

MEETING MINUTES

HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL OF

D02.B0.02

June 27, 2000

The Westin Hotel – Seattle, Washington

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ACTION ITEMS

1. **Base oils shipped to selected additive suppliers to blend matrix oils...MDTF**
2. **Complete hardware changes and lab inspections ...T-10 & M-11 Task Forces**
3. **Ready or Not ?...1Q Task Force**
4. **Resolve RFWT issue...HDEOCP**
5. **Sequence VIII for L-38 ?...HDEOCP**

MINUTES

- 1.0 Call to Order
 - 1.1 Chairman Jim McGeehan opened the meeting at 1:08 PM on June 27, 2000, in the Grand Ballroom I of The Westin Hotel in Seattle, Washington. There were 12 members or representatives and approximately 69 guests present. The attendance list is shown as Attachment 2.
- 2.0 Agenda
 - 2.1 The agenda for the meeting (Attachment 1) was reviewed and requests for time to discuss the L-38 / Sequence VIII and the JDQ-78A were deferred to new business.
- 3.0 Meeting Minutes
 - 3.1 The minutes of the April 26, 2000, meeting were approved as posted on the TMC website.
- 4.0 Membership
 - 4.1 There were no membership changes.
- 5.0 Matrix Design Task Force

- 5.1 Don Marn presented the MDTF report (Attachment 3) and indicated that the number of oils to be used in the test matrices was back to 9, consisting of 3 base oils [(1) Group I and (2) Group II] and 3 additive technologies. He projected that the blended oils would be available by mid-September and could be available earlier. There is still some uncertainty with regard to the number of T-10 stands, which will be used in the T-10 matrix, but the cost to the ACC, API and EMA would remain the same. EMA needs to identify the 3 additive technology suppliers so the base oils can be shipped to them for blending the matrix test oils.
- 5.2 Characteristics of the base oils selected for use in the matrix are as follows:
- | | | |
|----------|---------------|-----------------|
| Group I | 78% Saturates | 1500 ppm Sulfur |
| Group II | 92% Saturates | 200 ppm Sulfur |
| Group II | 99% Saturates | <10 ppm Sulfur |
- 5.3 Don Marn moved for acceptance of the matrix design using 9 test oils with 26 M-11 EGR tests, 28 1Q tests and 26 or 28 T-10 tests. Various seconds. The motion passed with 11 for, 0 against and 0 abstains.
- 6.0 T-10 Status Report
- 6.1 Brian Lawrence presented the T-10 Task Force report (Attachment 4) and requested that oil samples from either T-9 or T-10 tests be forwarded to Joe Franklin for use in development of the IR method for oxidation. He also noted he is being transferred back to the U.K. and Wim Van Dam will become the T.F. chairman.
- 6.2 Greg Shank presented "proof of concept" discrimination data for the T-10 (Attachment 5).
- 6.3 Brian Lawrence moved to accept the recommendation of the T-10 T.F. that the test has demonstrated "proof of concept" and is ready to start matrix work, subject to another T.F. review and approval. Motion seconded. John Zalar brought up that approval by the HDEOCP that the test was ready to start matrix testing would trigger billing of the stakeholders per the memorandum of agreement (MOA) for that particular test. The motion passed with 12 for, 0 against and 0 abstains.
- 7.0 M-11 EGR Status Report
- 7.1 John Graham presented some recent Cummins experience with EGR engines in the field and the M-11 EGR Task Force report (Attachment 6).
- 7.2 John Graham moved acceptance of the M-11 EGR test as meeting "proof of concept" for PC-9 matrix testing, subject to M-11 T.F. assessment of proposed hardware improvements on or before September 7, 2000. Motion seconded. The motion passed with 12 for, 0 against and 0 abstains.
- 8.0 1Q Status Report
- 8.1 No one from Caterpillar was present and no task force report was given. Jim McGeehan expressed there is some concern that the test does not discriminate. He also reiterated that tests not ready in time for the matrix would be dropped from the category.
- 9.0 Oxidation Task Force
- 9.1 Rich Lee summarized the Oxidation Task Force report and actions from the last HDEOCP meeting. See the minutes from the April 26, 2000, HDEOCP meeting for his complete presentation.

10.0 Volatility Task Force

- 10.1 Cliff Venier has agreed to chair a Volatility Task Force and is seeking additional task force members as well as data on heavy duty engine oils. He presented some current volatility limits and proposed some questions for the T.F. to address (Attachment 7).

11.0 Sooted Oil Pumpability

- 11.1 Chris May gave a LOTRUO report (Attachment 8), noting that they have received more oils and are close to having enough samples to initiate a round robin using the standard low temperature tests (CCS, MRV). They still could use 1 gallon samples of drain oil containing 5% or more soot.
- 11.2 Work they have already done indicates a sensitivity of some of the tests to the pre-condition of the oil. A standardized pre-conditioning may be necessary to obtain repeatable results. Modified equipment and new procedures are also being evaluated.

12.0 Elastomer Task Force

- 12.1 Tom Boschert presented the Elastomer Task Force report (Attachment 9) and recommended that the elastomer requirements NOT be part of D-4485, but rather be part of an EMA or OEM specification.

13.0 PC-9 Timeline

- 13.1 Brent Shoffner presented the PC-9 Timeline forecast (Attachment 10) and is now predicting the "API license date" as sometime after September, 2002.

14.0 Roller Follower Wear Test

- 14.1 Dick Kuhlman made a presentation (Attachment 11) contending that the RFWT is redundant to the M-11 and should be dropped from consideration as part of PC-9.
- 14.2 Frank Bondarowicz made a presentation (Attachment 12) contending that the RFWT is not redundant and should be kept in PC-9 because International will continue to use those cam followers for many years in their engines.

15.0 New Business

- 15.1 Zack Bishop approached the HDEOCP about the possibility of substituting the Sequence VIII test for the L-38 test in older heavy duty categories which are still active. He presented some data (Attachment 13) from the Sequence VIII matrix, which indicates the Sequence VIII would directionally give the same answers as the L-38. Don Burnett stated that the L-38 fuel is very stable, but if labs have supplies they don't need, they should contact Phillips. Rich Lee proposed using the Sequence VIII as an alternative test to the L-38, in active heavy duty categories, and the motion was seconded. Brian Lawrence proposed an amendment that further investigations take place and report back to the HDEOCP. The amended motion passed via voice vote with no objections or abstains.
- 15.2 Ken Chao requested facilitator support in elevating the JDQ-78A test method to an ASTM standard. Ralph Cherrillo indicated this was permissible if there was additional support for doing so. John Graham moved and Ken Chao seconded providing facilitator support to elevate the JDQ-78A test method to a standard. The motion passed with 11 for, 0 against and 1 abstain.

16.0 Adjournment

- 16.1 The meeting was adjourned at approximately 4:00 PM on June 27, 2000. The next meeting is scheduled for September 20, 2000, in Chicago at the Holiday Inn International – O'Hare.

Submitted by,
Jim Wells
Secretary to the HDEOCP

**Westin Hotel
Seattle, WA
June 27, 2000
1:00-5:00 pm**

Chairman/Secretary: Jim McGeehan/Jim Wells
Topic: PC-9

Desired Outcome:

- EGR Tests Discrimination
- Matrix Design Task-Force recommendations
- Introduction Date Time Line

TOPIC	PROCESS	WHO	TIME
Agenda	<ul style="list-style-type: none"> ● Review Agenda & Desired Outcome ● Voting members 	Group	1:00-1:05
Minutes Approval	<ul style="list-style-type: none"> ● April 26, 2000 Minutes 	Group	1:05-1:15
Oil Volatility	<ul style="list-style-type: none"> ● HDEOCP approved oxidation tests ● Oil Volatility Task Force formation 	Rich Lee Clifford Venier	1:15-1:30
Matrix Design	<ul style="list-style-type: none"> ● API&NCDT recommendations ● Formulation matrix ● Test matrix ● Cost and Time 	Don Marn Ralph Cherrillo	1:30-2:00
Status of EGR tests & discrimination	<ul style="list-style-type: none"> ● Mack T-10 ● Cummins M-11 ● Caterpillar 1Q 	Greg Shank John Graham Dave Nycz	2:00-3:00
Sooted Oil Pumpability	<ul style="list-style-type: none"> ● Task force report 	Chris May	3:00-3:30
Elastomers	<ul style="list-style-type: none"> ● Task Force Report 	Tom Boschert	3:30-3:45
PC-9 Time line	<ul style="list-style-type: none"> ● Total overview 	Brent Shoffner	3:45-4:00
Roller Follower Test	<ul style="list-style-type: none"> ● Need for roller Follower tests versus the Cummins M-11. 	Dick Kuhlman	4:00-4:15
Next Meeting	<ul style="list-style-type: none"> ● Date and place 	Jim McGeehan	4:15-4:20
New/ Old business	<ul style="list-style-type: none"> ● 	Group	4:20-5:00






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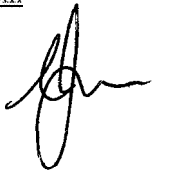

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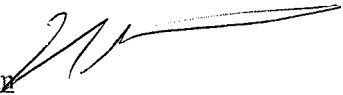


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WALTER GROFF SWRI 6220 Culebra Rd San Antonio, TX 78238	PH (210) 522-2823 FX (210) 684-7523 WGROFF@SWRI.ORG		
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SECTION D.02.B0.02
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL

ATTENDANCE LIST

JUNE 27, 2000

GUESTS

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<u>Rick OLIVER</u>	<u>972-724-2136</u>	
<u>RST</u>		
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SECTION D.02.B0.02
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL

ATTENDANCE LIST

JUNE 27, 2000

GUESTS

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	Fax No.	FEE
	e-mail add.	
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Address: <u>1919 E Tulsa</u>		
<u>Wichita, KS 67216</u>		
Name: <u>John Sander</u>		
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SECTION D.02.B0.02
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL

ATTENDANCE LIST

JUNE 27, 2000

GUESTS

Name:	Phone No.	ROOM
Company:	Fax No.	FEE
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SECTION D.02.B0.02
HEAVY DUTY ENGINE OIL CLASSIFICATION PANEL

ATTENDANCE LIST

JUNE 27, 2000

GUESTS

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PC-9 Matrix Design Task Force

Status Report

To

ASTM D02.B

Heavy Duty Engine Oil
Classification Panel

Tuesday June 27, 2000

Westin Hotel

Seattle, Washington

PC-9 Matrix Design Task Force Update

Final Formulations Matrix (9 Test Oils)

- ▶ Three Base Oils: One Group 1 and Two Group II
- ▶ Viscosity Grade: SAE 15W-40
- ▶ Technology: Three DI + VM Combinations

Viscosity Grade - Base Oil →		1 - I	1 - II	1 - II*
Technology ↓				
A		X	X	X
B		X	X	X
C		X	X	X
Component Key				
Technology		A	B	C
Base Oil		I	II	II*
Viscosity Grade		1		

PC-9 Matrix Design Task Force Update

PC-9 Test Matrices:

- Statistical Matrix Designs for:
M11/EGR, 1-Q/EGR, T-10/EGR
 - Designed to Provide:
 - Precision/BOI along with Reference Oil/LTMS Data
- Number of Tests:
 - M11/EGR = 26
 - 1-Q/EGR = 28
 - T-10/EGR = 26 or 28
- For Each Proposed Test Matrix
 - Cost Estimate Developed
 - Project Timeline Developed

PC-9 Matrix Design Task Force Update

Stand/Lab Test Capacity For PC-9 Matrix Project

Calibration Requirements For Each Lab:

First Stand = 3 Tests

Additional Stands = 2 Tests

	M-11/EGR	1-Q/EGR	T-10/EGR
Maximum Number of Stands	6	7	6
Number of Labs Participating	4	6	5
Test Prices Used	M-11/EGR	\$85,000	
For Project	1Q/EGR	\$60,000	
Cost Estimates	T-10/EGR	\$65,000	

PC-9 Matrix Design Task Force Update

Test Matrix Design & Project Cost

PC-9 Test:	M11/EGR		1Q/EGR		T-10/EGR		Total Cost	
	# Tests	\$	# Tests	\$	# Tests	\$	# Tests	\$
Number of Tests:	26	2.210	28	1.680	26	1.690	80	5.580
Project Cost (Funding Group)	10	0.850	8	0.480	9	0.585	27	1.915

*Calibration Requirements: 3 Tests for First Stand, 2 Tests for Additional Stands in Each Laboratory

			Test Prices Used	M-11/EGR	\$85,000	4 / 6
			For Matrix Project	1Q/EGR	\$60,000	6 / 7
			Cost Estimates	T-10/EGR	\$65,000	5 / 6

PC-9 Matrix Design Task Force Update

Matrix Design Options & Project Cost

Stand/Lab Test Capacity For PC-9 Matrix Project

Calibration Requirements For Each Lab:

First Stand = 3 Tests

Additional Stands = 2 Tests

	M-11/EGR	1-Q/EGR	T-10/EGR <i>(Alternative)</i>
Maximum Number of Stands	6	7	7
Number of Labs Participating	4	6	5
Test Prices Used	M-11/EGR	\$85,000	
For Project	1Q/EGR	\$60,000	
Cost Estimates	T-10/EGR	\$65,000	

PC-9 Matrix Design Task Force Update

Test Matrix Design & Project Cost

(using an Alternative T-10 Matrix)

PC-9 Test:	M11/EGR		1Q/EGR		T-10/EGR		Total Cost	
	# Tests	\$	# Tests	\$	# Tests	\$	# Tests	\$
Number of Tests:	26	2.210	28	1.680	28	1.820	82	5.710
Project Cost (Funding Group)	10	0.850	8	0.480	9	0.585	27	1.915

*Calibration Requirements: 3 Tests for First Stand, 2 Tests for Additional Stands in Each Laboratory

			Test Prices Used	M-11/EGR	\$85,000	4 / 6	
			For Matrix Project	1Q/EGR	\$60,000	6 / 7	
			Cost Estimates	T-10/EGR	\$65,000	5 / 7	Alternate T-10

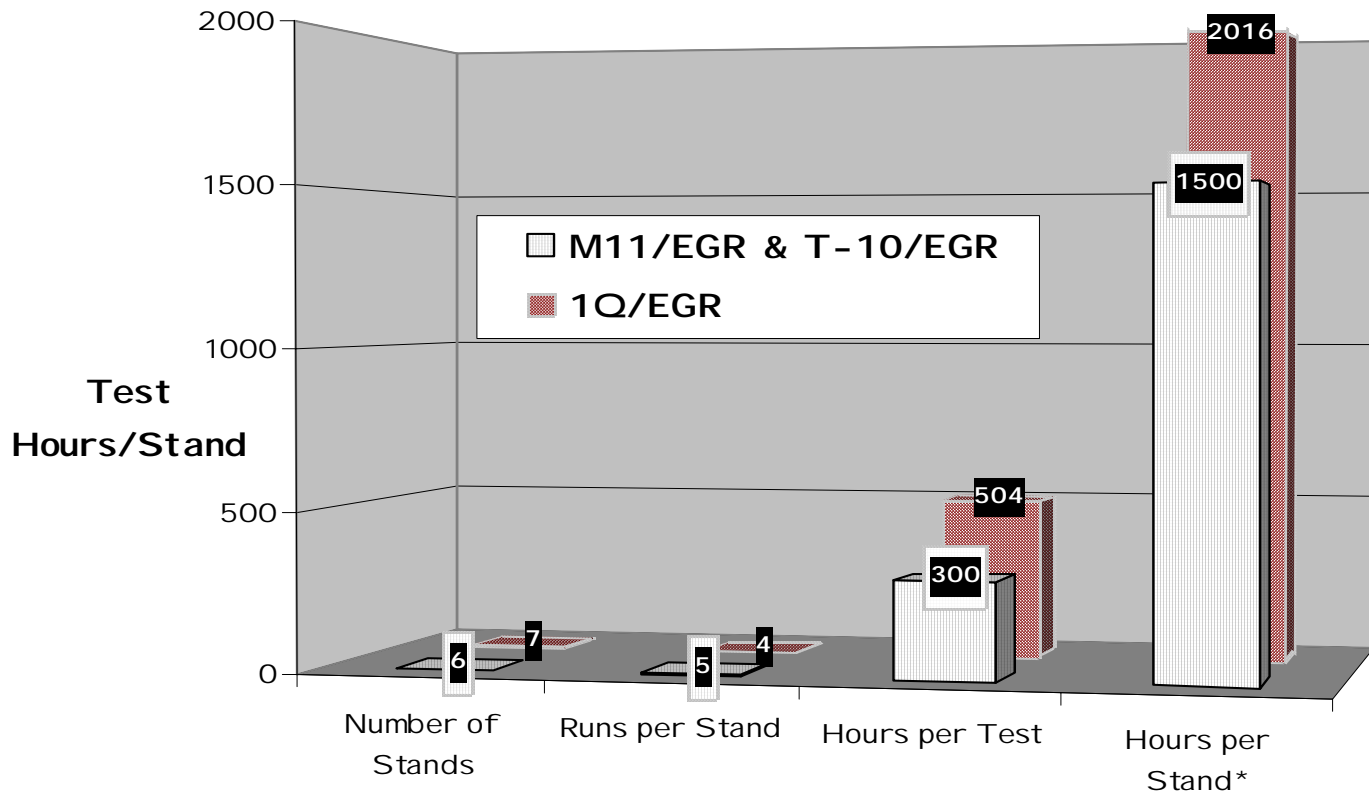
PC-9 Matrix Design Task Force Update

Matrix Design Options and Project Timing

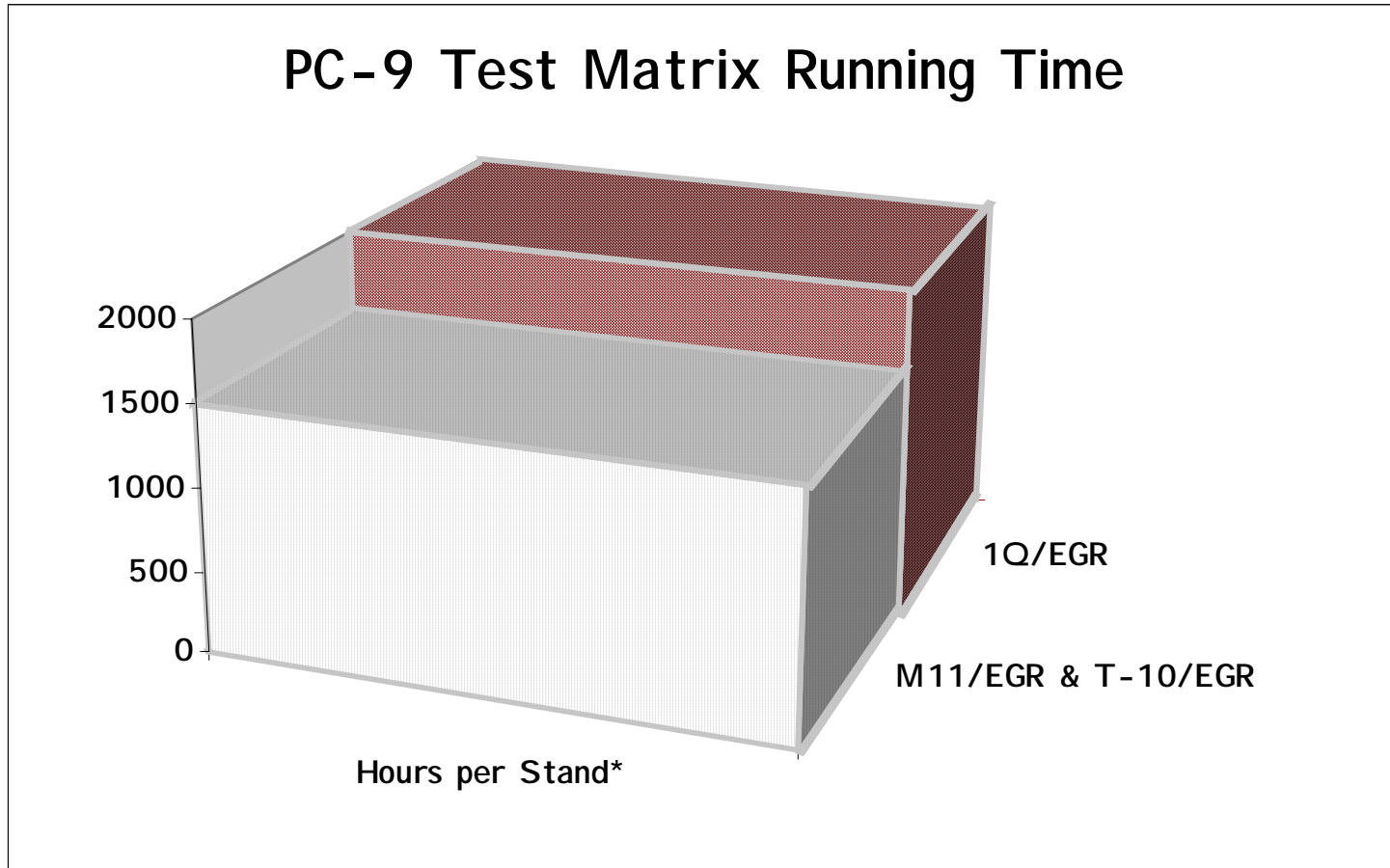
<u>Matrix Timing:</u>						
Test	Labs	Stands	Tests	Tests/Stand	Test Length	Test Time/Stand [#]
M11/EGR	4	6	26	5	300 h	1500 h
1Q/EGR	6	7	28	4	504 h	2000 h
T-10/EGR	5	6	26	5	300 h	1500 h
<i>Alternate</i>	<i>5</i>	<i>7</i>	<i>28</i>	<i>4</i>		<i>1200 h</i>
[#] Does Not Include Any Rebuild Time Between Runs						

PC-9 Matrix Design Task Force Update

PC-9 Test Matrix Running Time



PC-9 Matrix Design Task Force Update



PC-9 Matrix Design Task Force Update

Proposed Timeline:

- **PC-9 Formulations Matrix**

- Technologies Selected *April 11, 2000*
[3 Technologies Have Been Selected by EMA. However, These Selections Have Not Been Identified or Made Available to the PC-9 MDTF.]
- Technologies Available *? ? ?*
- Base Oils Available *July 31, 2000*
- Blends Prepared (Available) *September 18, 2000*

- **PC-9 Matrix Testing**

- Matrix Start *September 26, 2000*
- Matrix Completion *February 5, 2001*
- Data Evaluation Completed *March 14, 2001*

Mack T-10 Test

Proof of Concept

T-10 Task Force Report To HDEOCP

June 27, 2000

Test Development - Highlights

- Task Force has met 7 times, since inception at June 99 ASTM meeting (St Louis).
- TF Meeting 4/18/00:
 - Elected to increase Oil Gallery Temp. from 225°F to 235°F.
 - Motivated by test sponsor concerns/projected heat rejection data w/EGR.
- HDEOCP Meeting 4/26/00:
 - Recognized T-10 as official PC-9 test for oxidation.
- TF Meeting 6/7/00:
 - Accepted Integrated IR method as recommended assessment of T-10 oxidation.

Work In Progress

- Continuing to validate test procedure with elevated Oil Gallery Temp.
 - Sound on basis of data available to date.
- Evaluating alternative inlet manifold material/construction:
 - Test precision improvement likely via replacement of current Al hardware.
 - TEI investigating ceramic coating, stainless steel, etc.
 - Issue to be resolved prior to matrix start-up.
- Back-up from Analytical Sub-Group:
 - Continuing to validate Integrated IR method for oxidation.
 - Investigating Photo-Acoustic IR as possible precision improvement.
 - Scoping improvements to ASTM D664 (TAN) method as possible fall-back-position.

Data Review

- Task force has reviewed data from a total of 15 full-length T-10 tests, comprising:
 - 7 tests with 225°F Oil Gallery Temp.
 - Including two repeat tests on one oil (TMC 1005).
 - Total of 4 formulations have been tested under these conditions.
 - 8 tests with 235°F Oil Gallery Temp.
 - 2 repeat tests on unidentified oils to be completed mid July.
 - Total of 4 formulations have been tested under these conditions.
 - 2 oils have been tested at both temperatures.

Data Analysis - Conclusions

- Task Force has conclude that:
 - T-10 has demonstrated discrimination/”proof of concept” at both 225°F and 235°F OGT with respect to principal test criteria.
 - Same number of tests have now been completed at 235°F and data demonstrates that:
 - ~ Temperature increase has not adversely affected viability of the developed test procedure.
 - ~ Does not significantly impact test severity, with exception of oxidation parameter.
 - ~ There is no loss of discriminating power.

Task Force Recommendation

- TF Meeting 6/7/00 unanimously approved the following motion:
 - “The T-10 Task Force recommend that the T-10 test be moved forward for *Proof of Concept*, at the HDEOCP on June 27, 2000, with the caveat that T-10 Task Force will reconvene to determine that the test is matrix ready before the matrix is started.”

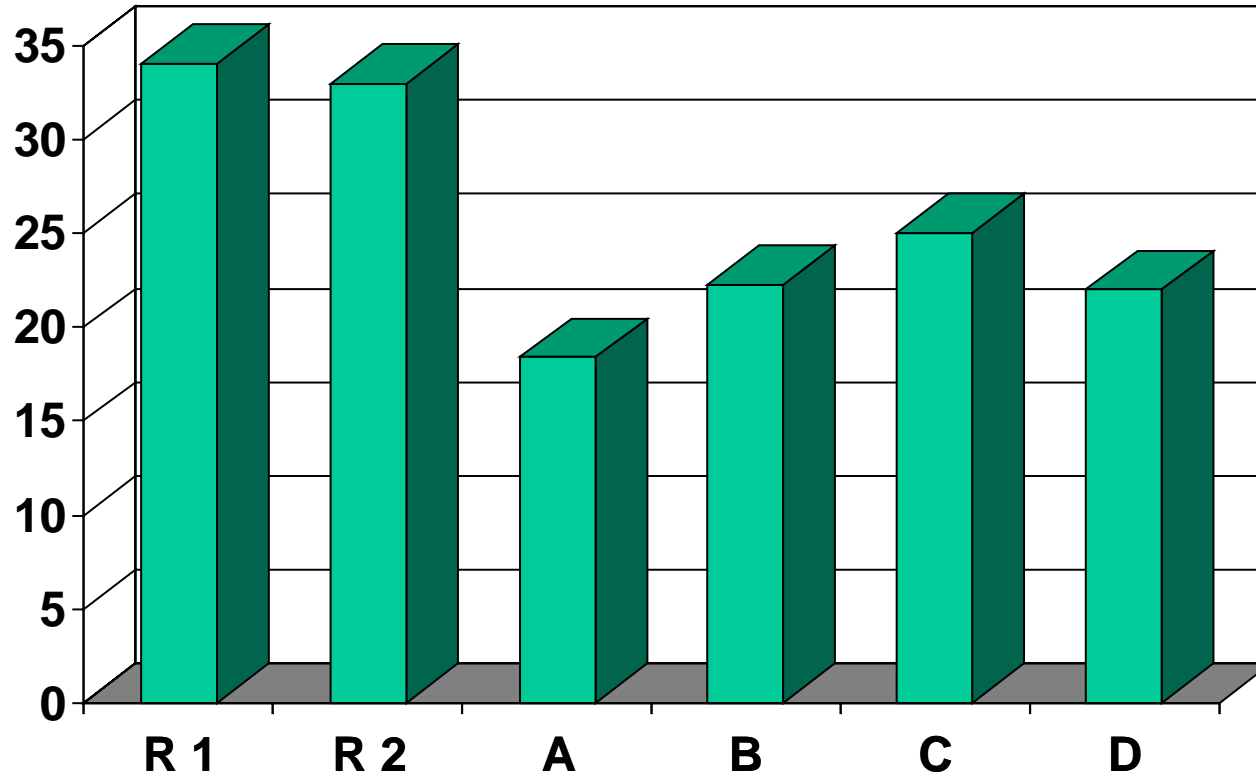


Mack T 10

- Test Discriminates Oil Performance
- Lab Visitation's to be completed 8/1/00
- Task Force to meet in July
- Task Force says Test is Ready
- Recommend HDEOCP Acknowledge
T 10 is Ready for August Matrix Start

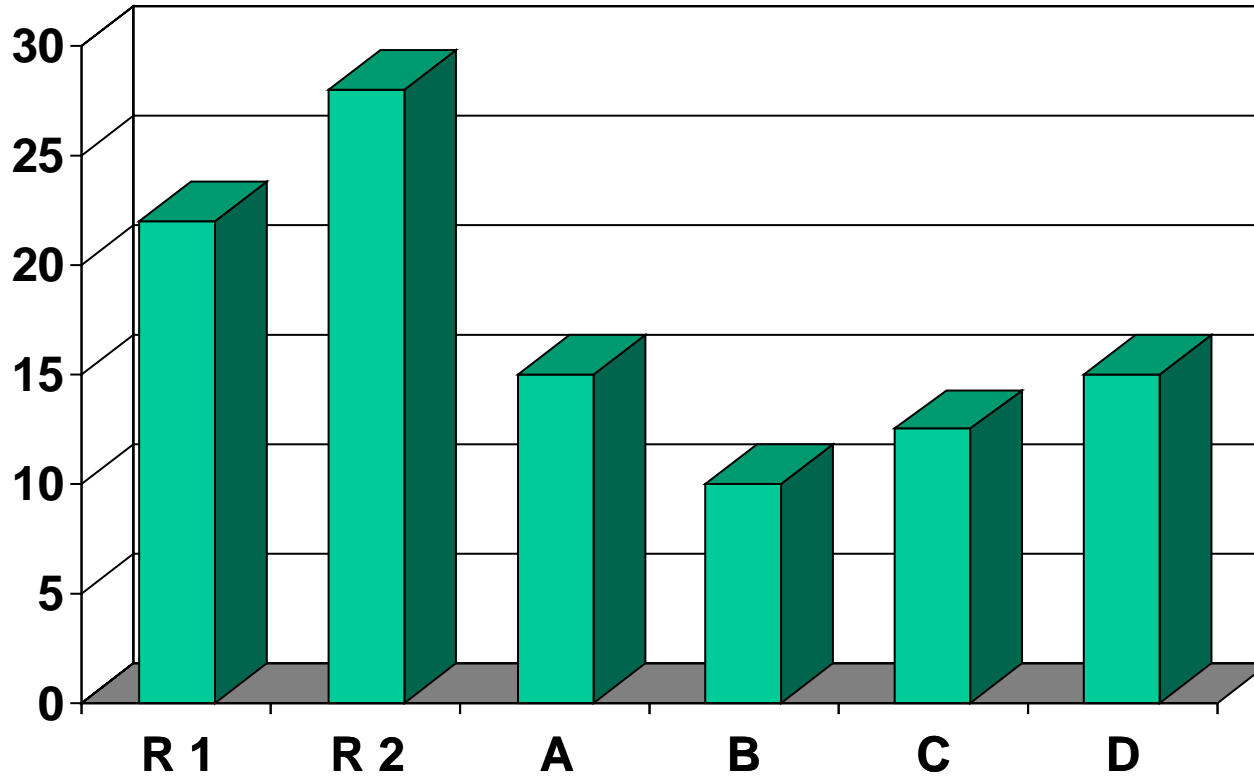
T 10

Discrimination / Liner Wear



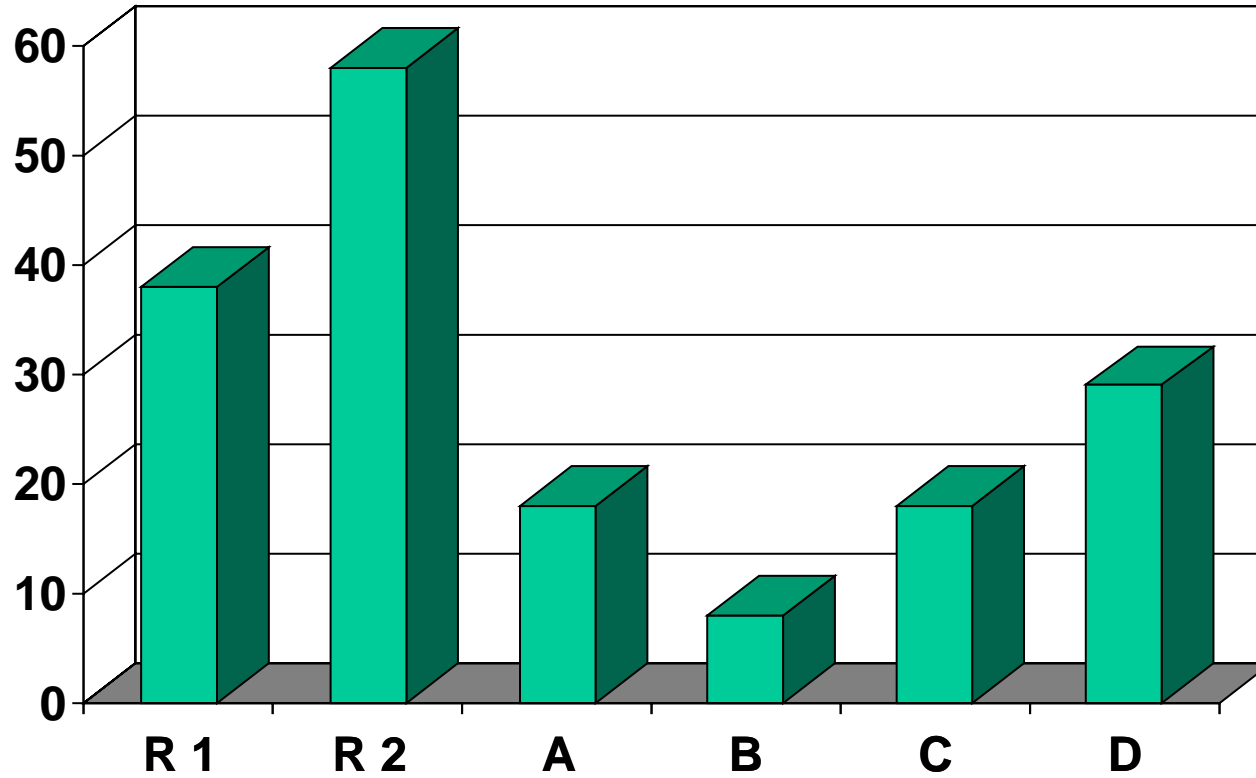
T 10

Discrimination Oxidation IR



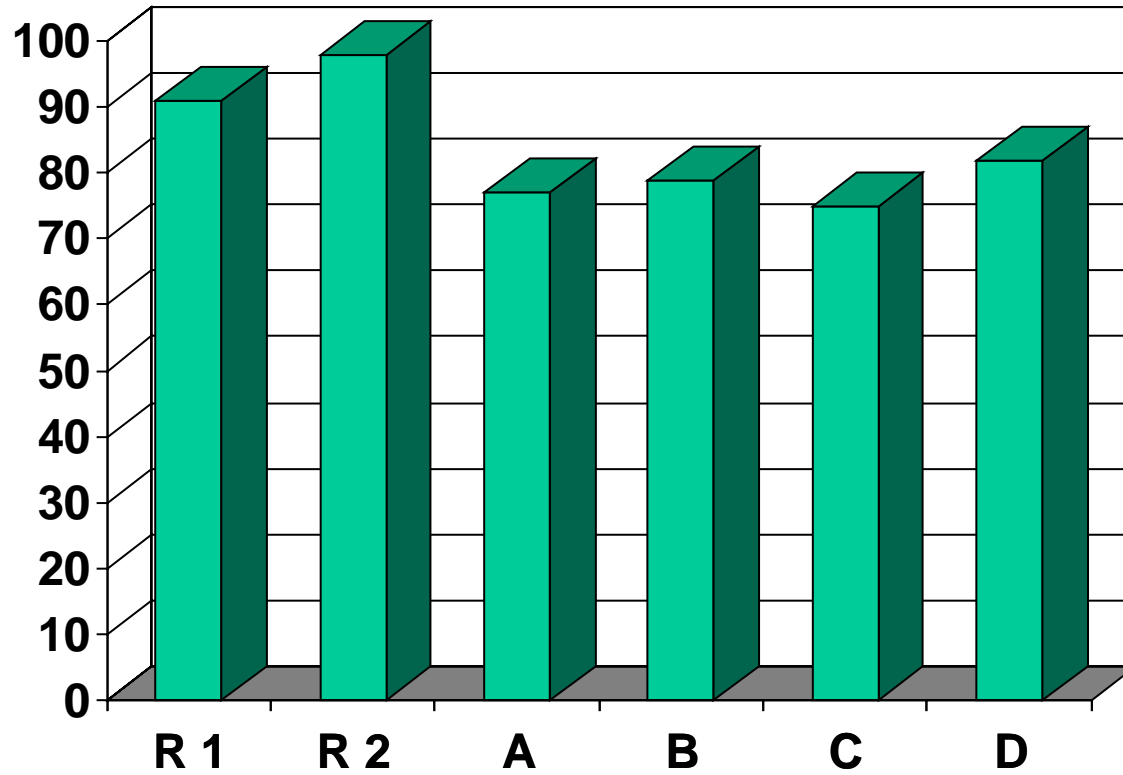
T 10

Discrimination EOT Lead



T 10

Discrimination RWL



2002 EGR Engine Requirements

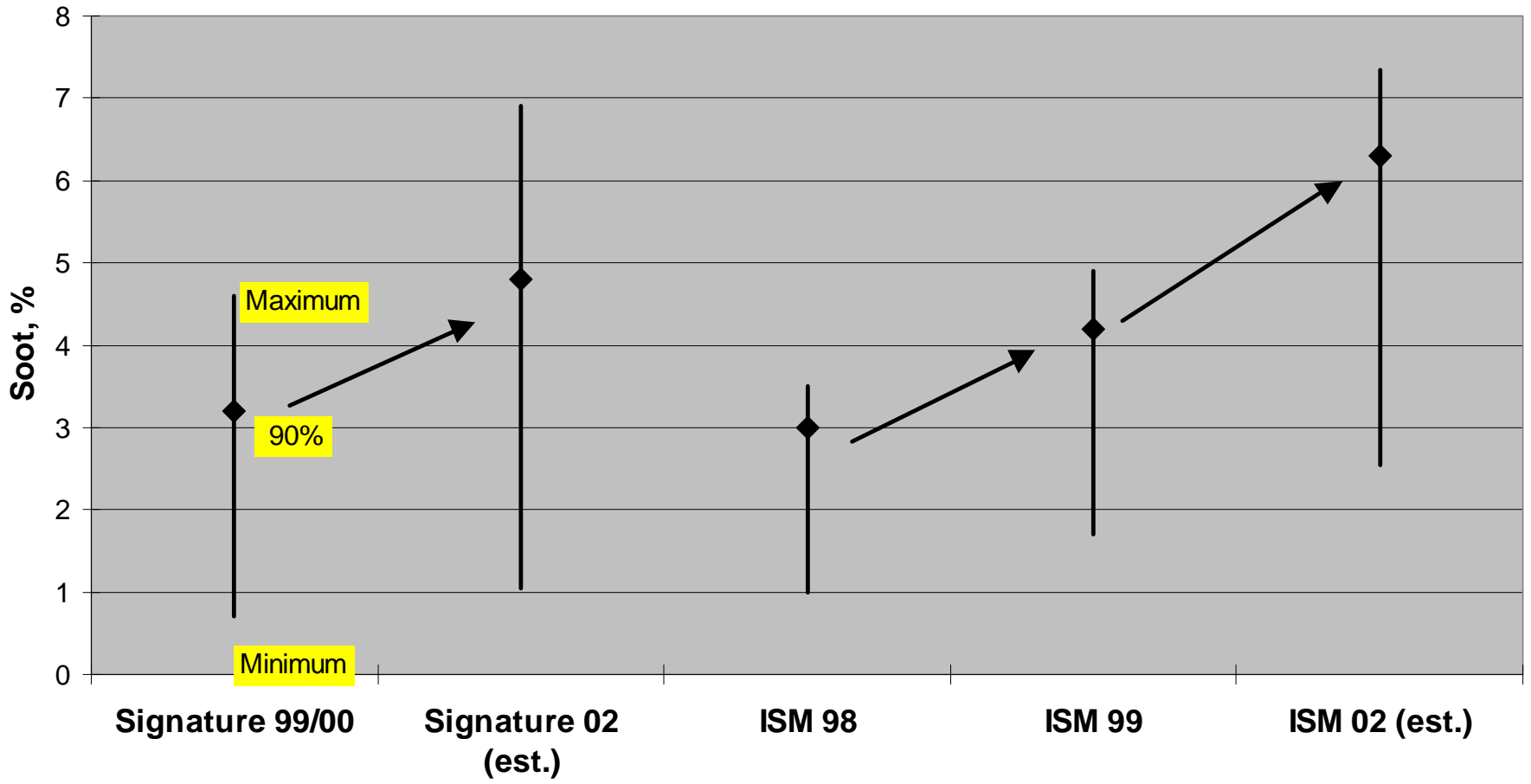


- Heat rejection to coolant increase of up to 35%
 - More time above oil thermostat set point of 240 F
 - Maximum oil temperature up from 265 F to 285 F
- Soot rate increase of 15 to 50%
 - Oils with 9 % soot capability needed
- Power cylinder wear below 50 F ambient
- Sliding contact cam & tappet wear

Soot in multiple field tests

Normalized to 50K miles, normal duty
(628 oil samples)

Projected soot increase: 15-50% over '99



Cam & Tappet Wear



- Sliding contact system not covered by PC-9
- Cummins has used passenger car oil specifications to protect B & C engines
 - Loss of Seq III F valve train wear test is an issue
- EGR winter operation increases severity
 - CH-4+ fails at less than 40,000 miles

M11 EGR Taskforce



John Graham
June 27, 2000

M11 EGR

Test Development



- Development tests at Cummins & ETS
 - Responsive to operating conditions, metallurgy, additive chemistry & fuel sulfur -- 56 tests
 - Preliminary procedure released 3Q 98
- Procedure with production hardware 4Q 99
 - Tests on 3 reference oils and 3 candidates -- 12 runs
 - Discrimination demonstrated for overhead wear, oil filter plugging, sludge & ring wear

M11 EGR Test Meets Proof of Concept Requirements – Matrix Ready Sept 1

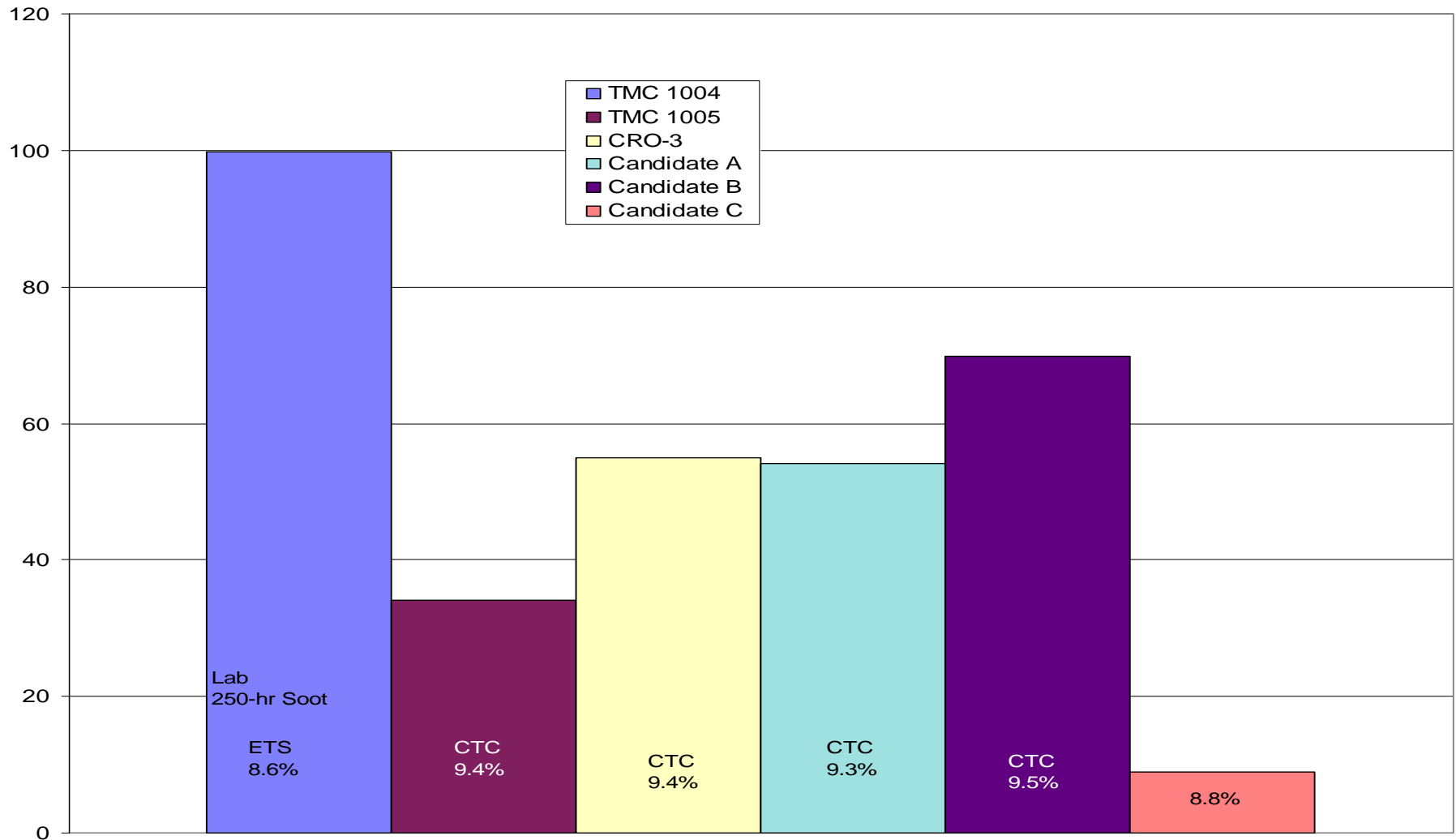


- M11 EGR Taskforce agreed that test meet 'Proof of Concept' requirements and was matrix ready
- Test Improvements to be evaluated during July & August
 - Xhead precision ground & batch hardened
 - Other hardware Improvements?

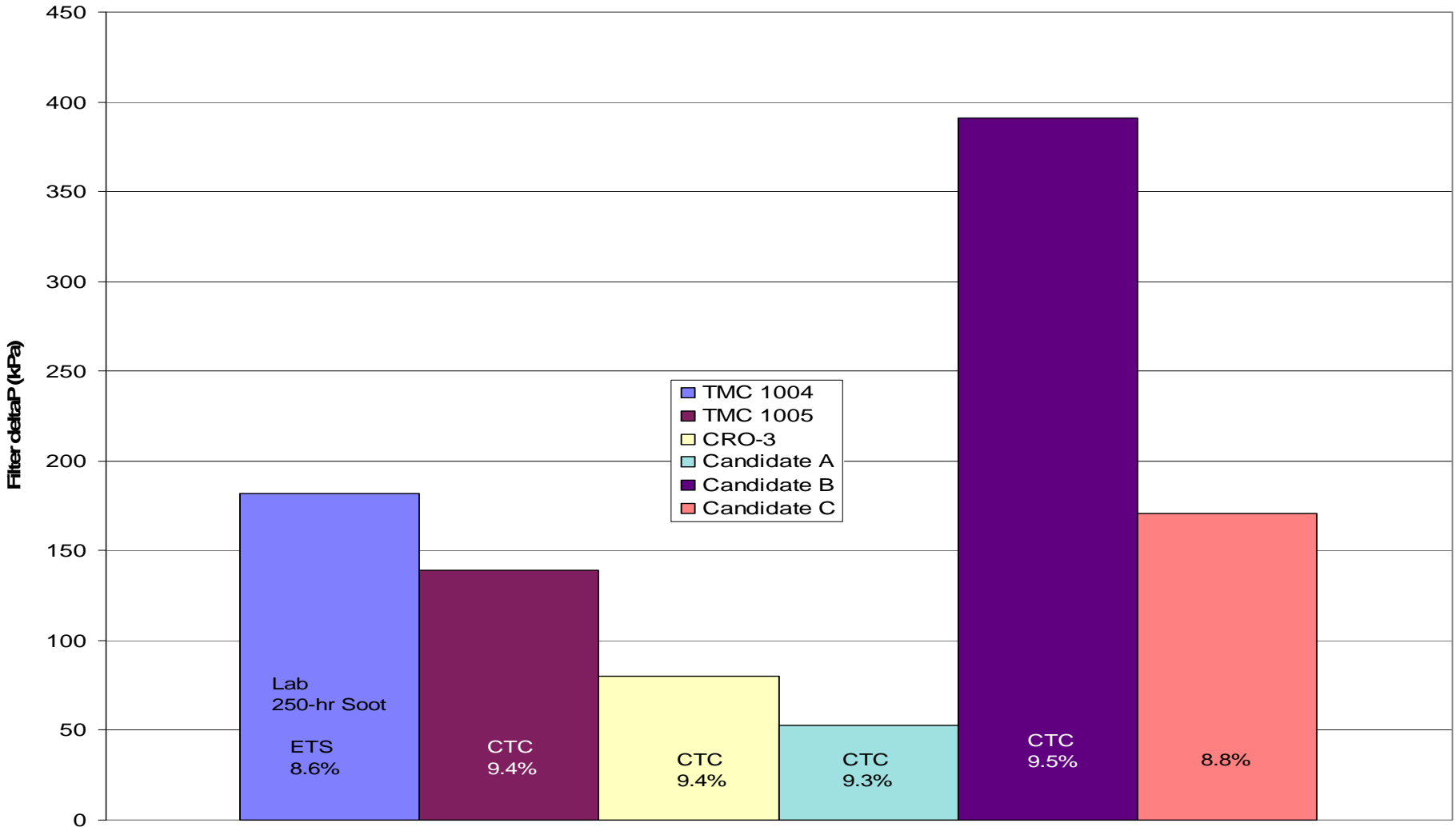
M11 300-hr EGR Test Conditions: Summary

Parameter/Stage	Unit	A (Soot)	B (Rated)
Stage Length	H	50	50
Engine Speed	r/min	1800 +/- 5	1600 +/- 5
Torque	N·m (lb·ft)	1300 (960)	1930 (1424)
Intake Manifold Air Temperature	°C (°F)	65.5 (150)	65.5 (150)
Coolant Out Temperature	°C (°F)	65.5 (150)	65.5 (150)
Oil Gallery Temperature	°C (°F)	115.5 (240)	115.5 (240)

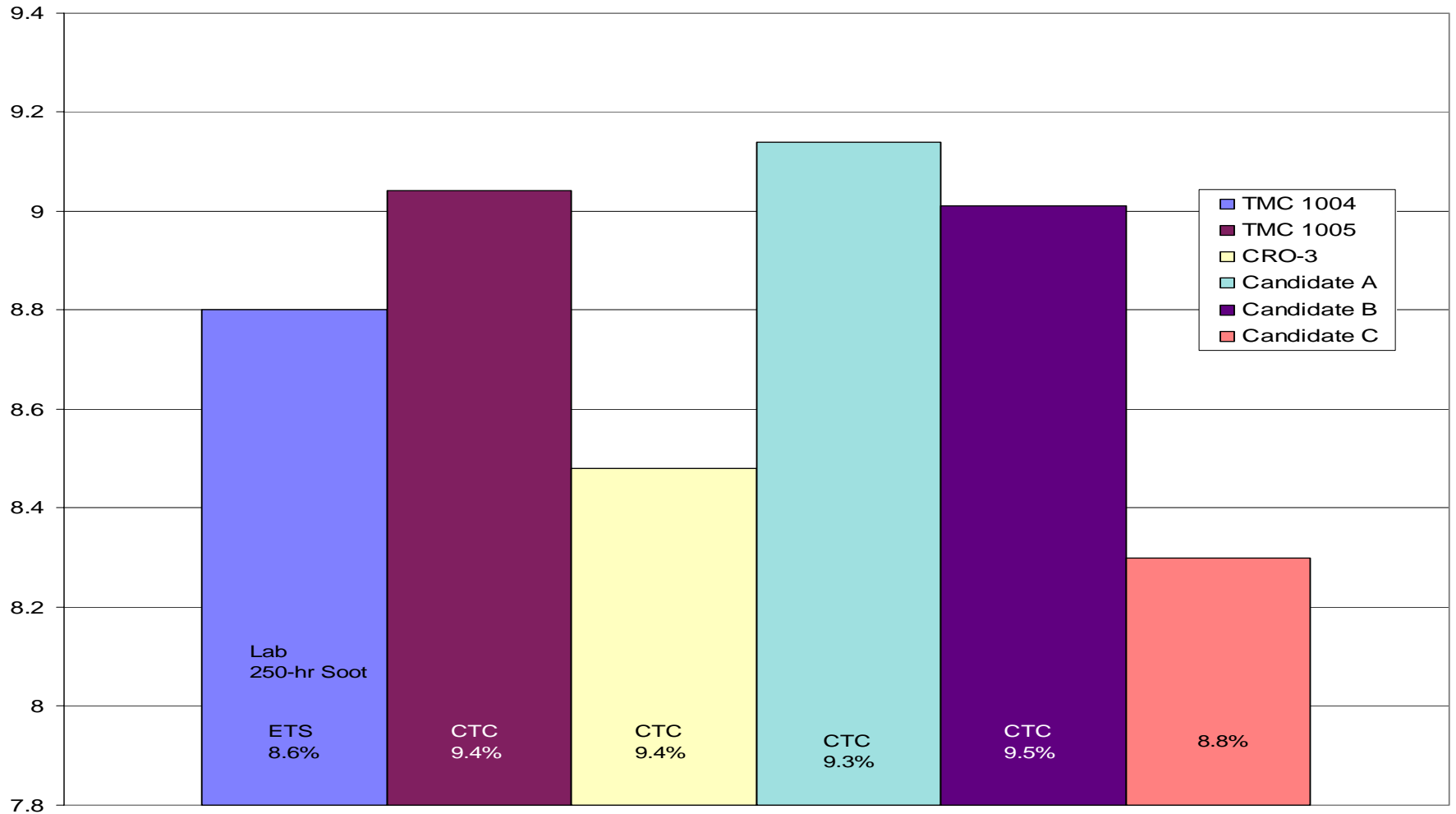
300-hr M11 EGR Test Results: Crosshead Weight Loss



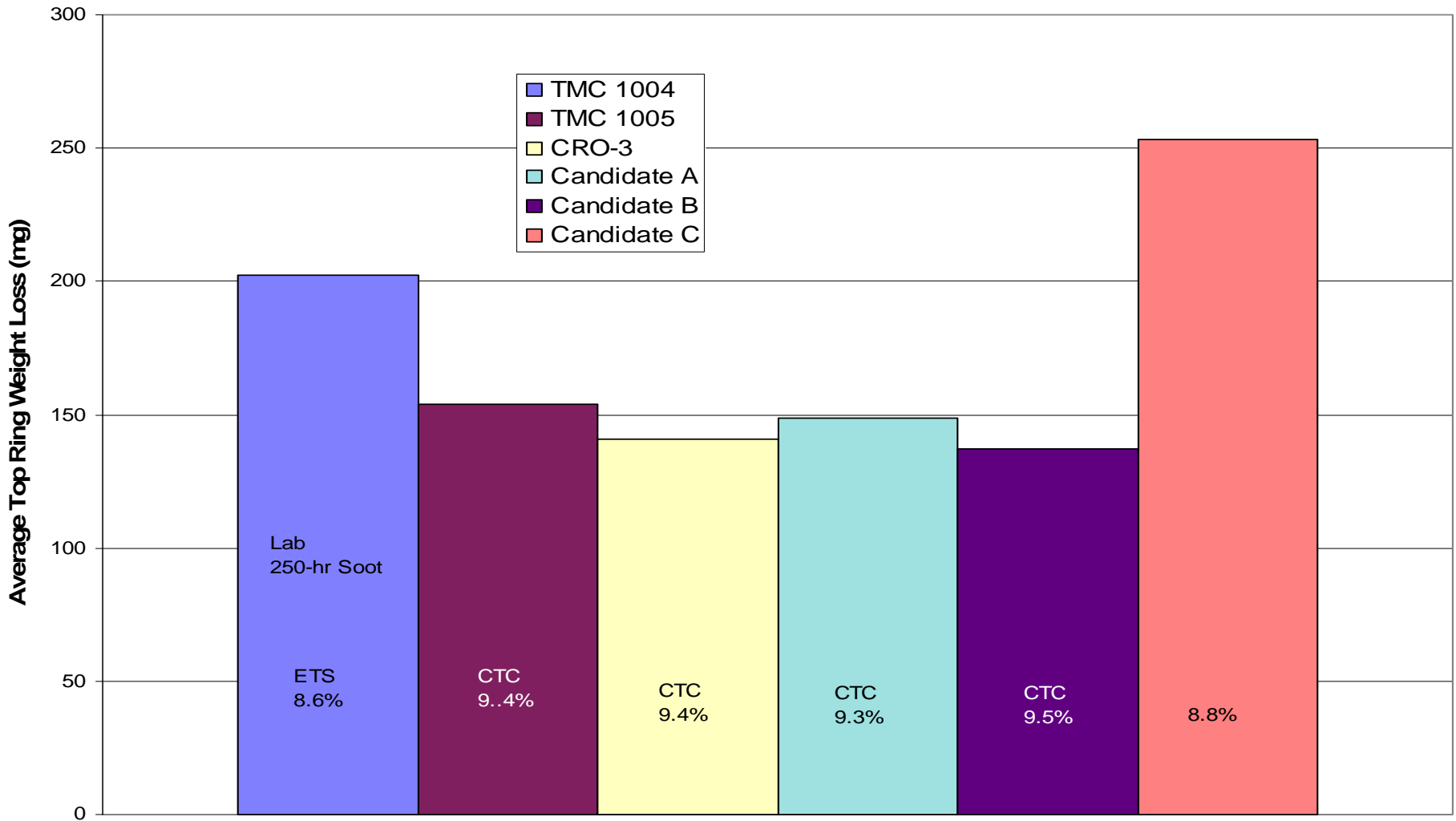
300-hr M11 EGR Test Results: Oil Filter delta P



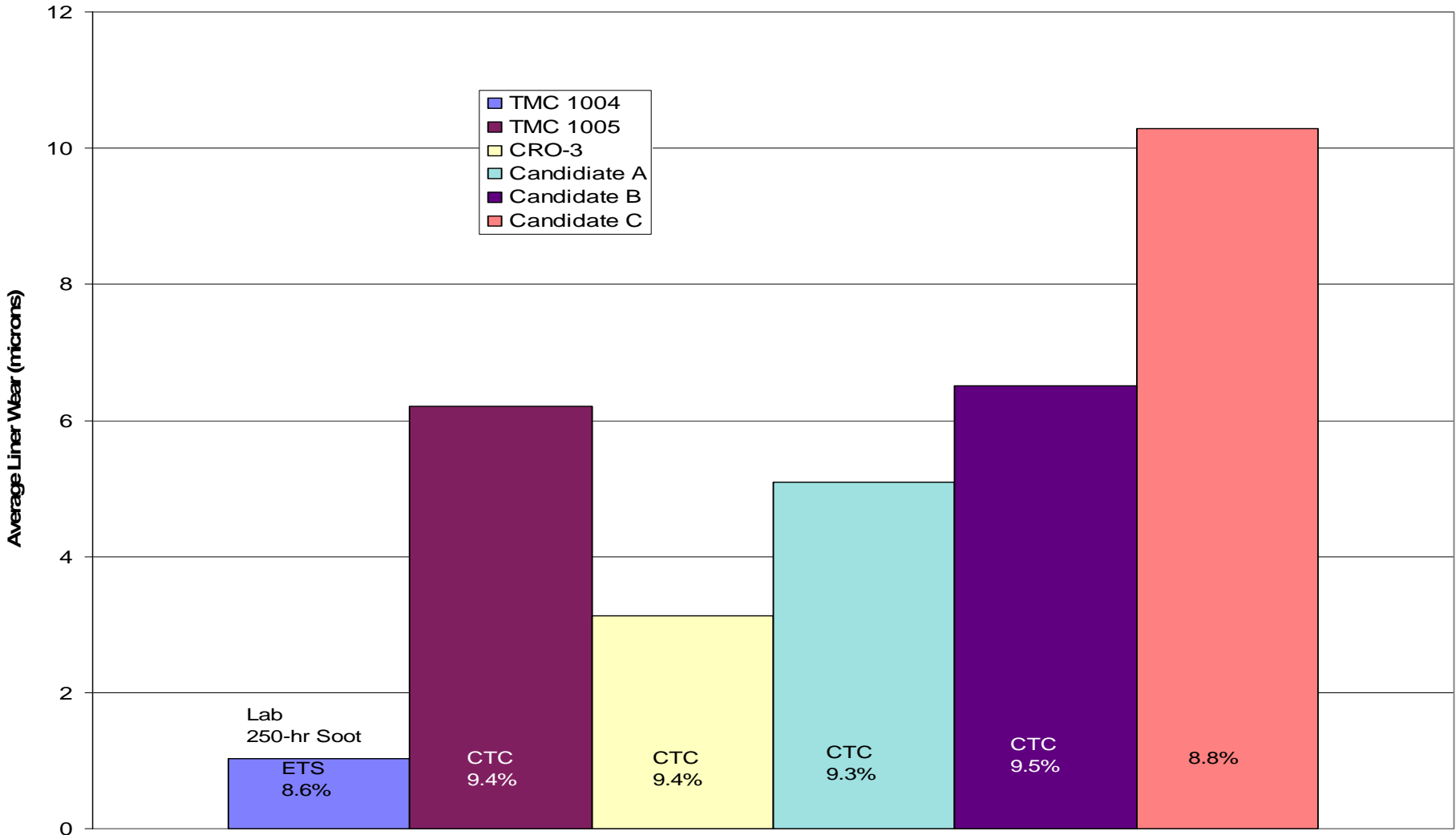
300-hr M11 EGR Test Results: Rocker Cover Sludge



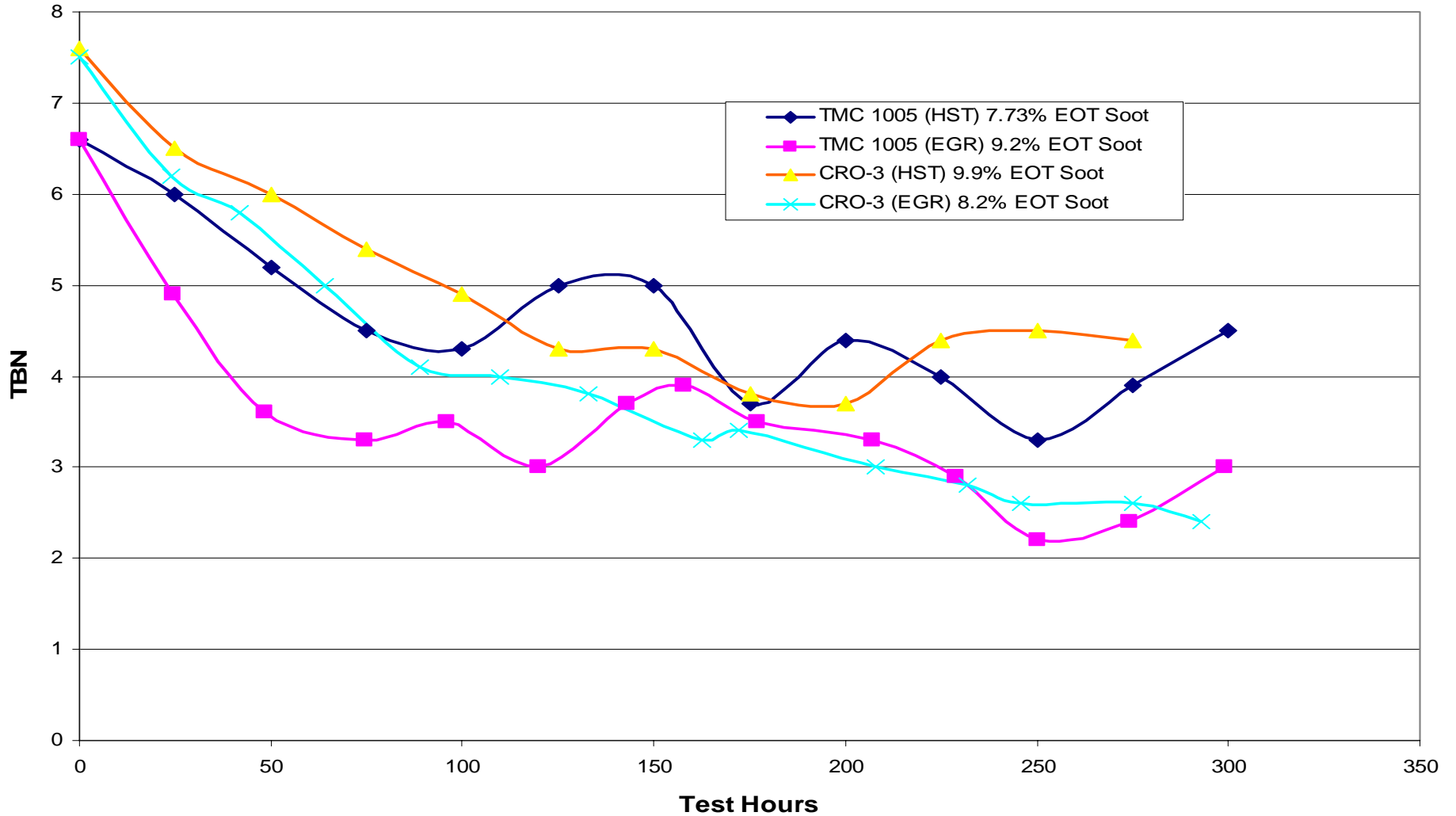
300-hr M11 EGR Test Results: Top Ring Wear



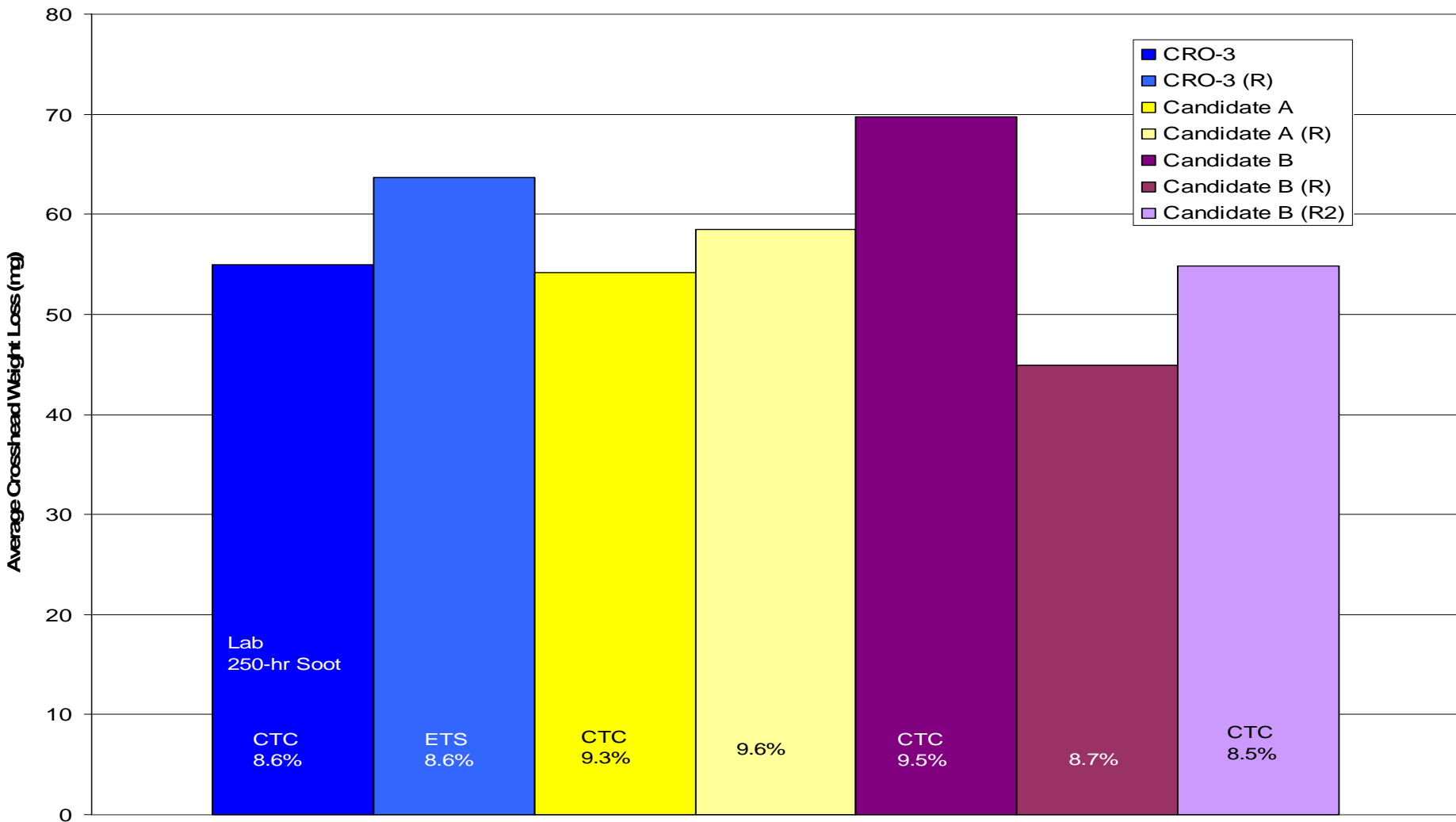
300-hr M11 EGR Test Results: Liner Wear



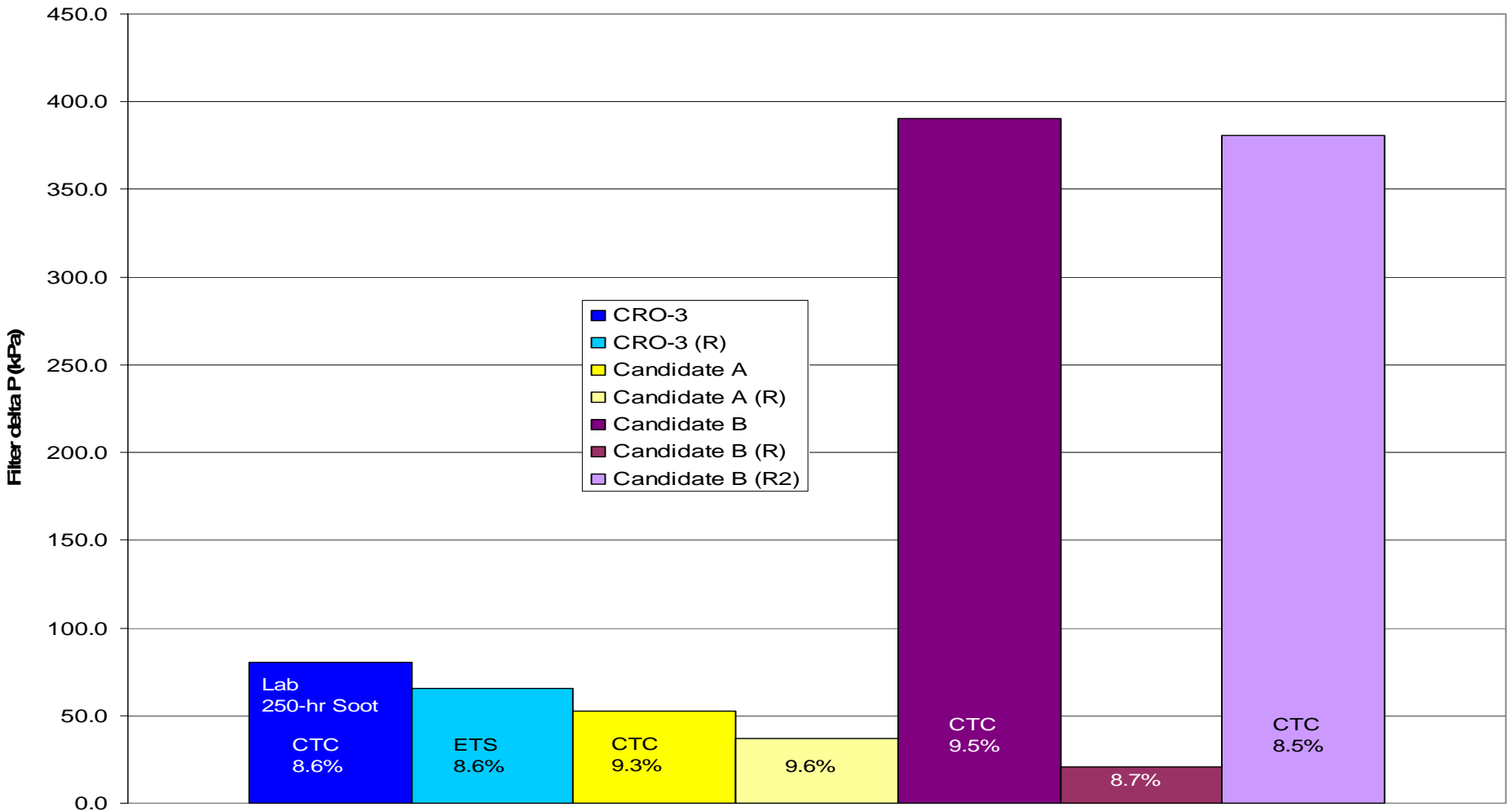
TBN: 300-hr EGR vs 300-hr HST



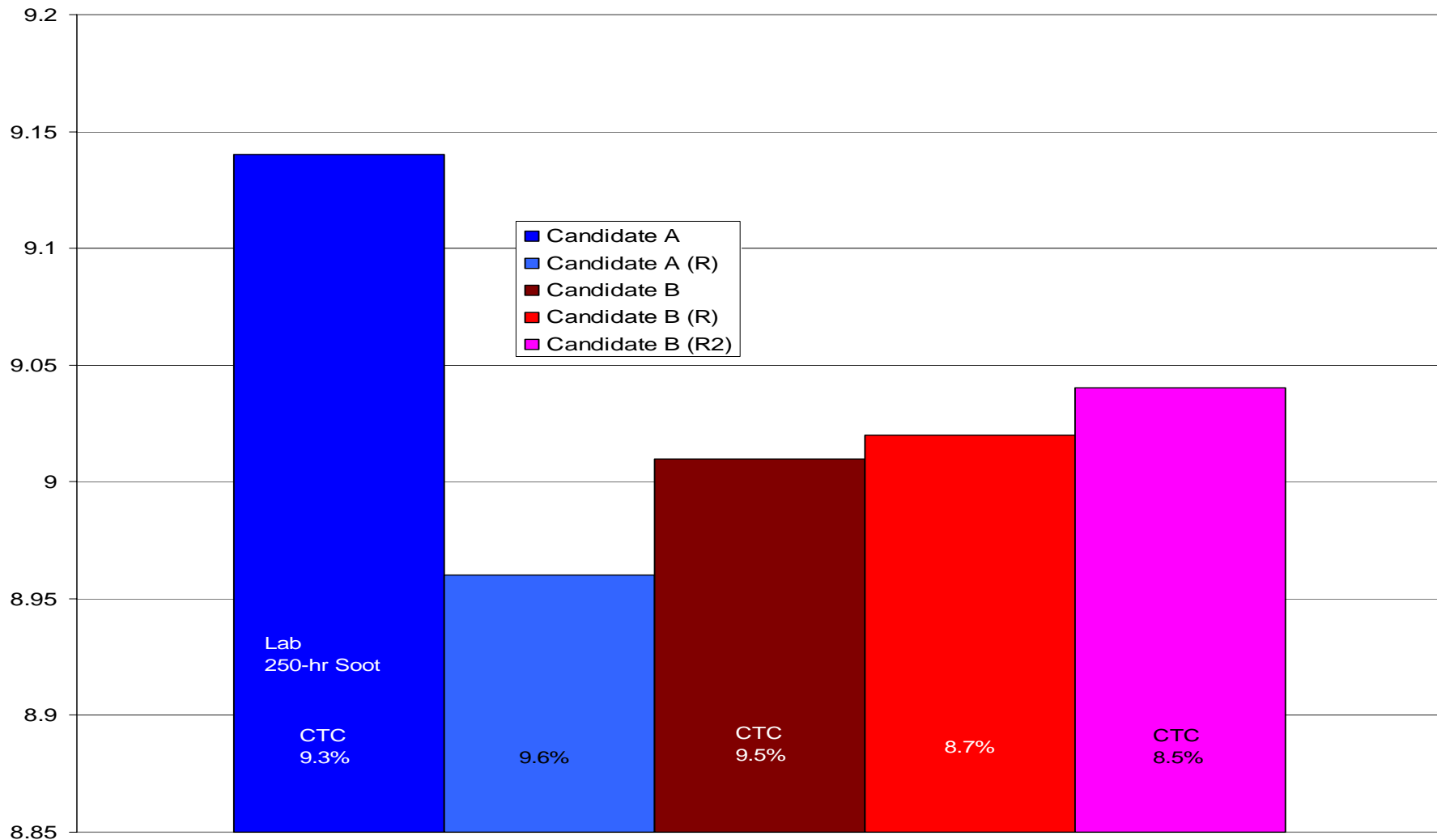
300-hr M11 EGR Precision Data: Crosshead Weight Loss



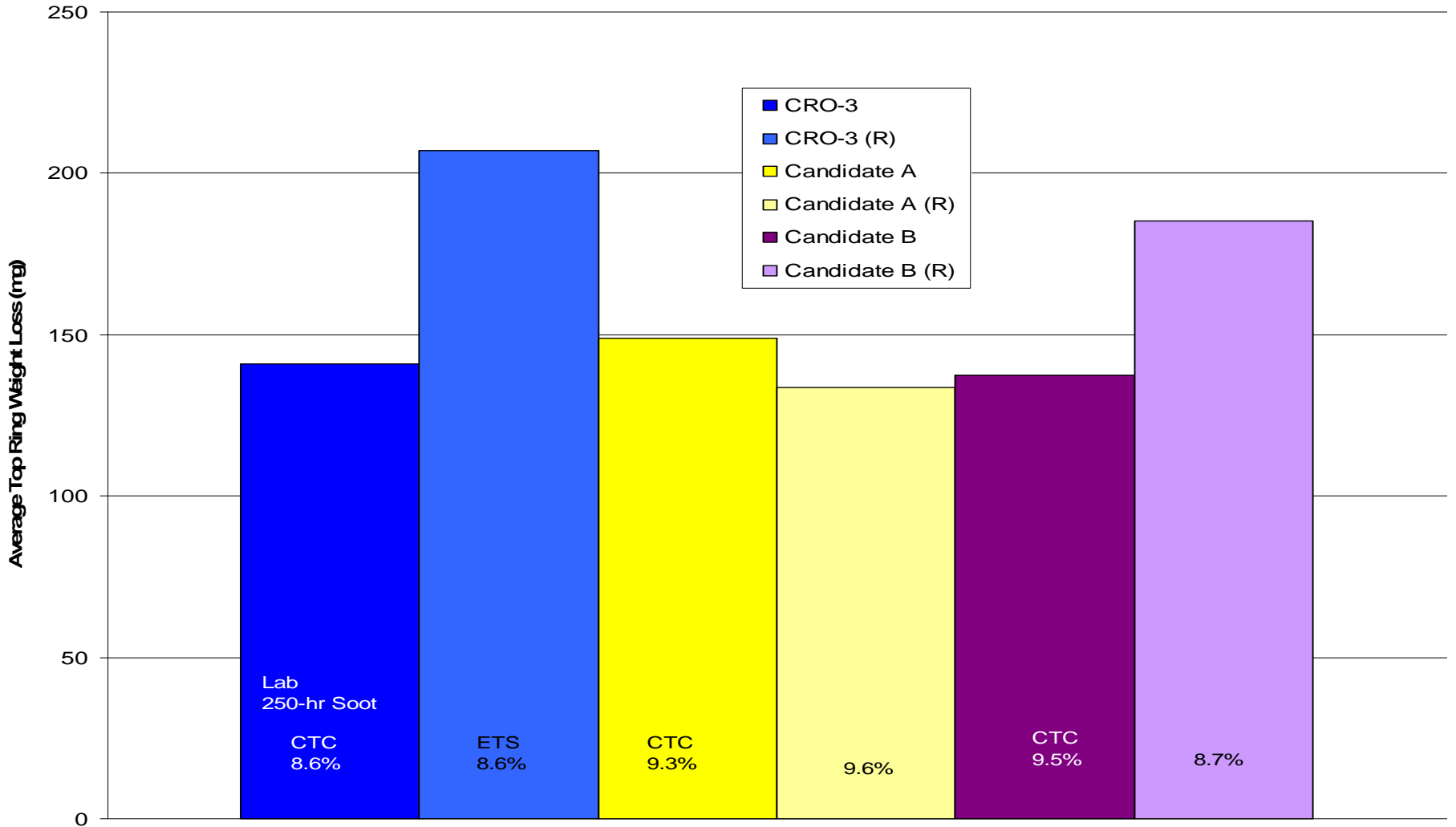
300-hr M11 EGR Precision Data: Oil Filter delta P



300-hr M11 EGR Precision Data: Rocker Cover Sludge



300-hr M11 EGR Precision Data: Top Ring Wear



Request Support of HDEOCP



Motion: Accept M11 EGR test as meeting “proof of concept” for PC-9 Matrix testing subject to M11 EGR Taskforce assessment of proposed hardware improvements on or before Sept 7 2000

HDEOCP Volatility Task Force

Cliff Venier

27 June 2000

HDEOCP Volatility Task Force

- **Proposed Questions to be Answered**
 - **Does volatility affect field performance? How?**
 - **Does volatility affect engine test performance? How?**
 - **What is the volatility of current HDEOs?**
 - **How will base oil changes for SL/GF-3 affect volatility?**
 - **What is the appropriate North American HDEO volatility level?**

HDEOCP Volatility Task Force

➔ Current Limits

- API

- SJ 10W-30 - Noack < 22%, D6417 < 17%
- SJ 15W-40 - Noack < 20%, D6417 < 15%
- SL all grades - Noack < 15%, D6417 < 10%
- CH-4 10W-30 - Noack < 20%, D6417 < 17%
- CH-4 15W-40 - Noack < 18%, D6417 < 15%

HDEOCP Volatility Task Force

➔ Current Limits

- ACEA (Noack only)
 - A1-98 - < 15%
 - A3-98 - < 13%
 - A2-96 Issue 2 - 10W-X or lower < 15%; others < 13%
 - B1-98 - < 15%
 - B3-98 - < 13%
 - B2-98, B4-98 - 10W-X or lower < 15%; others < 13%
 - E all grades - < 13%

HDEOCP Volatility Task Force

- ➔ Volunteers to this date
 - Pat Fetterman - Infineum
 - Rich Lee - Oronite
 - Charlie Passut - Ethyl
 - Ted Selby - Savant
 - Cliff Venier - Pennzoil-Quaker State
 - Lew Williams - Lubrizol

HDEOCP Volatility Task Force

- ➔ Request for Data on Heavy Duty Oils
 - **API Credentials**
 - **SAE Vis Grade**
 - **Vis, 100°C**
 - **CCS**
 - **Volatility (one or both)**
 - **Noack Loss**
 - **Sim Dis at 700°F**

ASTM HDEOCP Mtg
June 26, 2000 - Seattle, WA

**LIAISON REPORT: ASTM TASK FORCE
ON LOW TEMPERATURE RHEOLOGY OF
USED ENGINE OILS (LOTRUO)**

C.J. May, K.O. Henderson, F.W. Girshick

Recent LOTRUO Activities

- **Preliminary evaluation of T8 E-O-T drain sample (TMC 1004, 5% soot) completed by 11 member working group:**
 - **CCS measurements indicate sample has thickened out-of-grade, i.e. classed as 20W; poorer precision than fresh oil at -10°C, but not at -15°C**
 - **TP-1 MRV testing at -20C (20W) and -25C (15W) indicates precision poorer than fresh oil D4684**
 - **Scanning Brookfield (SBr) shows good precision for Gelation Index and G.I. Temp.**
 - **Appeared to be two populations of SBr viscosity-temperature data with standard preheat, further work confirming this sample v. sensitive to preheat conditions**

Recent LOTRUO Activities (Cont'd)

- **SBr without preheat shows good precision, different viscosity-temperature behaviour**
- **Rheometric analysis confirms sensitivity of oil to preheat (soot agglomeration?), particularly at low shear rates**
- **Additional 'step-out' analyses of this sample have been done by Cannon Inst. and Savant**
 - **modified MRV rotors**
 - **MRV without pre-heat**
 - **extended range Scanning Brookfield**

Recent LOTRUO Activities (Cont'd)

- **Website established for exchange of information/ ideas within the ASTM standards forum framework.**
- **With recent donations of additional used oils, we have almost enough samples to initiate full fledged round robin activities on standard low temp. rheology tests (CCS, MRV)**
 - **samples range from 5-9% soot, appear to show range of rheological properties**
 - **need 1 or 2 more samples; T10 drains would be ideal**
 - **confirm pretreatment steps**
 - **target completion of R/R's by September**
 - **extended range SBr would be needed to assess some oils**

Next Steps

- Preliminary rheological analyses have been conducted at IOL on these samples (* = working group data)

<u>Test</u>	<u>5798-2101</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
CCS-10, cP	3,290*	~3,400			
CCS-15, cP	5,790*		~5,300	~7,600	~4,200
TP-1 MRV-15 Vis, cP (Y. Str, Pa)	---	---	---	~51,000 (<175)	---
TP-1 MRV-20 Vis, cP (Y. Str, Pa)	19,600* (<35*)	~26,000 (<70)	~34,000 (<175)	>600,000 (>350)	~14,000 (<35)
TP-1 MRV-25 Vis, cP (Y. Str, Pa)	55,300* (<70*)	~76,000 (<105)	~89,000 (<210)	Solid	~29,000 (<35)
Gel Index (GIT)	5.4* (-13.3)*	< 6	< 6	NI	< 6
SBr Temp. @ 30,000 cP, °C	-15.4*	-12.7	-6.7	NI	-23.7
SBr Preheat Sensitivity?	Yes*	Yes	Yes	?	No

**PC-9 Elastomer Task Force Report
June 23, 2000**

The PC-9 Elastomer Task Force -

Using D 471 (PC-7 method):

Survey Industry to select the most aggressive Reference Fluid(s) with field service

This reference fluid(s) will be used to provide a baseline for oil, additive and elastomer manufacturers – as practiced in ILSAC GF-3 and individual OEM specifications

An oil cannot be more aggressive than the reference fluid(s) toward elastomers

An elastomer must be compatible with the reference fluid(s)

Because there are no rigid limits to this approach, it is not suggested that this become part of ASTM D 4485 but rather become part of an EMA specification or individual OEM specifications similar to OEM PCMO specs or the GF-3 ILSAC spec.

There are several items that must occur for this to happen:

- 1. The D471 PC-7 method must be recognized and accepted in ASTM – preferably in D11.15 who oversee the D471 test method**

D11.15 have agreed to ballot in their group to oversee this test method and add new Service Fluids

- 2. A continued source of elastomers must be identified and distribution assured**

A source has been identified and is being recommended to the Task Force

- 3. Once Reference oil(s) is identified distribution of it must be assured**

The TMC has agreed to procure and distribute reference oil(s)

At our most recent Task Force meeting we agreed to the following:

- 1. We agreed that the elastomer sheets should be from one source. We have identified two distributors who have expressed interest in distributing the materials and will ask them to bid on supplying the material.**
- 2. The additive companies will estimate the number of tests to be run over the next 2 year period to give an idea of the demand for this test**
- 3. It is requested that those supplying PC-9 matrix oils run the elastomer test on the oils to add to the tests on 20 oils already run.**
- 4. Companies will be developing PC-9 fluids – the request for reference fluids continues until the end of the PC-9 matrix and limits are set by the HDEOCP. At that time, reference fluid selection must be made from the available data.**

I do not expect to hold a meeting of the Task Force until this fall when reference fluid(s) will be selected

Tom Boschert

Leader PC-9 Elastomer Task Force

PC-9 Timeline Notes

Brent Shoffner 6/27/2000

- HDEOCP accepts proof of concept and the tests are ready for Precision Matrix:

1Q	August 2000
M11 EGR	August 2000
T-10	6/27/2000

- Oil should be available at the Precision Matrix Laboratories September 25, 2000.
- The stakeholders should approve the Memo of Agreement in August 2000.
- The Precision Matrix is projected to start in late September 2000.
- The PC-9 “license allowed date” is currently June 2002.
- Based on experience with the current ASTM system, the “API License Date” will be later than September 2002.

Summary of Events Required for PC-9 Licensing

Brent Shoffner 6/27/2000

ID	Task Name	Start	Finish	1999				2000				2001				2002		
				Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	
1																		
2	Define PC-9 Performance Parameters	03/16/99	03/16/99	◆														
3	Design Prec. Mtx. Appr. API Lubes Comm	03/17/99	05/31/00		■													
4	PC-9 Funding MOA Signed	01/03/00	08/15/00					■										
5	1Q & M11EGR adequate for oil devel.	05/15/00	05/15/00							●								
6	Finalize Base Oil selections for Prec. Mtx.	05/31/00	05/31/00							●								
7	Finalize Additive selections for Prec. Mtx.	01/06/00	06/30/00		■													
8	Base Oils Recd by Additive Companies	07/03/00	07/31/00							■								
9	Blend Prec. Mtx. Oils>TMC>Labs	08/01/00	09/25/00							■								
10	Final Acceptance of New Engine Tests *	08/02/00	08/02/00							★								
11	Final Acceptance of Test Parameters	08/02/00	08/02/00							★								
12	PC-9 Demonstration Oil is Validated	01/22/01	01/22/01											◆				
13	Pre-Matrix Activities	08/03/00	08/30/00							■								
14	PC-9 Precision Matrix Testing	09/26/00	02/05/01							■								
15	Precision Matrix Data Analysis	02/06/01	03/14/01											■				
16	HDEOCP Post Matrix Test Acceptance	03/15/01	04/13/01											■				
17	CMA Registrations Allowed	04/16/01	05/11/01											■				
18	Finalize Pass/Fail Criteria (Sub B Mtg)	04/16/01	06/27/01											■				
19	New Product Development	06/28/01	06/27/02													■		
20	API Licensing Allowed	06/28/02	06/28/02														■	

* Acceptance of each engine test (by HDEOCP) for discrimination and preliminary precision prior to starting the precision matrix.

RSI Data Demonstrate the Redundancy of The RFWT Proposed for PC-9

- **21 exact matches have been tested in the M11 and RFWT**
- **There are no reversals**
- **All passing M11 oils passed RFWT**
- **All Failing M11 oils passed RFWT**

RFWT CORRELATION TO ENGINE “X”

◆ ENGINE “X”, INDEPENDENT VARIABLE, MUST CORRELATE TO RFWT, DEPENDANT VARIABLE, WITH $R^2 \geq 0.80$.

◆ PAST DATA DID NOT SHOW ACCEPTABLE CORRELATION.

CHART FROM D02.B02 HDEOCP JUNE 20, 1995 & JUNE 25, 1996 SHOWS $R^2=0.05$.

CURRENT CORRELATION IS? ($R^2 = 0.21$ was presented on June 27, 2000)

◆ CONCERNS

DOES ENGINE “X”, (M-11), WITH EGR, HAVE ACCEPTABLE CORRELATION WITH RFWT?

WEAR MECHANISM DIFFERS – ROLLING VS SLIDING.

NEW INTERNATIONAL® ENGINES WILL USE THE SAME DESIGN ROLLER FOLLOWER.



MEMORANDUM: 98-272
DATE: December 16, 1998
TO: Brian Koehler, Chairman, L-38 Surveillance Panel
FROM: John L. Zalar, Chairman, GF-3 Statistical Task Group
SUBJECT: Sequence VIII Matrix Analysis

Attached is the final report on the statistical analysis of the Sequence VIII matrix. The content of this report represents a consensus of the GF-3 Statistical Task Group. Our task group is available to answer questions and to assist your panel in their consideration of the results and conclusions contained in this report.

JLZ/geb

Attachment

c: Sequence VIII Surveillance Panel
Lisa Ying
Gordon Farnsworth
Jim Rutherford
Phil Scinto
Tom Franklin
Frank Fernandez
Frank Farber
Mike Kasimirsky

**Figure 1. L-38 / Sequence VIII
Mean Total Bearing Weight Loss (mg)**

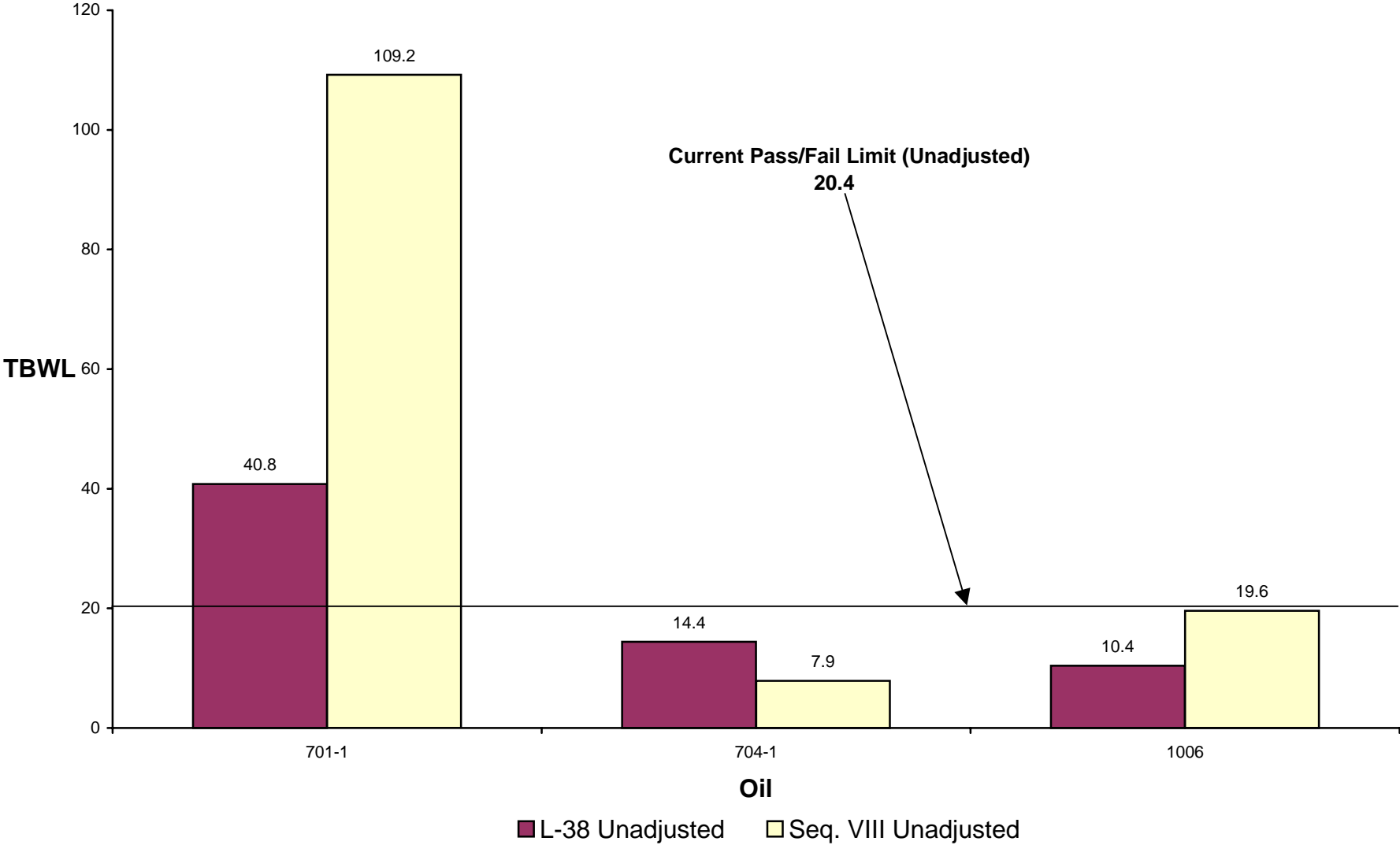


Figure 2. Sequence VIII vs L-38
Total Bearing Weight Loss (mg)

