

Corrected: 11/10/2005

## Caterpillar C13 Surveillance Panel

Conference Call  
Monday November 7, 2005  
1:00pm to 3:00pm CST

Action Items: Lab F re-submit ring rating data, all labs look at ring rating values to make sure they are correct, and verify method used to rate the carbon on the top of the second ring.

### 1) Attendance

The meeting was called to order at 1:05pm. Those in attendance are: Jim Moritz, Brad Carter, Abdul Cassim, Steve Jeter, Ricardo Conti, Mark Sutherland, Ron Buck, Elisa Santos, Jose Gutierrez, Jim Rutherford, Jim Gutzwiller, Jim McCord, Cathy Devlin, Chris Castanien, Mike Griggs, Bob Campbell, Charlie Passut

### 2) Confirm voting members

There are 9 voting members on the C13 Surveillance Panel and all were present or had a proxy.

### 3) Matrix data analysis

At the time of the meeting, there was a problem with the ring deposit data set; all the values from lab F were the same. They had been correct previously. The values for the tests from lab F need to be re-transmitted. Also, not all labs were rating light and heavy carbon on the top side of the 2<sup>nd</sup> ring. The analysis and subsequent presentatons may have been performed on this problematic data set. Abdul Cassim said that despite problems with data set, the parameter will be included in some fashion. He proposes this parameter to go forward, with final analysis to come. Abdul has run some analysis using equal weighting for both carbon types and said there is still discrimination. CAT will still go with this parameter as it will cover lower piston deposits. Some labs reported heavy and light carbon and some reported one value for carbon. The one value for carbon could be only light carbon or could be one number for all carbon. The rings have been cleaned now, but the labs are to verify how the data was reported. The parameter still shows 2 oils to be bad. This parameter will have a minor weighting in the merit system and doesn't have a lab bias. There is no copper oil cooler on the test engine, so the copper effect will be negligible. There was no support for or disagreement with adding this parameter and going forward. The Surveillance Panel was silent.

Jim Gutzwiller updated the Surveillance Panel with the activities of the lab bias task group. The oil pan fitting location is resolved. Lubrizol acquired the correct oil heat exchanger so all the oil pressures between the labs are closer together now. The group could still work on an oil pressure adjustment method. There is still work on the high torque at lab F. Labs have started recording exhaust CO2 levels. The Intake air restriction levels are closer between the labs now and may have brought the labs closer together on Oil Consumption (OC) and Top Groove Carbon (TGC). The remaining issues are whether to implement an oil gallery pressure adjustment and the higher torque levels at lab F.

4) Recommendation to HDEOCP

Abdul discussed his presentation. See attachment. CAT has investigated several lower piston deposit parameters. Second ring deposits are of the most concern. The back of the ring is almost always packed and the bottom is usually clean. The top of the ring shows the most discrimination. No other lower piston deposits discriminated. CAT feels that the carbon levels on the top of the second ring (R2TCA) relates to ring sticking which is a field concern and could lead to high oil consumption. This parameter will add weight to bad oils dropping out. This parameter appears to have reasonable precision, according to CAT.

Panel discussion followed. The Surveillance Panel still has questions about what ratings were used and what to do with the data and the parameter and how will the parameter be calculated and reported going forward. Ring ratings were not performed as an official rated parameter in the last rating workshop. The Surveillance Panel was reminded that the OEM sets the test parameter requirements and the Surveillance Panel decides if the measurements of the parameters are adequate to define it. Ring weight loss values haven't shown much and can be dropped. Abdul Cassim motioned that the C13 is ready for the test to be included in PC-10 qualification testing. The pass/fail parameters are OC, TGC, TLC, R2TCA, and no hot stuck rings. Jim McCord seconded. With the question of the R2TCA parameter problems, some asked how older tests are going to be handled. When the labs verify how the rings were rated, the final technique will be determined. The motion carried with 6 votes for the motion, 2 votes against, and 1 waive. Labs must verify how the ring carbon was rated and submit what methodology was used and lab F will re-submit their data. The labs should check the TMC file and verify that it is correct.

Jim McCord motioned to remove ring weight loss as a reported item and remove the requirement to clean the rings and to leave the carbon on. Bob Campbell seconded. The motion passed unanimously.

5) Confirm data set for calculating LTMS

Least Squares means and arithmetic means have been developed for both data sets, the full data set of 32 tests and the 24 test BOI data set. If the latest 2 tests are included, the data set would be more robust but the full analysis would have to be re-run. The labs are to start looking at the LTMS system. Another method for determining the mean, is to use LS means, but only include labs that are running the test right. K values need to be determined. They traditionally are based on the number of parameters.

6) O & H meeting in San Antonio on November 15<sup>th</sup> from 8:00 to 4:00 at SwRI in Building 209.

7) The meeting was adjourned at 2:15.

## Discussion Topics

- Summary of previous decisions of C13 SP
- Open issues requiring C13 SP resolution
  - Potential replacement parameter for UWD
  - Operational issues/lab bias
- Readiness of C13 for inclusion in PC-10 Category
  - Exit Ballot



## Summary of Previous C13 SP Decisions

- Action taken regarding several potential Pass/Fail parameters based on review of industry statistical analysis
  - Scuffing of Pistons, Rings, Liners Accepted as Non-interpretable
  - No Hot Stuck Rings Accepted as P/F
  - Delta OC Accepted as P/F
  - Average TLC and TGC Accepted as P/F
  - Average UWD Rejected as P/F due to strong correlation with TLC and TGC
- Delta OC and Deposit Parameters proposed to be included in a merit system
- C13 Lab Bias Task Group established to investigate causes for lab differences and recommend solutions to improve test



## Open issue – Replacement Parameter for UWD

- Caterpillar investigated several alternate parameters to capture concerns of lower piston deposits (with help of industry statistician)
- Caterpillar believes deposits in Second Ring/Groove area are important indicators of potential field oil consumption issues
  - Second Ring Top Carbon (R2TCA)
  - Second Ring Back Carbon (R2BKCA)
  - Second Ring Bottom Carbon (R2BCA)
  - Second Groove Unweighted Deposits (G2UWD)
  - Lower Piston Unweighted Deposits (includes all deposits except TLC and TGC)
- Details of all analyses are included in Elisa's presentation



## Open issue – Replacement Parameter for UWD

- From parameter looked at, Caterpillar believes R2TCA is most appropriate parameter to address concerns
  - Relatable to potential 2<sup>nd</sup> Ring Sticking (field concern)
  - Excessive R2TCA could lead to loss of oil consumption control
  - Does not show strong correlation to TGC or TLC and balances them (no stand or lab bias)
  - Does show ability to discriminate between oils and base stock types
  - Appears to have reasonable precision compared to other accepted parameters

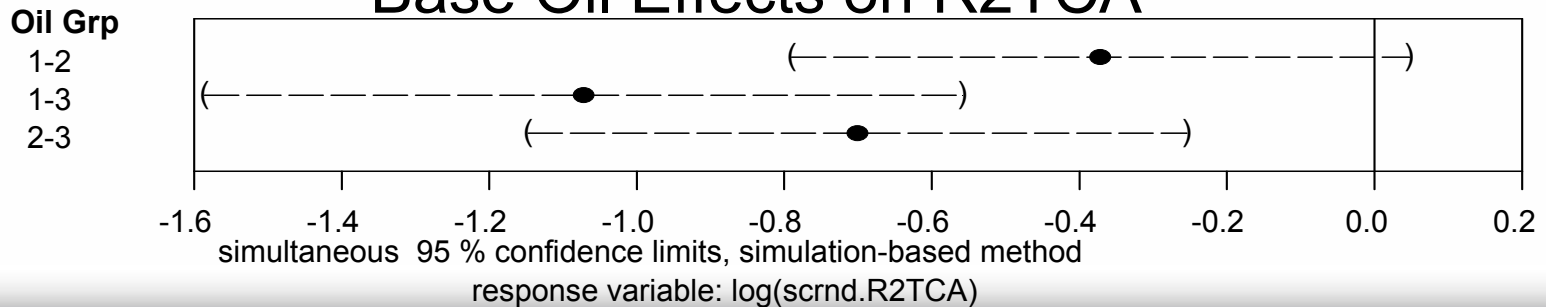


# Precision / Discrimination / BOI

Parameter	Precision based on the model	
	24 tests	32 tests
<b>Delta OC</b>	6.52	6.82
<b>OTGC</b>	5.54	5.43
<b>scrnd TLC</b>	4.02	4.25
<b>R2TCA</b>	~6.48	~5.57

Level				Least Sq Mean
PC10F	A			3.842
PC10C	A	B		3.245
<b>OILA</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>3.085</b>
PC10B		B	C	2.919
PC10E		B	C	2.883
PC10D		B	C	2.732
PC10G		B	C	2.713
<b>OILD</b>		<b>B</b>	<b>C</b>	<b>2.655</b>
PC10A			C	2.330

## Base Oil Effects on R2TCA



## Open issue – Operation Issues/Lab Bias

- C13 Lab Bias Task Group Formed
  - Lab and operational differences identified and some corrected.
  - Mild Lab A has made the adjustments recommended by the C13 SP and are now obtaining results on the same severity level as the bulk of the other labs in terms of OC and TG
  - Current activities focused on Torque and External Oil System
  - Other solutions to be implemented to improve test consistency.
- Task Group should continue to progress as quickly as possible, but corrective measures may not be available before initial use of test for PC-10
  - This is common issue for several new tests and should not prevent approval of test for use





## Readiness of C13 for inclusion in PC-10

- Caterpillar believes that the C13 test has met the requirements for use in PC-10 and the open issues remaining from the last SP meeting have been addressed
- Caterpillar would like the SP to consider a motion to declare the test ready for use in the category



# Caterpillar proposal for C13 Merit System

	Min	Merit Anchor	Max	Merit Weight
Oil Consumption Delta	10	25	31	300
ATLC	15	30	35	300
ATGC	30	46	53	250
R2TCA	5	16	22	150

