

**MINUTES of the CRC HEAVY DUTY RATING WORKSHOP  
HELD IN SAN ANTONIO, TEXAS at the EMBASSY SUITES HOTEL**

**October 03 - 07, 2004**

**CRC Workshop Coordinator: Mike Pansza  
CRC Chairman: Tony Barrera  
CRC Secretary: Marianne May**

**Sunday, October 03, 2004** - Phase I of the workshop started at 8:00 AM. Prior to this all of the equipment had been brought over to the hotel by the coordinator and some contracted labor. Those in attendance started setting up the equipment needed for the workshop. There were three rows of six (6) rating booths and six-calibration booths set-up. All rating booths were equipped with lights, piston stands and pistons. In each of the three rows (A, B, & C) of rating booths we had a \* mixture of Caterpillar, Cummins and Mack pistons (single and multi-cylinder). \* **See attachment I**. We also had two rocker covers and two oil pans prepared for sludge ratings. After completing the workshops' setup, there were six pre-selected pistons setup in the calibration booths with pre-selected areas on each that were rated for the calibration part of the workshop.

*Note 1:* We also had some "Black" articulated pistons set up separately to rate but, the data generated on these pistons will **not be included** with the rest of the data from this workshop. A recommendation for a rating method will be forth-coming from this group to the appropriate ASTM Panel.

A meeting was called to order at 10:00 AM. Mike Pansza – CRC Workshop Coordinator, opened the meeting and handed everyone an envelope with all the rating forms needed as well as our respective row assignments. He went on and explained that there are three additional rating forms to complete when finished with our assigned row of 6 pistons and if needed, additional forms were made available for more ratings. Before any rating commenced, everyone was given a CRC rust/varnish rating scale. The workshop continued with the calibration exercise and data review. At this time, raters who were found to be outside the acceptable range were encouraged to review their breakdown ratings for accuracy. It was then the responsibility of the individual to administer his or her severity adjustments and after that the participants then began the practical application of piston rating. After lunch, the rest of the day was spent rating and calculating pistons. We were also reminded to rate one piston at a time, calculate it and turn in the data for computer input before proceeding to the next piston. This will allow the data to be generated in a timelier manner.

**Monday, October 04, 2004** - Rating continued all day.

**Tuesday, October 05, 2004** - Rating continued in the morning till 10:00 AM. All remaining piston data was then collected for computer input. Before lunch all Phase I data generated was reviewed for any erroneous errors or obvious outliers. During this period a brief introduction of the Yi process was introduced to the participants. Time constraints limited this discussion but it was emphasized that at future workshops the

process would be implemented. The meeting continued going over data generated from the “Black” pistons. After reviewing the data on the “Black” pistons the following recommendations were made and agreed unanimously by all participants in attendance.

There being no further business for Phase I participants, meeting adjourned at 12:00 PM.

After lunch, Phase II participants met and continued with the second part of the workshop.

*Note 2:* Phase II part of the workshop was conducted with the same format as Phase I with the exception being tearing down instead of setting up.

After completing the calibration exercise, participants reviewed the data and then began the practical application of piston rating.

**Wednesday, October 06, 2004** - Rating continued all day.

**Thursday, October 07, 2004** - Rating continued for most of the morning. At approximately 11:00 AM the participants indicated that all of their ratings were completed and those participants remaining commence tearing down the workshop. After the workshop teardown was completed a meeting was called to order with the remaining participants to review the Phase II piston data for any erroneous errors or obvious outliers.

At each of the two sessions (I &II) (during the data review) time was taken to introduce and explain to the raters the expansion of the Yi process for use as a new tool in the understanding of the individuals performance at the workshop. Session II's discussion was much more in-depth because there was no time limitation like Session I.

The Yi process was introduced to the CRC Workshop some seven years ago. It has provided an improved technique to the raters for understanding differences that exist in the Unweighted Total Demerits (UWTD). This value has been the benchmark of performance for more than twenty-five years. Technology improvements have made it possible to review thousands of data points in a very short period of time. We are no longer limited to reviewing only UWTD and a few out-liers.

The expansion of the Yi process with some initial guidelines of interpretation now make it possible to review every zone, of every piston, of every rater at each session. (Remember Yi is an indication of how similar or dissimilar the individual raters evaluated the deposits.) This tool allows the rater to review their data in a most effective and efficient manner in order to maximize their time spent at the workshop. It makes identification of rater errors very obvious with the highlighted values. A single highlighted value is **not** an indication of a rater problem. In order to get an accurate indication of rater performance at least fifty data points (six pistons) are desired. Individual piston zones provide the data we have always wanted, but did not have the tools to acquire the information. The expanded Yi process makes it possible in a most timely manner.

Rater misinterpretation can be easily identified. Consistent "flagged" data on a particular zone are usually an indication of different interpretation of a definition or possible misinterpretation of the specific area to be rated. The expanded Yi process

makes obvious raters errors - rated wrong area, arithmetic calculations, or temporary loss of focus (interpretations) obvious.

The data grouping is an indication of performance of the rater at this workshop with these specific pistons, under this workshop's conditions utilizing the current CRC methodology, scales, and definitions. This particular workshop data demonstrates the method is very user friendly, allowing most raters of all experience levels, laboratory and field, to effectively interpret the deposits in a very similar manner. The grouping guidelines are outlined below:

	Minimum Number of Parts Rated	Minimum Yi's within 1 STD of mean	Minimum Yi's within 2 STD of mean	Maximum AvgYi STD	Group Total	
White -	6	60%	90%	1.00	17	57%
Red -	6	80%	95%	0.75	4	13%
Blue -	6	85%	98%	0.65	2	7%
Yellow -		All other data			7	23%

These four criterion were chosen after numerous hours of review of the data from the last three CRC Diesel Engine Deposits Workshops and the last three Gasoline Engine Deposits Workshops and are based on using accepted statistical standards. Both gasoline and diesel pistons are evaluated using similar methodology. The same flexibility characteristics of the CRC methodology used to evaluate the deposits is built into the YI expanded process so it can be utilized in the most effective and efficient manner to assist the rater in their self-calibration process.

All participants attending the CRC workshop whom have contributed data to the data base used for the Yi process will receive a certificate of participation. The color association is indicative of the range of the individual zonal results from the smallest (Blue) to the largest (Yellow), allowing an instantaneous interpretation of the overall workshop performance for each individual rater. (See Attachment II).

*Note 3:* This rating data packet includes sludge ratings and all piston ratings (*except the black piston ratings*). All data printed is Level I unless otherwise identified. Please remember when reviewing this data, it represents the results developed by *all* the participants at this workshop and that includes the novice, field and standardized engine test raters.

*Note 4:* Recommendations that were made by the Phase I participants concerning the rating of “Black” pistons was also presented to the Phase II group and again all those participants in attendance agreed unanimously.

# Dark Coated Piston Deposit Evaluation Method

1. Use CRC Manual 20 method modified as follows:
  - a. Carbon levels-
    - 1<sup>st</sup> groove – HC, MC, LC and estimated fill volume percent (TGF)
    - 2<sup>nd</sup> groove – HC and LC and estimated fill volume percent (2<sup>nd</sup> GF)
  
    - 1<sup>st</sup> land (crown) – HC and LC
    - 2<sup>nd</sup> land – HC and LC
  
    - Undercrown – LC only
    - Oil coolant gallery – LC only
  - b. Varnish/lacquer deposits can not be evaluated reliably because of the interference of the dark coating.

2. Report Items:

- 1<sup>st</sup> groove deposits and TGF
- 2<sup>nd</sup> groove deposits and 2<sup>nd</sup> GF
- 1<sup>st</sup> land (crown) carbon deposits, TLHC and TLFC
- 2<sup>nd</sup> land carbon deposits
- Undercrown carbon deposits
- Oil coolant gallery carbon deposits
- Total unweighted carbon demerits (TUCD)

Marianne May  
Secretary, CRC Heavy Duty Diesel Rating Workshop

## Attachement I

A1	Square Cut	Caterpillar
A2	Keystone	Caterpillar
A3	Articulated	Caterpillar
A4	Articulated	Caterpillar
A5	Articulated	Cummins
A6	Articulated	Mack
2	Black Pistons	(Articulated)
2	Oil Pans	
2	Rocker covers	