

**HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL  
OF  
ASTM D02.B0.02  
October 16, 2001  
Hyatt Regency O'Hare Hotel, Rosemont, IL**

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**ACTION ITEMS**

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| <b>1. Draft "B" ballot to ASTM.</b>                             | <b>Tom Franklin</b>                    |
| <b>2. Letter to API LC on backward compatibility.</b>           | <b>Jim McGeehan</b>                    |
| <b>3. Establish 75 hour "T-10" test to produce MRV samples.</b> | <b>T-10 Task Force</b>                 |
| <b>4. Issue Research Reports.</b>                               | <b>T-10, M-11 &amp; 1R Task Forces</b> |
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**MINUTES**

- 1.0 Call to Order
  - 1.1 The meeting was called to order by Chairman Jim McGeehan at 7:31 a.m. on October 16, 2001, in the Hyatt Regency O'Hare Hotel of Rosemont, IL. There were 13 members present or represented and approximately 15 guests present. The attendance list is shown as Attachment 2.
- 2.0 Agenda
  - 2.1 The published agenda (Attachment 1) was reviewed. Tom Boschert asked for time to update the group on 'elastomer' changes and Lew Williams asked for time to review backward compatibility.
- 3.0 Previous Meeting Minutes
  - 3.1 The minutes of the September 26, 2001 meeting were approved as posted on the TMC website. It was noted that paragraph 8.12 had been revised to appropriately reflect the position of ExxonMobil on M-11 EGR and T-10 top ring weight loss.
- 4.0 "B" Ballot Preparation

- 4.1 In addition to those organizations listed in paragraph 11.1 of the 9/26/01 minutes, ExxonMobil, RohMax and Pennzoil-Quaker State agreed to help provide funding for Tom Franklin's work in preparing the "B" ballot of revisions to D4485 to include the CI-4 category.
  - 4.2 The draft ballot will need to be at ASTM headquarters by October 22 for them to issue the ballot in time to close before the December meetings in Miami.
- 5.0 Chairman's Comments
- 5.1 Chairman McGeehan took this opportunity to express thanks and appreciation to the many task forces and their leaders who have worked so diligently to bring all the new tests and procedures to this point of acceptance.
- 6.0 Membership
- 6.1 There were no changes in membership.
- 7.0 Exit Ballot 3 Review (See Attachment 3 for ballot summary)
- 7.1 High Temperature, High Shear
    - 7.11 Infineum negative on the proposed HTHS limit and would never move to affirmative, but they will abstain to allow the category to proceed.
  - 7.2 Used Oil Viscometrics
    - 7.21 Lubrizol negative on used oil viscometrics designation for "all" viscosity grades. They would switch to affirmative if it were limited to 15W-40 and lighter viscosity grades.
    - 7.22 Valvoline negative on used oil viscometrics designation for all viscosity grades. They would switch to affirmative if the "all viscosity grades" was dropped and "each viscosity grade tested" was inserted in the exit ballot wording.
    - 7.23 Dave Stehouwer moved and Lew Williams seconded inserting in the exit ballot limit wording, that the limit would apply to 0W, 5W, 10W and 15W viscosity grades. The motion passed via voice vote with none against and no abstentions. Lubrizol and Valvoline negatives now change to affirmative.
  - 7.3 CAT 1R

- 7.31 Lubrizol negative on final oil consumption. Mark Rees presented slides showing oil consumption for two tests on the same oil (Attachment 4). The consumption for one test essentially decreased for the entire test. The other went down and then back up toward the end. They propose a limit of FOC / IOC = 1.4 or less. This was arrived at from the matrix data mean plus 2 standard deviations for FOC. They feel the proposed exit ballot limit is set in the noise of the test.
  - 7.32 Ethyl abstain, but on FOC they propose using the last 3 or 4 oil consumption readings to establish FOC instead of just the last two readings. Tom Boschert showed a slide (Attachment 5) with matrix data which they feel reinforces Lubrizol's position. Tom also asked for clarification on how multiple tests are handled with tiered limits. The arithmetic average for each pass / fail parameter would be compared to the appropriate tiered limit.
  - 7.33 Pennzoil-Quaker State feels that oils that start with low oil consumption should not be penalized, which a ratio would do.
  - 7.34 After some discussion, CAT / EMA agreed a delta of 1.8 g/h for final oil consumption would be acceptable. So, Lew Williams moved that FOC = IOC + 1.8 g/h. Dwayne Tharp seconded the motion which passed via voice vote with none against and no abstentions. This cleared the exit ballot negatives.
- 7.4 Mack T-10
- 7.41 Infineum negative on the delta 250-300 lead limit of 10. They feel it should be 15.
  - 7.42 Jim Rutherford presented a "merit" system proposal for the T-10, which would add some flexibility to coping with five pass / fail parameters (Attachment 6).
  - 7.43 John Zalar presented updated T-10 (and other) tiered limits (Attachment 7).
  - 7.44 Greg Shank made a presentation on the merit system (Attachment 8) and then moved acceptance of the proposed "Mack T-10 Merit System" to evaluate oils against the API CI-4 performance category. A minimum merit total of 1000 would be required. Bill Kleiser seconded the motion. Lubrizol expressed the opinion that they feel the proposed system is more restrictive on multiple tests than the proposed tiered limits. The motion passed with 12 for, 0 against and 1 abstain. The Valvoline exit ballot abstain and the Infineum negative change to affirmative with adoption of this merit system.
- 7.5 Cummins M-11 EGR
- 7.51 Ethyl expressed concern about test filter variability.

- 7.52 Dave Stehouwer reported on available test filter data (Attachment 9) and indicated tests were still underway. Dust capacity and pleat count have yet to be determined, but pressure drop variability does not seem to be as large as anticipated.
- 7.53 The research report is nearly complete, but it probably will not issue in time to obtain a number for this ballot.

#### 7.6 Elastomer Compatibility

- 7.61 Tom Boschert reported on the Elastomer Surveillance Panel activities (Attachment 10) and noted that since they had formed a surveillance panel, they would bring the procedure to standard under D02 instead of D11.
- 7.62 Tom Boschert moved and Lew Williams seconded that the proposed new elastomer limits, which were circulated, be adopted for CI-4. The motion passed via voice vote with none against and no abstentions.
- 7.63 Tom Boschert moved and Pat Fetterman seconded that the proposed statistical method for the elastomer test be accepted as circulated. The motion passed via voice vote with none against and no abstentions.

#### 7.7 CAT 1K / 1N

- 7.71 Dwayne Tharp reported that CAT would prefer the 1N test as the primary aluminum piston deposit test in the CI-4 category, with the 1K as an acceptable alternative, but for a limited period of time. Infineum objected strongly to this change and indicated they would vote negative if the ballot proceeded with the change. Dwayne agreed they could stay with the exit ballot wording.

#### 7.8 Sequence III-F Oxidation

- 7.81 Oronite have concerns that insufficient III-F hardware will soon create an availability problem for this test. Assurances were given by GM that hardware availability would not be a problem.

#### 8.0 Backward Compatibility

- 8.0 Mark Rees reviewed the tabled proposal on backward compatibility from the last meeting (Attachment 11). During the discussion, Tom Boschert proposed adopting the current wording in D4485 (X2.8.3), by changing CH-4 oils to CI-4 oils and inserting CH-4 between API and CG-4. Not quite sure what happened to the original motion, but Boschert's proposal passed via voice vote with none against and no abstentions. There is still concern that should be addressed, about the permissibility of using

passes in CI-4 tests to allow claims of CH-4 quality, until CI-4 can be licensed.

- 8.1 Jim McGeehan is to send a letter to the API Lubes Committee, registering the above action, in time for their Nov. 6<sup>th</sup> meeting.

#### 9.0 Next Meeting

- 9.1 The next meeting of the HDEOCP is now scheduled for December 4, 2001, at the Fontainebleau Hotel in Miami.

#### 10.0 Adjournment

- 10.1 The meeting was adjourned at 11:03 a.m. on October 16, 2001.

Submitted by:

Jim Wells  
Secretary to the HDEOCP

**ASTM-HDEOCP**  
**Hyatt Regency O'Hare**  
**9300 West Bryn Mawr - Rosemont, IL 60018**  
**(847) 696-1234**

October 16<sup>th</sup> 2001  
**7:30 a.m-12:00 noon**

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**Chairman/ Secretary:** Jim Mc Geehan/Jim Wells  
**Purpose:** PC-9  
**Desired Outcomes:**

- Finalize All API CI-4 limits
- Issue ASTM B ballot

TOPIC	PROCESS	WHO	TIME
Agenda Review	<ul style="list-style-type: none"> <li>• Desired Outcomes &amp; Agenda</li> </ul>	Group	7:30 – 7:35
Minutes Approval	<ul style="list-style-type: none"> <li>• September 26<sup>th</sup> 2001</li> </ul>	Group	7:35-7:40
Membership	<ul style="list-style-type: none"> <li>• Changes</li> <li>• Chairman's comments</li> </ul>	Group Jim Mc Geehan	7:40-7:45
B Ballot Cost	<ul style="list-style-type: none"> <li>• Companies funding project: list</li> </ul>	Jim Mc Geehan	7:45 –8:00
Exit Criteria Ballots	<ul style="list-style-type: none"> <li>• Review and resolve issues</li> </ul>	Group	8:00 – 12:00

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<b>Fischl, Frederick</b> Infineum USA LP P.O. Box 735, 1900 E. Linden Ave. Linden, NJ 07036	(908) 474-2720 (908) 474-7939 <a href="mailto:fred.fischl@infineum.com">fred.fischl@infineum.com</a>	FF	☺
<b>Florkowski, Dennis</b> DaimlerChrysler CIMS 482-00-13 800 Chrysler Dr. Auburn Hills, MI 48326-2757	(248) 576-7477  <a href="mailto:df11@diamlerchrysler.com">df11@diamlerchrysler.com</a>		
<b>Franklin, Joseph M.</b> PerkinElmer Automotive Research 5404 Bandera Road San Antonio, TX 78238	(210) 523-4671 (210) 681-8300 <a href="mailto:joe.franklin@perkinelmer.com">joe.franklin@perkinelmer.com</a>		
<b>Franklin, Thomas M.</b> FR&TS Inc. 25835 White Eagle Dr. San Antonio, TX 78258-64604	(210) 497-1310 (210) 497-1315 <a href="mailto:tfranklin@earthlink.net">tfranklin@earthlink.net</a>		
<b>Funk, Raymond</b> Citgo Petroleum Corp. P.O. Box 3758 Tulsa, OK 74102	(918) 495-5931 (918) 495-5022 <a href="mailto:rfunk@citgo.com">rfunk@citgo.com</a>		
<b>Garcia, Miguel A.</b> Repsol YPF 2609 Native Oak Dr. Flower Mound, TX 75022	(972) 691-8060 (972) 691-0477 <a href="mailto:mgarcia@repsol-ypf.com">mgarcia@repsol-ypf.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Gauthier, Alain</b> TotalFinaElf, CRES b.p. 22 69360 Solaize, France	(33) 4 78 02 60 38 (33) 4 78 02 60 92 <a href="mailto:alain-paul.gauthier@totalfinaelf.com">alain-paul.gauthier@totalfinaelf.com</a>		
<b>Girshick, Fred W.</b> INFINEUM 1600 E. Linden Ave. Linden, NJ 07036	(908) 474-3247 (908) 474-2085		
<b>Glaser, John</b> Perkin Elmer Automotive Research 5404 Bandera Rd. San Antonio, TX 78238	(210) 647-9459 (210) 523-4607 <a href="mailto:john.glaser@perkinelmer.com">john.glaser@perkinelmer.com</a>		
<b>Goldblatt, Irwin</b> Castrol NA 240 Centennial Ave. Piscataway, NJ 08854	(732) 980-3606 (973) 686-4224 <a href="mailto:irwin.goldblatt@castrolna.com">irwin.goldblatt@castrolna.com</a>		
<b>Gomez, Redescal</b> PDVSA Intevep APDO 76345 Caracas, 1070A Venezuela	(582) 908-6754 (582) 908-7723 <a href="mailto:gomezriv@pdvsa.com">gomezriv@pdvsa.com</a>		
<b>Goodrich, Barb</b> 305 Radcliffe Dr. Newark, DE 19711	(302) 731-9438 <a href="mailto:begoodrich@aol.com">begoodrich@aol.com</a>		
<b>Graham, Mary</b> Conoco P.O. Box 1267 Ponca City, OK 74602-1267	(580) 767-4013 (580) 767-4534 <a href="mailto:mary.e.graham@usa.conoco.com">mary.e.graham@usa.conoco.com</a>		
<b>Grant, Lee</b> Southwest Research Inst. P.O. Box 28510 San Antonio, TX 78228	(210) 522-5004 (210) 684-7523 <a href="mailto:lgrant@swri.org">lgrant@swri.org</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Graves Jr., L. Martin</b> BP Amoco Chemicals P.O. Box 3011 M.S. C-2 Naperville, IL 60566-7011	(630) 420-4925 (630) 961-7979 <a href="mailto:graveslm@bp.com">graveslm@bp.com</a>		
<b>Grinfield, Rebecca</b> Southwest Research Institute 6220 Culebra Rd. San Antonio, TX 78238	(210) 522-3652 (210) 522-5097 <a href="mailto:bgrinfield@swri.org">bgrinfield@swri.org</a>		
<b>Groff, Walter</b> Southwest Research Institute 6220 Culebra Rd. San Antonio, TX 78238	(210) 522-2823 (210) 684-7523 <a href="mailto:wgroff@swri.org">wgroff@swri.org</a>		
<b>Grona, Larry</b> Analytical Petroleum Consultants 3410 Clearfield San Antonio, TX 78230-3314	(210) 696-2889 (210) 696-2889 <a href="mailto:lcgrona@aol.com">lcgrona@aol.com</a>		
<b>Gutzwiller, Jim</b> Infineum USA, L.P. 4335 Piedras West, Suite 101 San Antonio, TX 78228	(210) 732-8123 (210) 732-8480 <a href="mailto:James.Gutzwiller@infineum.com">James.Gutzwiller@infineum.com</a>		
<b>Hardy, Bryant</b> Conoco P.O. Box 1267 Ponca City, OK	(580) 767-5601 <a href="mailto:bryant.j.hardy@usa.conoco.com">bryant.j.hardy@usa.conoco.com</a>		
<b>Harris, Raymond B.</b> PPC Lubricants 245 Green Lane Dr. Camp Hill, PA 17011	(717) 761-2426 (717) 939-3156 <a href="mailto:hcmgt@aol.com">hcmgt@aol.com</a>		
<b>Hart, Marv</b> Century Lubricants Co. 2140 S. 88 <sup>th</sup> St. Kansas City, KS 66111	(913) 441-7160 (913) 441-2333 <a href="mailto:mhart@centurylub.com">mhart@centurylub.com</a>		



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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Herzog, Steven</b> RohMax USA, Inc. 723 Electronic Drive Horsham, PA 19044-2228	(215) 706-5817 (215) 706-5801 <a href="mailto:s_herzog@rohmax.com">s_herzog@rohmax.com</a>	SH	☺
<b>Hoffman, Kent</b> Lubrication Engineers, Inc. 1919 E. Tulsa Wichita, KS 67216	(316) 529-2112 <a href="mailto:hoffmank@lubricationengineers.com">hoffmank@lubricationengineers.com</a>		
<b>Hope, Ken</b> Chevron Phillips Chemical Co. LP 1862 Kingwood Dr. Kingwood, TX 77339	(281) 359-6519 <a href="mailto:hopekd@cpchem.com">hopekd@cpchem.com</a>		
<b>Iwamoto, Ross</b> 76 Lubricants Co. 1920 East Deere Ave. Santa Ana, CA 92705	(714) 428-7409 (714) 428-7498 <a href="mailto:riwamoto@tosco.com">riwamoto@tosco.com</a>		
<b>Jacobson, Mark</b> Dupont 36263 Derby Downs Solon, OH 44139	(440) 248-9151 (440) 248-9161 <a href="mailto:mark.s.jacobson@usa.dupont.com">mark.s.jacobson@usa.dupont.com</a>		
<b>Jetter, Steven M.</b> ExxonMobil R&E 600 Billingsport Rd. Paulsboro, NJ 08066	(856) 224-2867 (856) 224-2102 <a href="mailto:steven_m_jetter@email.mobil.com">steven_m_jetter@email.mobil.com</a>		
<b>Karol, Tim</b> R.T. Vanderbilt Co. 33 Winfield St. Norwalk, CT 06855	(203) 853-1400 (203) 831-0648 <a href="mailto:tkarol@rtvanderbilt.com">tkarol@rtvanderbilt.com</a>		
<b>Kiovsky, Tom</b> Fuels & Lubes Asia 33078 Allenbury Dr. Solon, OH 44139	(440) 248-3198 <a href="mailto:t.kiovsky@att.net">t.kiovsky@att.net</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Klein, Rick</b> Oronite 30150 Telegraph Rd., Suite 416 Bingham Farms, MI 48025	(248) 540-3277 (248) 540-3279 <a href="mailto:rmkl@chevron.com">rmkl@chevron.com</a>		
<b>Knight, John W.</b> Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249	(210) 690-1958 (210) 690-1959 <a href="mailto:jknight@testeng.com">jknight@testeng.com</a>		
<b>Kuhlman, Dick</b> Ethyl Corporation 2000 Town Center, Suite 1750 Southfield, MI 48075	(248) 350-0647 (248) 350-0025 <a href="mailto:dick_kuhlman@ethyl.com">dick_kuhlman@ethyl.com</a>		
<b>Lee, Rich</b> Chevron Oronite 100 Chevron Way Richmond, CA 94802	(510) 242-2988 (510) 242-3173 <a href="mailto:rhle@chevron.com">rhle@chevron.com</a>		
<b>Malandro, Dennis</b> Infineum USA, LP 1900 E. Linden Ave. Linden, NJ 07036	(908) 474-3895 (908) 474-2298 <a href="mailto:dennis.malandro@infineum.com">dennis.malandro@infineum.com</a>		
<b>Marn, Don</b> Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-1481 (440) 347-1286 <a href="mailto:djm@lubrizol.com">djm@lubrizol.com</a>	DM	☺
<b>Matson, Mark L.</b> Marathon Ashland Petroleum LLC 539 S. Main Findlay, OH 45840	(419) 421-4239 (419) 421-2264 <a href="mailto:mlmatson@mapllc.com">mlmatson@mapllc.com</a>		
<b>May, Chris</b> Imperial Oil 453 Christina St., S. Sarnia, Ontario N7T 8C8 Canada	(519) 339-2827 (519) 339-2317 <a href="mailto:chris.j.may@esso.com">chris.j.may@esso.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Mazzamaro, Glenn</b> CIBA Specialty Chemicals 540 White Plains Rd. Tarrytown, NY 10591	(914) 785-4221 (914) 785-4249 <a href="mailto:glenn.mazzamaro@cibasc.com">glenn.mazzamaro@cibasc.com</a>		
<b>McCarthy, Stacey</b> Detroit Diesel 13400 Outer Drive, W. Detroit, MI 48239	(313) 592-5176 (313) 592-3892 <a href="mailto:stacey.mccarthy@detroitdiesel.com">stacey.mccarthy@detroitdiesel.com</a>		
<b>McCord, James</b> Southwest Research Institute 6220 Culebra Rd. T-33 San Antonio, TX 78238	(210) 522-3439 (210) 523-6919 <a href="mailto:jmccord@swri.org">jmccord@swri.org</a>		
<b>McFall, David</b> Lubes'N'Greases Magazine 1300 Crystal Dr., Suite 1203 Arlington, VA 22202	(703) 416-7284 (703) 416 0015 <a href="mailto:david.vmc@verizon.net">david.vmc@verizon.net</a>		
<b>Migdal, Cyril</b> Crompton Corp. 199 Benson Rd. Middlebury, CT 06749	(203) 573-2532 (203) 573-2165 <a href="mailto:cyril_migdal@cromptoncorp.com">cyril_migdal@cromptoncorp.com</a>		
<b>Miller, Ed</b> Consultant 42 Edgehill Dr. Wappingers Falls, NY 12590	(845) 297-8276 <a href="mailto:milleredf@aol.com">milleredf@aol.com</a>		
<b>Mitchell, Bill</b> John Deere & Co. P.O. Box 8000 Waterloo, IA 50704-8000	(319) 292-8241 (319) 292-8441 <a href="mailto:MitchellWilliamE@jdcorp.deere.com">MitchellWilliamE@jdcorp.deere.com</a>		
<b>Moritz, Jim</b> PerkinElmer AR 5404 Bandera Rd. San Antonio, TX 78238	(210) 523-4601 (210) 523-4607 <a href="mailto:jim.moritz@perkinelmer.com">jim.moritz@perkinelmer.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Mulford, Luis</b> Savant 4800 James Savage Rd. Midland, MI 48642	(517) 496-2301  <a href="mailto:savant@savantgroup.com">savant@savantgroup.com</a>		
<b>Nahumck, William M.</b> The Lubrizol Corp. 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-2596 (440) 347-4096 <a href="mailto:wmn@lubrizol.com">wmn@lubrizol.com</a>		
<b>Nann, Norbert</b> Nann Consultants Inc. 59 Edgehill Drive Wappinger Falls, NY 12590	(845) 297-4333 (845) 297 4334 <a href="mailto:norbnann1@aol.com">norbnann1@aol.com</a>		
<b>Newcombe, Jim</b> Infineum USA, LP 34388 Quaker Valley Rd. Farmington Hills, MI 48331	(248) 476-8171 (248) 474-0739 <a href="mailto:james.newcombe@infineum.com">james.newcombe@infineum.com</a>		
<b>Oliphant, Tom</b> American Refining Group 77 N. Kendall Ave. Bradford, PA 16701	(814) 368-1353 (814) 368-1328 <a href="mailto:toliphant@amref.com">toliphant@amref.com</a>		
<b>Oliver, Rick</b> RSI 2805 Beverly Dr. Flower Mound, TX 75022	(972) 726-2136  <a href="mailto:crickoliver@home.com">crickoliver@home.com</a>		
<b>Olszewski, T. A.</b> Exxon Company USA 800 Bell Street Houston, TX 77252	(713) 656-4398 (713) 656-5301 <a href="mailto:tom.a.olszewski@exxon.com">tom.a.olszewski@exxon.com</a>		
<b>Orrin, Douglas</b> MathSoft 1573 Martinique Drive Troy, MI 48084	(248) 816-3332 (248) 816-5858 <a href="mailto:dorrin@splus.mathsoft.com">dorrin@splus.mathsoft.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Paboucek, Jim</b> Castrol HD Lubricants 9300 Pulaski Highway Baltimore, MD 26220	(410) 682-9409 (410) 780-8632 <a href="mailto:jim_paboucek@burmahcastrol.com">jim_paboucek@burmahcastrol.com</a>		
<b>Parry, Barb</b> Mohawk Lubricants Ltd. 130 Forester St. North Vancouver, BC VTH2M9	(604) 924-2703 (604) 929-8371 <a href="mailto:bparry@mohawklubes.com">bparry@mohawklubes.com</a>		
<b>Patrick, Dick</b> Citgo Petroleum Corporation P.O. Box 3758 Tulsa, OK 74102	(918) 495-5937 (918) 495-5935 <a href="mailto:rpatri1@citgo.com">rpatri1@citgo.com</a>	RJP	☺
<b>Pearse, Steven</b> Castrol Technology Centre Whitchurch Hill Pangbourne Reading Berkshire, England RG8 7QR	44 (0) 118 976 5459 <a href="mailto:pearses@castrol.com">pearses@castrol.com</a>		
<b>Peckham, Jack</b> Lubricants World 4545 Post Oak Place, #210 Houston, TX 77027	(713) 993-9320 <a href="mailto:jpeckham@phillips.com">jpeckham@phillips.com</a>		
<b>Place, William E.</b> Oronite 30150 Telegraph Rd., Suite 416 Bingham Farms, MI 48025	(248) 540-3277 (248) 540-3279 <a href="mailto:wepl@chevron.com">wepl@chevron.com</a>		
<b>Ratliff, Kevin</b> BP 150 W. Warrenville Rd. Naperville, IL 60563	(630) 420-5073 (630) 961-7979 <a href="mailto:ratlifks@bp.com">ratlifks@bp.com</a>		
<b>Reddy, Vijay N.</b> Thermo Haake 149 Commonwealth Dr. (Thermal Lab) Menlo Park, CA 94025	(650) 688-7075 (650) 688-7202 <a href="mailto:vijay.reddy@thermohaake.com">vijay.reddy@thermohaake.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Rees, Mark</b> The Lubrizol Corp. 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-5385  <a href="mailto:mree@lubrizol.com">mree@lubrizol.com</a>	MR	☺
<b>Righi, Dino</b> Lubrizol Corp. 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-4436 (440) 943-9013 <a href="mailto:dwri@lubrizol.com">dwri@lubrizol.com</a>		
<b>Rosenbaum, John</b> Chevron Products Co. 100 Chevron Way Richmond, CA 94802-0627	(510) 242-5673 (510) 242-3758 <a href="mailto:rosj@chevron.com">rosj@chevron.com</a>		
<b>Rumford, Robert H.</b> Haltermann Products 1201 South Sheldon Rd. Channelview, TX 77530-0429	(281) 457-2768 (281) 457-1469 <a href="mailto:rhrumford@haltermann-usa.com">rhrumford@haltermann-usa.com</a>		
<b>Runkle Jr., William A.</b> Valvoline Company LA 3 South P.O. Box 14000 Lexington, KY 40512-4000	(859) 357-7686 (859) 357-3343 <a href="mailto:wrunkle@ashland.com">wrunkle@ashland.com</a>	WAR	☺
<b>Rutherford, Jim</b> Chevron Oronite 100 Chevron Way Richmond, CA 94802-0627	(510) 242-3410 (510) 242-1930 <a href="mailto:jaru@chevron.com">jaru@chevron.com</a>	JAR	☺
<b>St. Germain, Bob</b> Crompton Corp. 6847 Napier Lane Houston, TX 77069	(281) 587-2393 (281) 587-0338 <a href="mailto:robert_stgermain@cromptoncorp.com">robert_stgermain@cromptoncorp.com</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Sander, John</b> Lubrication Engineers, Inc. 1919 E. Tulsa Wichita, KS 67216	(316) 529-2112 (316) 529-4654 <a href="mailto:sanderj@lubricationengineers.com">sanderj@lubricationengineers.com</a>		
<b>Sarlo, Mark</b> Southwest Research Institute 6220 Culebra Rd. San Antonio, TX 78238	(210) 522-3754 (210) 523-6919 <a href="mailto:msarlo@swri.org">msarlo@swri.org</a>		
<b>Schoppe, Dean</b> PerkinElmer AR 5404 Bandera Rd. San Antonio, TX 78238	(210) 523-4605 (210) 523-4607 <a href="mailto:dean.schoppe@perkinelmer.com">dean.schoppe@perkinelmer.com</a>		
<b>Schuettenburg, Alex</b> Phillips Petroleum 148 AL, PRC Bartlesville, OK 74004	(918) 661-3863 (918) 661-8060 <a href="mailto:adschue@ppco.com">adschue@ppco.com</a>		
<b>Scinto, Phil</b> Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-2161 (440) 347-9031 <a href="mailto:prs@lubrizol.com">prs@lubrizol.com</a>		
<b>Selby, Ted</b> Savant, Inc. 4800 James Savage Rd. Midland, MI 48642	(517) 496-2301 (517) 496-3438 <a href="mailto:tselby@savantgroup.com">tselby@savantgroup.com</a>		
<b>Shah, Mayur</b> Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092	(440) 347-1697 <a href="mailto:mpsa@lubrizol.com">mpsa@lubrizol.com</a>		
<b>Shaub, Hal</b> Center For Innovation 1112 Hidden Ridge Dr. #1071 Irving, TX 75038	(972) 518-1223 (972) 756-1063 <a href="mailto:hshaub@webtv.net">hshaub@webtv.net</a>		

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	<b>Phone No. Fax No. e-mail add.</b>	<b>INITIAL WHEN PRESENT</b>	<b>ROOM FEE</b>
<b>Shipinski, John</b> Toyota 1588 Woodridge Ann Arbor, MI 48105	(734) 995-3754 (734) 995-5971 <a href="mailto:shipinski@ttc-usa.com">shipinski@ttc-usa.com</a>		
<b>Shugarman, Arnold</b> Consultant 1906 E. Catalina Ave. Santa Ana, CA 92705	(714) 206-6136 <a href="mailto:shugarman@earthlink.net">shugarman@earthlink.net</a>		
<b>Siemelink, Hans</b> Shell Oil One Shell Plaza, 910 Louisiana Rd. Houston, TX 77002	<a href="mailto:hsiemelink@shell.com">hsiemelink@shell.com</a>		
<b>Spence, Steve</b> Mohawk Lubricants Ltd 130 Forester St. N. Vancouver, Canada V7H 2M9	(604) 924-2701 <a href="mailto:sspence@mohawklubes.com">sspence@mohawklubes.com</a>		
<b>Smith, Clinton</b> Imperial Oil 111 St. Clair Ave. Toronto, Ontario M5W1K3	(416) 968-8308 (416) 968-5680 <a href="mailto:clint-smith@esso.com">clint-smith@esso.com</a>		
<b>Smith, Leigh L.</b> CITGO Petroleum Corp. 28 Cedar Hill Rd. Newtown, CT 06470	(203) 270-8156 (203) 270-8452 <a href="mailto:lsmith2@citgo.com">lsmith2@citgo.com</a>		
<b>Smith, Roy (A09)</b> Detroit Diesel Corp. 13400 W. Outer Loop Dr. Detroit, MI 48239-4001	(313) 592-5758 (313) 592-7888 <a href="mailto:roy.smith@detroitdiesel.com">roy.smith@detroitdiesel.com</a>		
<b>Stephens, Carl</b> Ashland Inc. 22 <sup>nd</sup> and Front Sts. Ashland, KY 41101	(606) 329-5198 (606) 329-3009 <a href="mailto:cstephens@ashland.com">cstephens@ashland.com</a>		



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<b>Strigner, Paul</b> 31 Seguin St. Ottawa, Ontario Canada K1J 6P2	(613) 746-0647 (613) 746-9292		
<b>Sutherland, Mark</b> Chevron / Oronite 4502 Centerview, Suite 210 San Antonio, TX 78228	(210) 731-5600 (210) 731-5699 <a href="mailto:msut@chevron.com">msut@chevron.com</a>		
<b>Sutherland, Robert</b> Pennzoil-Quaker State 1520 Lake Front Circle The Woodlands, TX 77380	(281) 363-8029 (281) 363-8002 <a href="mailto:RobertSutherland@pzlqs.com">RobertSutherland@pzlqs.com</a>		
<b>Sztenderowicz, Mark</b> Chevron Products Co. 100 Chevron Way Richmond, CA 94802-0627	(510) 242-1022 (510) 242-3758 <a href="mailto:mlsz@chevron.com">mlsz@chevron.com</a>		
<b>Tarbox, Steven R.</b> 76 Lubricants Company 1920 E. Deere Avenue Santa Ana, CA 92705	(714) 428-7400 (714) 428-7498 <a href="mailto:starbox@tosco.com">starbox@tosco.com</a>		
<b>Tharby, Ron</b> Tharby & Associates 273 Juniper Ave. Burlington, Ontario L7L2TS	(905) 632-1568 (905) 333-8194		
<b>Tucker, Richard</b> Shell International Petroleum Co. P.O. Box 1380 Houston, TX 77251-1380	(281) 544-8354 (281) 544-6196 <a href="mailto:rtucker@shellus.com">rtucker@shellus.com</a>		
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**ASTM****SECTION D.02.B0.02  
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL****ATTENDANCE LIST****OCTOBER 2001****PREVIOUS GUESTS**

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<b>Weismiller, Michael</b> Ciba Spec. Chemicals 540 White Plains Rd. Tarrytown, NY 10591	(914) 785-5515 <a href="mailto:michael.weismiller@cibasc.com">michael.weismiller@cibasc.com</a>		
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<b>Wilson, Malcolm W.</b> Chevron Global Lubricants 100 Chevron Way Richmond, CA 94802	(510) 242-1292 (510) 242-2358 <a href="mailto:maww@chevron.com">maww@chevron.com</a>		

**ASTM****SECTION D.02.B0.02  
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL****ATTENDANCE LIST****OCTOBER 2001****PREVIOUS GUESTS**

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<b>Zalar, John</b> 6555 Penn Ave. ASTM TMC Pittsburgh, PA 15206	(412) 365-1005 (412) 365-1047 <a href="mailto:jlz@tmc.astm.cmri.cmu.edu">jlz@tmc.astm.cmri.cmu.edu</a>	JLZ	☺
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# ASTM

## SECTION D.02.B0.02 HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL

### ATTENDANCE LIST

OCTOBER 2001

### GUESTS

	Phone No. Fax No. e-mail add.	ROOM FEE
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Name: _____		
Company: _____		
Address: _____		
Name: _____		
Company: _____		
Address: _____		
Name: _____		
Company: _____		
Address: _____		
Name: _____		
Company: _____		
Address: _____		
Name: _____		
Company: _____		
Address: _____		

ASTM – DEOCP-ON  
EXIT – CRITERIA BALLOTS ON PC-9 LIMITS

**AFFIRMATIVE ON ALL LIMITS**

RohMax

ChevronTexaco

ExxonMobil

Cummins Inc.

International Truck & Engine

GM

ASTM – HDEOCP  
EXIT – CRITERIA BALLOTS ON PC-9 LIMITS

**NEGATIVES**

Infineum – HT/HS/ Mack T-10

Valvoline – Pumpability

Lubrizol - Caterpillar 1R/Pumpability

## ASTM – HDEOCP

### **ABSTAINS**

- Chevron Oronite – Mack T-10/Seq IIIF
- Imperial Oil – Seq IIIF
- Valvoline – Mack T-10
- Infineum – Volatility
- John Deere – Cat IR/IK; Pumpability
- Equilon - HT/HS
- Ethyl - Caterpillar 1R

# HDEOCP

16<sup>th</sup> October 2001



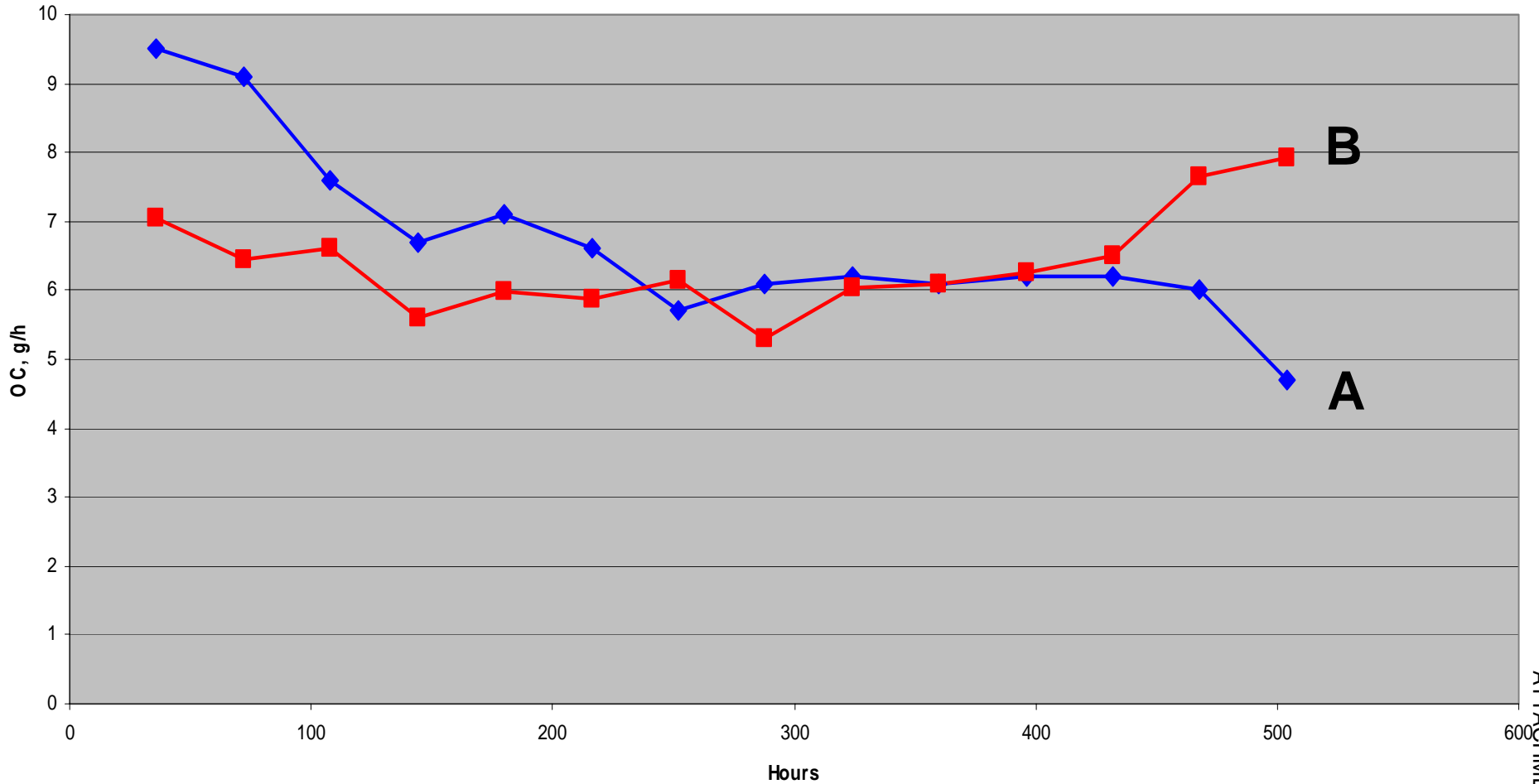
# Caterpillar 1R Limit Proposal

# Caterpillar 1R Oil Consumption

**Note: Same Oil Run Twice!**

1R	Test A	Test B
WDR	282.4	340
TGC	20.25	26.5
TLC	13.75	20.25
IOC	6.7	6.2
FOC	5.4	7.8
Delta OC	-1.3	1.6
Ratio FOC/IOC	0.806	1.249

# Caterpillar 1R Oil Consumption



# Caterpillar 1R Oil Consumption

- Current oil consumption “delta” proposal results in ratios that fall within the variability of the test
  - Least mean square mean of matrix data = 1.09
  - Root mean square error = 0.1567
- This will cause oils with good volatility to fail
- Lubrizol offers the proposal that:-

Oil Consumption limit at 2 sigma of the matrix data,  
EOT/IOC ratio = 1.4

LAB	A	A	A	F	G	G	B	G	A	A	A	G	G	F	G	D	B	D
CMIR	41535	41536	41537	41545	41539	41541	41554	41540	41538	41760	41573	41542	41761	41546	41570	41968	41547	41543
STAND	1	2	3	1	1	3	1	2	1	2	3	1	2	1	3	1	1	1
ENRUN	45	40	32	6	65	34	31	36	46	41	33	66	37	7	35	43	32	44
TESTLEN	504	504	504	504	504	504	504	504	504	504	504	504	504	504	504	504	504	504
IND	1005-1	1005-1	PC-9A	1005-1	1005-1	PC-9A	1005-1	1005-1	PC-9A	PC-9D	1005-1	PC-9A	PC-9D	PC-9A	1005-1	PC-9A	PC-9A	1005-1
OCONH036	13	9.8	11.3	14.2	15.6	6.8	12.7	13.6	6.1	7.9	11.8	6.4	8	7.2	7.7	12	9.9	13.4
OCONH072	11.3	8.8	11.1	9.5	12.1	8.7	11.5	12.6	8.1	11.7	10.8	7.1	9.4	7.9	11.8	10.1	7.3	13
OCONH108	11	8.7	9	8.3	10.3	7.8	10.3	11.1	8.3	12	10	6.8	9.4	6.9	11.8	11.4	9	11.8
OCONH144	10.8	9.2	8.9	6.6	16.4	7.6	10.2	10.8	9.4	9.3	9.7	7	10.1	6.4	9.4	11.6	9.4	10.7
OCONH180	9.6	7.3	10.6	5.1	9.1	6.3	14.8	10.8	9	10.8	9.7	6.5	6.6	5.6	9.2	10.2	8.4	11.2
OCONH216	10	7.6	9.9	4.3	9.1	6.5	10.7	9.6	7.9	15.4	9.6	6	8.4	5.6	8.1	10.3	8.5	10.6
OCONH252	10	8.1	9.5	7.9	9.7	6.8	8.6	10.8	8.9	14.3	9.3	5.6	6.1	5.4	7.8	10	9.8	10.5
OCONH288	9.2	8	9.6	7.8	10.7	6.9	10	9.6	8.3	13.1	9.2	6.2	8.8	5.1	8.4	9.7	13.9	10.6
OCONH324	9.5	6.5	7.2	7.9	8.9	6.1	6.8	15.1	8.7	10.9	8.9	9.5	8.4	6.6	7.4	8.9	16.6	10
OCONH360	8.8	7.8	10.3	7.1	7.2	5.9	9	8.9	7.2	9.5	8.3	5.8	8.8	5.4	7.6	9.6	13.5	9.1
OCONH396	8.3	7.7	8.7	7.1	7.8	6.1	9.3	90	7.5	11.5	9.4	6.4	8.4	5.1	8	9.6	12.8	9
OCONH432	9.3	7.7	8.1	8.3	7.6	6.1	7	9.2	7.8	11.3	9.9	6.7	8.8	4.1	7.3	10.5	11	10.3
OCONH468	8.3	6.8	8.1	7.7	8.2	5.4	9.6	10.6	8.3	11.2	8.4	6.2	9.1	4.9	6.7	10.6	15.1	9.5
OCONH504	8.7	6.9	8.3	9.3	8	5.5	8.9	8.1	6.7	10.9	8.5	6.5	9.6	5.5	8.2	9.7	9.2	9.4
initial	10.8	8.5	10.0	8.0	11.8	7.2	11.3	11.3	8.2	11.6	10.1	6.5	8.3	6.4	9.4	10.8	8.9	11.6
final	8.5	6.9	8.2	8.5	8.1	5.5	9.3	9.4	7.5	11.1	8.5	6.4	9.4	5.2	7.5	10.2	12.2	9.5
final - initial	-2.3	-1.7	-1.8	0.5	-3.7	-1.8	-2.0	-2.0	-0.7	-0.6	-1.7	-0.1	1.1	-1.2	-2.0	-0.7	3.3	-2.2

Lucky break on hr 468

close!

Proposed Mack T10 Merit Rating System  
presented to  
Heavy Duty Engine Oil Classification Panel

# Participants

## Subgroup of the Mack T10 Task Force

- Mack
- ExxonMobil
- Infineum
- Lubrizol
  - Ethyl
- Oronite

# Merit Rating System Terms Applied to Each Criterion

- Anchors -- based on EMA one test limit
- Maximums -- limit of acceptable performance
- Minimums -- best achievable result
- Weights -- relative contribution to total merit



# Proposed Merit Rating System

- A result at or below the anchors for all five criteria would pass the test.
- If any of the five criteria results is above the maximum, the test fails.
- If results are below the maximums for all five criteria but one or more results is above the anchors, a mathematical system determines whether marginal numbers above the anchors are compensated by better than anchor results on other criteria.

# Parameters

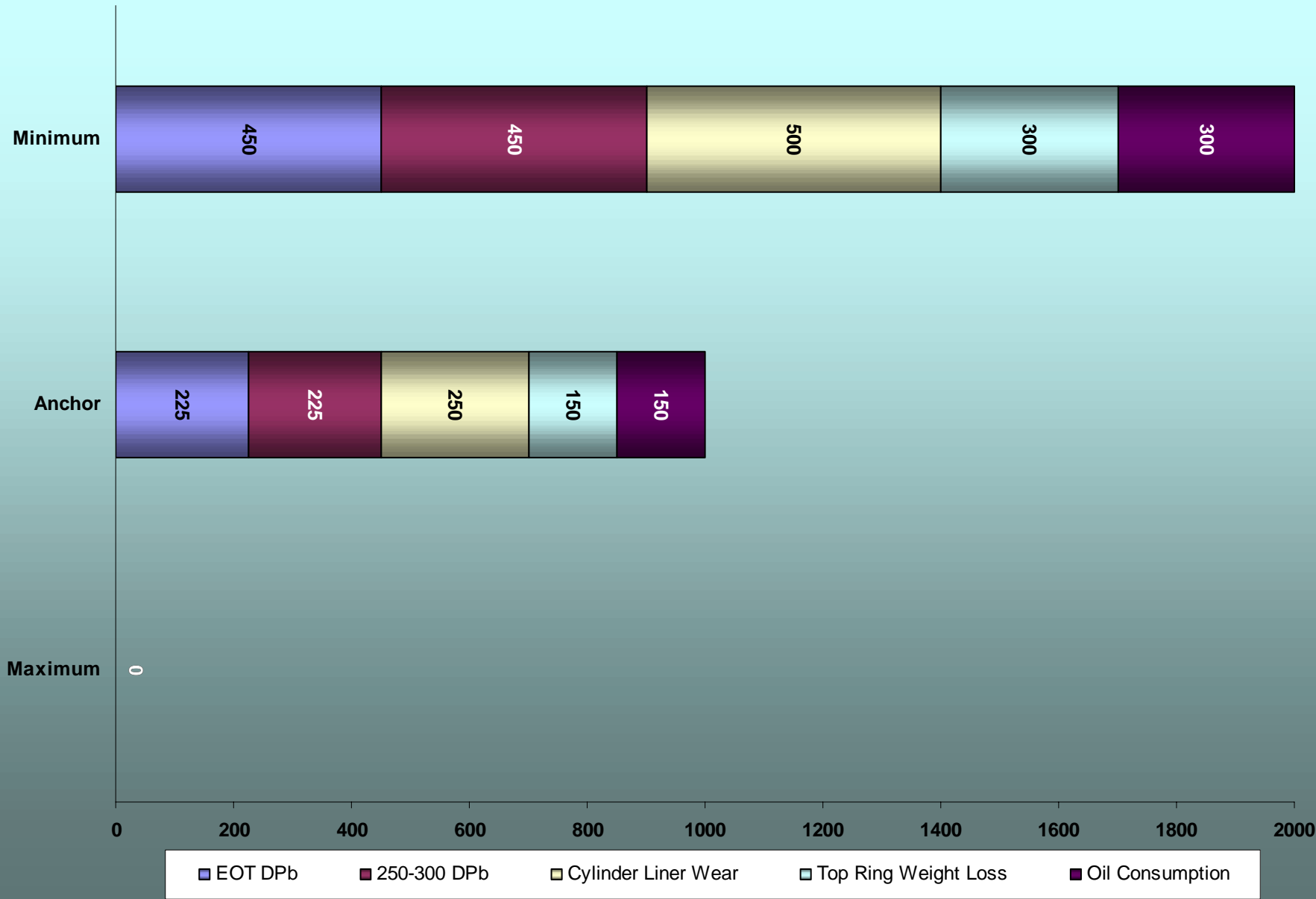
Criterion	EOT Delta Pb	250-300 Hour Delta PB	Cylinder Liner Wear	Top Ring Weight Loss	Oil Consumption
Weight	225	225	250	150	150
Maximum	35	12	32.0	158	65.0
Anchor	30	10	30	140	57
Minimum	5	0	12	50	25

# Multiple Test Acceptance Procedure

- Multiple test evaluation would consist of averaging the five individual criteria across multiple tests. The Mack T10 Merit Rating System would be applied to the averages for the criteria.

# Examples Using Hypothetical Test Results

		EOT Delta Pb	250-300 Hour Delta PB	Cylinder Liner Wear	Top Ring Weight Loss	Oil Consumption	Calculated Merit	Final Merit
On the border		30	10	30.0	140	57.0	1000	<b>1000</b>
Borderline Failures		<b>31</b>	10	30.0	140	57.0	955	<b>955</b>
		30	<b>11</b>	30.0	140	57.0	888	<b>888</b>
		30	10	<b>31.0</b>	140	57.0	875	<b>875</b>
		30	10	30.0	<b>141</b>	57.0	992	<b>992</b>
		30	10	30.0	140	<b>57.1</b>	998	<b>998</b>
One parameter can make up for another		<b>31</b>	5	30.0	140	57.0	1068	<b>1068</b>
		30	<b>11</b>	20.0	140	57.0	1026	<b>1026</b>
		30	7	30.0	140	<b>60.0</b>	1011	<b>1011</b>
		30	10	20.0	<b>150</b>	57.0	1056	<b>1056</b>
		30	4	<b>31.0</b>	140	57.0	1010	<b>1010</b>
Over Maximum Failures		5	5	5.0	5	<b>80.0</b>	1306	<b>Fail</b>
		5	5	5.0	<b>200</b>	20.0	1238	<b>Fail</b>
		5	5	<b>35.0</b>	5	20.0	1013	<b>Fail</b>
		5	<b>15</b>	5.0	5	20.0	1213	<b>Fail</b>
		<b>36</b>	5	5.0	5	20.0	1393	<b>Fail</b>
Multiple Test Averaging	Failed First Test	25	10	<b>32.5</b>	140	57.0		<b>Fail</b>
	Second Test	25	10	28.0	140	57.0		
	Average -- Pass	25	10	30.3	140	57.0	1014	<b>1014</b>

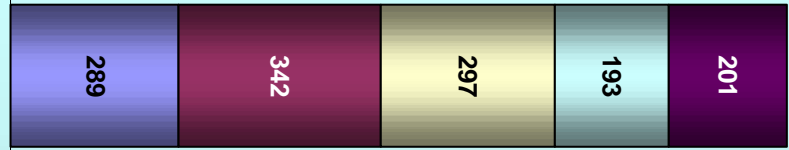


October 16, 2001

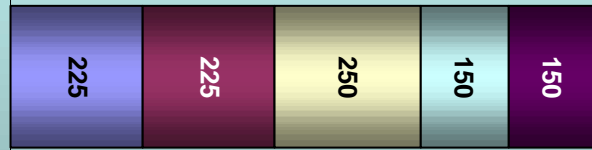
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8

Anchors-13TestSD



Anchors



Anchors+13TestSD



-1000 -500 0 500 1000 1500

EOT Delta Pb 250-300 Hour Delta PB Cylinder Liner Wear Top Ring Weight Loss Oil Consumption

# T-10 Tiered Limits

	1 Test	2 Tests	3 Tests
Liner Wear	30	31.6	32.4
Top Ring Weight Loss	140	152.5	158.1
EOT Lead	30	33.4	34.9
250-300 Lead	10	12.5	13.6
Ave. Oil Consumption	57	62.3	64.6

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

# 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



# 1R Tiered Limits

	1 Test	2 Tests	3 Tests
WDR	382.0	396.0	402.2
TGC	52	56.7	58.7
TLC	31	34.8	36.5
IOC	13.1	13.1	13.1
FOC	IOC+1.8	IOC+1.8	IOC+1.8

JLZ / 10-16-01

# T-8E Tiered Limits

	1 Test	2 Tests	3 Tests
Rel. Vis. @ 4.8% Soot	1.8	1.9	2.0

## Benefits of a Merit System

- More cost effective testing
- Consistent with reducing the time between ASTM acceptance and first date of API licensing
- Allows test developer to weight individual parameters
- Adds an incentive for improved performance
- Flexibility in setting up system
- Easier to gain consensus on limits

- Testing is more cost effective as some accommodation has been incorporated into the merit system for the precision of the test. This accommodation for precision is done on a parameter by parameter basis. A borderline fail under the fixed limit system, could be acceptable under a merit system and thus eliminate additional testing.
- To the extent that repeat testing is eliminated, this will help speed up approval programs and reduce stand availability constraints.
- Key performance parameters can be heavily weighted vs. less critical, but nonetheless important parameters.
- To enable a passing merit to be achieved, formulators have an incentive to improve performance (merits) in key performance areas to ensure an overall pass if another parameter is a borderline fail.
- The system developers are not looking at simply “limits” they can set maximums, minimums, weighting factors etc.
- The added flexibility of a merit system should help in gaining consensus

## Motion

To accept the proposed “Mack T-10 Merit System<sup>1</sup>” to evaluate oils against the API CI-4 performance category. A minimum merit of 1000 would be required.



# **M11 EGR Test**

**Presentation to  
HDEOCP  
October 16, 2001  
David M Stehouwer**

# Evaluation of Beaded Filters

---

- Concern over number and spacing of pleats
- Questionable used filters returned to FG
- Statistical sampling (36) of 550 filter batch returned to FG
- Perform flow vs. restriction
- Examine extremes for pleat count and spacing
- Perform dust capacity testing on extremes
- Refer to O&H Panel

## Analysis of Returned Filters by Fleetguard

<b>Oil</b>	<b>Filter</b>	<b># Pleats</b>	<b>Area Cm2</b>	<b>Gm/100 cm2</b>	<b>Total Contaminant Gm</b>
E	A	61	5243	2.00	105
E	B	55	4727	1.65	80
E	MCD1 Even			1.6971	
E	MCD1 Bunched			1.3855	
E	MCD1 Average	59	5071	1.5413	78
E	MCD7 Even			0.9663	
E	MCD7 Bunched			0.8132	
E	MCD2 Average	56	4813	0.88975	43
Test	Even			4.7729	
Test	Bunched			4.4734	
Test	Average	60	5157	4.6232	238

David M Stehouwer, Cummins Inc.



# Observations from Filter Analysis

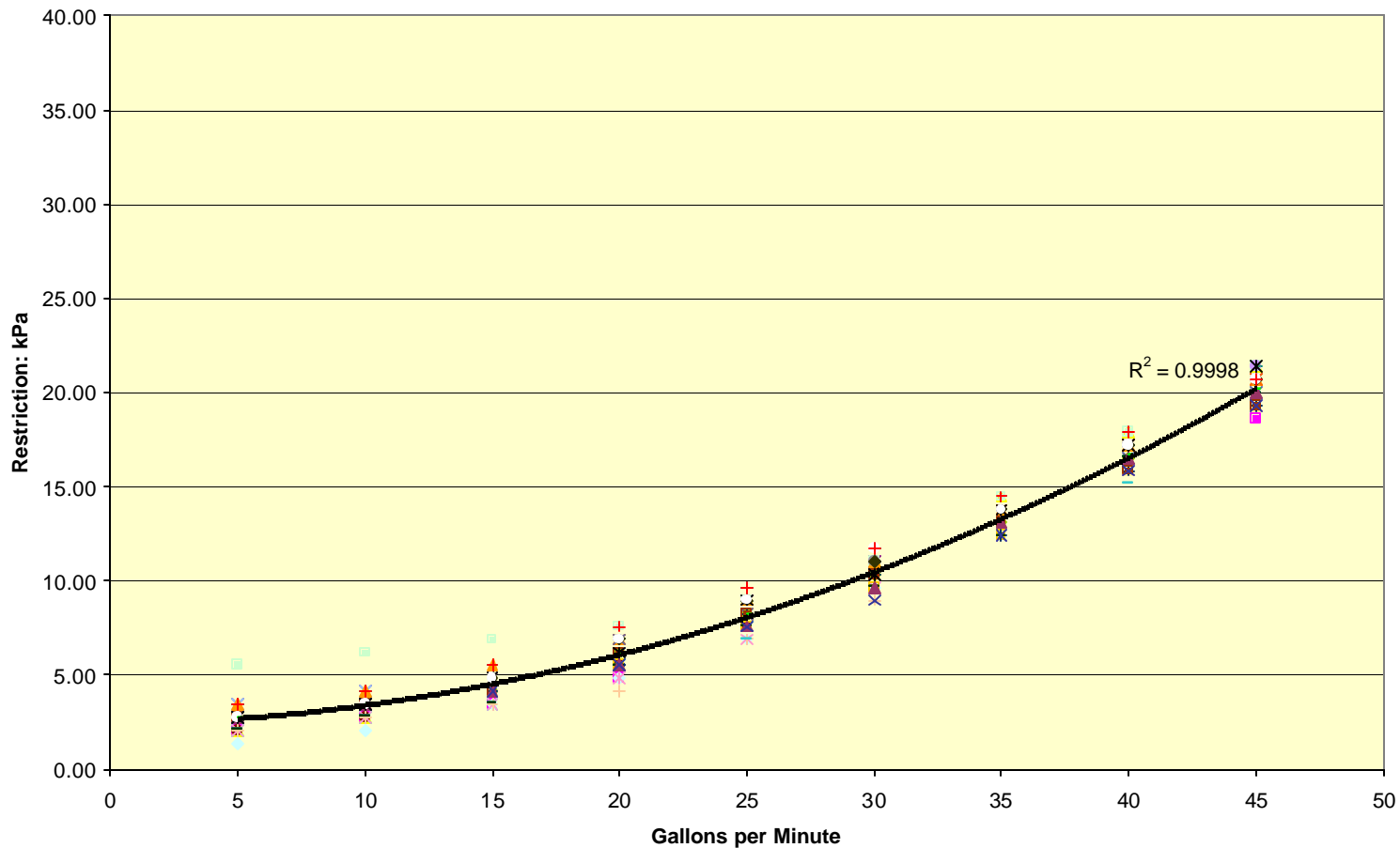
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- Pleat count is from 55 to 61 with a target of 55 min.
- Bunched pleats do remove slightly less material, but...
- Bunched pleats can remove a lot of deposit with less variation than expected
- The relationship with sludge ratings and filter deposits suggests that when an oil exceeds its capacity to hold sludge, it comes out all over the engine... filter, pan, valve covers etc.

# Flow vs. Restriction for Reference Filters

## ○ Analysis of 34 filters reference filters

Flow vs Restriction

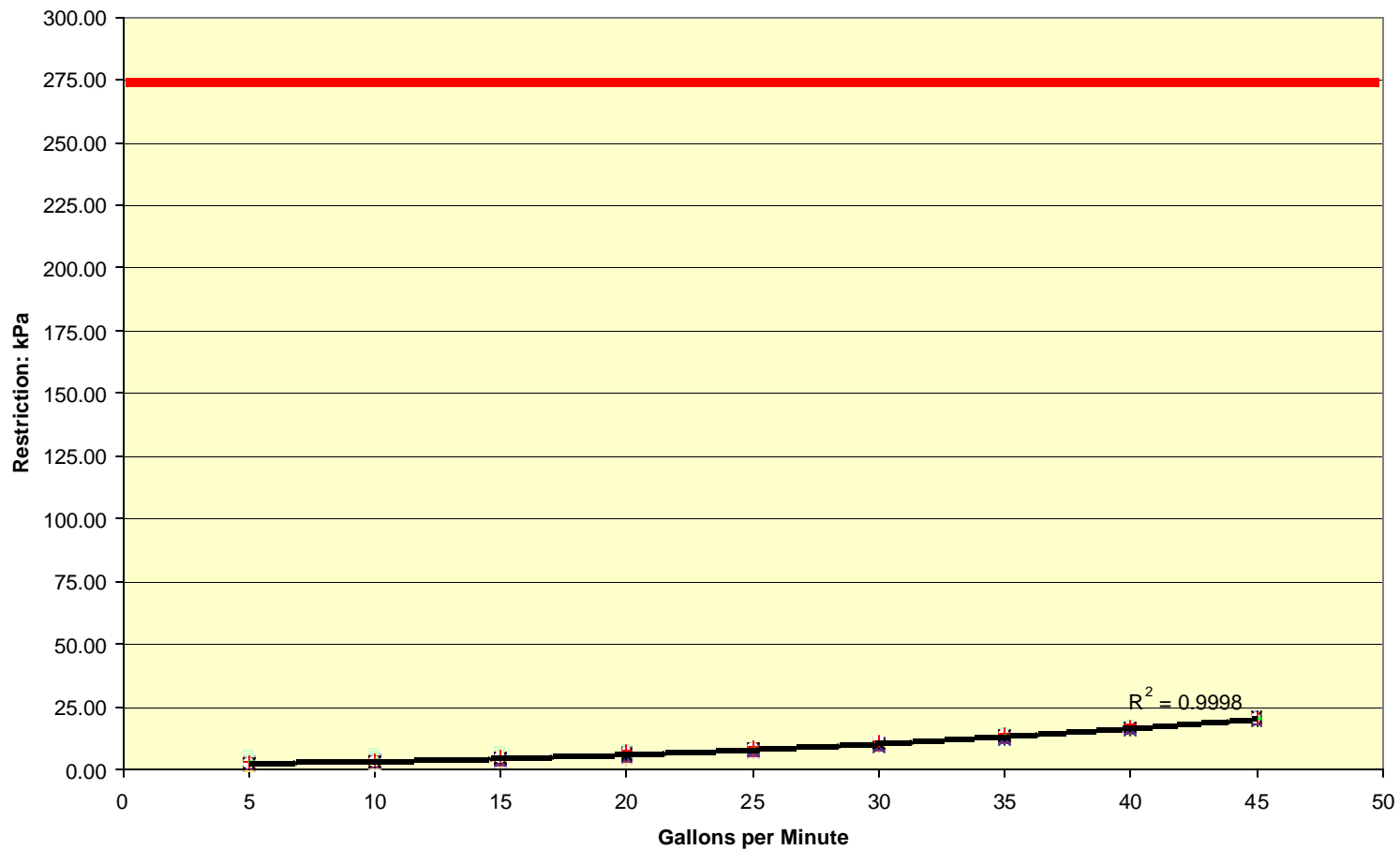


David M Stehouwer, Cummins Inc.

# Flow vs. Restriction for Reference Filters

## ○ Showing M11 EGR Filter Plugging Limit

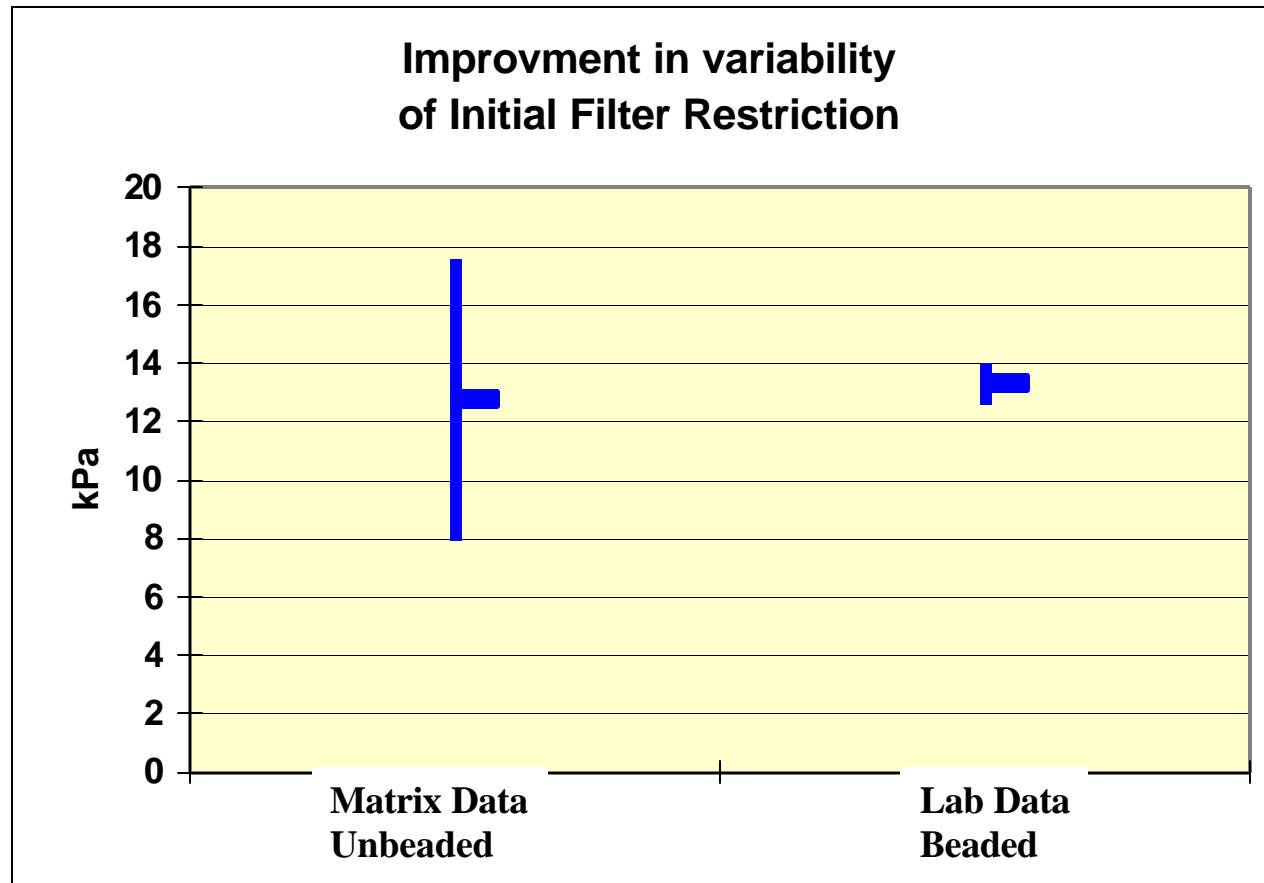
Flow vs Restriction



David M Stehouwer, Cummins Inc.

# Improvement in Consistency

- Comparison of 1st 14 matrix runs using unbeaded filters with lab result on beaded filters. Mean +/- 1 sd.



# CI-4 Elastomer Surveillance Panel

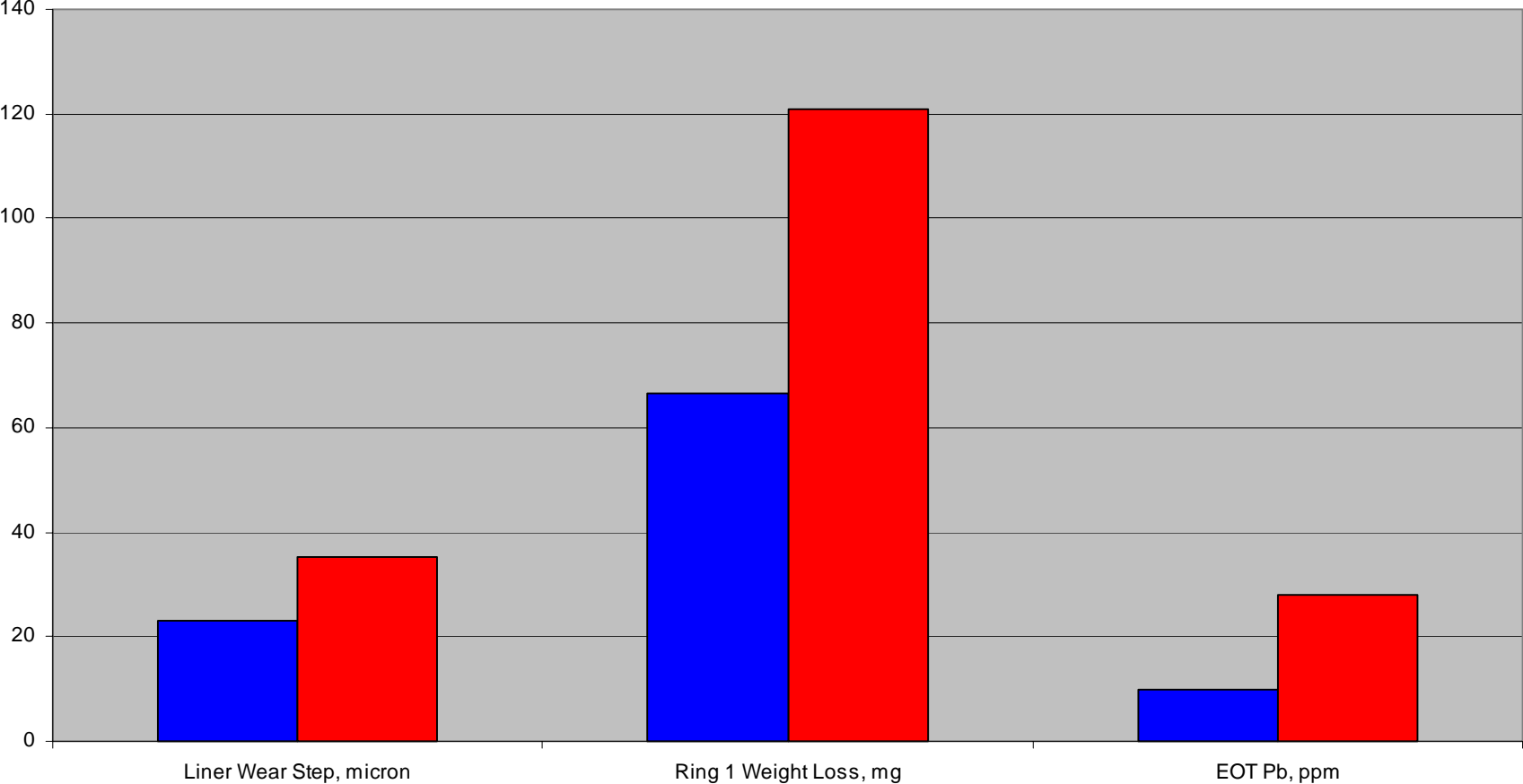
## Actions from Oct. 11 Mtg.

- Recommend Changes to proposed limits
- Adopted statistical method for determining if a candidate oil is different than the ref.oil or limit
- Will bring procedure to standard within D02 not D11 - some rewording needed
- Defined a system for listing ref. Oil data on TMC website
- Preliminary ideas on BOI/VGRA - will request data for review to present to API BOI/VGRA TF

# CI-4 Backward Compatibility

# EGR Backward Compatibility

Mack T9 / T10 Comparison

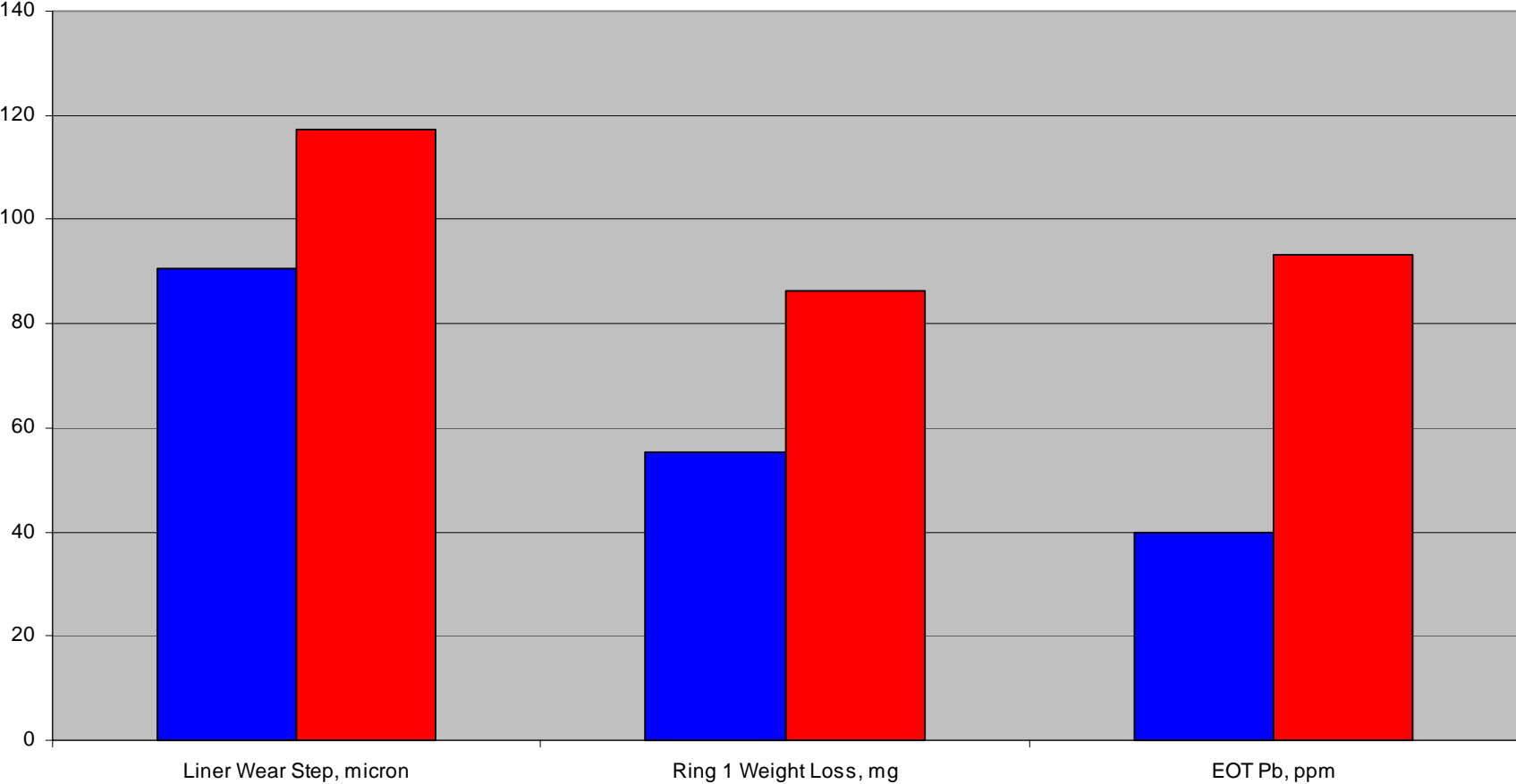


■ Mack T9  
■ Mack T10



# EGR Backward Compatibility

Mack T9 / T10 Results as Percentage of Limits

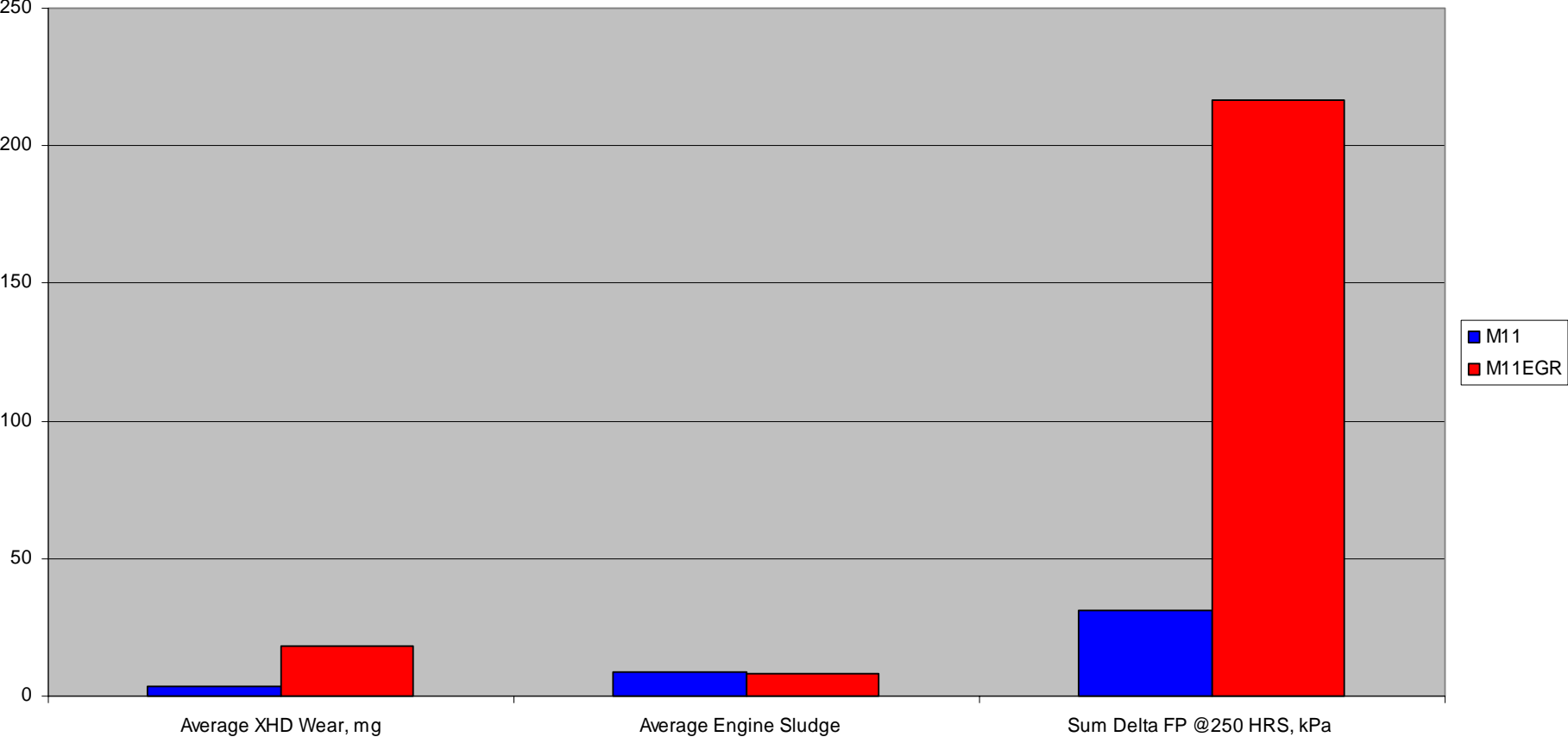


■ Mack T9  
■ Mack T10



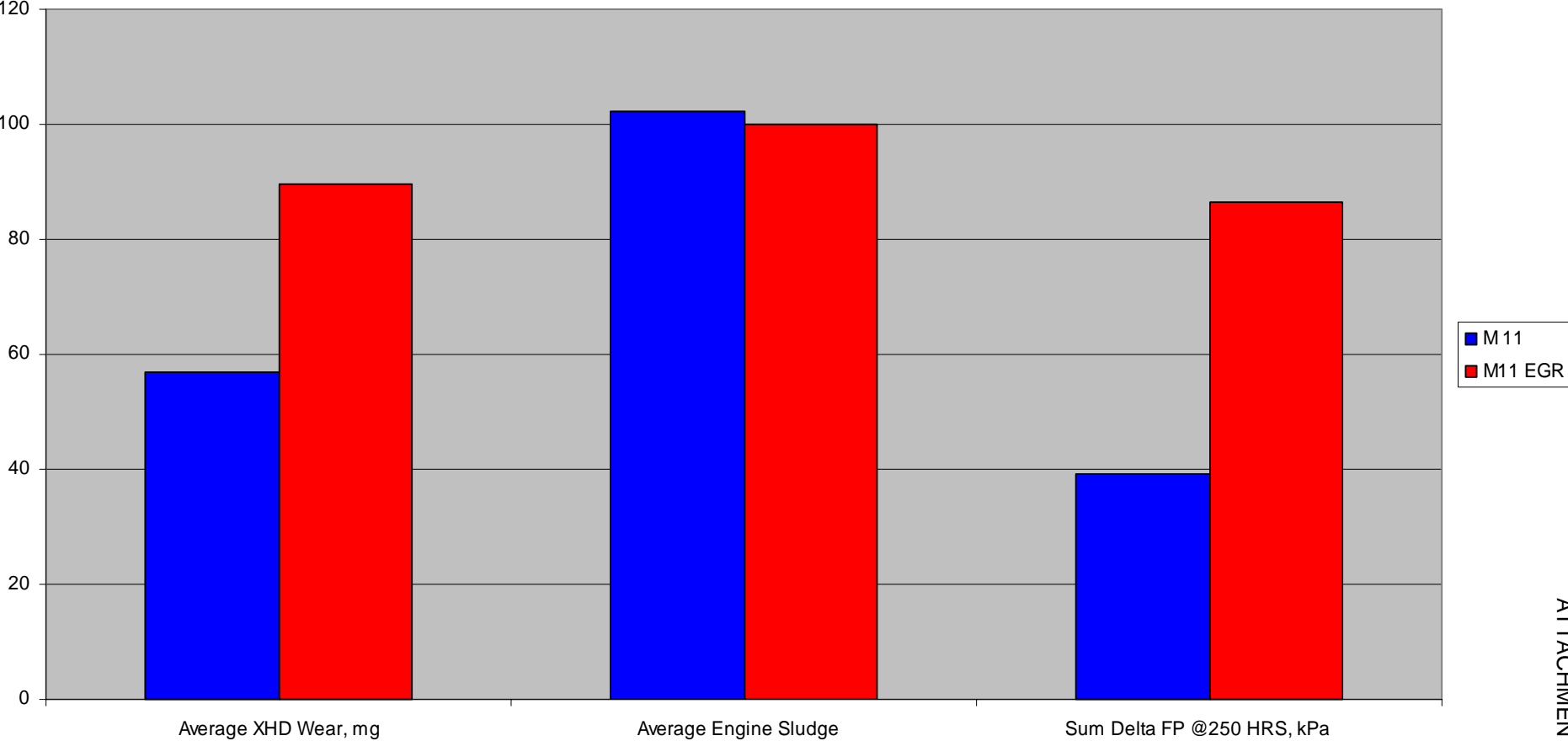
# EGR Backward Compatibility

Cummins M11 / M11EGR Comparison



# EGR Backward Compatibility

Cummins M11 / M11EGR Results as Percentage of Limits



# EGR Backward Compatibility

- Performance observed in the new EGR tests is more severe than their non-EGR predecessors
- Lubrizol offers the motion that:-
  - “The tests and limits as approved by ASTM B used to qualify oils for API CI-4 may be used to qualify oils for API CH-4”