponding table, this is a failing result.

A6.4.5 If results for all of the test parameters from a given test method are better than the corresponding *Maximum* values, but one or more results is worse than the corresponding *Anchor* values, the appropriate Merit Rating System applies a mathematical calculation methodology to determine whether marginal results worse than the *Anchor* values are compensated by better than *Anchor* values on other test parameters.

A6.4.6 If any of the test parameters from a given test method are at or better than the *Minimum* values shown in the corresponding table, merit points are received equal to twice the *Weight* values in the corresponding table for that parameter.

A6.4.7 Multiple test evaluation for a given test method consists of averaging the individual test parameter results across multiple tests. The C13 and ISM Merit Rating Systems are then applied to the averages of the test parameter results.

A6.5 Multiple Test Acceptance Criteria (MTAC) is one of several data-based approaches for evaluation of the quality and performance of a formulation where more than one test may be run. For a candidate tested once, test data for each criterion shall be a pass. For a candidate tested twice, the average value of each result shall be a pass. For a candidate tested three or more times, one test might be declared an outlier and thus discarded and the average value of retained test data for each result shall be a pass. Data are rounded in accordance with the procedures specified in Practice E29.

A6.5.1 For categories CK-4 and FA-4 WK51937 (COAT) Average Aeration (40 h-50 h), the following process shall be used to calculate the MTAC mean of test results for a formulation with two or more operationally valid test results.

A6.5.2 For categories CK-4 and FA-4 D7422(T-12) Top Ring Mass Loss, mg and D7422(T-12) Cylinder Liner Wear, microns, the following process shall be used to calculate the average of test results for a formulation with two or more operationally valid test results **without the MTAC provision to declare one test an outlier and discard.**

A6.5.3 Obtain severity adjusted (if applicable) test results for engine test of interest.

A6.5.4 Calculate the arithmetic average of the test results for each test criterion.

A6.5.5 Round each criterion average to the same number of decimal places as in the applicable criterion pass limit.

A6.5.6 Compare each rounded criterion average to its applicable pass limit to determine if performance criteria have been met.

- We move that the Class Panel accept our comments as Editorial to Ballot Item 16 Work Item 51955

## Affirmative with Comment

Ballot Number: D02.B0 (15-09) Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
TECHNICAL CONTACT: Lyle O Bowman  
lbowman@namwobl.com  
(415) 47-9300

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Email Address: brent.calcut@aftonchemical.com

File Attachment:

Statement:

Section	Statement
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Annex A5	<p>On Page 3 &amp; 4, all "A5" should be "A6". A new section should be made for the new category. A5 (API CJ-4) should not be changed in ASTM 4485.</p> <p>MTAC requirements for the Caterpillar Oil Aeration Test need to be clarified. Three options could be considered: (1) copy the T-12 comment, "MTAC determined with no option to exclude results", (2) add COAT to Section A1.1.1 so it's treated exactly like the EOAT or (3) add it's standard deviation into Table A5(6).1 and allow outlier determination. Remove reference to "D7422 (T-12)" from Section A5(6) because the merit rating system is not used.</p> <p>Include Volvo T-13 IR &amp; pVis to Table A5.1 (A6.1) Outlier Test Determination Values.</p> <p>In Table A5(6).3 &amp; A5(6).4, update format to match other tables in ASTM D4485. The limits should be on the rows and the parameters in the columns.</p> <p>In Table A5(6).3 &amp; A5(6).4, the reference to footnote "(2)" is not necessary.</p> <p>Typo on Page 2. Should be "xW", instead of "Xw".</p>
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## Affirmative with Comment

Ballot Number: D02.B0 (15-09)                      Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
TECHNICAL CONTACT: Lyle O Bowman  
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File Attachment:

Statement:

Section	Statement
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I'm voting "Affirmative" on this ballot, acting under the assumption that the following editorial changes will be addressed before the final revision:

- The Top Ring Weight Loss criteria for the ISM test (D7468) should be added back in (there has been no discussion about deleting this criteria from the CK-4/FA-4 category, so we presume this omission was just a clerical error).
- Section 4.1.6.7 references the IIIF (D6984) and IIIG (D7320). Section 4.1.6.15 references the EOAT (D6894). We presume these are "copy and paste" errors, and should be removed.
- There should be 4.1.6.# sections for each of the interim test methods (T-13 and COAT).
- The IIIF, IIIG, and EOAT, should be removed from section 6.9?

## Affirmative with Comment

Ballot Number: D02.B0 (15-09) Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
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Member's Name: Robert Salgueiro

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Statement:

### Section Statement

4.1.6 **There are no gasoline tests in CK-4 or FA-4, so the proposed wording below need to be changed before final implementation.**

4.1.6 CK-4 or FA-4 — Oil meeting the performance requirements measured in the following diesel ~~and gasoline~~ engine tests, and bench and chemical tests.

4.1.6.7 & **The Seq. IIIF, IIIG and EOAT are not part of either CK-4 or FA-4 and should be removed from the following sections of the ballot which describe the tests which are part of CK-4 and FA-4. Also, the T-13 and COAT should be added to this section.**

4.1.6.15 ~~4.1.6.7 Test Method D6984, the Sequence IIIF test, is used to measure bulk oil viscosity increase, which indicates an oil's ability to withstand the higher temperatures found in modern diesel engines. (An alternative is Test Method D7320, the Sequence IIIG test.)~~

~~4.1.6.15 Test Method D6894, the EOAT procedure, has been correlated with oil aeration in diesel engines equipped with HEUI used in medium-duty diesel engines.~~

Add section 4.1.6.xx Test Method WK50204 Volvo T-13 diesel engine test has been ...

Add section 4.1.6.yy Test Method WK51937 COAT test procedure, has been ...



- 6.9 For CK-4 or FA-4 test results to be valid from the following test types, they shall have been conducted in stands/equipment in current calibration by the TMC: Test Methods D874, D5800, D5966, D6594, D6750, ~~D6894 (EOAT), D6984 (HIF)~~, D7156, D7216, D7320, D7422, D7468, D7484, D7549, WK50204 (T-13), and WK51937 (COAT).
- 5.1 Table **In Section 5. Performance Requirements, Table 3C, the ISM is missing the separate Top Ring Mass Loss parameter and 100 mg max 1, 2, and 3, test limits.** This parameter is outside of the 1000 Merit minimum limit, is part of CJ-4, and should be carried forward to CK-4 and FA-4.

## Affirmative with Comment

Ballot Number: D02.B0 (15-09)                      Close Date: DECEMBER 2, 2015

Item Number: 016 Revision Of D4485-2015A Specification for Performance of Active API Service Category Engine Oils WK51955  
(SEE VOLUME 5 .2 )  
TECHNICAL CONTACT: Lyle O Bowman  
lbowman@namwobl.com  
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Phone Nr: 5102423557                      Fax Nr:

Email Address: ShawnWhitacre@chevron.com

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Statement:

<b>Section</b>	<b>Statement</b>
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There are a handful of items in the revision that need to be cleaned up. These will be discussed at HDEOCP and at Sub B.

# Presentation to HDEOCP: PC-11 into ASTM D4485 WK51955



**Oronite**

J. Rutherford  
R. Stockwell  
L. Birnbaumer  
December 8, 2015



**ADDING UP™**



Oronite

## Background

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- Oronite fully supports the inclusion of CK-4 and FA-4 tests and limits as depicted in the Work Item WK51955 into D4485.
- Our comments are directed to clarifying the Multiple Test Acceptance Criteria language around these new categories as well as pointing out errors in the other Sections
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Oronite

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---

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  - The Cummins ISB should be listed as 4.1.6.4
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  - 4.1.6.15 needs to be removed as the EOAT is not part of these service categories
  - The Caterpillar Oil Aeration Test and the Volvo T-13 are missing
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**Oronite**

# Proposal

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- Oronite believes that API CK-4 and FA-4 should have their own Annex to detail the outlier criteria, merit systems and process for evaluating multiple tests.
  - API CK-4 and FA-4 have a different T-12 from API CJ-4
  - Precedence for other Heavy Duty Categories having their own Annex
- Propose leaving Annex A5 as it is and adding Annex A6



Microsoft Word  
Document



Oronite

# Proposal

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- Annex A6 is exactly like Annex A5 except for:
  - Adds T-13 Standard Deviations to the Table for determining outliers
  - Updates all of the Standard Deviations for the tests in this Table
    - Updated with current Industry values
  - Included the Standard Number for the Roller Follower Wear Test
  - Removes the T-12 Merit System
  - Adds the process for handling results from multiple COATs and API CK-4/API FA-4 T-12s.
    - This language was modeled on what exists in Annex A1 but with API CK-4/API FA-4 restrictions.
      - ➔ T-12 Top Ring Mass Loss and Cylinder Liner Wear have constant limits that apply to the average of the test results with NO provision for outlier removal
      - ➔ COAT Average Aeration (40h-50h) have constant limits and can be MTACed.
      - ➔ Removes the need for footnotes W and Y



Oronite

# Proposal

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- Table 3 CK-4 or FA-4
  - Footnote X for the T-11 MRV includes a reference to (Items 12/13)
    - What is this reference?
      - ➔ Items 12 and 13 on the same ballot are for the Seq. IIIG and Elastomer slab thickness
  - Remove footnote W and Y as they are not descriptions of MTAC; MTAC is handled in the Annexes and not as part of Table 3 Engine Oil Categories
  - Assign footnote W instead of V by the C13 and ISM
    - W See Annex A6 for additional information





**Oronite**

# Proposal

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- We move that the Class Panel accept our comments as Editorial to Ballot Item 16 Work Item 51955

**A6. CK-4 or FA-4 MULTIPLE TEST PROGRAMS AND TEST METHOD D7549 (C13) AND D7468 (ISM) MERIT RATING SYSTEM APPLICATIONS**

A6.1 For the CK-4 or FA-4 test parameters on which outlier criteria apply (contained in Table A6.1), if three or more tests are run, one complete test can be discarded if the outlier criteria defined in Practice E178 are met at a significance level of 5%.

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**TABLE A6.1 Outlier Test Determination Values**

Test Parameter	Standard Deviation
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D6750 (1N) Weighted demerits (WDN)	27.1
D6750 (1N) Top groove fill (TGF), %	0.488165 ln(TGF+1) transform
D6750 (1N) Top land heavy carbon (TLHC), %	0.9 ln(TLHC+1) transform
D6750 (1N) Average Oil consumption, g/kWh	0.045
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A6.2 The C13 and ISM Merit Rating Systems calculation methodology is described in the corresponding test methods.

A6.3 Tables A6.2-A6.3 each contain *Maximum*, *Anchor* and *Minimum* values, as well as *Weight* values, for the specified tests and the test parameters.

A6.4 Application of the C13 and ISM Merit Rating Systems to single and multiple test results follows the guidelines provided below:

**TABLE A6.2 Caterpillar C13 Merit System**

	Delta Oil Consumption, g/h	Top Land Carbon, avg %	Top Groove Carbon, avg %	Second Ring Top Carbon, %
Weight (Total = 1000)	300	300	300	100
Maximum	31	35	53	33
Anchor	25	30	46	22
Minimum	10	15	30	5

**TABLE A6.3 Cummins ISM Merit System**

	Crosshead Mass Loss, avg mg	Delta Oil Filter Pressure, kPa	Engine Sludge, avg merits	Valve Adj. Screw Mass Loss, mg
Weight (Total = 1000)	350	150	150	350
Maximum	7.1	19	8.7	49
Anchor	5.7	13	9.0	27
Minimum	4.3	7	9.3	16

A6.4.1 If all of the test parameter results from a given test method are equal to or better than the *Anchor* values shown in the corresponding table, this is a passing merits result.

A6.4.2 If all of the test parameter results from a given test method exactly meet the *Anchor* values in the corresponding table, each test result receives merits equal to the *Weight* values and the total merit rating of 1000 is a passing merits result.

A6.4.3 If any of the test parameter results from a given test method are at the *Maximum* values shown in the corresponding table, zero merit points are earned for that parameter.

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A6.5.3 Obtain severity adjusted (if applicable) test results for engine test of interest.

A6.5.4 Calculate the arithmetic average of the test results for each test criterion.

A6.5.5 Round each criterion average to the same number of decimal places as in the applicable criterion pass limit.

A6.5.6 Compare each rounded criterion average to its applicable pass limit to determine if performance criteria have been met.

# DAIMLER

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## **DD 13 Scuffing Test ASTM Taskforce Update**

- JW Marriot Austin, TX
- December 8<sup>th</sup>, 2015

## Test Current Status

- DD13 scuffing test work has continued since non-inclusion into PC-11
  - Smaller working group utilized
  - 20 Prove out data sets were completed
  - Results: Concluded we have a viable test, refined procedure in an effort to tighten up test precision, with the intention of moving forward to generate precision statement.
- ASTM taskforce re-initiated June 2015
- 5<sup>th</sup> DD13 Scuffing Test ASTM Taskforce meeting conducted Dec 7

# Timeline Overview

	2015												2016					
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June
Define Matrix test procedure																		
Conduct lab visits/inspections																		
Review operational data of Prove-out tests																		
Complete report forms and data dictionary																		
Conduct rating workshop																		
Conduct Precision Matrix																		
Finalize Hours to Scuff Definition (Test Criteria)																		
Analyze matrix testing																		
Calculate test standard deviation along with oil targets & standard deviations																		
Finalize reference oil selection																		
Set up LTMS																		
Determine stand calibration based on precision matrix testing																		
Review and finalize the Qi Limits/control limits																		
Determine calibration and referencing protocols																		
Finalize the test procedure including any additional items including any learnings from the review of the matrix (critical parameters, shutdown protocols, etc.)																		
ASTM ballot issued																		
Appendix K (not required, but will reviewed)																		
Research report																		

## Outcomes of Meeting / Next Steps

- Agreed to conduct stand visits on Thursday, Dec 10
- Initial agreement on tests to run to help define test precision
  - Two oils were selected
  - Order of tests to be re-defined based on elimination of one initial run
- Follow up meeting planned for Tuesday, Dec 15
  - Lab testing to start CW5 1

## Availability of API CH-4 through CJ-4 Tests for PC-11

Test	Hardware / Test Issues	Availability Through 2020	Notes
Cat 1K/1N	Liners, auxiliary components	Likely	1980's vintage engine. New liners similar performance. Hardware subpanel actively resolving issues with auxiliary stand and miscellaneous components.
Cat 1P/1R	New liner supplier	Likely	1990's vintage engine. New liner supplier. Similar metallurgy and surface finish, with modern surface finish characterization. Similar performance on recent 1P refs.
Cat C13	No current issues	Likely	Engine block, injectors, turbos only available through reman. Reduced life from rebuilt injectors.
Cummins ISM	No current issues	Likely	Engine production ended 2009. ISM engine now produced outside the US.
Cummins ISB	No current issues	Likely	Engine block supply issues resolved.
Mack T-11	Oil Consumption	Likely	Engine production ended 2006. Finite / decreasing number of new engine blocks. Engine build life issues with oil consumption. Improvement from reduced tolerance liners and piston crowns?
Mack T-12	Oil Consumption	Likely	Engine production ended 2006. Finite / decreasing number of new engine blocks. Improvement from reduced tolerance liners and piston crowns.
RFWT	Engine configuration	Likely	Long term supply of test parts at CPD. 6.5 L engine no longer in production at AM General, but available in supply network. Configuration? Injection pump available.
Seq IIIF/IIIG	Hardware depletion Aug 2016	No	Hardware depletion projected Aug 2016. 3 labs have successfully referenced blocks with 9th build. IIIG correlation through API CLOG TF?
EOAT	Using last known hardware	No	EOAT oversight transferred to Cat Surveillance Panel. Discussions in Cat SP for correlation with COAT.

December 7, 2015



## Availability of API CH-4 through CJ-4 Tests for PC-11

Test	Hardware Issues	Availability Through 2020	Notes
Cat 1K/1N	Liners, auxiliary components	Likely	1980's vintage engine. Liner porosity and surface. Hardware subpanel actively resolving issues with auxiliary stand and miscellaneous components.
Cat 1P/1R	New liner supplier	Likely	1990's vintage engine. New liner supplier. Similar metallurgy and surface finish, with modern surface finish characterization. Similar performance on recent 1P reference tests.
Cat C13	No current issues	Likely	Engine block, injectors, turbos only available through reman. Reduced life from rebuilt injectors.

## Availability of API CH-4 through CJ-4 Tests for PC-11

Test	Hardware Issues	Availability Through 2020	Notes
Cummins ISM	No current issues	Likely	<p>Engine production ended 2009.</p> <p>ISM engine now produced outside the US.</p>
Cummins ISB	No current issues	Likely	Engine block supply issues resolved.

## Availability of API CH-4 through CJ-4 Tests for PC-11

Test	Hardware Issues	Availability Through 2020	Notes
Mack T-11	Oil Consumption	Likely	<p>Engine production ended 2006. Finite number of engine blocks.</p> <p>Engine build life issues with oil consumption.</p> <p>O/C Improvement from reduced tolerance liners and piston crowns?</p>
Mack T-12	Oil Consumption	Likely	<p>Engine production ended 2006.</p> <p>Finite / decreasing number of new engine blocks.</p> <p>Some improvement from reduced tolerance liners and piston crowns.</p>

## Availability of API CH-4 through CJ-4 Tests for PC-11

Test	Hardware Issues	Availability Through 2020	Notes
RFWT	Engine configuration	Likely	<p>Long term supply of test parts at CPD.</p> <p>6.5 L engine no longer in production at AM General, but available in supply network. Configuration?</p> <p>Injection pump still available.</p>
Seq IIIF/IIIG	Hardware depletion Aug 2016	No	<p>Hardware depletion projected Aug 2016.</p> <p>3 labs have successfully referenced blocks with 9th build.</p> <p>IIH correlation through API CLOG TF?</p>
EOAT	Using last known hardware	No	<p>EOAT oversight transferred to Cat Surveillance Panel. Discussions in Cat SP for correlation with COAT.</p>

# CLOG Update

## Category Life Oversight Group

# Members

<b>Member</b>	<b>Company</b>
<b>Thom Smith</b>	<b>Valvoline</b>
<b>Scott Lindholm</b>	<b>Shell</b>
<b>Gail Evans</b>	<b>Lubrizol</b>
<b>Brent Calcut</b>	<b>Afton</b>
<b>Mike Ragomo</b>	<b>ExxonMobil</b>
<b>Matthew Ansari</b>	<b>Chevron</b>
<b>Robert Stockwell</b>	<b>Oronite</b>
<b>Simon Tung</b>	<b>Vandebilt</b>
<b>Kevin Ferrick</b>	<b>API</b>
<b>Dennis Bachelder</b>	<b>API</b>

# Objective

Establish Performance Criteria for Existing API Categories Using New Tests

# Tasks

- Define the scope of our work (i.e. what is technically required to maintain a category?)
- Generate discussion and ideas to ensure the activity is progressing
- Review any historical perspective available
- Define the best way to develop or show correlation to replacement engine tests
- Develop a timeline for the activity
- Estimate potential funding and suggest ways to acquire it



Target Test & Parameter(s) for Tie-Back		Categories at Stake that Cannot Be Continued if Tie-Back Not Established									Potential Surrogate Tests for Tie-Back
		1997 to 2000		2001-2004	2005-2010	2011-2017	1998-2003	2004-2009	2010-2016	2011-2017	
Test	Parameters	SJ (P<0.08)	SJ (P≥0.08)	SL	SM	SN	CH-4	CI-4	CJ-4	/RC	Test
IIIF	60hr - %KV40	✓	✓	-	-	-	✓	-	-	-	IIIH pVis
	80hr - %KV40	-	-	✓	-	-	-	✓	✓	-	IIIH pVis
	80hr - WPD	✓	✓	✓							IIIH WPD
	80hr -Other	✓	✓	✓	-	-	-	-	-	-	IVB ACW?
IIIG	%KV40	FBO	FBO	FBO	✓	✓	FBO	FBO	FBO	-	IIIH pVis
	WPD	FBO	FBO	FBO	✓	✓	-	-	-	-	IIIH WPD
	Other	FBO	FBO	FBO	✓	✓	-	-	-	-	IVB ACW?
VE	All wear limits	✓	-	-	-	-	-	-	-	-	IVB ACW?
VG	Rated merits	✓	✓	✓	✓	✓	-	-	-	-	VH
IVA	ACW	✓	✓	✓	✓	✓	-	-	-	-	IVB
IIIGB	P Ret	-	-	-	-	-	-	-	-	✓	"IIIH B"?
VID	FE	-	-	-	-	-	-	-	-	✓	VIE & VIF
EOAT	Aeration	-	-	-	-	-	✓	✓	✓	-	COAT

# Recommendation #1

- **The group agreed to recommend to LG to discontinue API SH.**
  - **SH exists only after a “C” category.**
  - **Only 15 licensees.**
- API Asked EMA if this was CH4/SH was still necessary
  - EMA responded they still need CH4 but not CH4/SH

# Recommendation #2

- **The group agreed to recommend to LG to discontinue API SJ.**
  - **SJ is slated for servicing vehicles built in 2001 and earlier.**
  - **SJ/EC can't be licensed currently.**
  
- **If VE/IVA and IIF are needed for other categories then may not take much to keep**

# Recommendation #3

- **The group agreed to recommend to LG to discontinue API SL/EC.**
  - **VIB test is not available**
  - **Will take resources (\$\$) to establish relationship to VIE.**
- **API has received a note from Joe Franklin formally stating that the VIB is no longer available**
- **API will commence obsoleting API SL/Energy Conserving**

# Recommendation #4

- **The group agreed to recommend to LG to discontinue API SM/EC.**
  - **VIB test is not available**
  - **Will take resources (\$\$) to establish relationship to VIE.**
- **API has received a note from Joe Franklin formally stating that the VIB is no longer available**
- **API will commence obsoleting API SM/Energy Conserving**

# Current Status

## Sequence IIIF Deposits and vis increase

4 test IIIH matrix - 1006 and 433 at 2 labs

add an HD oil - T-13 reference Oil (will need IIIF on it)

## Sequence IIIG Deposits and vis increase

from precision matrix

## Sequence IIIG and IIIF wear

Have asked ACC registration for IIIF and IIIG wear statistics

May need to run IIIF and IIIG reference oils in the IVB

## Sequence IVA Wear

need 90 and 120 $\mu$  equivalent in IVB from precision matrix

## Sequence VE wear

not needed - IVA @ 120 $\mu$  equivalent in IVB, VG equivalent in VH plus 0.06P min

## Sequence VG Deposits

Will come from VH precision matrix if and when that happens

## Sequence VID Fuel Economy

Will come from VIE and VIF precision matrices

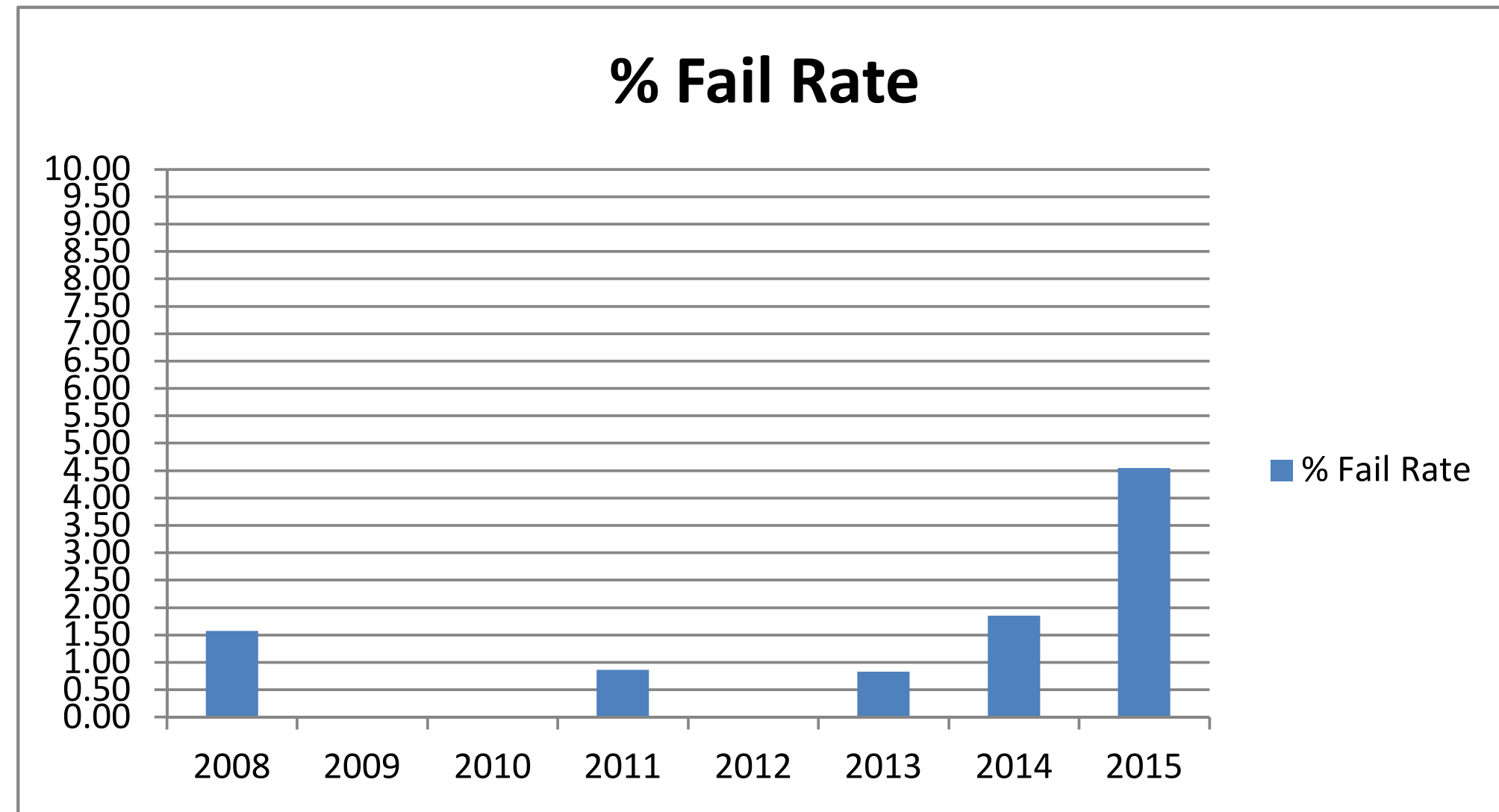
## EOAT

Proposed using oil 1005 Cat aeration results to set limit

# IIF and IIG Wear Statistics

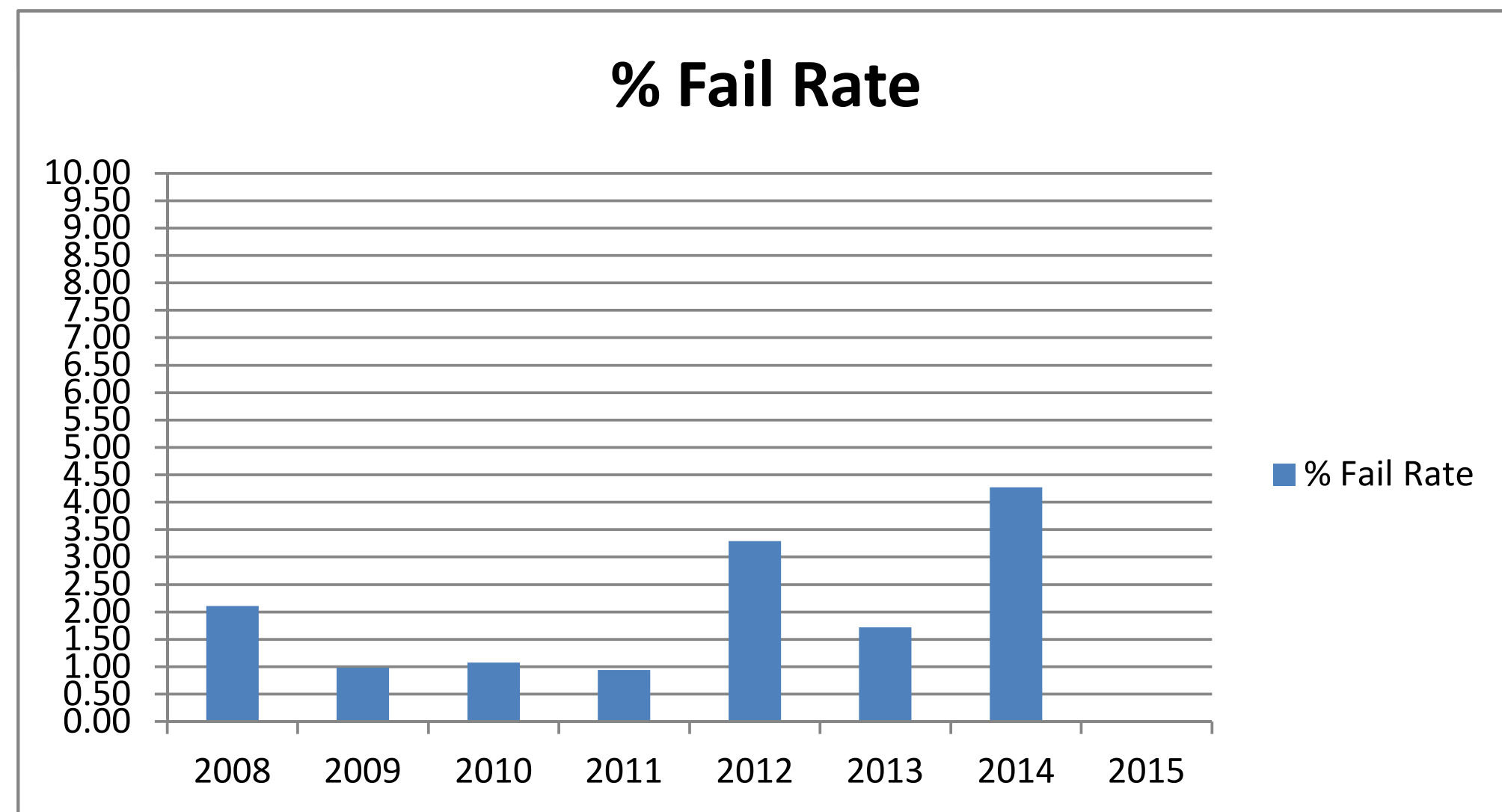
## IIF SCREENED AVERAGE CAM + LIFTER WEAR

Total Tests	Total Fails	% Fail Rate	Year
127	2	1.57	2008
141	0	0.00	2009
149	0	0.00	2010
115	1	0.86	2011
113	0	0.00	2012
120	1	0.83	2013
108	2	1.85	2014
44	2	4.55	2015



## IIG AVERAGE CAM + LIFTER WEAR

Total Tests	Total Fails	% Fail Rate	Year
285	6	2.11	2008
408	4	0.98	2009
465	5	1.08	2010
318	3	0.94	2011
243	8	3.29	2012
233	4	1.72	2013
211	9	4.27	2014
201	0	0.00	2015



# Update on EOEC Reference Oil (Oil 1006) from Elastomers SP to HDEOCP

December 8, 2015

Austin, TX



# Background

- Oil 1006 is the only reference oil used for D7216 (EOEC and LDEOC seals) test monitoring.
  - Oil 1006 is over 15 years old and uses non-current (GF-2?) PC technology.
- Oil 1006-1 will be consumed in about four months, necessitating the need to evaluate a new reference oil/batch of Oil 1006 for EOEC and LDEOC testing.

# Update

- Options (to be evaluated by SP in January):
  - Evaluate Oil 1006-2 for EOEC and LDEOC seals
  - Solicit and evaluate new reference oils for LDEOC seals
- Evaluating Oil 1006-2 is the lead (only) case for EOEC seals as some of the test limits for API CJ-4 and PC-11 seals are based on the performance of Oil 1006.
- The Elastomers SP wanted to update the HDEOCP on this batch change, as there is a possibility for a change in elastomer performance.
- Rough estimate is 4 years for Oil 1006-2 assuming current usage.
- If the HDEOCP were to decide to utilize another reference oil of EOEC testing, Mike Birke should be contacted as the Elastomers SP chair.