HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL

OF

ASTM D02.B0.02

December 6, 2005

Marriot Waterside Hotel – Norfolk, VA

ACTION ITEMS

1. ISB and ISM ballot negative voters work with Cummins to resolve differences.

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 1:30 p.m. on Tuesday, December 6, 2005, in the Hampton II Room of the Marriot Waterside Hotel – Norfolk, VA.

1.2 There were 18 members present and 54 guests present. The attendance list is shown as Attachment **2.**

2.0 Agenda

2.1 The agenda is included as Attachment **1.**

3.0 Minutes

3.1 The minutes from the October 27, 2005 meeting were approved as written.

4.0 Membership

4.1 There were no membership changes.

5.0 Chairman Comments and Summary of Activity

5.1 Chairman McGeehan provided an update and summary of activity during the last 6 months. See Attachment **3**. The API said CJ-4 will be the specification identifier for PC-10. Subcommittee B ballots were approved for the equivalent limits of the M11-EGR to ISM and the T-9 to T-10 and the T-6 to T-10. The CAT 1P test has been added to the category. The Sequence IIIF at API CI-4 limits will be required or the Sequence IIIG at limits to be defined will be allowed. There are 3 piston deposit tests: 1N, 1P, and C13 and 3 valve train wear tests: ISM, ISB and RFWT. This category will have 10 fired engine tests and 6 bench tests. The sulfated ash limit changed to a non-critical limit at 1.0%. Exit criteria ballots had been issued for the T-12 and the ISB. The results for the T-12 are 13 affirmative votes and 5 negative votes. The results for the ISB are 8 affirmative votes and 11 negative votes. See Attachment **4**.

6.0 Mack T-12

6.1 The T-12 ballot negative vote reasons were reviewed. The reasons included uncertainty over the mention of adding IR by peak height and the lack of stability and the apparent increased severity of the Top Ring Weight Loss (TRWL) parameter, the desire to have a full set of limits for all of the tests since an oil will have to pass all of the tests, concern that oil consumption appears to be related to engine build issues and not oil quality, concern that FTIR is not very selective and that the Sequence IIIF should cover oxidation.

6.2 Greg Shank presented modifications to the limits. See Attachment **5**. Greg has had conversations with the additive companies and taken another look at the merit system limits. Greg indicated that he thinks oil consumption is not build related and that it can be influenced by the oil. The maximum oil consumption value was raised though. The values for TRWL were raised somewhat. The maximum for cylinder liner wear (CLW) was raised. The lead values are good protection against oxidation, but the maximum values were raised slightly as well. The FTIR by peak height will be removed.

6.3 In response to the changes, the negative voters indicated acceptance of the limits, but would still like to have the full slate of limits settled for all the tests. The limits will be left as is for now as "provisional approval".

7.0 Cummins ISB

7.1 The ISB ballot negative vote reasons were reviewed. The reasons included dissatisfaction with the soot and torque correction factors, particularly the torque correction (The Cummins Surveillance Panel removed the torque correction after the ballot was issued). Other concerns are that matrix oil 830-2 had adequate wear performance but would fail 80% of the time at the proposed limits and the limits are too restrictive, and the viscosity stay-in-grade requirement is redundant with the T-11 and appears unattainable.

7.2 Dave Stehouwer presented the Cummins response. See Attachment **6**. Cummins did not get much data comparing the T-11 and ISB soot and viscosity after their request, so the viscosity limit was added. The matrix stats and originally proposed limits were shown for background. The cam wear limit was based on a very incomplete data set of Adcole cam measurements to compare techniques. Cummins have agreed to drop the viscosity limit from the ISB and Mack will add a low limit in the T-11. The T-11 limit will be a minimum of 3.5% soot at 4 cSt increase from the sheared viscosity. The matrix labs sent the matrix camshafts to Cummins for evaluation with the Cummins rating method. Cummins has a visual rating method with an acceptable limit of 2.0. A 2.0 correlates to an 80 by the Adcole which correlates to a 50 Mitutoyo. At this limit, one 830 run is a fail. The Tappet Weight Loss limit was raised to 100 mg. At this limit, one 830 run is a fail and two PC-10B runs are fails. The ISB will not have a merit system, so MTAC limits will be used.

7.3 Many of the original negative votes would be switched to affirmative at these limits with the viscosity requirement removed, but there are still two major negative votes. The companies staying with a negative vote are to work directly with Cummins to resolve. There is still a desire to have the whole package of limits for the all the tests as a whole.

8.0 Mack T-11

8.1 Greg Shank had an update on the T-11 limits proposal. See Attachment **7**. The current T-11 limit is a 6.0% soot minimum at a 12 cSt increase from the sheared viscosity. Volvo has discussed adding a slope requirement to the latter part of the test. The proposal is now a 6.7% soot minimum at a 15 cSt increase from the sheared viscosity. Cummins and Volvo had discussions between them to remove the viscosity requirement from the ISB and add a 3.5% soot minimum at a 4 cSt increase from the sheared viscosity. A statement was made that the 3.5% soot minimum at 4 cSt increase limit does not address Cummins' original problem with oils that don't stay in grade. Cummins stated that they wanted T-11 and ISB data and didn't get it. The 4 cSt limit will catch a few oils that have exceeded 22 cSt at low levels of soot. Cummins will address the stay in grade flagging from the field. Greg Shank **motioned** that the T-11 limits proposal be issued for exit ballot. Dave Stehouwer seconded. The **motion passed** on a unanimous voice vote.

9.0 Cummins ISM

9.1 Dave Stehouwer gave a presentation on revised limits for the ISM. See Attachment **8**. A brief history lesson of 830 as oil E in the PC-9 matrix was shown. Using M11EGR tiered limits from the PC-9 matrix, 40% of matrix runs would fail, but the data might not have been soot corrected. The original proposed limits were shown. Anchors are slightly above the mean for 830-2 in the ISM and the maximum is 1 sigma above the anchor. TRWL is removed from the merit system but is left in with a maximum limit of 100 mg. The weighting factors have been adjusted to account for the removal of TRWL. With the new limits, oil 1004 fails 100% of the time. The average merit for 830 is around 1200. One test was not good enough overall and failed and one exceeded the cap for OFDP. Dave Stehouwer **motioned** that the new proposal be accepted as the limits for the ISM in PC-10. Robert Stockwell seconded.

9.2 Discussion: 830-2 is not oil E, it is a second re-blend. 830-2 averages 13.8 mg crosshead weight loss (CHWL) in the M11EGR. It never fails crosshead weight loss. Average Injector Adjusting Screw Weight Loss (AIASWL) is still too tight, the maxima are picked from 1 sigma of the data, set CHWL so that the maximum is 7.5 mg as for CI-4 plus. That would use a higher sigma. There is a problem with bringing this as a motion since the full slate of limits is not available and there were many negatives on the ISM exit criteria ballot. Other negatives: this is moving in the right direction but wants more time to check and study these limits but another exit criteria ballot would be the right way and feels that the values are about right. This is worth going through an exit ballot. The data might not be soot adjusted correctly. Still concerned about CHWL and AIASWL. All the merit system weighting removed from the rings was put on the wear and with all the wear tests there are, that is not necessary. Should put some more weight on the sludge. Cummins is very concerned about the injector adjusting screws. The panel has not seen any data showing the screw problem from the field. Oil ISMA has adjusting screws with too much weight loss. Concern that another exit ballot might yield another 6 or 9 negatives which is no progress. Might make faster progress discussing directly with Cummins. The companies that are still against the new limits are to work directly with Cummins to resolve. The ballot must state that values will be soot corrected. The recent reference oil data from one lab has not been soot corrected. The motion was **withdrawn**.

10.0 C13

10.1 Elisa Santos presented a summary of the C13 results. See Attachment **9**. This is a summary of analyses presented before. The correlation of Delta Oil Consumption (OC) with deposits is weak. The Ep is greater than 1 for TLC, around 0.9 for TGC and around 0.60 for OC. There was no MAD survey for Carbon on the Top Side of the 2nd Ring (R2TCA). Base oil has an effect on OC, Top Groove Carbon (TGC), Top Land Carbon (TLC) and R2TCA. There is detail of the correlations and the precision. Most analyses are on the 24 test matrix data set. The 32 test data set includes the mini-matrix. R2TCA has been analyzed even though there are some problems with the original ratings.

10.2 Abdul Cassim gave his presentation. See Attachment **10**. The parameters in the merit system are OC, TLC, TGC, and R2TCA. The other pass/fail parameter is no hot stuck rings. Piston, ring, or liner distress (scuffing) will be non-interpretable if it occurs. The merit system should provide clear separation of Oil A and Oil D/PC-10G as failing and passing oils with values that are acceptable to CAT. The original merit proposal has been changed. TLHC was replaced with TLC and UWD was replaced with R2TCA. R2TCA parameter limits are set because heavy carbon is not desirable. The cap is set such that 100% light carbon will still pass. The weighting is the smallest at 15% of the total. There is support to retain the parameter. A merit system should have more than 3 parameters, so 4 parameters will be used. Some of the issues about rating the R2TCA: some labs did not rate heavy carbon, some labs rated the chamfers on the back of the ring and some did not. Some labs rated polished carbon as light since it did not have any depth. The Surveillance

Panel has agreed on a final rating method and is in the process of conducting a round robin and acquiring rings to have a rating workshop soon. The limits will be set so that very poor oils PC-10F and PC-10C will fail. The merit system values have been changed to reduce the weight of the R2TCA and to allow a slightly higher value before it fails. The Surveillance Panel selected oil PC-10B as the reference oil. Abdul Cassim **motioned** to accept the C13 with the merit system shown for an exit ballot for inclusion in PC-10. Greg Shank seconded.

10.3 Chairman McGeehan expressed concern about the variability and lateness of the rating. Abdul said that it wouldn't improve the rating to include it as a rate and report only. The rating was not properly rated during the matrix, but the only oils that had heavy carbon were run at labs that properly rated heavy carbon. It will improve as we go forward and the limit is set pretty high. There is concern over setting a limit based on faulty data. The value is set high enough such that it is a failsafe for now. CAT will have to introduce this in their own spec if it is not included now. There has not been an exit ballot yet for the C13 and it is needed. Need to make sure that all parameters are included on the ballot. A workshop will help the rating, but that doesn't work to set the limit based on the faulty data. How will existing tests be handled with the rating since it was performed differently? An allowance may have to be made for older tests that may not have ring rating data or was rated with the different methods. How much will the values change when all labs start rating heavy carbon? Probably less than double. The independent labs ran most of the tests and rated the rings properly. A rating workshop will help indicate what the matrix data would have looked like. The **motion passed** on a unanimous voice vote to issue the exit ballot.

10.4 Abdul announced that Mike Quinn has retired.

11.0 ACC Report

11.1 Lew Williams provided a summary of provisional test registrations. See Attachment **11**. There have been 9 registered C13 tests so far at a cost of over $1M. A total of 153 tests for PC-10 have been provisionally registered so far including retroactive registrations. 46 tests have been registered for the ISB, T-12 and C13 tests.

11.2 The C13 BOI/VGRA Guidelines have been sent for ballot. The task force recommended the guidelines to the API Lubes Committee (LC) and the LC authorized issuing a letter ballot. The ballot is to close 12/16/05. The ballot is included as Attachment **12**.

11.3 There are still PC-10 timing concerns. PAPTG desires nine months from the passing ballot until first API licensing. The exit ballot process has worked well to bring forward the concerns. The HDEOCP needs to complete exit ballot reviews and move to a complete ballot ASAP. The ACC wants more meetings to complete the balloting process. It is desirable to have OEM specs at or shortly after the completion of the HDEOCP PC-10 ballot. ACC continues to review the spec to determine the critical path, but is not able to determine the completion date yet.

11.4 Some tentative dates for future meetings were proposed. January 10th with exit ballots due back by January 5th. A meeting in February also with the date to be determined.

11.5 Steve Kennedy described the details of the BOI resolution. See Attachment **13**. The task force worked to develop a progressive BOI using properties of base oil mixture, not the traditional groups. It covers a limited number of viscosity grades (15W-40, 10W-30, and 10W-40). A single test can be used to read to similar base oil mixtures, or a range can be defined from two tests. The VGRA proposal is similar to existing CAT single cylinder tests.

11.6 What about the ISB and T12 group III tests? The contracts are signed but tests not run yet. This program is highly desirable, but not holding anything up.

12.0 Time-Line

12.1 Bill Runkle showed the time line. See Attachment **14**. The time line has been adjusted based on the information from the last meeting. Using 9 months from January 26 gets to October 26. The EMA can allow October 15th. Now the difference is a few weeks, not months.

13.0 Next Meetings

13.1 January 10th in San Antonio at SwRI
13.2 January 26th in Chicago at the Embassy Suites
13.3 A time in February. Date to be determined.

14.0 Viscosity task Force

14.1 Andrew Jackson gave a presentation on the SAE J300 viscosity task force. See Attachment **15**. There were meetings and an open forum meeting to discuss what to do with the viscosity standard. Discussed scope of SAE J300. There were many presentations made at the open forums. The task force is having a meeting on Wednesday afternoon of ASTM week.

15.0 CAT ECF-2

15.1 Abdul Cassim gave a presentation on ECF-2. See Attachment **16**. Caterpillar are introducing two new oil specifications. CAT remains committed to the API system. The new specs address off-highway and on-highway needs. The specs have not been completely finalized. ECF-2 replaces ECF-1 for use off-highway and pre-2007 truck engines. Worldwide use through 2011+. Removal of ash maximum with a minimum of 1.0%. Will include a C13, but the limits could be different from CJ-4. The new spec is ECF-3 and is for 2007 truck engines in the US. Implemented in two phases: interim version prior to CJ-4 licensing with a subset of CJ-4 tests and the full version concurrent with CJ-4 licensing and based on final CJ-4. There will be many field trial engines that need a suitable oil. The customers need a guideline for what oil to use during field trials before CJ-4 oils are available. ECF-2 and ECF-3 will be mutually exclusive specifications. ECF-2 and ECF-3 interim draft specs should be ready January 16, 2006, finalized February 17, 2006 and implemented June 5, 2006. ECF-3 final will be introduced throughout 2006. ECF-1 will be retired by the 3rd quarter of 2006 and there will be a registration system with a published list for ECF-2 and ECF-3. ECF-3 interim should have oils in the field by June 5, 2006. CAT will try to stay flexible on the Sequence IIIF and IIIG. ECF-3 includes the PC-10 chemical box. There is a concern that there won't be enough test capacity to run all the tests needed for ECF and CJ-4.

16.0 Detroit Diesel Specifications

16.1 Detroit Diesel will issue a spec for natural gas engines.
16.2 Detroit Diesel will issue a spec for the NAFTA region which will be CH-4 and may include tests from DHD-1 at the same limits.

17.0 Two-Cycle Diesel

17.1 Patrick Lai announced that the 6V92 stand might not have been available. A survey indicated that there is some demand for a calibrated 6V92. There is still a calibrated 6V92 stand available at Imperial as a result of the survey.

18.0 The meeting was adjourned at 5:00 pm.

Final Agenda
ASTMSECTION D.02.BO.02
HEAVY-DUTY ENGINE OIL CLASSIFICATION PANELS

Marriott Waterside, Norfolk, VA
December 6th, 2005
1:30 pm-5:30 pm

Chairman/ Secretary: **Jim Mc Geehan/Jim Moritz**
Purpose: **PC-10**

Desired Outcomes: **Complete PC-10 on time**

TOPIC	PROCESS	WHO	TIME
Agenda Review	• Desired Outcomes & Agenda	Group	1:30-1:35
Minutes Approval	• October 27th , 2005	Group	1:35-1:40
Membership	• Changes: Additions • Ballot status on CF-4/CH-4 • Delivering PC-10 on time!	Jim Mc Geehan	1:40-1:45
Mack T-12	• Mack T-12 "Exit-Criteria" ballot results • Discussion and Vote	Jim Mc Geehan Greg Shank	1:45-2:15
Mack T-11	• Mack T-11 proposed limits • Vote and Exit-Criteria Ballot	Greg Shank	2:15-2:45
Cummins ISB	• Cummins ISB "Exit-Criteria" Ballot results • Discussion and vote	Jim Mc Geehan, Dave Stehouwer	2:45-3:15
Cummins ISM	• New proposed limits base results from previous ballot negatives • Discussion and vote	Dave Stehouwer	3:15-3:45
Caterpillar C13	• Data Analysis • Proposed Merit system • Vote and Exit-Criteria Ballot	Abdul Cassim Elisa Santos	3:45-4:30
ACC Report	• ACC's timing concerns and other issues • PAPIG-testing activity • Caterpillar C13 BOI resolution	Lew Williams Joan Evans Steve Kennedy	4:30-5:15
Time-line	• Review and conference call Dec 14th 2005	Bill Runkle	5:15-5:25
New Business	•		5:25-5:30
Next Meetings	• January 26th 2006 in Chicago at Embassy Suites O'Hare Rosemont		

HDEOCP Meeting, December 6th, 2005, Norfolk, VA

	Name	Company	Member
1	WIM VAN DAM	CHEVRON ORONITE	✓
2	ABDUL H. CASSIM	CATERPILLAR INC.	✓
3	STEVEN HERZOG	ROHMAX, USA L.P.	✓
4	ROBERT STOCKWELL	GM	✓
5	Roger Gault	EMA	
6	HEATHER DEBAUN	INTERNATIONAL TRUCK & ENGINE	✓
7	W.A. RUNKLE	THE VALVOLINE CO	✓
8	THOM SMITH	THE VALVOLINE COMPANY	
9	DAVID STEHOUWER	CUMMINS	✓
10	Frank Fernandez	Oronite	
11	Daniel Lindwig	Registration Systems, Inc.	
12	Terry Bates	Manuty Consultancy Ltd.	
13	Lewis Williams	Lubrizol	✓
14	Clinton Smith	Imperial Oil	✓
15	Andrew Ritchie	Infineum	
16	PAT FETTERMAN	INFINEUM	✓
17	CHRIS CASTANIEN	LUBRIZOL	
18	PATRICK LAI	IMPERIAL OIL	
19	Scott Harold	CIBA	✓
20	ANDY JACKSON	EXXONMOBIL	
21	E.A. HAPTHOMPSON	GBL STDS DEV	
22	MIKE RILEY	FORD	
23	DAVID TABER	Conoco Phillips	✓
24	Dan Pridemore	Afton Chemical	

HDEOCP Meeting, December 6th, 2005, Norfolk, VA

	Name	Company	Member
25	JOHN ZALAR	ASTM TMC	
26	DWIGHT BOWDEN	OH TECHNOLOGIES	
27	Jason Bowden	OH Technologies, Inc.	
28	Jim CARTER	HALTERMANN PRODUCTS	
29	Helen Cummiskey	American Refining Group	
30	CHARLES BAKER	EXXON MOBIL RES & ENGR	
31	Jim Rutherford	Chevron Oronite	
32	Phil Scinto	Lubrizol	
33	Dave Duncan	Lubrizol	
34	Ron Erck	VGI	
35	Elisa Santos	Infineum	
36	RODICA BARANESCU	INTERNATIONAL TRUCK & ENGINE	✓
37	Chris Laroo	EPA	
38	Don Nash	Flint Hills Resources	
39	Bob St. GERMAIN	CHEMTURA	
40	Steven Kennedy	ExxonMobil	✓
41	Lyle Bowman	Retired	
42	Ben Weber	SwRI	
43	Mark Cooper	Chevron Oronite	
44	Scott Zechiel	Detroit Diesel	
45	Tony BARRAS	SWRI	
46	Mark Matson	Marathon Petroleum Co.	
47	Traci Freeman	Afton Chemical	
48	Beth Schwab	Afton Chemical	

HDEOCP Meeting, December 6th, 2005, Norfolk, VA

	Name	Company	Member
49	MATT URBANAK	SHELL	✓
50	KEITH SELBY	SHELL	
51	Ken Hope	Chevron Phillips	
52	Irwin Goldblatt for S. Goodrich		
53	NORB NANN	NANN CONSULTANTS, INC.	
54	MIKE MCMILLAN	MMCMKLAN123AT COMCAST.NET MLM CONSULTING SERVICES	
55	Joe Franklin	Intertek Automotive Res.	
56	David Smith	API	
57	DAVID McFALL	LUBES 'N' GREASES MAGAZINE	
58	KEN CHAD	Deere & Company	✓
59	Mesfin Belay	Detroit Diesel	✓
60	KEN GOSHORN	VOLVO POWERTRAIN	
61	RAY FUNK	CITGO PETROLEUM	
62	Hal Shaub	C.I. Inc. E-Mail: HALSHAUBCENTERFOR INNOVATION@HSN.COM	
63	HARRY E. DIETZMANN	SWRI	
64	GREG SHANK	Volvo Powertrain	
65	JIM MCGEEHAN	CHEVRON	✓
66	JIM MORITZ	INTERTEK AUTOMOTIVE	
67	Charlie Passaut	Afton Chemical	✓
68	TOM COUSINEAU	AFTON CHEMICAL	
69	Glenn Mazzamaro	Stellar Additive Services	
70	Ronald Loomis	Lubrizol	
71	John Glaser	Intertek	
72	JIM GUTZWILLER	INFINEUM	

Status of API CJ-4 (PC-10)

December 6th 2005

Jim Mc Geehan • Chairman HDEOCP

Successful B Ballots On Test Limits

- API CI-4: Limits Cummins M11-EGR to ISM
- API CH-4:Limits Mack T-10 to Mack T-9
- API CF-4: Limits Mack T-10 to Mack T-6

Agreements on API CJ-4 tests

- Cat IP added
- Seq.IIIF at API CI-4 limits or
- Seq IIIG at limits to be defined

Three piston deposit tests in API CJ-4

- Caterpillar IN
- Caterpillar IP and
-
- Caterpillar C13

Three valve-train wear tests in API CJ-4

- Cummins ISM
- Cummins ISB, and
- Roller Follower wear test

10 Engine Tests and 6 Bench Tests

Performance Criteria	Fuel Sulfur, Wt %/ppm	Test	PC-10 2006
Engine Tests			
Aluminum Piston Deposits, Oil Consumption	0.05	Caterpillar 1N ASTM D 6750	1
Forged Steel Piston Oil Consumption / Deposits	0.05	Caterpillar 1P ASTM D 6681	2
Oil Consumption and Piston Deposit	15 ppm	Caterpillar C-13	3
Viscosity Increase Due to Soot at 6.0%*	0.05	Mack T-11 ASTM D 7156	4
Ring, Liner Bearing Wear & Oil Consumption	15 ppm	MackT-12	5
Valve Train Wear, Filter ΔP and Sludge	.05	Cummins ISM	6
Valve Train Wear	15 ppm	Cummins ISB	7
Roller-Follower Valve Train Wear	0.05	GM 6.5-L RFWT ASTM D 5966	8
Aeration	0.05	Navistar EOAT ASTM D 6894	9
Oil Oxidation	0.10	See III G (CI-4) or IIIF(D 6984)	10
Bench Tests			
Foam Sequence I, II, III	–	ASTM D 892 (non opt. A)	1
Volatility	–	Noack D 5800	2
Elastomer Compatibility		EOEC (DXXXX) plus Vamac	3
High Temperature/High Shear		Viscosity After Shear D 4683	4
Corrosion		HTCBT 135°C D 6594	5
Shear Stability – 90 Cycles	–	Bosch Injector ASTM D 7109	6
Total Number of Engine and Bench Tests			***16***

Changes In last 6 months

- **Sulfated ash limit changed to non-critical at 1.0%**

ASTM-HDEOCP EXIT CRITERIA BALLOT for:

- **Mack T12 PC10 Merit Limits BOTH DUE: NOVEMBER 22, 2005**
- **Exit Ballot these limits for the Cummins ISB**

Company	Name	Mack T 12		Cummins ISB	
		Affirmative	Negative	Affirmative	Negative
Afton Chemical	Charles Passut		X comments		X comments
BP	Steven Goodier		X comments		X comments
Caterpillar Inc	Abdul Cassim				
Chevron Oronite LLC	Wm. Kleiser		X comments		X comments
Chevron	Jim Mc Geehan	X			X comments
Ciba Specialty Chemicals	Scott Harold				X comments
ConocoPhillips	David E. Taber	X		X	
Cummins	Warren Totten	X		X	
DDC	Mesfin Belay	X		X	
Dana Corporation	Howard Robins	X		X	
Deere & Co	Ken Chao	X		X	
EMA	Roger Gault	X		X	
ExxonMobil	Steven Kennedy	X			X comments
GM	Robert Stockwell				
Infineum	Pat Fetterman		X comments		X comments
Int'l Truck & Engine	Heather DeBaun	X		X	
Lubrizol	Lewis Williams		X comments		X comments
PerkinElmer	Thomas M. Franklin				
RohMax USA	Steven Herzog	X			X comments
Shell	Matthew Urbanak	X			X comments
Valvoline	Wm. Runkle Jr.	X		X	
Volvo Power Train	Greg Shank	X			X comments
	Totals	**13**	**5**	**8**	**11**

See attached for comments

Wednesday November 30, 2005

T12 Proposal PC 10 Exit Ballot

Criterion	EOT Delta Pb	250-300 Hour Delta PB	Cylinder Liner Wear	Top Ring Weight Loss	Oil Consumption
Weight	200	200	250	200	150
Maximum	35	15	24	105	85
Anchor	25	10	20	70	65
Minimum	10	0	12	35	50

1000

Mack Merit 1000 min

- NO FTIR Parameter

55205	820-2	16	5	22	56	77	1085	**1085**
55213	820-2	25	11	18	30	76	1140	**1140**
55216	820-2	24	14	22	44	63	897	**897**
55217	820-2	12	6	22	42	64	1298	**1298**
55715	820-2	20	8	18	56	67	1234	**1234**
55722	820-2	20	7	15	45	60	1476	**1476**
55723	820-2	16	5	13	101	66	1254	**1254**
56153	820-2	24	8	16	45	71	1276	**1276**
55712	PC10B	24	8	15	46	60	1397	**1397**
55728	PC10B	34	12	15	44	62	1075	**1075**
55935	PC10B	22	9	15	96	53	1188	**1188**
56010	PC10B	30	8	8	31	61	1430	**1430**
56562	PC10B	40	17	11	41	65	836	**Fail**
55713	PC10E	43	23	17	35	57	494	**Fail**
55718	PC10E	18	7	13	36	63	1586	**1586**
55725	PC10E	23	8	11	106	62	1141	**Fail**
55937	PC10E	27	10	21	65	55	1026	**1026**
55940	PC10E	26	7	15	87	59	1159	**1159**
56726		23	9	14	67	57	1331	**1331**
PC10E								

ISB Cam and Tappet Test

Presentation to HDEOCP

Warren Totten
David Stehouwer
December 6, 2005

Precision Summary

	Repeatability s (Within Stand)	Reproducibility s (Btween Stand)	Reproducibility s (Between Lab)
Tappet Wear (mg) Soot Adj	8.1645 Ep=1.84	16.8574 Ep=0.89	16.9092 Ep=0.89
Camshaft Wear (um)	4.7021 Ep=3.19	7.1512 Ep=2.10	7.1512 Ep=2.10
XHead Wear (mg) Soot Adj	0.3817 Ep=1.96	0.3817 Ep=1.96	0.5221 Ep=1.44
Torque Adjstd Cam Wear (um)	5.0833 Ep=2.95	5.0833 Ep=2.95	6.3063 Ep=2.38

Target Summary

	Oil 830-2	PC10B	PC10E
Tappet Wear (mg) Soot Adj	LS Mean = 88.23 Mean = 85.8167 S = 16.1416	LS Mean = 93.47 Mean = 88.6833 S = 15.8176	LS Mean = 67.54 Mean = 57.86 S = 9.4796
Camshaft Wear (um)	LS Mean = 40.20 Mean =40.2667 S = 9.2058	LS Mean = 44.85 Mean = 41.9833 S = 5.6722	LS Mean = 36.86 Mean = 34.14 S = 5.0093
XHead Wear (mg) Soot Adj	LS Mean = 2.072 Mean = 2.0833 S = 0.5345	LS Mean = 2.057 Mean = 2.0667 S = 0.4367	LS Mean = 1.940 Mean = 2.0000 S = 0.4743
Torque Adjstd Cam Wear (um)	LS Mean = 40.86 Mean =40.86 S = 6.8895	LS Mean = 42.29 Mean = 42.2984 S = 4.7694	LS Mean = 33.94 Mean = 33.0695 S = 6.0193

ISB Balloted Limits

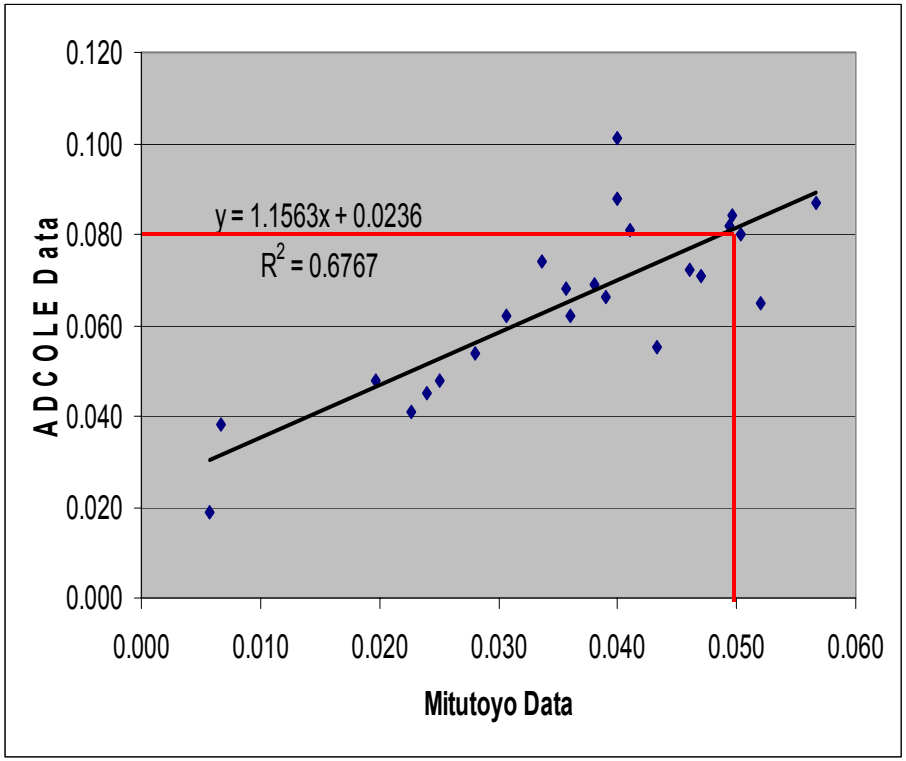
- **Tappet wear limit**
  - **Target limit 75 mg weight loss. MTAC limits are: 75/83.1/86.7 for 1/2/3 tests**
- **Cam wear limit**
  - **Target limit 30 µm wear by Mitutoyo snap gauge. MTAC limits are: 30/33.4/35**
- **Viscosity limit: Viscosity@100C less than or equal to 16.3 cSt at 100 hr**

Concerns Expressed in Exit Ballot

- Viscosity control should not be measured in ISB
- Cummins and Mack have agreed to add viscosity parameter to T-11 @ 3.5% Soot:
  - Ie. Min. 3.5% soot @ 4cSt over sheared Vis.
- Tappet and Cam Limits too restrictive to reflect the acceptable performance of 830-2 and PC 10-B
- Cams were evaluated @ Cummins and better correlation with Mitutoyo established
- Tappet limit re-evaluated to reflect preformance of 830-2 and PC 10-B

Camshaft Wear

- A 2.0 Cummins visual rating is deemed acceptable for end of test requirements in the ISB test
- 2.0 visual is equivalent to 80 um with the ADCOLE.
- Based upon correlation data using the historical ratings and the PC-10 matrix cam ratings a camshaft wear limit of 50 µm as determined by a Mitutoyo snap gauge is proposed.
- This limit fails one PC-10 matrix test in TMC 830-2



Tappet Wear

- Based upon rating and evaluation the proposed limit is 100 mg of wear.
- This limit fails one test on TMC 830-2 and two on PC-10B.

Limits

- The following limits are being proposed for ballot
  - Tappet weight loss – 100 mg
  - Camshaft wear – 50 µm
  - Crosshead weight loss – record,
    - use ISM methodology for screening
  - Soot / Viscosity Control – Measure in Mack T-11

Estimated MTAC Limits

- **Tappet wear limit**
  - **Target limit 100 mg weight loss.**
  - **MTAC limits are: 100 /108 / 112 mg for 1/2/3 tests**
- **Cam wear limit**
  - **Target limit 50 µm wear by Mitutoyo snap gauge.**
  - **MTAC limits are: 50 / 54 / 56 um for 1/2/3 tests**
- **Statisticians need to verify MTAC Limits.**

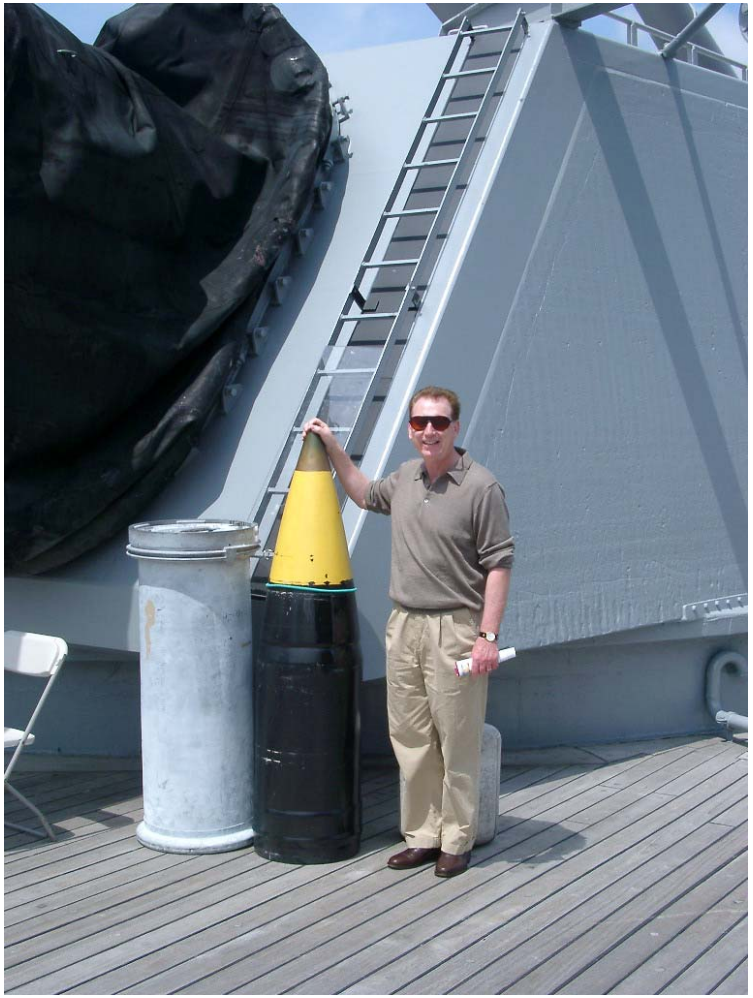
T11 Proposal for PC10 (CJ-4)

Visc 12 cSt Inc.
TGA Soot 6.0 min
Std .25 COV 4.2

Visc 15 cSt Inc.
TGA Soot 6.7 min
Std .26 COV 4.3

Visc 4 cSt Inc.
TGA Soot 3.5 min.
Std .27 COV 4.3

PC 10 ***WILL*** Be Delivered On Time



Warren Totten; David Stehouwer

December 6, 2005

History Lesson:
M11 EGR and Oil E (TMC 830)

Report to HDEOCP
ISM Merit System Revised Limits

Warren Totten
David Stehouwer
December 6, 2005

PC-9 Matrix

M11 EGR Oils – LS Means and Standard Deviations

Oil	adjXHDW	TRWL	sqrt(OFDP)	AES	ln(ASWL)	TRGI	ln(RBWL)	AWS
A	15.7	156.3	13.5673	9.0	4.8499	0.0012	3.9209	5.3
B	15.7	131.5	20.2788	8.9	4.6749	0.0014	3.9836	5.9
C	24.0	111.3	26.3477	7.2	3.5832	0.0007	3.9706	5.5
D	12.2	157.9	13.6704	7.2	5.0184	0.0000	3.6820	6.2
E	17.3	131.7	11.7164	8.5	4.7883	0.0007	3.2919	5.9
F	17.7	161.5	14.0805	7.7	4.4964	0.0009	3.2178	6.4
G	13.2	140.1	13.6620	7.5	4.5729	0.0012	3.0668	6.4
H	19.7	162.8	14.1506	8.2	4.9642	0.0006	2.9523	7.0
J	18.2	158.2	14.0751	8.1	4.6913	0.0013	3.5089	6.2
std dev	3.7	22.9	2.7	0.38	0.4100	0.00056	0.3804	0.67

Note: Oil E (TMC 830) had XHDW 17.3 mg

PC-9 Matrix

Analysis of Data – M11 EGR

- **Crosshead wear is transformed and adjusted to 4.6 average soot.**

$$XHDW_{adj} = 10^{\log(XHDW) - 0.2575(avSoot - 4.6)}$$

- **All other parameters as reported. OFDP transformed to SQRT.**
  - **Data Set**

CMIR	oil	base	tech	lab		xhdw	trwl	ofdp	aes	aswl		trgi	rbwl	aws
1	38932	E	2	Y	A	23.609126	172.0	127	7.4	108.4	0.0010000000	16.2	4.2	
2	38967	B	2	X	A	18.860696	125.0	308	8.8	43.7	0.0010000000	30.1	3.9	
3	38969	G	1	Z	A	12.024254	124.5	175	7.3	68.2	0.0010000000	18.6	4.7	
4	38935	E	2	Y	A	17.497106	128.9	97	8.1	85.0	0.0001666667	22.3	4.1	
5	38970	F	3	Y	A	20.770668	134.2	186	7.0	42.7	0.0010000000	17.6	4.3	
6	38933	E	2	Y	A	11.403427	115.5	66	8.0	51.2	0.0011666667	7.6	5.3	
7	38966	J	3	Z	A	20.313626	170.5	265	7.7	71.8	0.0010000000	23.8	4.5	
8	38934	E	2	Y	A	16.018042	139.1	143	7.6	82.1	0.0000000000	17.1	4.5	
9	38968	A	1	X	A	20.292868	144.5	288	8.9	56.6	0.0001666667	25.0	4.4	
10	38936	E	2	Y	B	23.283084	147.2	246	8.7	116.6	0.0005000000	36.2	3.8	
11	38971	D	1	Y	B	19.409366	144.7	191	6.9	196.6	0.0003333333	42.0	5.7	
12	40920	J	3	Z	B	22.573732	139.7	179	7.8	120.7	0.0015000000	32.4	5.3	
13	38972	B	2	X	B	19.005164	131.8	601	8.3	191.9	0.0016666667	66.2	5.3	
14	38931	E	2	Y	D	15.914587	112.8	118	9.1	98.9	0.0011666667	37.2	6.4	
15	38963	D	1	Y	D	9.810164	162.9	224	7.8	136.1	0.0000000000	54.8	5.7	
16	38965	C	3	X	D	23.597374	107.1	606	7.7	33.5	0.0008333333	67.7	5.5	
17	38964	H	2	Z	D	22.282757	164.0	184	8.6	155.8	0.0008333333	20.9	7.0	
18	38927	E	2	Y	G	11.739236	104.1	178	9.0	160.5	0.0000000000	26.2	8.2	
19	38962	F	3	Y	G	9.698728	196.9	171	8.2	160.9	0.0005000000	24.3	9.6	
20	38930	E	2	Y	G	11.478874	148.2	190	8.4	96.6	0.0003333333	21.9	9.1	
21	38960	H	2	Z	G	10.702293	167.7	175	8.6	180.4	0.0006666667	25.4	9.6	
22	38959	A	1	X	G	6.245662	176.2	76	8.9	246.2	0.0020000000	69.8	7.3	
23	38928	E	2	Y	G	14.913275	143.7	111	8.9	139.0	0.0003333333	28.1	9.0	
24	38929	E	2	Y	G	12.098821	129.5	55	8.8	404.0	0.0013333333	62.6	8.0	
25	38958	C	3	X	G	NA	NA	706	NA	NA	NA	NA	NA	
26	38961	G	1	Z	G	9.496053	163.8	160	7.4	117.4	0.0011666667	17.0	9.1	

PC-9 Matrix

M11 EGR Accepted Test Limits (Oct 2001)

M11 EGR Tiered Limits

	1 Test	2 Tests	3 Tests
Crosshead Weight Loss	20	21.8	22.6
Top Ring Weight Loss	175	186.0	190.9
Oil Filter Delta P	275	319.8*	340.8*
Average Sludge	7.8	7.62	7.54

* Calculated in transformed units (sqrt) and converted back to original units

These limits were calculated using ASTM D 3244

PC-9 Matrix

How did Oil E (TMC 830) perform?

- Oil E is a borderline passing oil for the M11 EGR test
- One test limits are; CWL-20mg, TRWL-175mg, OFDP-275 kPa, AES-7.8
- Four of ten (40%) of the accepted reference oil tests failed the accepted test limits

PC-9 MATRIX DATA - OIL E			
CWL	TRWL	OFDP	AES
23.6	172	127	7.4
17.49	128.9	97	8.1
11.4	115.5	66	8
16.01	139.1	143	7.6
23.28	112.8	246	8.7
15.91	104.1	118	9.1
11.23	178.2	178	9
11.47	148.2	190	8.4
14.9	143.7	111	8.9
12.09	129.5	55	8.8

Initial Exit Ballot

Proposed PC-10 Parameters

Criterion	Crosshead Weight Loss	Top Ring Weight Loss	Oil Filter Delta P	Adjusting Screw Weight Loss	Sludge
Weight	250	100	250	250	150
Maximum	6.0	90	20	40	8.9
Anchor	5.0	65	12	30	9.0
Minimum	3.5	40	5	15	9.5

Revised ISM Merit System for PC-10

Criterion	Crosshead Weight Loss	Top Ring Weight Loss	Oil Filter Delta P	Adjusting Screw Weight Loss	Sludge	Total Merits
Weight	350	0	150	350	150	1000
Maximum	7.1	100	19	45	8.7	
Anchor	5.7		13	27	9.0	
Minimum	4.3		7	16	9.3	
Average	5.3	58.9	11.3	24.6	9.0	
St Dev	1.42	15.64	5.93	11.03	0.15	

- **Anchors set above mean of 830**
- **Maximum is 1 sigma above anchor (ASWL relaxed)**
- **TRWL is 100 max**
- **Weights are revised to emphasize wear parameters and minimize Sludge and OFDP**

Merit Results for ISM Test Data

Reference Tests		Crosshead Weight Loss	Top Ring Weight Loss	Oil Filter Delta P	Adjusting Screw Weight Loss	Sludge	Calculated Merit	Final Merit
28402	1004-3	8.3	61	35	139	9.0	-2391	Fail
30048	1004-3	7.4	72	238	155	9.0	-7533	Fail
35313	1004-3	9.4	62	24	138	9.0	-2345	Fail
43672	1004-3	7.8	64	110	59	8.9	-2611	Fail
50254	1004-3	8.0	53	126	191	9.1	-5531	Fail
51225	1004-3	8.5	46	75	44	7.9	-2128	Fail
47644	830-2	5.7	57	9	20	9.2	1408	1408
50224	830-2	4.6	44	10	38	9.0	1133	1133
50226	830-2	6.4	62	6	18	8.9	1211	1211
51799	830-2	4.4	56	12	34	9.1	1272	1272
52996	830-2	2.4	68	7	24	9.0	1587	1587
52997	830-2	7.0	34	11	25	9.1	833	833
54195	830-2	4.7	40	13	27	9.1	1292	1292
54204	830-2	4.9	78	27	41	8.8	463	Fail
55570	830-2	7.1	77	8	9	9.0	1125	1125
55571	830-2	6.1	73	10	9	8.7	1175	1175
	Average	**5.3**	**58.9**	**11.3**	**24.6**	**9.0**		**1226.2**
	Sd Dev	**1.42**	**15.64**	**5.93**	**11.03**	**0.15**		**208.0**
50769	ISMA	5.9	76	10	137	8.6	-1300	Fail
51224	ISMA	5.9	44	3	43	9.1	856	856

Merit Results for ISM Test Data

- 830-2 has an average Merit of 1226
  - Better than borderline pass as it was in M11 EGR
  - Not a super premium oil
- Only 2 of the 830 matrix runs fail
  - High CHWL and High OFDP, ASWL
  - High CHWL can be offset by good ASWL
- All 1004 runs fail
- ISMA fails for high ASWL

ISM Merit System for PC-10

- **Motion: Accept the ISM Merit System as summarized here.**

Criterion	Crosshead Weight Loss	Top Ring Weight Loss	Oil Filter Delta P	Adjusting Screw Weight Loss	Sludge	Total Merits
Weight	350	0	150	350	150	1000
Maximum	7.1	100	19	45	8.7	
Anchor	5.7		13	27	9.0	
Minimum	4.3		7	16	9.3	
Average	5.3	58.9	11.3	24.6	9.0	
St Dev	1.42	15.64	5.93	11.03	0.15	

Elisa Santos
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Caterpillar C13

Summary Matrix Data Analysis
24 tests

November 29th, 2005

Summary (1)

- Data source:
  - 24 test results for six PC-10 oils (three Base Oils and two Technologies)
- Critical parameters:
  - Delta OC; Top Land Carbon; Top Groove Carbon; Carbon at the Top Side of the Second Ring
- Lab differences:
  - Lab F is different from all the other labs for **Delta OC**
  - Lab B is different from all the other labs for **TLC**
  - Lab A is different from Lab G for **TGC**

Summary (2)

- Impact of Base Oil on **Delta OC** seems to vary with Technology
  - Delta OC increases with Base Oil (1,2,3) for Technology B
  - And there are no significant differences among Base Oils for Technology A

- In general, for TGC & TLC, Base Oil 3 results are higher when compared to Base Oil 2 and Base Oil 1

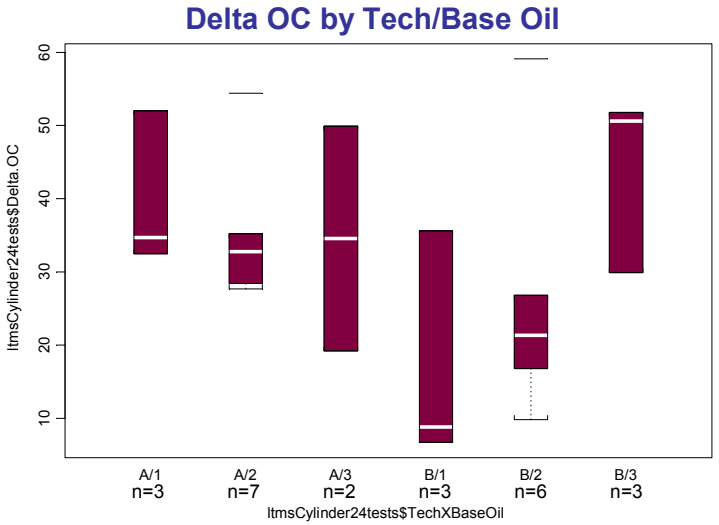
- For Carbon at the Top Side of the Second Ring (R2TCA)
  - Base Oil 3 results are higher when compared to Base Oil 2 and Base Oil 1
  - Base Oil 2 results are higher when compared to Base Oil 1

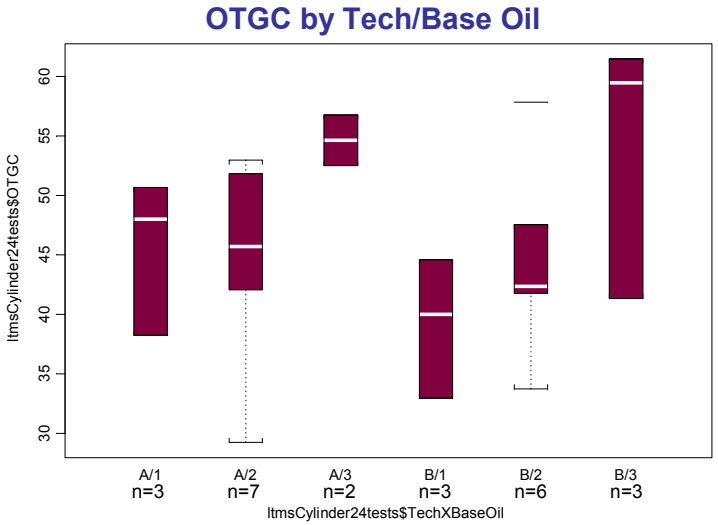
Summary (3)

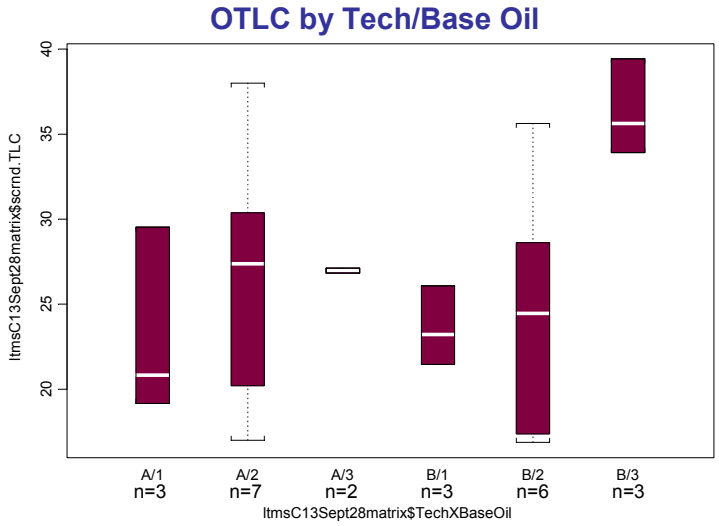
- Correlation of Delta OC with Deposits is very weak: ~ 0.4 or lower, some of them not significantly different from zero

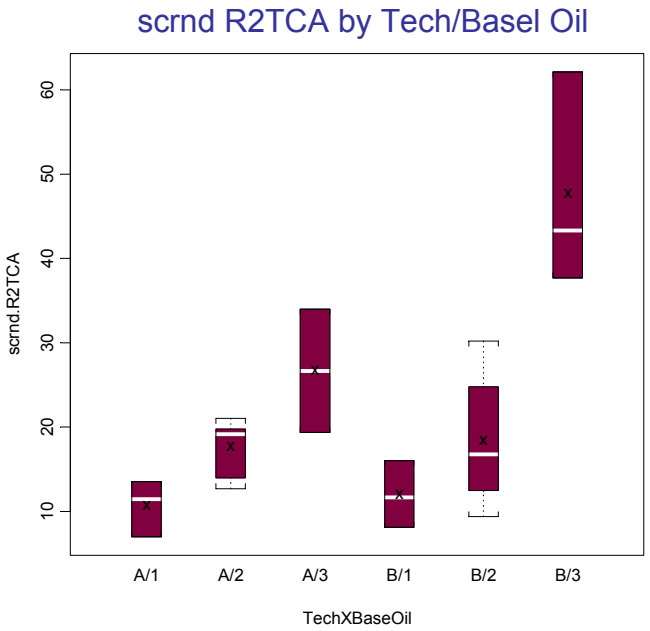
- Precision:
  - E_p is greater than 1 for TLC
  - ~ 0.90 for TGC
  - ~ 0.69 for Delta OC
  - No MAD survey for R2TCA

Parameter versus Tech/Base Oil Combination









Pairwise Correlations: 24 tests

Taking into account the final model for each parameter

Variable	by Variable	Correlation	Count	Signif Prob
Residual scrnd TLC	**Residual Delta OC**	**0.3578**	24	**0.086**
Residual OTGC24	**Residual Delta OC**	**0.398**	24	**0.0541**
Residual OTGC24	Residual scrnd TLC	-0.2718	24	0.1989
Residual LN scrnd R2TCA	**Residual Delta OC**	**0.0784**	24	0.7156
Residual LN scrnd R2TCA	Residual scrnd TLC	0.0594	24	0.7829
Residual LN scrnd R2TCA	Residual OTGC24	0.3057	24	0.1463

24 tests / raw data

Variable	by Variable	Correlation	Count	Signif Prob
scrnd TLC	**Delta OC**	**0.3756**	24	0.0705
OTGC24	**Delta OC**	**0.4481**	24	0.0281
OTGC24	scrnd TLC	0.3053	24	0.1468
scrnd R2TCA	**Delta OC**	**0.1545**	24	0.471
scrnd R2TCA	scrnd TLC	0.4925	24	0.0145
scrnd R2TCA	OTGC24	0.4571	24	0.0247

Precision

- Desirable values for E p are greater than 1
  - E p is greater than 1 for TLC and close to 1 for OTGC

	Precision based on the model		Median of MAD survey	E p1	E p2
Parameter	24 tests	32 tests			
Delta OC	6.52	6.82	4.5	**0.6902**	**0.6598**
OTGC	5.54	5.43	5	**0.9025**	**0.9208**
scrnd TLC	4.02	4.25	4.5	**1.1194**	**1.0588**
LN scrnd R2TCA	0.297 (transf)	0.3 (transf)			
LN scrnd R2TCA	5.22 (around median)				

MAD survey indicates the maximum acceptable difference between two test results on the same formulation

Appendix:

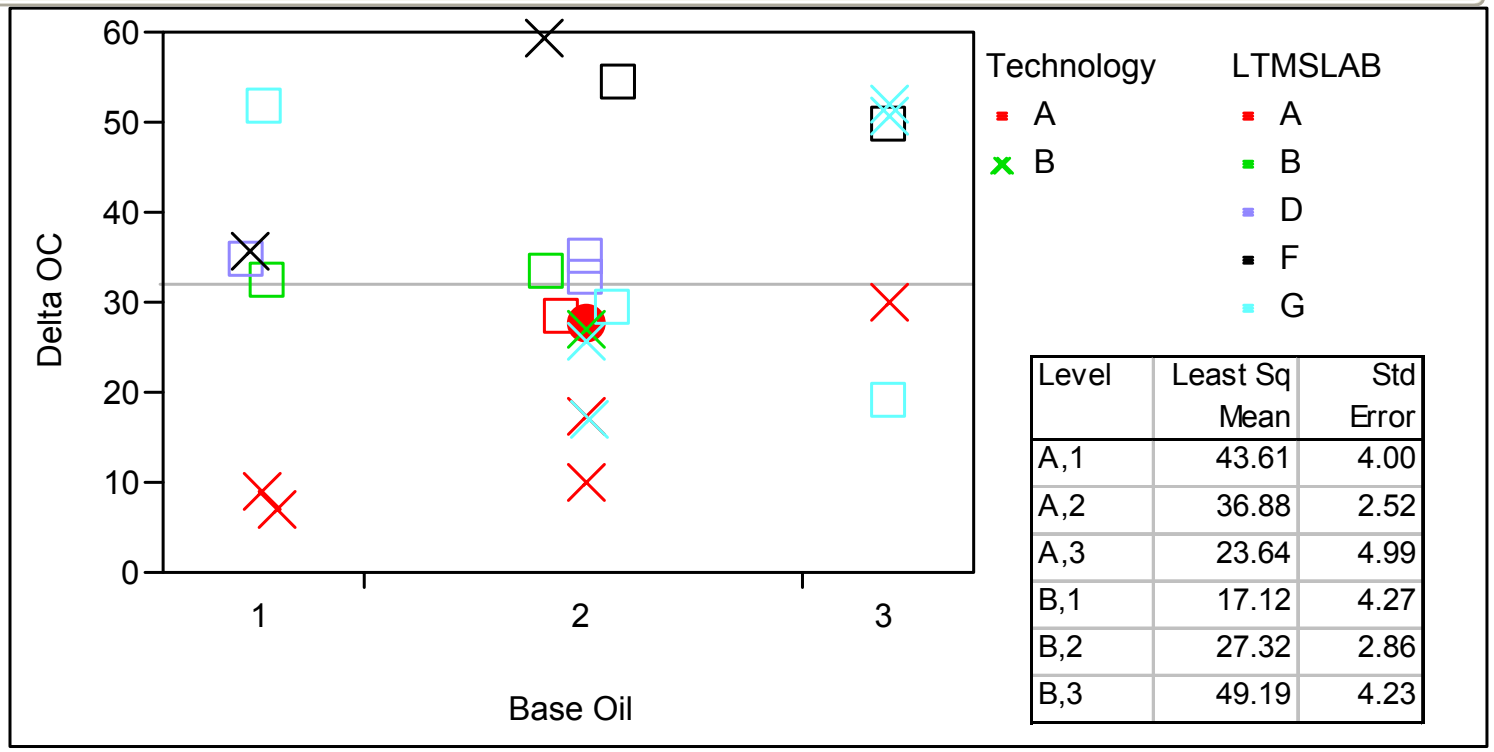
Plots

1. Delta OC versus Base Oil
2. OTGC versus Base Oil
3. scrnd TLC versus Base Oil
4. scrnd R2TCA versus Base Oil

Modeling Summary by parameter

Delta OC versus Base Oil

Delta OC By Base Oil

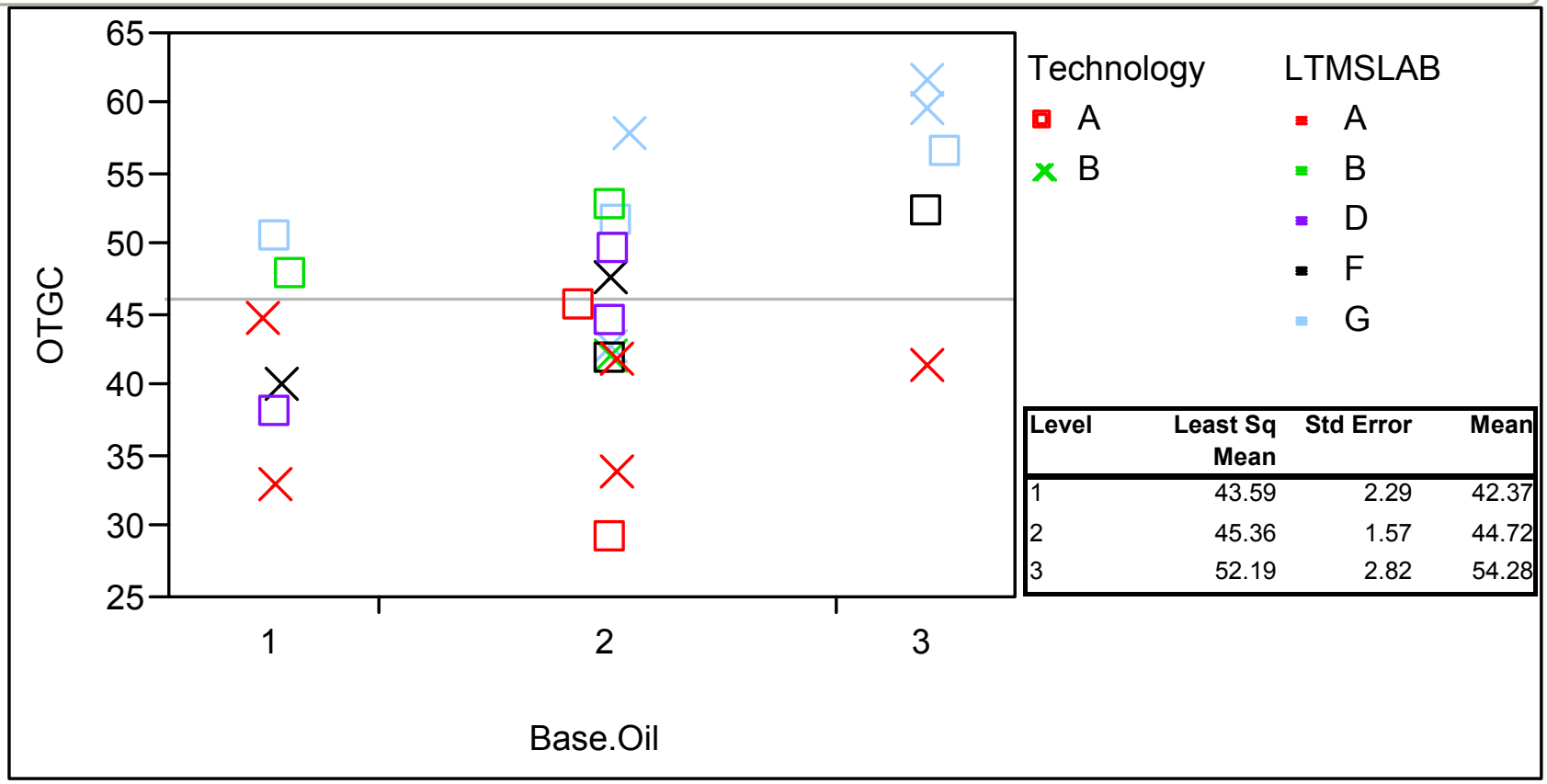


Level	Least Sq Mean	Std Error
A,1	43.61	4.00
A,2	36.88	2.52
A,3	23.64	4.99
B,1	17.12	4.27
B,2	27.32	2.86
B,3	49.19	4.23

Excluded Rows 8

OTGC versus Base Oil

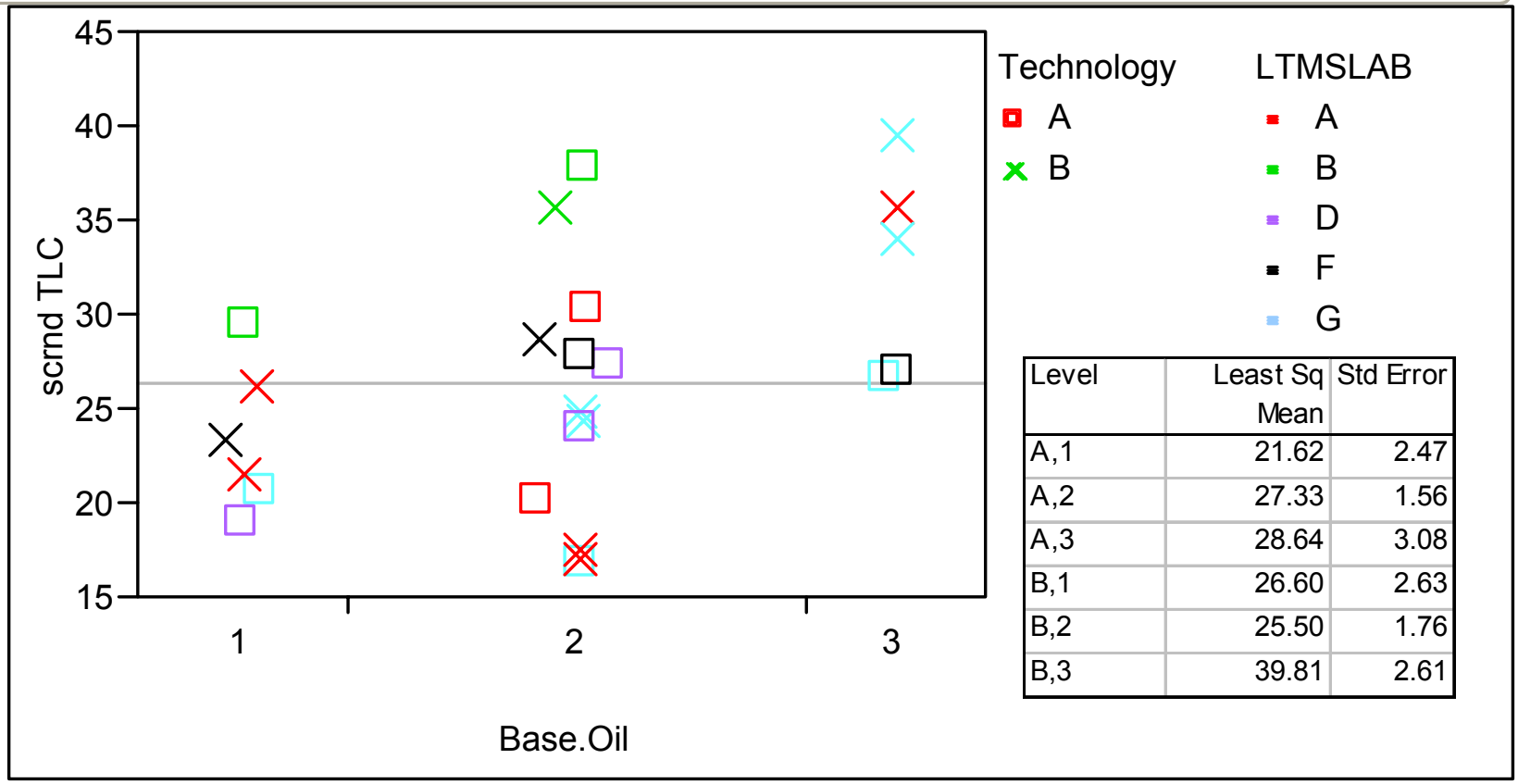
OTGC By Base.Oil



Level	Least Sq Mean	Std Error	Mean
1	43.59	2.29	42.37
2	45.36	1.57	44.72
3	52.19	2.82	54.28

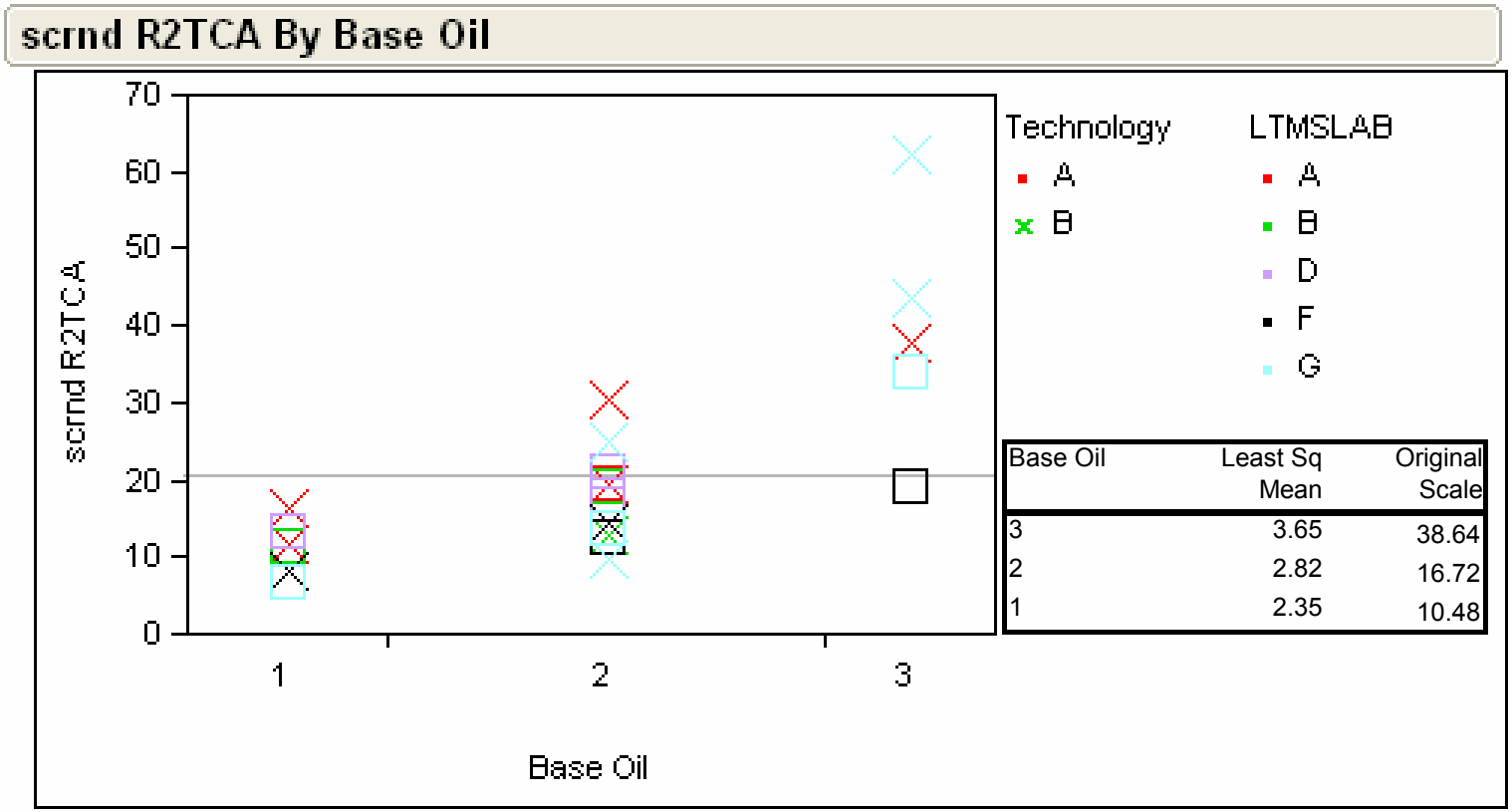
scrnd TLC versus Base Oil

scrnd TLC By Base.Oil



Level	Least Sq Mean	Std Error
A,1	21.62	2.47
A,2	27.33	1.56
A,3	28.64	3.08
B,1	26.60	2.63
B,2	25.50	1.76
B,3	39.81	2.61

scrnd R2TCA versus Base Oil



Modeling Summary by parameter

24 tests analysis based on Technology Type and Base Oil Type					
Parameter	**Transformation**	**Final Model**	**Rsquare adj**	**Precision**	**Lab differences**
Delta OC	None	Lab, Technology, Base Oil and interaction of Technology & Base Oil	81%	6.52	Lab F is different from other labs
OTGC	None	Lab and Base Oil	56%	5.54	Lab A different from Lab G
scrnd TLC	None	Lab, Technology, Base Oil and interaction of Technology & Base Oil	63%	4.02	Lab B is different from other labs
R2TCA *	Natural log	Lab and Base Oil	69%	0.3	Lab A and Lab F (borderline)

* Using the data available; the data issues discussed during the last SP meeting are being addressed

Proposed C13 MERIT SYSTEM

Presented to C13 SP
Steve Jetter/Abdul Cassim
Dec 5, 2005
Norfolk, Va

Current Parameters in Calculation

- **Parameters are those which were included in the motion the SP passed regarding readiness of the C13 test for PC-10**
  - The following pass/fail parameters included in system
    - **Oil Consumption Delta**
    - **Top Land Carbon**
    - **Top Groove Carbon**
    - **2nd Ring Top Carbon**
  - No Hot Stuck Rings needs to be a separate pass/fail due to on/off nature
  - Piston, Ring, or Liner distress to make test non-interpretable (validity criterion)

Limits and Weightings

- **Current proposal differs from 10-10-05 proposal based on feedback CAT has received on original draft merit system**
- **Proposed limits determined by following criteria**
  - Merit System should provide clear separation of Oil A and Oil D/PC-10G as Failing and Passing oils
  - Anchor Limits: Set at levels that Caterpillar desires for acceptable oil performance based on analysis of matrix data
  - Cap Limits: Set at maximum level that Caterpillar is willing to accept for that individual parameter vs. previous system that set at the 3-test limits (Caps now at 1 to 2 sdev)
  - Max Merit Limits: Set at level consistent with best performance observed in the Matrix data for the parameter
- **Weightings set to emphasize the parameters that showed the most discrimination and are most critical to Caterpillar**

Proposed Merit System

- **Original proposal**

Parameter	Anchor	Cap	Max Merit	Weight
Delta OC	25	30.6	10	300
TLHC	11.5	13.2	3	300
TGC	48	51.5	30	250
UWD	130	135.3	95	150

- **Initial proposal with new parameters**

Parameter	Anchor	Cap	Max Merit	Weight
Delta OC	25	31	10	300
TLC	30	35	15	300
TGC	46	53	30	250
2RTC	17.5	25	5	150

- **2RTC parameter limits…**

2RTC Parameter Limits

- **Caterpillar's initial proposal for limits based on the following**
  - Heavy Carbon on 2RTC is not desirable
  - Cap: Set to exclude heavy carbon on a test with all six rings having 100% carbon (no varnish). Will allow some amount of heavy carbon on single/multiple rings if not 100% carbon ratings
  - Anchor: Set near max value seen in matrix for oil PC-10G (max of PC-10G was 17.25)
  - Max Merit: Set at level consistent with best performance observed in the Matrix data for the parameter (7.0)
  - 2RTC is smallest overall contributor (15%) to overall Merit.
- **Based on feedback received during various discussions with concerned parties, Caterpillar understands that there is concern over this parameter and a more conservative approach to limit setting may be needed to gain acceptance**

2RTC Parameter Limits

- **Concerns with 2RTC parameter**
  - Matrix data not all generated with same methodology
    - **Some labs did not rate heavy carbon**
    - **Some labs rated chamfers and some did not**
    - **Some rlabs ated "polished" carbon as light carbon since it did not have any depth**
  - SP has agreed a final rating method and are in the process of comparing "matrix methods" to "final method" via a round robin ring rating
    - **In general, expected that above items will lead to higher ratings with final method when heavy carbon is present**
- **Caterpillar want to ensure that limits**
  - Exclude very poor oils (PC-10F, PC-10C)
  - Based on statistics of current data (final method should improve consistency of results)

2RTC Parameter Limits

- **Caterpillar's revised proposal for limits based on the following**
  - Cap: Set to exclude poor oils (PC-10F & PC-10C) but allow other matrix oils to pass parameter
  - Anchor: Set at 2 sdev below the Cap (~10 lower)
  - Max Merit: Set at level consistent with best performance observed in the Matrix data for the parameter
- **Based on review of data, the following values were determined by Caterpillar**
  - Cap: 30
  - Anchor: 20
  - Max Merits: 5

Final Proposed Merit System

- **Following merit system currently planned for presentation to class panel for exit ballot…**

Parameter	Anchor	Cap	Max Merit	Weight
Delta OC	25	31	10	300
TLC	30	35	15	300
TGC	46	53	30	250
2RTC	20	30	5	150

Final Proposed Merit System

- **Following merit system currently planned for presentation to class panel for exit ballot…**

Parameter	Limit	Cap	Max Merit	Weight
Delta OC	25	31	10	300
TLC	30	35	15	300
TGC	46	53	30	300
2RTC	22	33	5	100

Final Proposed Merit System – Matrix Data

	Test Results (Outlier Screened)				Merit Calculation					
IND	OC	TLC	TGC	2RTC	OC	TLC	TGC	2RTC	Total	P / F
OILA	28.4	36.13	51.79	21.46	130.0	-67.5	51.8	103.2	217.5	Fail
OILA	26.6	31.25	54.54	22.29	220.0	225.0	-66.1	97.3	476.3	Fail
OILD	18.5	26.38	47.71	12.50	430.0	372.5	226.8	155.9	1185.2	Pass
OILD	13.3	23.75	44.17	11.88	534.0	425.0	334.4	159.6	1452.9	Pass
OILD	20.2	20.42	41.42	19.58	396.0	491.7	385.9	114.2	1387.8	Pass
PC10G	8.3	29.58	33.54	12.08	600.0	308.3	533.6	158.3	1600.3	Pass
PC10G	16	29.50	39.00	17.25	480.0	310.0	431.3	127.9	1349.2	Pass
PC10G	20.6	28.08	35.00	16.46	388.0	338.3	506.3	132.6	1365.2	Pass
PC10A	52	20.83	50.48	7.00	-1050.0	483.3	108.2	188.2	-270.3	Fail
PC10A	32.5	29.54	48.00	11.46	-75.0	309.2	214.3	162.0	610.5	Fail
PC10A	34.7	19.17	38.25	13.54	-185.0	516.7	445.3	149.8	926.7	Fail
PC10B	27.7	30.38	29.25	19.79	165.0	277.5	600.0	113.0	1155.5	Pass
PC10B	29.5	17.00	51.83	13.96	75.0	560.0	50.0	147.3	832.3	Fail
PC10B	32.8	27.38	44.71	17.92	-90.0	352.5	324.2	124.0	710.7	Fail
PC10B	33.4	38.00	52.96	19.38	-120.0	-180.0	1.8	115.4	-182.8	Fail
PC10B	35.2	24.17	49.13	21.04	-210.0	416.7	165.8	105.6	478.1	Fail
PC10B	54.4	27.96	42.08	12.71	-1170.0	340.8	373.4	154.7	-301.1	Fail
PC10B	28.4	20.21	45.71	19.17	130.0	495.8	305.5	116.7	1048.0	Pass
PC10C	19.2	26.83	56.65	33.96	416.0	363.3	-156.6	-8.7	614.0	Fail
PC10C	49.9	27.13	52.50	19.38	-945.0	357.5	21.4	115.4	-450.6	Fail
PC10D	35.6	23.21	40.00	8.13	-230.0	435.8	412.5	181.6	800.0	Fail
PC10D	8.8	26.08	32.96	16.04	600.0	378.3	544.5	135.0	1657.9	Pass
PC10D	6.7	21.46	44.58	11.67	600.0	470.8	326.6	160.8	1558.2	Pass
PC10E	59.1	28.63	47.54	14.38	-1405.0	327.5	233.9	144.9	-698.7	Fail
PC10E	16.8	24.21	42.75	9.38	464.0	415.8	360.9	174.3	1415.0	Pass
PC10E	9.8	17.38	33.75	30.21	600.0	552.5	529.7	25.4	1707.6	Pass
PC10E	26.8	35.63	41.96	12.50	210.0	-37.5	375.8	155.9	704.2	Fail
PC10E	17.3	16.88	41.75	19.17	454.0	562.5	379.7	116.7	1512.9	Pass
PC10E	25.4	24.70	57.83	24.79	280.0	406.0	-207.1	74.6	553.5	Fail
PC10F	29.9	35.63	41.33	37.71	55.0	-37.5	387.5	-42.8	362.2	Fail
PC10F	50.6	33.92	59.46	43.33	-980.0	65.0	-276.8	-93.9	-1285.7	Fail
PC10F	51.8	39.42	61.46	62.08	-1040.0	-265.0	-362.5	-264.4	-1931.9	Fail

Final Proposed Merit System – Matrix Data

	Test Results (Outlier Screened)				Merit Calculation					
IND	OC	TLC	TGC	2RTC	OC	TLC	TGC	2RTC	Total	P / F
OILA	28.4	36.13	51.79	21.46	130.0	-67.5	43.2	154.8	260.4	Fail
OILA	26.6	31.25	54.54	22.29	220.0	225.0	-55.1	146.0	536.0	Fail
OILD	18.5	26.38	47.71	12.50	430.0	372.5	189.0	233.8	1225.3	Pass
OILD	13.3	23.75	44.17	11.88	534.0	425.0	278.6	239.3	1477.0	Pass
OILD	20.2	20.42	41.42	19.58	396.0	491.7	321.6	171.3	1380.6	Pass
PC10G	8.3	29.58	33.54	12.08	600.0	308.3	444.7	237.5	1590.5	Pass
PC10G	16	29.50	39.00	17.25	480.0	310.0	359.4	191.9	1341.3	Pass
PC10G	20.6	28.08	35.00	16.46	388.0	338.3	421.9	198.9	1347.1	Pass
PC10A	52	20.83	50.48	7.00	-1050.0	483.3	90.1	282.4	-194.2	Fail
PC10A	32.5	29.54	48.00	11.46	-75.0	309.2	178.6	243.0	655.8	Fail
PC10A	34.7	19.17	38.25	13.54	-185.0	516.7	371.1	224.6	927.4	Fail
PC10B	27.7	30.38	29.25	19.79	165.0	277.5	500.0	169.5	1112.0	Pass
PC10B	29.5	17.00	51.83	13.96	75.0	560.0	41.7	221.0	897.6	Fail
PC10B	32.8	27.38	44.71	17.92	-90.0	352.5	270.2	186.0	718.7	Fail
PC10B	33.4	38.00	52.96	19.38	-120.0	-180.0	1.5	173.2	-125.4	Fail
PC10B	35.2	24.17	49.13	21.04	-210.0	416.7	138.1	158.5	503.3	Fail
PC10B	54.4	27.96	42.08	12.71	-1170.0	340.8	311.2	232.0	-286.0	Fail
PC10B	28.4	20.21	45.71	19.17	130.0	495.8	254.6	175.0	1055.4	Pass
PC10C	19.2	26.83	56.65	33.96	416.0	363.3	-130.5	-13.1	635.7	Fail
PC10C	49.9	27.13	52.50	19.38	-945.0	357.5	17.9	173.2	-396.5	Fail
PC10D	35.6	23.21	40.00	8.13	-230.0	435.8	343.8	272.4	822.0	Fail
PC10D	8.8	26.08	32.96	16.04	600.0	378.3	453.8	202.6	1634.7	Pass
PC10D	6.7	21.46	44.58	11.67	600.0	470.8	272.1	241.2	1584.1	Pass
PC10E	59.1	28.63	47.54	14.38	-1405.0	327.5	194.9	217.3	-665.3	Fail
PC10E	16.8	24.21	42.75	9.38	464.0	415.8	300.8	261.4	1442.0	Pass
PC10E	9.8	17.38	33.75	30.21	600.0	552.5	441.4	38.1	1632.0	Pass
PC10E	26.8	35.63	41.96	12.50	210.0	-37.5	313.2	233.8	719.5	Fail
PC10E	17.3	16.88	41.75	19.17	454.0	562.5	316.4	175.0	1507.9	Pass
PC10E	25.4	24.70	57.83	24.79	280.0	406.0	-172.6	111.9	625.3	Fail
PC10F	29.9	35.63	41.33	37.71	55.0	-37.5	322.9	-64.2	276.2	Fail
PC10F	50.6	33.92	59.46	43.33	-980.0	65.0	-230.7	-140.9	-1286.6	Fail
PC10F	51.8	39.42	61.46	62.08	-1040.0	-265.0	-302.1	-396.6	-2003.7	Fail

ACC PAPTG Report to HDEOCP

December 6, 2005

PC-10 Test Registrations

Provisional

	July	August	September	October	November	Total
Cummins ISM	3	7	4	6	6	26
Retroactive	5	0	5			10
Cummins ISB	0	4	3	7	3	17
Mack T-11	5	7	9	9	7	37
Retroactive	5	4	25			34
Mack T-12	0	3	2	6	9	20
Caterpillar C13			3	2	4	9
Total	18	25	51	30	29	153

C13 BOI/VGRA Guidelines

- API BOI/VGRA Task Force, with endorsement from CAT, has recommended, by a vote of 8/0/0, C13 BOI and VGRA guidelines to API LC.
- API LC has authorized, by a vote of 8/0/0, issuing an API LC letter ballot.
  - Ballot to issue 12/1/05.
  - Ballot to close 12/16/05.
- BOI concept is to pass two “bracket” formulations and read to base oils that fall between the two brackets.
- VGRA concept is to read from lower vis grade to higher; 10W30 to 15W40.

PC-10 Timing Concerns

- To promote a level playing field, ACC PAPTG member companies will recommend to API LC a timing of nine months from the passing (75%) HDEOCP complete/final PC-10 ballot until first API licensing.
- The nine-month timing assumes no unattainable parameters, reasonable limits and a passing API LC C13 BOI/VGRA ballot.

PC-10 Timing Concerns

- Exit ballot process has worked well to bring forward concerns.
- HDEOCP needs to complete exit ballot reviews and move to a complete ballot ASAP.
- ACC PAPTG recommends HDEOCP meetings be held in early January, late January and perhaps again in early February to complete the balloting process.

PC-10 Timing Concerns

- OEM specs are yet to be set. It is desirable to have proposed OEM specs at the same time or shortly after the completion of the HDEOCP PC-10 ballot.
- ACC PAPTG continues to review the PC-10 spec to determine the critical path for program completion and to revise our timing estimates accordingly. Until PC-10 is more fully defined, we can not say with certainty when we will be able to meet the PC-10 additive needs of all classes of customers.

API Lubricants Committee Ballot
Proposed Revisions to API 1509, 15th Edition, April 2002

PLEASE RETURN BY FACSIMILE (202-962-4739) OR E-MAIL TO DENNIS L BACHELDER AT BachelderD@API.org, BY CLOSE OF BUSINESS DECEMBER 16, 2005

Name:		
Company:		
Telephone/Fax:		
E-mail Address:		

A DISAPPROVE VOTE MUST INCLUDE THE (A) SPECIFIC PARAGRAPH, SECTION, OR PART THE NEGATIVE BALLOT PERTAINS TO; (B) SPECIFIC SUBSTANTIVE REASONS FOR THE NEGATIVE; AND (C) PROPOSED WORDING OR ACTION TO RESOLVE THE NEGATIVE. PLEASE ATTACH YOUR COMMENTS ON A SEPARATE SHEET OF PAPER.

IF THE API LUBRICANTS COMMITTEE APPROVES ANY OF THE CHANGES, THEY WILL BE EFFECTIVE DECEMBER 16, 2005 OR THE DATE NOTED IN THE BALLOT ITEM, WHICHEVER COMES FIRST.

Ballot Item 1:

E.3.1.6 X API CJ-4 Base Oil Interchangeability Guidelines and Examples

The following BOI guidelines address the Caterpillar C-13 test in the API CJ-4 category. Acceptable test methods for base stock and base oil blend properties are listed in Table E-1. It is understood that when comparing properties, the precision of the methods is taken into consideration.
Caterpillar C13 Test Guidelines for base oil interchange within Groups I, II, and III appear in the sections below. When Group V base stocks are present, the C13 test must be run. Note: 1) The VI of the Group III in the candidate oil cannot be more than 6 VI Units different from the VI of the Group III in the oil which passed the C13. 2) PAOs (Group IV) can be interchanged one for another without testing, as long as the original PAO has had full approval and the interchange PAO meets the original manufacturer's specifications in all physical and chemical properties.

If only one passing C13 test is available on a given technology:

If only Group II and/or Group III base stocks are present in the passing Caterpillar C13 oil and the candidate, then C13 BOI is allowed if the viscosity index (VI) of the base oil blend for the candidate oil is the same or lower than the base oil blend of the passing C13 oil. (a)

If Group I base stock is present in either the passing C13 oil or the candidate, then C13 BOI is allowed if the base oil blend of the candidate has the same saturates level, the same or less sulfur, and the same or lower VI than the base oil blend of the passing C13 oil. (a)

(a) In addition to these constraints, the following conditions apply when Group III base stock is present in the C13 passing oil:
(1) The candidate oil must have the same or lower Group III content than the passing oil.

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(2) The typical viscosity index of the Group III in the candidate must be no more than 6 units higher than the typical viscosity index of the Group III in the passing C13 oil with no allowance for test precision.

Properties Comparison Guide *(BO= Base Oil)*

If only Group II and/or III in both the candidate and passing oils:

	Candidate		Passing Oil
BO blend VI		< or =	
Group III content, % in oil		< or =	
Group III VI		< or = Passing VI+6	

Worksheet 1

Example if only Group II and/or III in both the candidate and passing oils:

	Candidate		Passing Oil
BO blend VI	104	< or =	115
Group III content, % in oil	13.5	< or =	40
Group III VI	126	< or = Passing VI+6	126

Example 1

In this example, the candidate's properties meet the BOI criteria when compared to the passing oil. BOI is allowed for this candidate.

If Group I in either the candidate or passing oils:

	Candidate		Passing Oil
BO blend Sats, %		=	
BO blend Sulfur, ppm		< or =	
BO blend VI		< or =	
Group III content, % in oil		< or =	
Group III VI		< or = Passing VI+6	

Worksheet 2

Example 2: If Group I in either the candidate or passing oils:

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	Candidate		Passing Oil
BO blend Sats, %	87	=	87
BO blend Sulfur, ppm	347*	< or =	320
BO blend VI	93	< or =	99
Group III content, % in oil	0	< or =	15
Group III VI	---	< or = Passing VI+6	128

Example 2

*Need to apply the precision of the method.

The candidate's properties meet the BOI criteria when compared to the passing oil. In this case the precision of the sulfur method shows the sulfur contents to be the same (D2622, 320 ppm +/- 41 ppm covers 347 ppm). BOI is allowed for this candidate.

If more than one passing C13 test is available on a given technology:

For the C13, BOI is allowed if the candidate's base oil blend saturates level, sulfur content, and viscosity index fall within the range of saturates level, sulfur, and VI of the base oil blends in the original passing oils (minimum two tested/two passed oils), and the Group III content of the candidate oil falls within the range of Group III content covered by the original passing oils.

Also, the typical viscosity index of the Group III in the candidate oil must be no more than 6 units higher than the typical viscosity index of the Group III in the passing C13 oil with no allowance for test precision.

Properties Comparison Worksheet

	Passing Oil 1	Passing Oil 2	Candidate
BO blend Sats, %			
BO blend Sulfur, ppm			
BO blend VI			
Group III content, % in oil			
Group III VI	< or = Passing VI+6	< or = Passing VI+6	
Is C-13 required?			Yes or no?
Reason			

Worksheet 3

	Passing Oil 1	Passing Oil 2	Candidate
BO blend Sats, %	87	96	87
BO blend Sulfur, ppm	347	0	320
BO blend VI + 6	93	115	99

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API Lubricants Committee Ballot
Proposed Revisions to API 1509, 15th Edition, April 2002

Group III content, % in oil	0	40	15
Group III VI	--	126	128
Cat C-13	Pass	Pass	
Is C-13 required?			No
Reason			BOI is allowed. Sats, S, VI, and Group III content fall within matrix ranges. Candidate Group III VI is within the acceptable +6 range.

Example 3

	Passing Oil 1	Passing Oil 2	Candidate
BO blend Sats, %	87	96	94
BO blend Sulfur, ppm	347	0	90
BO blend VI	93	115	112
Group III content, % in oil	0	40	20
Group III VI	--	126	134
Cat C-13	Pass	Pass	
Is C-13 required?			Yes
Reason			BOI is not allowed. Base oil Sats, S, and VI fall within matrix ranges, but Candidate Group III VI is outside the acceptable +6 range.

Example 4

Approve		**Approve with Comments**		**Disapprove**		**Abstain**	

Comments:

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API Lubricants Committee Ballot
Proposed Revisions to API 1509, 15th Edition, April 2002

Ballot Item 2:

E.3.1.6 X API CJ-4 VGRA Guidelines for Caterpillar C13 Test

Performance Test	From SAE	To SAE
C13	10W-30	15W-40
	10W-40	10W-30, 15W-40
	15W-40	None

Worksheet 1

Approve		Approve with Comments		Disapprove		Abstain	

Comments:

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Caterpillar C13 BOI-VGRA Lubricants Committee Ballot

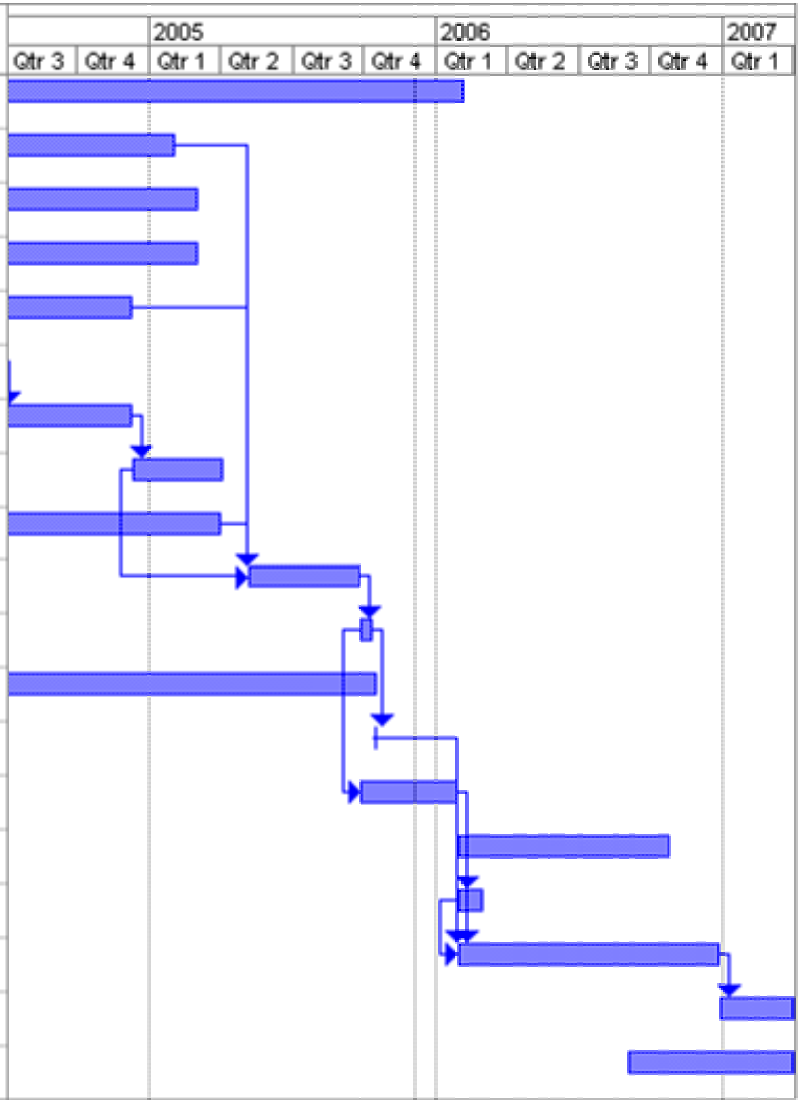
ASTM HDEOCP Meeting
December 6, 2005,
Norfolk, VA

Cat C13 BOI-VGRA Guidelines

Overview / Status

- **Potential lack of comprehensive Cat C13 read-across was a major concern within the industry**
  - ***Limited testing capacity for timely completion of PC-10 programs***
  - ***Very expensive engine test (>$125K)***
- **The API BOI-VGRA TF worked to develop a "progressive" BOI proposal & VGRA for the Cat C13**
  - ***BOI defined around properties of the base oil mixture; not traditional Groups (I through V) & base stock slate***
  - ***Viscosity index used as a property in addition to saturates & sulfur***
  - ***Options to read from a single test, or define a range based on two tests***
  - ***VGRA proposal similar to existing Cat single-cylinder test; covers a limited number of viscosity grades (15W-40, 10W-30, 10W-40)***
- **Lubricants Committee ballot to finalize guidelines issued, return due December 16**

Task Name	Start	Finish
NCDT Activity	Wed 3/26/03	Fri 2/3/06
Funding Group	Mon 2/3/03	Tue 2/1/05
New Test Development	Wed 9/25/02	Wed 3/2/05
New Test Discrimination	Fri 1/2/04	Wed 3/2/05
Matrix Design	Thu 4/1/04	Tue 12/7/04
Chemical Limits Selection	Mon 3/31/03	Tue 6/22/04
Select Matrix Oils	Wed 6/23/04	Tue 12/7/04
Matrix Oil Prep	Wed 12/8/04	Fri 4/1/05
Accept Parameters/Tests	Tue 6/22/04	Thu 3/31/05
Matrix Testing	Wed 5/4/05	Fri 9/23/05
Analyze Matrix	Mon 9/26/05	Mon 10/10/05
Select Reference Oils	Tue 6/1/04	Fri 10/14/05
HDEOCP Test Acceptance	Wed 10/12/05	Wed 10/12/05
Technology Demonstration & Limits Approval	Mon 9/26/05	Thu 1/26/06
ASTM D-2, SC-B Ballot & Approval	Fri 1/27/06	Mon 10/23/06
API Lubes Committee Final Approval	Fri 1/27/06	Mon 2/27/06
Minimum Product Qualification Interval	Fri 1/27/06	Mon 12/25/06
API Licensing	Tue 12/26/06	Mon 5/21/07
Engines in Field	Fri 9/1/06	Mon 5/21/07



Update on SAE J300 Engine Oil Viscosity Classification Task Force

EOVC TF Membership and Meetings

- Chairman Andy Jackson, ExxonMobil
- Vice-Chairman Bob Olree, GM Powertrain
- Current membership:
  - 9 Finished lubricant manufacturers and marketers
  - 5 Additive companies
  - 2 OEMs
  - 6 Other
- Increased OEM participation desired.
- Meet twice a year at the ASTM Summer and Winter meetings (Wednesdays, 1:00 to 5:00 pm).

Main activity at last EOVC TF meeting, June 22, 2005 in Pittsburgh

- Addressed TC-1 Chairman Dewey Szemenyi's request to review role and scope of SAE J300
  - What is it? What should it be?
  - Who are its major customers/stakeholders?
  - Should it stay like it is or should it undergo a major transformation?
  - If SAE J300 should change, in what way?

Summary – EOVC TF Discussion on Role and Scope of SAE J300

What is it? What should it be?

- Current scope statement: "This SAE Standard defines the limits for a classification of engine lubricating oils in rheological terms only. Other oil characteristics are not considered or included."
- Significant discussion on the scope. Scope considered broad enough to allow for improvements.

Who are its major customers/stakeholders?

- List developed: OEMs (incl. Passenger Vehicles, Heavy Duty, Railroad, Aviation, Small Engines), Consumers, Government agencies, Technology ministries of governments around the world, Industry committees with viscosity grade read-across guidelines, Oil companies, Additive companies, Researchers on advanced lubricants, Service counters, mechanics, "experts", API ….

Should it stay like it is or should it undergo a major transformation?

- General feeling that whilst change may be desirable in SAE J300, the prospect of a major transformation is daunting in light of the number of customers and stakeholders identified.
- We need to be mindful of existing needs and not try to overly perturb the system.

If SAE J300 should change, in what way?

- General consensus that SAE J300 may need to be modified to meet future needs. Several suggestions were made for areas to be considered.
- Two presentations on SAE J300 at the Open Forum on GF-5 Fuel Economy were considered

Recommendation from June 22, 2005 meeting.

- Hold an Open Forum on the Future of SAE J300 at the Powertrain and Fluid Systems Conference, Oct 25, San Antonio
- EOVC will determine work areas, prioritize and form sub-teams to investigate

Presentations on SAE J300 at 2005 Open Forums

Open Forum Presentations, April 12, 2005, SAE World Congress, Detroit

A New Look at Viscosity Classification

Ted Selby, *Savant, Inc.* and Mike McMillan, *GM Research*

Extending SAE J300 to Include Engine Oils with High Fuel Economy

Andy Jackson, Charles Baker, Chris May and Doug Deckman - *ExxonMobil*

Open Forum Presentations, October 25, Powertrain and FluidSystems Conference, San Antonio

Brief History of SAE J300

Chris May, *Imperial Oil*

What's Wrong with SAE J300

Bob Olree, *General Motors Powertrain*

The EMA Position on SAE J300

Greg Shank, *Volvo Powertrain* and Dave Stehouwer, *Stehouwer Tech. Services*

Effect of New SAE J300 CCS and MRV Limits on Fuel Economy

Mark Devlin, *Afton*

SAE J300 Today and in the Future

Larry Smith, *Infineum*

SAE J300 Engine Oil Viscosity Classification – The Oronite Position

Kevin Carabell, *Chevron Oronite*

The Impact of SAE J300 on Base Stock Properties

Patrick Mosier, *Lubrizol*

SAE EOVC TF Meeting, 1:00 to 4:00 pm, Dec. 7, 2005, Hampton VII

AGENDA

1. Welcome and Introductions
2. Appointment of Secretary
3. Approve minutes of last meeting (June 22, 2005)
4. Review of membership.
   - 4.1. OEM Representation
   - 4.2. International representation

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5. Discuss outcome of SAE Open Forum "Open Forum on the Future of the SAE J300 Engine Oil Viscosity Classification System." Identify, regroup and prioritize topics identified;

- **5.1. Minor Revision, Major Revision or Whole New System?**
- **5.2. New Viscosity Grades - SAE 20 and Lower**
- **5.3. W-Grade Issues**
- **5.4. SAE J300 and Heavy Duty Oils**
- **5.5. Should SAE J300 Include Rheological Effects on Fuel Economy?**
- **5.6. Accommodating High VI Basestocks**

6. Select work topics to address in 2006 and identify sub-teams to investigate and develop recommendations

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7. Old Business
8. New Business

Caterpillar Announcement for New Specs

Caterpillar are introducing two new Oil specifications

1. Cat remains committed to the API system
2. New Cat specifications are in addition to API specs
3. Addresses Off-highway and On-highway needs
4. Addresses gap in oil availability before API CJ-4 licensing for 2007 engines
5. Timetable for new spec roll-out




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Caterpillar Announcement for New Specs

Caterpillar are introducing two new Oil specifications

CAT ECF-2

- Replaces ECF-1
- Off-Highway and Pre-2007 truck engines
- Worldwide use through 2011+
- Removal of ash maximum
- Ash minimum of 1.0%
- Minimum of API CH-4
- Includes C13 Engine Test
  - Limits could differ from CJ-4

CAT ECF-3

- New specification for 2007 truck engines in US
- Implemented in two phases
- Interim version prior to CJ-4 licensing
  - Subset of CJ-4 tests
- Full version concurrent with CJ-4 licensing
  - Based on final API CJ-4
- Includes C13 Engine Test
  - Limits could differ from CJ-4

ECF-2 and ECF-3 will be mutually exclusive specifications




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Caterpillar Timetable for New Specs

	Announcement	Draft Spec for Comment	Final Spec	Implementation
ECF-2	Dec 6, 05	Jan 16, 06	Feb 17, 06	Jun 5, 06
ECF-3 Interim	Dec 6, 05	Jan 16, 06	Feb 17, 06	Jun 5, 06
ECF-3 Final	Dec 6, 05	1 Qtr '06	2/3 Qtr '06	CJ-4 Licensing

1. ECF-1 being retired by 3rd Quarter 2006
2. Registration system with published list for ECF-2 and ECF-3
3. Comments on draft specifications invited