

HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL
OF
ASTM D02.B0.02
April 6, 2006
Detroit Courtyard Marriott, Detroit, Michigan

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ACTION ITEMS

1. Issue T-12 to T-10 Exit Ballot

Jim Mc Geehan

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 8:30 a.m. on Thursday April 6, 2006, in the Marriott A room of the Detroit Courtyard Marriott, Detroit, MI.
- 1.2 There were 13 members present and 10 guests present. The attendance list is shown as Attachment 2.

2.0 Agenda

- 2.1 The agenda shown (included as Attachment 1) was used except that Wim van Dam presented the T-10 to T-12 in place of John Zalar.

3.0 Minutes

- 3.1 The minutes from the January 26, 2006 meeting were approved as written.

4.0 Membership

- 4.1 There were no membership changes.

5.0 Chairman's Comments

- 5.1 D4485 Ballot: Lyle Bowman has issued the revised D4485 standard for review. Possible corrections are changing the word "any" to "all" in the T-11 limits and change the terminology for merits from "higher and lower" to "better and worse".
- 5.2 CJ-4 review open forum: There were comments that there are too many wear tests and that the category is too expensive. This group did put this category together and it may be a very robust category. Chairman McGeehan offered to host a dinner Tuesday at June ASTM for members and spouses. Volvo is disappointed at some of the comments from the SAE open forum held two days prior. Volvo will push their spec as a worldwide spec and doesn't feel that there will be niche products. Hopefully, there could be a worldwide or at least US and Europe category next time. There still may be some fragmentation and the 3 stakeholders need to work very hard to achieve a more uniform category for broader use. Even with so many tests, the category was delivered on time.

6.0 Mack T-12 to T-10

- 6.1 Wim van Dam presented the work of the Mack Surveillance Panel to use the Mack T-12 test as a substitute for the Mack T-10 test. See Attachment 3. The T-10 test will not be around much longer. There are two calibrated T-10 stands, and their calibrations will expire soon. The calibrated stands have had their calibration period extended by a couple of months to give time to resolve. There are approximately less than 10 sets of engine build parts. Volvo has reminded us that there are piston forgings available, but those pistons would be bushingless. That is, no bronze bushing for the wrist pin. The wrist pin would ride on the steel piston. The desire is to wrap this up by the June meeting. The Surveillance Panel considered several different approaches. One is to just use a lower merit value. The second is to develop an alternate merit system. The third is to predict T-10 performance from a set of correlation equations, then use the T-10 merit system. The Surveillance Panel felt that the second approach was the best approach, but there was one negative vote.
- 6.2 Approach #1: Relatively simple by selecting a lower merit number possibly in the 400 to 600 merit range. One problem is what happens when one value exceeds the maximum. Are the merits kept at zero or do we allow a negative merit contribution. A new set of maxima would have to be developed. It is basically a new merit system.
- 6.3 Approach #2: This is more complicated and requires a data set of oils run in both test types. New anchors, minima, and maxima would have to be developed. That would consist of comparing the actual T-10 performance with the T-10 merit system and develop limits that would keep the T-10 performance similar.
- 6.4 Approach #3: This is also more complicated. Requires a data set of oils run in both test types. Establish the correlations for each parameter and use the equations to predict T-10 performance and use the T-10 merit system.
- 6.5 The details of approach #2 were explained. Some of the oils translate well, but some have merits that differ greatly. The reference oil improves quite a bit. The OEM expressed a concern that the lead limits are too high so a modification to the system was shown. Another modification was to use the reference oil average 7 times to equal the number of candidate runs, instead of using the average of the reference as one data point. There are many more runs on TMC820-2 than the candidate data oils used in the data set. The Surveillance Panel recommends this system as the basis. None of the systems are straightforward. The OEM has received much lobbying and feels that there could be negatives on an exit ballot. Volvo has investigated this and decided that the lead values of 43 are too high, especially for use in ACEA. Volvo is willing to offer a compromise to get this accomplished by June. Many felt that more emphasis should be placed on the reference oil results.
- 6.6 Greg Shank presented a compromise. See Attachment 4. The compromise is what Volvo can live with and is based on some of the lobbying. Steve Kennedy discussed some adjusted limits. Top ring weight loss and oil consumption would move, but the data may not show a problem on top ring weight loss. Possibly use the anchor value for cylinder liner wear of 23 but use a maximum of 26. Volvo can live with a max of 26. Steve Kennedy listed off some new values in maximum, anchor, minimum order. Cylinder Liner Wear (CLW): 26, 23, 12. Top Ring Weight Loss (TRWL): 117, 82, 47. Oil Consumption (OC): 95, 82, 50. Zero to 300 Hour Delta Lead (EOT Pb): 42, 35, 10. 250 to 300 Hour Delta Lead (PB2): 18, 13, 0. The seven candidate oils would have merit values as follows: 982, 816, 871, 352, 1474, 1188, 1495. Greg Shank **moved** to send out an exit ballot with a 2 week response time for a T-12 to T-10 using the compromise values. Bill Kleiser seconded. The **motion passed** unanimously with 13 votes for, 0 against and 0 waives.
- 6.7 Mack tests in old categories: Since the T-10 itself will no longer be available, what happens to the T-9 and T-6. Lubrizol thinks that the older categories need to be supported and will be presenting some proposals.
- 6.8 T-8 to T-11. Volvo suggests that if the T-11 is used in place of the T-8, that it be the 180 hour T-11A. Reference oil 1004 has not been run in a T-11. There are no lab or hardware issues to prevent the T-8 from being run. The group is trying to be proactive and will start to get data on 1004 in a T-11. To do this, 3 tests on 1004 in a T-11 have been offered. Also,

need to consider what to do with a T-8A. The T-8A is in current categories. The Mack Surveillance Panel will take this on.

7.0 Recommendations to API

- 7.1 Steve Kennedy updated the group. The API lubes committee approved the ballot for CJ-4. After May 1st, oils can state that they meet CJ-4 or OEM specs, but are not required to. CJ-4 oils can be in a bottle that only states CI-4+. There is some concern that for off-highway applications with higher sulfur fuel, the CJ-4 oil may not yield the same service interval. There is no legal way to claim CJ-4 before October 15th. The oil marketers should help the customer understand what is in the bottle during the transition. CJ-4 oil is better than CI-4+ and meets CI-4+. The user may find that TBN levels are different. Between June and October, communication between oil marketer, OEM and user will be critical. Communicate accurately in terms of TBN level, not oil quality.

8.0 Next meetings

- 8.1 Conference call to discuss the exit ballot unless very controversial.
- 8.2 June 27, 2006. Toronto ASTM

9.0 The meeting was adjourned at 11:00 am.

Tentative Agenda
ASTMSECTION D.02.BO.02 Attachment 1; Page 1 of 1
HEAVY-DUTY ENGINE OIL CLASSIFICATION PANELS

Courtyard Marriott, Detroit Downtown
333 East Jefferson Ave, Detroit, MI 48226 (313-222-7700)
April 6th, 2006
8:30 am-11:15 am

Chairman/ Secretary: **Jim Mc Geehan/Jim Moritz**
Purpose: **Mack Tests in existing categories**
Desired Outcomes: **Agree on limits for Mack T-12 to T-10**

TOPIC	PROCESS	WHO	TIME
Agenda Review	<ul style="list-style-type: none"> • Desired Outcomes & Agenda 	Group	8:30-8:35
Minutes Approval	<ul style="list-style-type: none"> • January 26th , 2006 	Group	8:35-8:40
Membership	<ul style="list-style-type: none"> • Changes: Additions 	Jim Mc Geehan	8:40-8:45
Mack T-12 to T-10	<ul style="list-style-type: none"> • TMC reported data • Other presentations • Recommendation for "Exit-Criteria ballot" 	John Zalar Group	8:45-9:45
Mack Tests in old categories	<ul style="list-style-type: none"> • Mack T-6 / T-9 to T-10 to T-12 • Mack T-8 to T-11 • Recommendations: Obsolete old API categories that can not be supported by T-12 or T-11 	Greg Shank Group	9:45-10:45
Recommendations to API	<ul style="list-style-type: none"> • Summary of recommendations to API 		10:45-11:00
Collect money for room and coffee.			11:00-11:15
Next Meetings	<ul style="list-style-type: none"> • June 2006 		

HDEOCP Meeting, April 6th, 2006, Detroit, MI

	Name	Company	Member
1	JIM MORITZ	INTERTEK	N
2	W.A. RUNKLE	ASTLAND VALVEWORK	Y
3	D.M. STEHOEVEN	CUMMINS.	Y
4	Dan Pridemore	Afton	N
5	Thomas Binemann	Afton	N
6	Charles Passut	Afton.	Y
7	Kenis Williams	Ludrizol	Y
8	Heribert Nussel	ISP	N
9	Steven Kennedy	Etzon Mobil	Y
10	Rick Finn	Infinium	N
11	Joan Evans	Infinium	Y-Hodge
12	Bill Place	John Deere	N
13	Roger Gault	EMA	N
14	Scott Harold	CIBA	Y
15	Scott Feuchel	Detroit Diesel	N
16	STEVEN HERZOG	ROHMAX	Y
17	KEN CHAO	Deere & Company	Y
18	Bill Kleizen	Oronite	Y
19	WIM VAN DAM	ORONITE	N
20	GREG SHANK	Volvo Powertrain	Y
21	Frank Fernandez	Chevron Oronite	Y
22	Jim Rutherford	Chevron Oronite	N
23	Jim W. GERTMAN	CHEVRON	Y
24			

Using the Mack T12 as an Alternative to the Mack T-10

A Recommendation from the Mack Surveillance Panel

April 6, 2006

Developing T-12 Limits for CI-4 (Plus)

- Three different approaches have been considered :
 1. Use T-12 Merit System with lower Pass/Fail Merit
 2. Develop an Alternative T-12 Merit System to be used when a T-12 test is run for CI-4 qualification
 3. Predict T-10 performance from T-12 engine test data and use T-10 Merit System
- The Mack Surveillance Panel, after much discussion, decided to recommend the use of approach 2
 - One panel member voted negative

1) Use T-12 Merit System with lower Pass/Fail Merit

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- Relatively simple approach
- Involves selecting a Merit Limit (400 – 600 Range ?)
- Determine what happens when test results exceed the Merit System Max
 - Keep that parameter's contribution at zero
 - Allow the merit contribution to go negative
- Define a new set of Maxima that cannot be exceeded
- Biggest Challenge :
 - Defining the new limit and the new Maxima

2) Develop an Alternative T-12 Merit System

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- More complicated approach
- Requires a data set on oils run in both tests
 - Available are 7 Candidate oils and 1 Reference oil
- Compare the actual T-10 performance with the limits in the T-10 Merit System
- Create an alternative merit system that maintains the same relationship between actual T-12 performance and the new alternative T-12 Merit System
- Biggest Challenge :
 - Determining what data set to use for definition of the new Merit System

3) Predict T-10 performance and use T-10 Merit System

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- More complicated approach
- Requires a data set on oils run in both tests
 - Available are 7 Candidate oils and 1 Reference oil
- Establish the correlation equations for each parameter
- Use these equations to predict the T-10 performance from T-12 engine test data
- Apply the existing T-10 Merit System to obtain the test result for CI-4 (Plus) qualification purposes
- Biggest Challenge :
 - Determining the correlation equations when there is no obvious correlation for some parameters

Defining an Alternative T-12 Merit System

Step 1 : Compare the average performance of an Industry data-set with the anchor in the T-10 Merit System

<u>Oil</u>	<u>Test (T-10 or T-12)</u>	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
1	T-10	25.7	97.3	40.9	7	1
2	T-10	26.7	75	42.6	30	12
3	T-10	26.4	121.7	45.8	27	8.0
4	T-10	24.7	133	41.2	25	6
5	T-10	23.8	146	47	29	12
6	T-10	18.7	115.3	53.7	30	14.5
7	T-10	17	97	43.4	24	4
TMC 820 Avg	T-10	31.08	108.9	52.36	24.74	8.78

Average	24.3	111.8	45.9	24.6	8.3
T-10 Anchor	30	140	57	30	10
Average as % of T-10 Anchor	80	79	80	81	82

Candidate Average roughly **80 %** of Anchor for all parameters

Defining an Alternative T-12 Merit System

Step 2 : Calculate new anchor for the Alternative T-12 Merit System

<u>Oil</u>	<u>Test (T-10 or T-12)</u>	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
1	T-12	25.7	77.1	69.0	28	9
2	T-12	17.5	60	63.9	49	16
3	T-12	18.8	29.4	78.6	42	19
4	T-12	16.4	96.4	76.2	54	18
5a	T-12	16.4	56	71.3	27	9
6	T-12	25.0	59.0	64.8	23	10
7	T-12	15.2	44	61.8	34	12
TMC 820 Avg	T-12	18.63	53.89	68.63	20.11	8.22

Average	19.2	59.5	69.3	34.6	12.7
Anchor Calculation	24.0046875	75.28322785	86.5984375	42.76388889	15.42987805
Average as % of new T-12 Anchor	80	79	80	81	82

Average as % of Anchor is maintained for all parameters

Defining an Alternative T-12 Merit System

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Step 3 : Define the Alternative T-12 Merit System

Proposed T-12 Alternative Merit System

	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
Weight	250	200	150	200	200
Max	26	105	95	48	20
Anchor	24	75	85	43	15
Min	12	35	50	10	0

Maxima set at equal distance from anchor as in T-10 Merit System

Anchors rounded from earlier calculated numbers

Minima set at the same values as in T-12 Merit System

Parameter weights same as in T-12 Merit System

T-10 and T-12 Merit Systems

T-12 Merit System

	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
Weight	250	200	150	200	200
Max	24	105	85	35	14
T-12 Anchor	20	70	65	25	10
Min	12	35	50	10	0

T-10 Merit System

	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
Weight	250	150	150	225	225
Max	32	158	65	35	14
T-12 Anchor	30	140	57	30	10
Min	12	50	25	5	0

The Impact of Various Alternative T-12 Merit Systems on Candidate Performance

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	T-10	MSP Recommendation T-12 Weights	T-10 Weights	Modified OC and Pb Limits (80 / 40 / 14) T-10 Weights	TMC 820 Included 7 times	T-12
1	1616	1013	1038	1002	745	533
2	1109	1021	967	777	559	426
3	1205	1182	1113	950	748	436
4	1294	493	459	260	37	-22
5	979	1489	1487	1451	1380	1125
6	989	1229	1233	1203	951	779
7	1505	1532	1505	1468	1425	1071
TMC820	1013	1517	1519	1490	1410	1208
Average	1214	1185	1165	1075	835	694

Exit Ballot

Proposed T-12 Alternative Merit System

	<u>Cylinder Liner Wear</u>	<u>Top Ring Weight Loss</u>	<u>Oil Consumption</u>	<u>DELTA PB</u>	<u>PB2</u>
Weight	250	200	150	200	200
Max	26	117	95	42	18
Anchor	23	82	82	35	13
Min	12	47	50	10	0

Proposed T-10 Merit System (820 as 1 oil)

Weight	250	200	150	200	200
Max	26	105	95	48	20
Anchor	24	75	85	43	15
Min	12	35	50	10	0

Proposed T-10 Alternative (820 as 50%)

Weight	250	200	150	200	200
Max	24	105	95	48	20
Anchor	21	73	81	35	13
Min	12	35	50	10	0

Proposed T10 Compromise

Weight	250	200	150	200	200
Max	25	105	95	42	18
Anchor	23	75	83	35	13
Min	12	35	50	10	0