HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL

OF

ASTM D02.B0.02

January 26, 2006

Chicago O'Hare Embassy Suites Hotel – Rosemont, IL

ACTION ITEMS

1. **CAT to decide the fate of the 1P by February 3rd.** — **Abdul Cassim**
2. **Cummins confirm Sn removed from corrosion test.** — **Dave Stehouwer**
3. **Update PC-10 Mock Spec table.** — **Lew Williams**

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 8:00 a.m. on Thursday, January 26, 2006, in the Walden Room of the Chicago O'Hare Embassy Suites Hotel, Rosemont, IL.

1.2 There were 18 members present and 17 guests present. The attendance list is shown as Attachment **2.**

2.0 Agenda

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

3.0 Minutes

3.1 The minutes from January 10, 2006 were approved as written.

4.0 Membership

4.1 There were no membership changes. Cory Taylor attended for Steve Goodier of BP. See Attachment **2**.

5.0 Mack T-11 Low Temperature

5.1 The proposal for Low Temperature requirements from a T-11 was approved. See Attachment **3.** There were 15 positive votes and no negatives, but some comments. The fresh oil limit of 20000 should not be there. It is a base oil guideline and should not be included in D4485, but should be an API guideline. The fresh oil limit applies to read-across, that was the intent. Application of the MRV limit to the viscosity grade needs to be clarified. The modified proposal clears up the viscosity grade. Greg Shank **moved** to remove the reference to viscosity grade. Bill Kleiser seconded. The **motion carried** on a unanimous voice vote. The fresh oil requirement is removed from the proposal and relocated as a recommendation to use current T-11 rules for BOI/VGRA. Steve Kennedy **moved** to remove the requirement for MRV from the T-11 engine test itself and list as a

bench test as a T-11 or T-11A. Greg Shank seconded. The **motion carried** on a unanimous voice vote.

6.0 All API CJ-4 tests and limits

6.1 Lew Williams showed the summary of the full slate of tests. See Attachment **4**. The anchors will be moved to an annex and the main body of the document will show the merits. There was no opposition to the T-12 or the C-13 as shown. For the ISM, remove the Top Ring Weight Loss from the merit table and show the merit and the Top Ring Weight Loss as a separate pass/fail. Display the anchor sludge value as 9.0. There was no opposition to the T-11. The T-11A will be moved to the bench tests section, the reference to viscosity grade will be dropped, new oil requirements will be removed and MRV yield stress will change from a maximum of 35 to less than 35. There was no opposition to the ISB or the 1N as shown. CAT may revise the requirement to include the 1P. Abdul Cassim would like to review the 1P situation, but may remove the 1P from the PC-10 category. The answer won't be available until February 6, 2006. Since the 1P will substitute for a 1R, a C13 will also substitute for a 1R. The 1P is for backward compatibility. The C13 is more encompassing. The decision needs to be complete before a Lubes Committee conference call on February 6th. The 1P decision is needed by February 3rd. Abdul Cassim **moved** to accept exclusion of the 1P from PC-10 pending a decision from CAT by February 3rd and accept the C13 as an alternate for the 1P and the 1R. Charlie Passut seconded. The **motion carried** on a unanimous voice vote. Abdul requested data on 1P and C13 tests to see whether oils pass one test and fail the other. For the Sequence III tests, include the phrase MTAC with the footnote. The Roller Follower Wear test should list micrometers and tiered limits. The chemical limits are OK except to add the appropriate D numbers. HTHS remove "after shear" and list the temperature of 150C. For Corrosion, list tin as a report only. Some discussion ensued about whether tin had been removed already. Dave Stehouwer will check with Cummins. For bench tests, list the new ASTM number of D7109 for the 90 cycle shear test. The Volatility is OK. Aeration should list the MTAC limits. For Foam, there was discussion whether to include Option A or not. The HUEI is more severe than the foaming test and should provide protection. Charlie Passut **moved** to drop the comment for "No Option A" and use D892 as written. Steve Kennedy seconded. The **motion carried** on a unanimous voice vote. Seals are OK. There is a new ASTM number of D7216 for seals but does not include the Vamac material. Lew will update the table.

6.2 Greg Shank **moved** to accept all limits and all tests as described during this meeting for API CJ-4, whether or not the 1P is withdrawn. Abdul Cassim seconded. The **motion carried** on a unanimous voice vote.

7.0 MTAC

7.1 Jim Rutherford showed a spreadsheet of the details on MTAC for each test. See attachment **5**. The T-11A does not have MTAC for MRV. Use Sequence III MTAC as CI-4 and passenger car does. The Roller Follower Wear test has MTAC limits added. The Mack merit system does have MTAC. No opposition to MTAC system for the tests. There was consensus to accept the system for the category.

8.0 DEOAP Report

8.1 The DEOAP met January 25, 2006 and agreed to send ballots including the whole category to the Lubes Committee. A draft of User Language was discussed and shown as Attachment **6**. The new emission requirements are effective with on-highway 2007 model year, not 2007 calendar year.

9.0 NCDT Report

9.1 Bill Runkle showed the timeline. See Attachment **7**. October 15, 2006 still can be met. Roger Gault thanked everyone for their efforts.

10.0 ACC Report

10.1 Joan Evans announced that the T-12, ISM, and ISB are just about ready for official test registration, moving past provisional registrations. The T-11 and C-13 tests are very close for inclusion in the registrations.

11.0 Mack T-10 to T-12

11.1 Greg Shank updated the group with the Surveillance Panel activities. Data on oils that have run a T-10 and a T-12 are still needed. Low SAP oils may be different than 820. There is enough T-10 hardware to get to June 2006. The Surveillance Panel agreed to calculate the correlation rather than order new hardware. ACEA is OK with the decision. There are 2 calibrated T-10 stands with calibrations that expire in April and May. A deadline of February 1st was set to get data to the TMC for the correlation. There has been an idea to correlate the T-8 to the T-11. A correlation is still needed for the M11HST to the ISM. A HDEOCP meeting is proposed for March 23, 2006 in Chicago.

12.0 Learning Look-back

12.1 Chairman McGeehan discussed the timeline and stated that this category was requested in 2002. We have delivered on time; accomplishing this “as a team”. The industry is averaging a new category every 3 years. PC-11 might be needed for 2010/2012. There is not much data yet, and there are many unknowns. With what is known today, a new category for 2010 might not be needed. EMA has not yet discussed it. Chairman McGeehan commented on all the task forces and Surveillance Panels and all the work they have performed. He thanked everyone and adjourned the meeting.

12.2 This group should request a Committee B ballot and request that the seals test be updated to include Vamac.

13.0 Next meetings

13.1 March 23, 2006 in Chicago, IL.

14.0 The meeting was adjourned at 10:15 am.

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

Embassy Suites O'Hare, Rosemont
January 26th, 2006
8:00 pm-12:00 pm

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

Desired Outcomes: **Complete API CJ-4 on time**

TOPIC	PROCESS	WHO	TIME
Agenda Review	• Desired Outcomes & Agenda	Group	8:00-8:05
Minutes Approval	• January 10th , 2005	Group	8:05-8:10
Membership	• Changes: Additions • Delivering PC-10 on time!	Jim Mc Geehan	8:10-8:15
Mack T-11A Low temp.	• Exit-Criteria Ballot results • Discussion and Vote	Jim McGeehan	8:15-8:45
All API CJ-4 tests and limits	• Review • Discussion and vote	Lew Williams	8:45-9:15
MATC	• MATC of tests in API CJ-4 • Discussion and vote	Jim Rutherford	9:15-9:45
DEOAP report	• Report findings	Steve Kennedy	9:45-10:15
Coffee break	• Collect money for room		10:15-10:30
NCDT report	• Timing and other issues • Discussion and vote	Bill Runkle	10:30-10:45
ACC Report	• ACC's timing concerns and other issues	Joan Evans	10:45-11:00
Mack T-10 to T-12	• Present data to support T-10 to T-12 data	Greg Shank	11:00-11;30
Learning Look-back	• API CJ-4		11:30-12:00
Next Meetings	•		

HDEOCP Meeting, January 26th, 2005, Chicago, IL

	Name	Company	Member
1	JIM MORITZ	INTERTEK	NO
2	John Gepke	CHEVRON	YES
3	Jim Rutherford	Chevron Oronite	No
4	Steve Hungry	ROHMAX USA, LP	YES
5	PAT FETTERMAN	INFINEUM	YES
6	Joan Evans	"	NO
7	RICK FINN	"	
8	GREG SHANK	Volvo Power Train	YES
9	JOHN ZALAR	ASTM TMC	NO
10	DAVID TABER	ConocoPhillips	YES
11	JIM GUTZWILLER	INFINEUM USA LP	NO
12	Chris Lloyd	EPA	N
13	Corey Taylor	BP	Yes
14	John Frick	CITGO	No
15	ROBERT STOCKWELL	GM	Yes
16	Bill Place	John Deere	No
17	Dave Smith	API	
18	HEATHER DEBAUN	INTERNATIONAL TRUCK & ENGINE	YES
19	Steven Kennedy	Exxon Mobil	Yes
20	Scott Zechiel	Detroit Diesel DCX	NO
21	MERLIN BERRY	Detroit Diesel	Yes
22	Roger Gault	EMA	NO
23	Charles PASSUT	Afton Chemical	Yes
24	DAVE STEHOUWER	CUMMINS	YES

HDEOCP Meeting, January 26th, 2005, Chicago, IL

	Name	Company	Member
25	KEN CHAO	John Deere	Yes
26	Clinton Smith	Imperial Oil	NO
27	Frank Fernandez	Chevron Oronite	NO
28	William Kleiser	Chevron Oronite Co LLC	Yes
29	Lewis Williams	Lubrizol	YES
30	Joe Franklin	Intertek AR	No
31	W.A. RUNKLE	THE VALVOLINE CO.	YES
32	WIM VAN DAM	CHEVRON ORONITE	NO
33	ABDUL H CASSIM	CATERPILLAR INC.	YES
34	MATT URBANAK	SIGEL	YES
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			

ASTM-HDEOCP EXIT CRITERIA BALLOT
Mack T11 Proposal for PC10 (CJ-4)
Due: January 23, 2006

Company	Name	Affirmative	Negative	Comments
Afton Chemical	Charles Passut	X		
BP	Steven Goodier	X		
Caterpillar Inc	Abdul Cassim			
Chevron Oronite LLC	Wm. Kleiser	X		
Chevron	Jim Mc Geehan	X		
Ciba Specialty Chemicals	Scott Harold			
Comcast	David Stehouwer	X		X
ConocoPhillips	David E. Taber			
Cummins	Warren Totten	X		
DDC	Mesfin Belay	X		
Dana Corporation	Howard Robins			
Deere & Co	Ken Chao	X		
EMA	Roger Gault	X		
ExxonMobil	Steven Kennedy	X		X
GM	Robert Stockwell	X		
Infineum	Pat Fetterman	X		X
Int'l Truck & Engine	Heather DeBaun	X		
Lubrizol	Lewis Williams	X		X
PerkinElmer	Thomas M. Franklin			X
RohMax USA	Steven Herzog			
Shell	Matthew Urbanak			
Valvoline	Wm. Runkle Jr.	X		
Volvo Power Train	Greg Shank			
	Totals	**15**		**5 comments (see below Page 2)**

COMMENTS:

1. Lewis Williams Lubrizol

The fresh oil limit applies to the new oil MRV read from the core technology that passes the T-11 used oil MRV. The T-11 API BOI/VGRA rules apply.

2. Charlie Passut Afton

Afton believes that this ballot is incorrect. The fresh oil limit of 20,000 mPa*s is for base oil interchange and not an appropriate item for D 4485. This limit belongs in the API BOI rules for the T-11. If this item remains as stated for CJ-4 we will reconsider our position.

3. Pat Fetterman Infineum

I just noticed what I suspect is one emission from Chris' draft bench test list. In the PC-9/CI-4 category we put in an HTHS limit of 3.5 cP minimum, and although I don't recall specifically addressing it in PC-10, my assumption is that it should carry forward to this category.

4. David M. Stehouwer Comcast

Greg and I have discussed this with Steve Kennedy. It is our intent that no oils worse than a 15W @ -20C be considered "passing" in the T11, and that no more rigorous requirement be placed on lower viscosity oils.

As Steve points out this leaves unanswered the case of 20W, 25W and single grades.

If, as Greg suggests, we remove the limits applies to XW viscosity grades, then insert Limits applied independent of viscosity grades.

That would make the ballot: Mack T-11 or T-11A

"Low Temperature Pumpability (CJ-4)".

Used oil sample from T11 180 hrs. (5% Soot)

Used oil Limit @ -20 C 25,000 mPa s max

Yield Stress Oils used Modified D4684 < 35

Recommend BOI/VGRA Task Group use Current T11 Rules

Independent of viscosity grade

Fresh Oil Limit @ -20 C 20,000 mPa

Could you re-issue the Exit Ballot on this issue prior to the HDEOCP?

I note the use of the term Anchor in the merit systems. We might as well change that to “Target” to keep Lyle from casting a negative.

More from Dave: I note the use of the term Anchor in the merit systems. We might as well change that to “Target” to keep Lyle from casting a negative.

5. Steven Kennedy ExxonMobil

I can not open the attachment, but based on the text in your message, ExxonMobil votes affirmative with comment for the addition of the proposed MRV limits to the Mack T-11 test.

Application of the MRV limit relative to the specific viscosity grades mentioned needs to be clarified. Should it be interpreted as xW- grades other than those mentioned do not need to meet the MRV requirement, and therefore can be acceptable T-11 oils if they meet the high temperature viscosity limits? Or is there another interpretation that would preclude oils with higher xW- grades (20W and 25W) from being acceptable T-11 oil for the CJ-4 category?

Requirement	PC-10/CJ-4
Mack T-12 EGR Engine Test	
Mack Merit Rating, min.	1,000
Cylinder Liner Wear (Avg. 6 cylinders, 12 locations)	20
Top Ring Weight Loss (Avg. of 6 Cylinders)	70
End of Test Lead	25
Delta Lead 250 - 300 hrs.	10
Oil Consumption (Phase II)	65
Mack T-11 Engine Test	
Minimum TGA % Soot **@ 4.0 cSt** increase @ 100° C	3.50/3.38/3.33%
Minimum TGA % Soot **@ 12.0 cSt** increase @ 100° C	6.00/5.91/5.87%
Minimum TGA % Soot **@ 15.0 cSt** increase @ 100° C	6.70/6.59/6.55%
Mack T-11A Used MRV TP-1	
180 hour T-11 Drain MRV (-20C for 0W, 5W, 10W, 15W), mPa-s, max.	25,000
MRV Yield Stress, Pa, max.	35
Fresh oil MRV (-20C for 0W, 5W, 10W, 15W), mPa-s, max. (for read only)	20,000
Cummins ISM EGR Engine Test	
Cummins Merit Rating, min.	1,000
Crosshead Avg. Wt. Loss	5.7
Top Ring Weight Loss	100
Delta Oil Filter Differential Pressure 0 to 150 hr.	13
Average Engine Sludge / CRC Merits @ EOT	9.0
Average Injector Adjusting Screw Weight Loss, mg.	27
Cummins ISB EGR Engine Test	
Average Slider Tappet Weight Loss, mg, max.	100/108/112
Average Cam Lobe Wear, µm, max.	55/59/61
Average Crosshead Weight Loss, max.	R&R
Caterpillar C13 Deposit/Oil ConsumptionTest	
CAT Merit Rating, min.	1,000
Oil Consumption Delta (125=>475 hours), g/hr.	25
Top Groove Carbon	46
Top Land Carbon	30
Second Ring Top Carbon	22
Hot-stuck piston ring	NONE
Caterpillar 1N	
Weighted Demerits, max.	286.2/311.7/323.0
Top Groove Fill, max.	20/23/25
Top Land Heavy Carbon, max.	3/4/2005
Oil Consumption (0-252 hrs) g/kwh, max.	0.5
Piston/ring/liner scuffing	NONE
Piston ring stick	NONE
Caterpillar 1P	
Weighted Demerits, max.	350/378/390
Top Groove Carbon, max.	36/39/41
Top Land Carbon, max.	40/46/49
Oil Consumption (0 to 360 hrs) g/hr, max.	12.4
Final OC (312-360 hrs), max.	14.6
Piston/ring/liner scuffing	NONE
Sequence IIIF Engine Test	
EOT Kinematic Viscosity / % Increase @ 40° C, max.	275%
Sequence IIIG Engine Test	(alternative to IIIF)
EOT Kinematic Viscosity / % Increase @ 40° C, max.	150%
Roller Follower Wear Test D 5596	
Average pin wear, mils, max.	0.30

Requirement		PC-10/CJ-4
Chemical Limits (non-critical)		
Sulfated Ash, max.		1.0%
Phosphorus, weight %, max.		0.12%
Sulfur, weight %, max.		0.4%
Bench Tests		
High Temperature/High Shear D4683		
Viscosity after shear, mPa-s, min.		3.5
Corrosion ASTM D 6594 (135° C, HTCBT)		
Cu, ppm increase, max.		20
Pb, ppm increase, max.		120
Sn, ppm increase, max.		50
Copper strip rating, max.		3
Shear Stability ASTM D6278		
Kinematic Viscosity after 90 pass Shearing cSt @ 100° C, min.	XW-30 / XW-40	9.3/12.5
Volatility ASTM D 5800 (NOACK)		
Evaporative Loss @ 250° C, max.	[Viscosities other than 10W-30]	13%
Evaporative Loss @ 250° C, max.	[10W-30]	15%
D 6894 (EOAT)		
Aeration, Volume %, max.		8.0%
Foaming ASTM D 892 (NO Option A)		
Foaming / Settling	Sequence I	10/0 ml max.
	Sequence II	20/0 ml max.
	Sequence III	10/0 ml max.
Seal Compatability Tests		
Nitrile		
Volume Change (ASTM D 471)		+5 / -3
Hardness (ASTM D 2240)		+7 / -5
Tensile Strength (ASTM D 412)		+10 / -TMC 1006
Elongation (ASTM D 412)		+10 / -TMC 1006
Silicone		
Volume Change (ASTM D 471)		+TMC 1006 / -3
Hardness (ASTM D 2240)		+5 / -TMC 1006
Tensile Strength (ASTM D 412)		+10 / -45
Elongation (ASTM D 412)		+20 / -30
Polyacrylate		
Volume Change (ASTM D 471)		+5 / -3
Hardness (ASTM D 2240)		+8 / -5
Tensile Strength (ASTM D 412)		+18 / -15
Elongation (ASTM D 412)		+10 / -35
FKM		
Volume Change (ASTM D 471)		+5 / -2
Hardness (ASTM D 2240)		+7 / -5
Tensile Strength (ASTM D 412)		+10 / -TMC 1006
Elongation (ASTM D 412)		+10 / -TMC 1006
Vamac G		
Volume Change (ASTM D 471)		+TMC 1006 / -3
Hardness (ASTM D 2240)		+5 / -TMC 1006
Tensile Strength (ASTM D 412)		+10 / -TMC 1006
Elongation (ASTM D 412)		+10 / -TMC 1006

PC-10/CJ-4 Merit Systems

Mack T-12 EGR Engine Test

PC-10/CJ-4	Cylinder Liner Wear	Top Ring Wt. Loss	Delta Pb Final	Delta Pb 250-300 hr.	Oil Consumption
Weight	250	200	200	200	150
Maximum	24	105	35	15	85
Anchor	20	70	25	10	65
Minimum	12	35	10	0	50

Caterpillar C13 Deposit/Oil ConsumptionTest

PC-10/CJ-4 1000	Delta Oil Consumption	Ave. Top Land Carbon	Ave. Top Groove Carbon	2nd Ring Top Carbon
Weight	300	300	300	100
Maximum	31	35	53	33
Anchor	25	30	46	22
Minimum	10	15	30	5

ISM EGR Engine Test

PC-10/CJ-4 1000	Crosshead Ave. Wt. Loss	Top Ring Weight Loss	Oil Filter Pressure Delta	Ave. Engine Sludge	Ave. Valve Adj. Screw Wt. Loss
Weight	350	0	150	150	350
Maximum	7.1	100	19	8.7	49
Anchor	5.7		13	9	27
Minimum	4.3		7	9.3	16

Notes:

Maximum - At the Maximum you get zero merit points. Performance worse than the Maximum for any parameter is an automatic FAIL

Anchor - At the Anchor you receive merit points equal to the Weight

Minimum - At the Minimum you receive merit points equal to twice the Weight. There are no additional points for better performance than the minimum.

Requirement	PC-10/CJ-4
Chemical Limits (non-critical)	
D 874 Sulfated Ash, max.	1.0%
D 4951 Phosphorus, weight %, max.	0.12%
D 4951 *or* D 2622 Sulfur, weight %, max.	0.4%
Engine Tests	
Mack T-12 EGR	
Mack Merit Rating, min. (Annex 1)	1,000
Mack T-11	
Minimum TGA % Soot **@ 4.0 cSt** increase @ 100° C	3.50/3.38/3.33%
Minimum TGA % Soot **@ 12.0 cSt** increase @ 100° C	6.00/5.91/5.87%
Minimum TGA % Soot **@ 15.0 cSt** increase @ 100° C	6.70/6.59/6.55%
Cummins ISM EGR	
Cummins Merit Rating, min. (Annex 1)	1,000
Top Ring Weight Loss, max.	100
Cummins ISB EGR	
Average Slider Tappet Weight Loss, mg, max.	100/108/112
Average Cam Lobe Wear, µm, max.	55/59/61
Average Crosshead Weight Loss, max.	R&R
Caterpillar C13 Deposit/Oil ConsumptionTest	
CAT Merit Rating, min. (Annex 1)	1,000
Hot-stuck piston ring	NONE
Caterpillar 1N	
Weighted Demerits, max.	286.2/311.7/323.0
Top Groove Fill, max.	20/23/25
Top Land Heavy Carbon, max.	3/4/5
Oil Consumption (0-252 hrs) g/kwh, max.	0.5
Piston/ring/liner scuffing	NONE
Piston ring stick	NONE
Caterpillar 1P* Caterpillar reviewing necessity 2/3/06	
Weighted Demerits, max.	350/378/390
Top Groove Carbon, max.	36/39/41
Top Land Carbon, max.	40/46/49
Oil Consumption (0 to 360 hrs) g/hr, max.	12.4
Final OC (312-360 hrs), max.	14.6
Piston/ring/liner scuffing	NONE
Sequence IIIF	
EOT Kinematic Viscosity / % Increase @ 40° C, max. (MTAC)[a]	275%/275%(MTAC)/275%(MTAC)
Sequence IIIG	(alternative to IIIF)
EOT Kinematic Viscosity / % Increase @ 40° C, max. (MTAC)[a]	150%/150%(MTAC)/150%(MTAC)
Roller Follower Wear Test D 5596	
Average pin wear, mils, max.	0.30/0.33/0.36
or (µm), max.	*7.6/8.4/9.1*
D 6894 (EOAT)	
Aeration, Volume %, max. (MTAC)[a]	8.0%/8.0%(MTAC)/8.0%(MTAC)

[a] Multiple Test Acceptance Criteria (MTAC) is described in ASTM D 4485 Annex A1

Requirement		PC-10/CJ-4
Bench Tests		
Mack T-11A Used MRV TP-1		
180 hour T-11 Drain MRV, mPa-s, max.		25,000
MRV Yield Stress, Pa		< 35
High Temperature/High Shear D4683		
Viscosity @ 150°C, mPa-s, min.		3.5
Corrosion ASTM D 6594 (135° C, HTCBT)		
Cu, ppm increase, max.		20
Pb, ppm increase, max.		120
Copper strip rating, max.		3
Shear Stability ASTM D 7109		
Kinematic Viscosity after 90 pass Shearing cSt @ 100° C, min.	XW-30 / XW-40	9.3/12.5
Volatility ASTM D 5800 (NOACK)		
Evaporative Loss @ 250° C, max.	[Viscosities other than 10W-30]	13%
Evaporative Loss @ 250° C, max.	[10W-30]	15%
Foaming ASTM D 892		
Foaming / Settling	Sequence I	10/0 ml max.
	Sequence II	20/0 ml max.
	Sequence III	10/0 ml max.
Seal Compatability Tests ASTM D 7216		
Nitrile		
Volume Change		+5 / -3
Hardness		+7 / -5
Tensile Strength		+10 / -TMC 1006
Elongation		+10 / -TMC 1006
Silicone		
Volume Change		+TMC 1006 / -3
Hardness		+5 / -TMC 1006
Tensile Strength		+10 / -45
Elongation		+20 / -30
Polyacrylate		
Volume Change		+5 / -3
Hardness		+8 / -5
Tensile Strength		+18 / -15
Elongation		+10 / -35
FKM		
Volume Change		+5 / -2
Hardness		+7 / -5
Tensile Strength		+10 / -TMC 1006
Elongation		+10 / -TMC 1006
Vamac G		
Volume Change		+TMC 1006 / -3
Hardness		+5 / -TMC 1006
Tensile Strength		+10 / -TMC 1006
Elongation		+10 / -TMC 1006

PC-10/CJ-4 Merit Systems

Mack T-12 EGR Engine Test

PC-10/CJ-4 1000	Cylinder Liner Wear	Top Ring Wt. Loss	Delta Pb Final	Delta Pb 250-300 hr.	Oil Consumption
Weight	250	200	200	200	150
Maximum	24	105	35	15	85
Anchor	20	70	25	10	65
Minimum	12	35	10	0	50

Caterpillar C13 Deposit/Oil ConsumptionTest

PC-10/CJ-4 1000	Delta Oil Consumption	Ave. Top Land Carbon	Ave. Top Groove Carbon	2nd Ring Top Carbon
Weight	300	300	300	100
Maximum	31	35	53	33
Anchor	25	30	46	22
Minimum	10	15	30	5

ISM EGR Engine Test

PC-10/CJ-4 1000	Crosshead Ave. Wt. Loss	Oil Filter Pressure Delta	Ave. Engine Sludge	Ave. Valve Adj. Screw Wt. Loss
Weight	350	150	150	350
Maximum	7.1	19	8.7	49
Anchor	5.7	13	9	27
Minimum	4.3	7	9.3	16

Notes:

Maximum - At the Maximum you get zero merit points. Performance worse than the Maximum for any parameter is an automatic FAIL

Anchor - At the Anchor you receive merit points equal to the Weight

Minimum - At the Minimum you receive merit points equal to twice the Weight. There are no additional points for better performance than the minimum.

Mack T-12 EGR Engine Test		
Mack Merit Rating, min. 1,000	**MERIT**	Procedure full description, D4485 Annex partial description and MTAC
Cylinder Liner Wear (Avg. 6 cylinders, 12 locations) 20		
Top Ring Weight Loss (Avg. of 6 Cylinders) 70		
End of Test Lead 25		
Delta Lead 250 - 300 hrs. 10		
Oil Consumption (Phase II) 65		
Mack T-11 Engine Test		
Minimum TGA % Soot **@ 4.0 cSt** increase @ 100° C 3.50/3.38/3.33%	**TIERED**	D4485 Annex CJ outlier determination
Minimum TGA % Soot **@ 12.0 cSt** increase @ 100° C 6.00/5.91/5.87%	**TIERED**	D4485 Annex CJ outlier determination
Minimum TGA % Soot **@ 15.0 cSt** increase @ 100° C 6.70/6.59/6.55%	**TIERED**	D4485 Annex CJ outlier determination
Mack T-11A Used MRV TP-1		
180 hour T-11 Drain MRV, mPa-s, max. 25,000	**none**	D4485 Annex CJ outlier determination
MRV Yield Stress, Pa, <35		
Cummins ISM EGR Engine Test		
Cummins Merit Rating, min. 1,000	**MERIT**	Procedure full description, D4485 Annex partial description and MTAC
Crosshead Avg. Wt. Loss 5.7		
Top Ring Weight Loss 100		
Delta Oil Filter Differential Pressure 0 to 150 hr. 13		
Average Engine Sludge / CRC Merits @ EOT 9.0		
Average Injector Adjusting Screw Weight Loss, mg. 27		
Cummins ISB EGR Engine Test		
Average Slider Tappet Weight Loss, mg, max. 100	**TIERED**	D4485 Annex CJ outlier determination
Average Cam Lobe Wear, µm, max. 55	**TIERED**	D4485 Annex CJ outlier determination
Average Crosshead Weight Loss, max. R&R	**TIERED**	D4485 Annex CJ outlier determination
Caterpillar C13 Deposit/Oil ConsumptionTest		
CAT Merit Rating, min. 1,000	**MERIT**	Procedure full description, D4485 Annex partial description and MTAC
Oil Consumption Delta (125=>475 hours), g/hr. 25		
Top Groove Carbon 46		
Top Land Carbon 30		
Second Ring Top Carbon 22		
Hot-stuck piston ring NONE		
Caterpillar 1N		
Weighted Demerits, max. 286.2/311.7/323.0	**TIERED**	D4485 Annex CJ outlier determination (copy A9 CI-4)
Top Groove Fill, max. 20/23/25	**TIERED**	D4485 Annex CJ outlier determination (copy A9 CI-4)
Top Land Heavy Carbon, max. 3/4/2005	**TIERED**	D4485 Annex CJ outlier determination (copy A9 CI-4)
Oil Consumption (0-252 hrs) g/kwh, max. 0.5	**none**	D4485 Annex CJ outlier determination (copy A9 CI-4)
Piston/ring/liner scuffing NONE		
Piston ring stick NONE		

Caterpillar 1P

Weighted Demerits, max. 350/378/390	**TIERED**	D4485 Annex CJ outlier determination (copy A7 CH-4)
Top Groove Carbon, max. 36/39/41	**TIERED**	D4485 Annex CJ outlier determination (copy A7 CH-4)
Top Land Carbon, max. 40/46/49	**TIERED**	D4485 Annex CJ outlier determination (copy A7 CH-4)
Oil Consumption (0 to 360 hrs) g/hr, max. 12.4	**none**	D4485 Annex CJ outlier determination (copy A7 CH-4)
Final OC (312-360 hrs), max. 14.6	**none**	D4485 Annex CJ outlier determination (copy A7 CH-4)
Piston/ring/liner scuffing NONE		

Sequence IIIF Engine Test

EOT Kinematic Viscosity / % Increase @ 40° C, max. 275%	MTAC	D4485 A1 CI-4 1/sqrt

Sequence IIIG Engine Test (alternative to IIIF)

EOT Kinematic Viscosity / % Increase @ 40° C, max. 150%	MTAC	D4485 A1 CI-4 ln

Roller Follower Wear Test D 5596

Average pin wear, mils, max. 0.30/0.33/0.36	TIERED	D4485 Annex CJ outlier determination (copy A9 CI-4)

EOAT Test D 6894

Aeration, volume %, max 8.0	MTAC	D4485 A1 CI-4

PC-10 Draft User Language

DEOAP Version 1 -

The API CJ-4 requirements describe oils for use in those high-speed four-stroke cycle diesel engines designed to meet the on-highway exhaust emission standards being implemented for 2007 model year as well as for previous model years. These oils are compounded for use in all applications with diesel fuels ranging in sulfur content up to 500 ppm (0.05% by weight). However, the use of these oils with greater than 15 ppm (0.0015% by weight) sulfur fuel may impact aftertreatment system durability and/or oil drain interval.

These oils are especially effective to sustain emission control system durability, where, particulate filters and other advanced aftertreatment systems are used. Optimum protection is provided for control of catalyst poisoning, particulate filter blocking, engine wear, piston deposits, low and high temperature stability, soot handling properties, oxidative thickening, foaming, and viscosity loss due to shear.
(Note – add ACC protocol paragraph from prior categories)
API CJ-4 oils exceed the performance criteria of API CI-4, CI-4 PLUS, CH-4, CG-4 and CF-4 and can effectively lubricate engines calling for those API Service Categories. When using CJ-4 oil with higher than 15 ppm sulfur fuel consult the engine manufacturer for service interval.

Task Name	Start	Finish
NCDT Activity	Wed 3/26/03	Fri 3/31/06
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	Fri 10/20/06
API Lubes Committee Final Approval	Mon 2/6/06	Fri 3/10/06
Minimum Product Qualification Interval	Fri 1/27/06	Fri 10/13/06
API Licensing	Sun 10/15/06	Mon 5/21/07
Engines in Field	Mon 9/4/06	Mon 5/21/07