
Status of ISM Test Development

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To HDEOCP

December 7, 2004

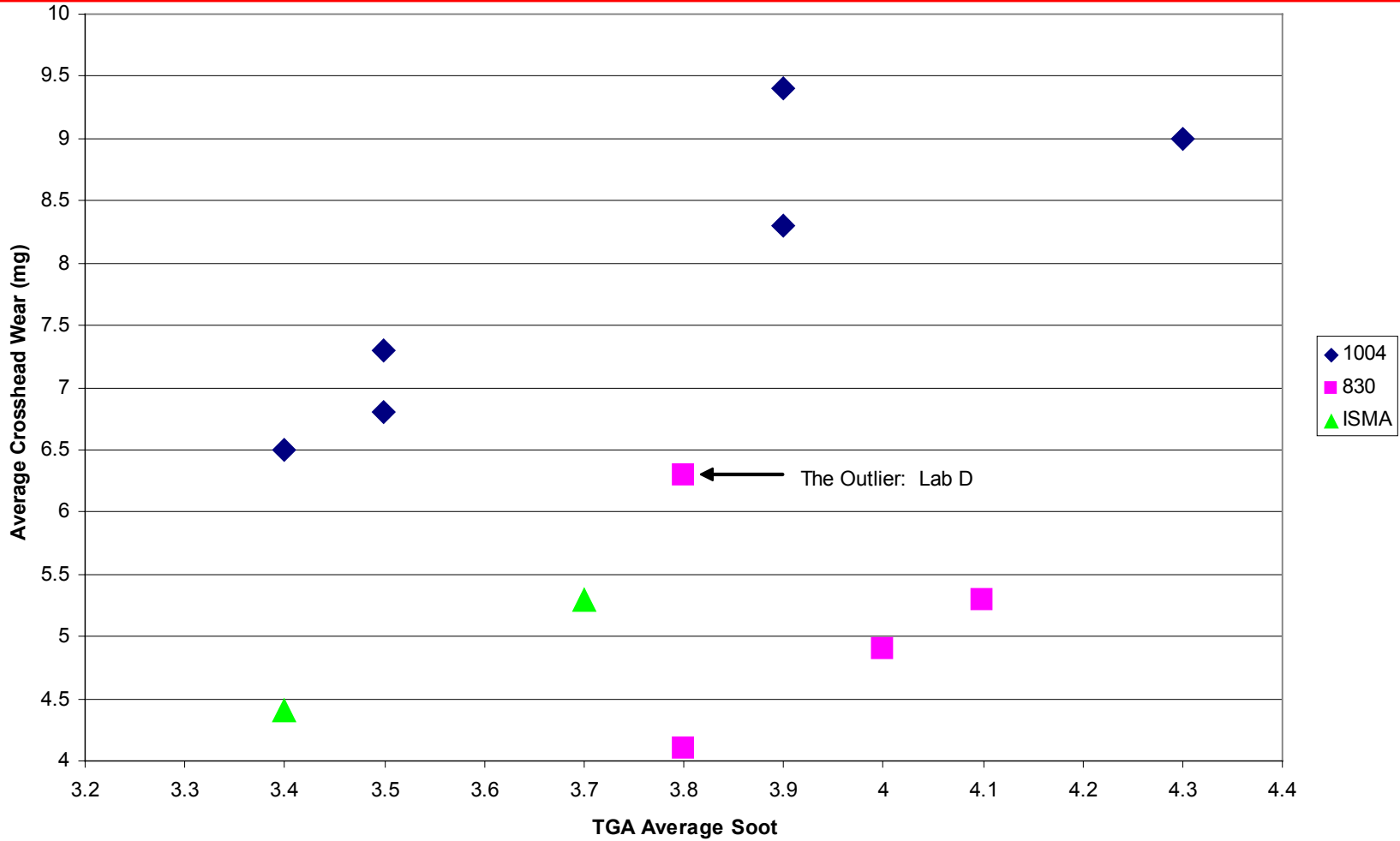
Conclusions from Surveillance Panel

- **Is ISM test ready for PC 10 carry-forward?**
 - **Statistical analysis from 12 test matrix complete**
 - **Test does discriminate between oils**
 - **Crosshead Weight Loss**
 - » **soot correction needed**
 - **Filter plugging (modified calculation)**
 - **Sludge (rater calibrations)**
 - **Precision is good**
- **Is ISM ready to set limits for M11 EGR?**
 - **Crosshead Weight Loss**
 - **soot correction needed**
 - **Filter plugging (modified calculation)**
 - **Sludge (rater calibrations)**

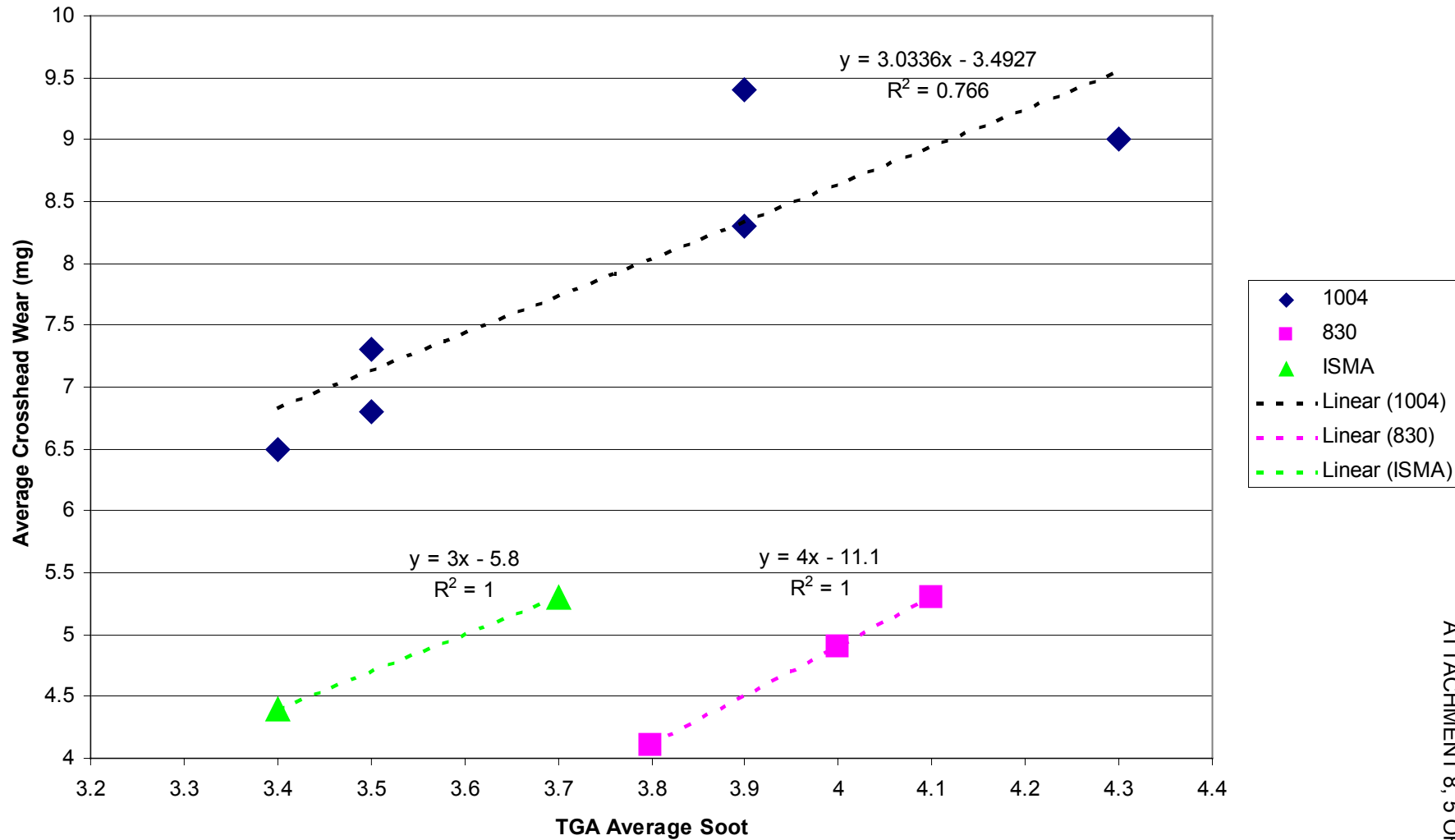
Recommendation

- **It is the opinion of the ISM Development Task Force and the Cummins Surveillance Panel that the ISM test does show the ability to differentiate oils with acceptable precision on wear and filter plugging, however items such as soot correction, outlier screening, correlation to M11 EGR, and the actual OFDP calculation still need to be finalized.**
- **Passed by unanimous vote of Cummins Surveillance Panel / ISM Task Force**

ISM Matrix Average Crosshead Wear as a Function of Soot



ISM Matrix Average Crosshead Wear as a Function of Soot Outlier Lab Removed

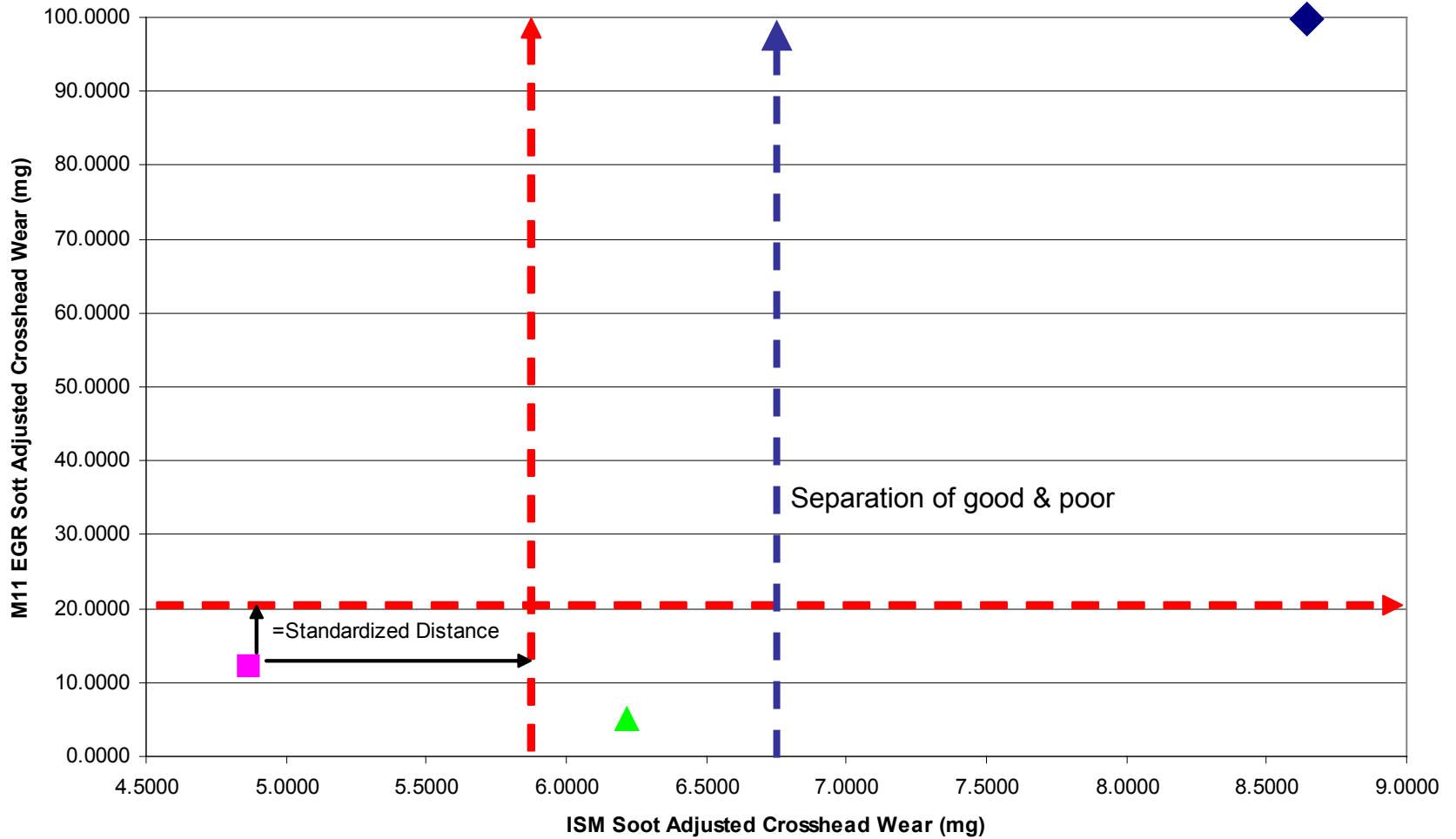


Cross Head Weight Loss

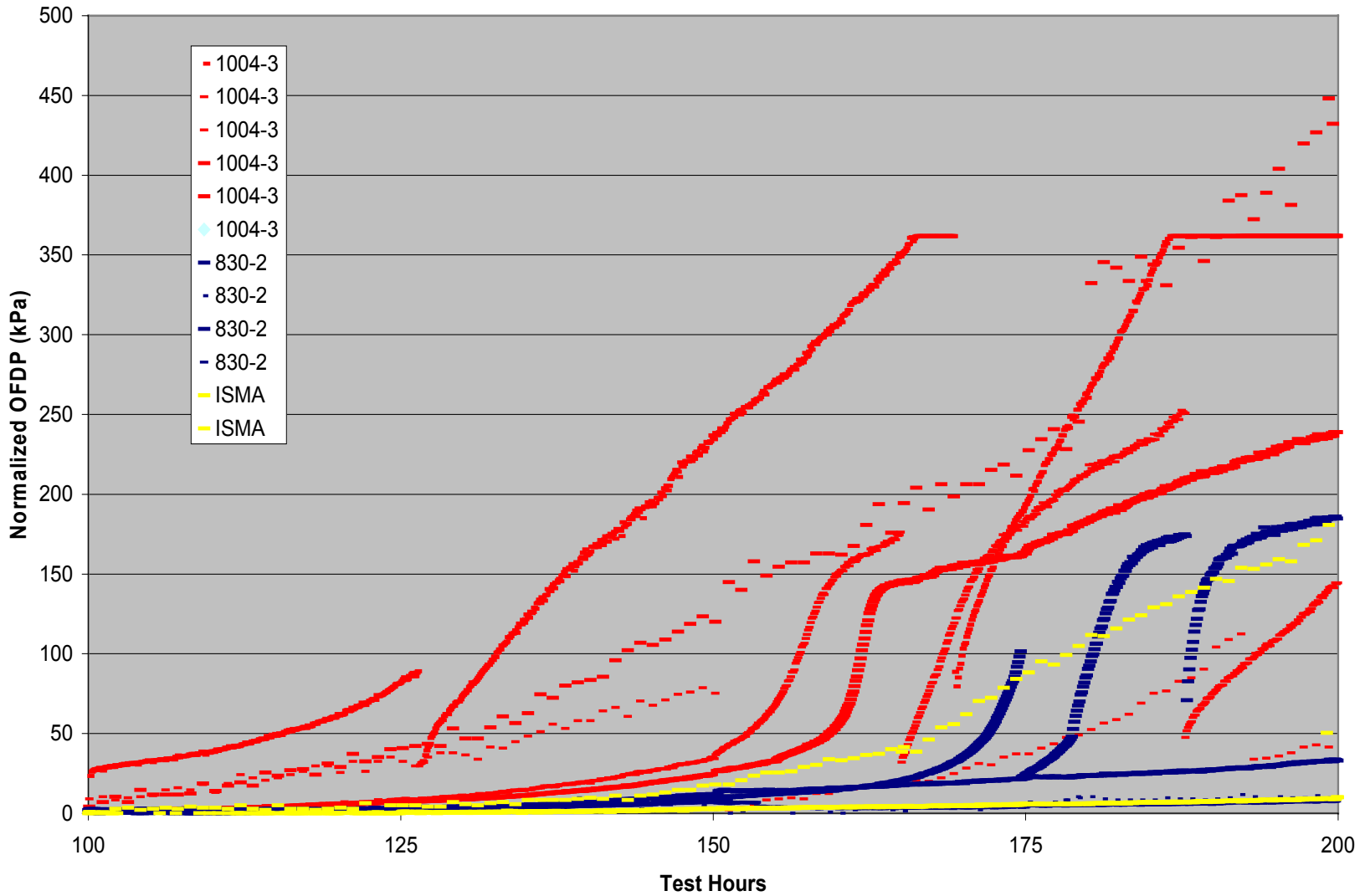
- **Model Fit: $CWL=f(\text{Lab, Oil, Average Soot})$**
 - **No Lab Differences**
 - **Lab G 0.84 Mild if Fit Procedure Change Instead of Soot**
 - **All 3 Oils Statistically Significantly Different**
 - **CWL Increases 3.0332 per 1% Avg Soot**

Crosshead Weight Loss	Oil 1004	Oil 830	Oil ISMA
LS Mean @ 4% Soot	8.6385	4.8680	6.3605
Mean @ 4% Soot	8.6416	4.8678	6.2149
StdDev @ 4% Soot	0.5784	0.1477	0.0070
Mean @ New Soot	8.9000	4.7667	6.8767
StdDev @ New Soot	0.5568	0.6110	NA
M11 EGR Target	99.8000	12.2000	5.1000

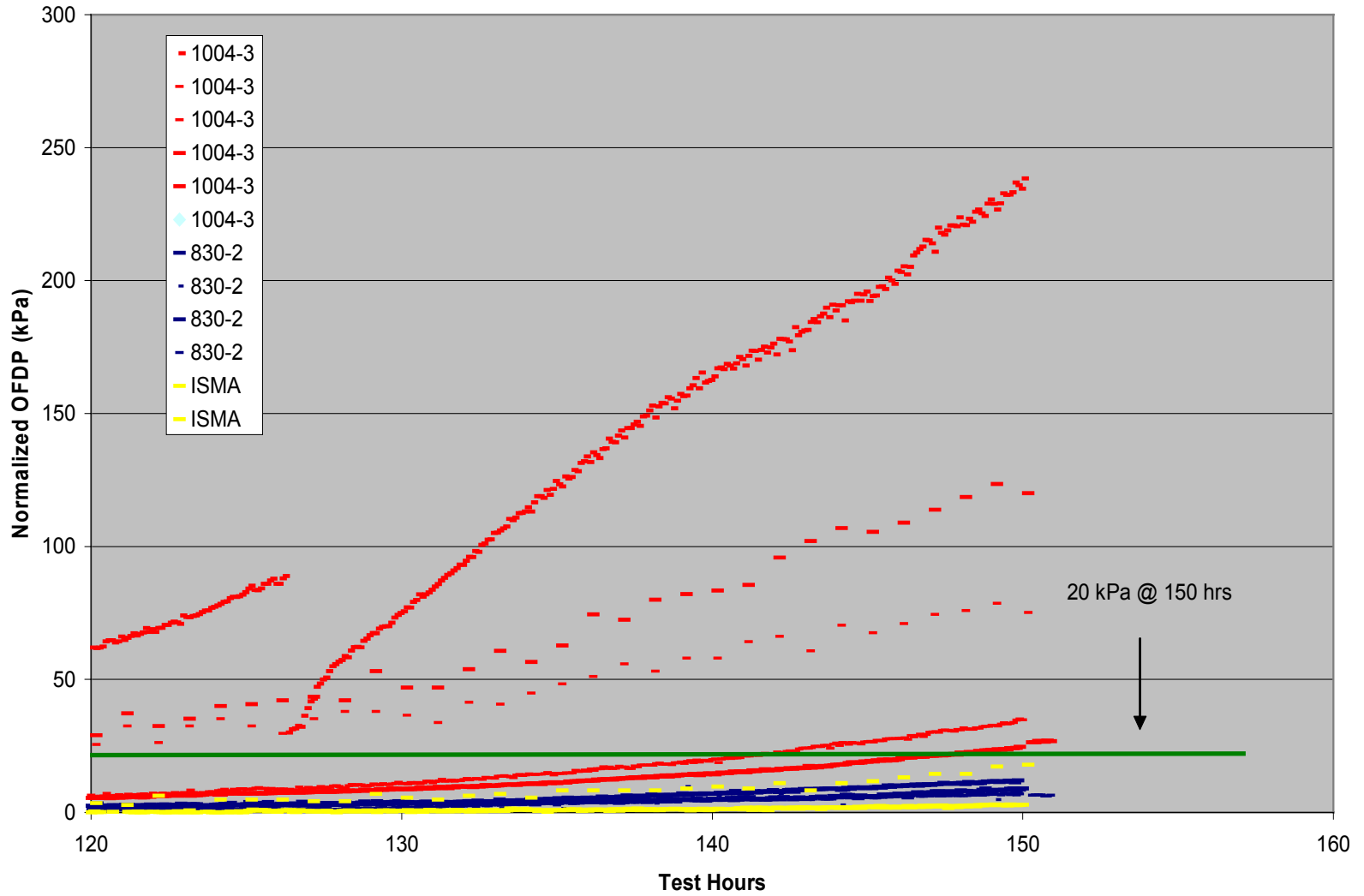
M11 EGR Crosshead Wear as a Function of ISM Crosshead Wear Oil Averages



OFDP

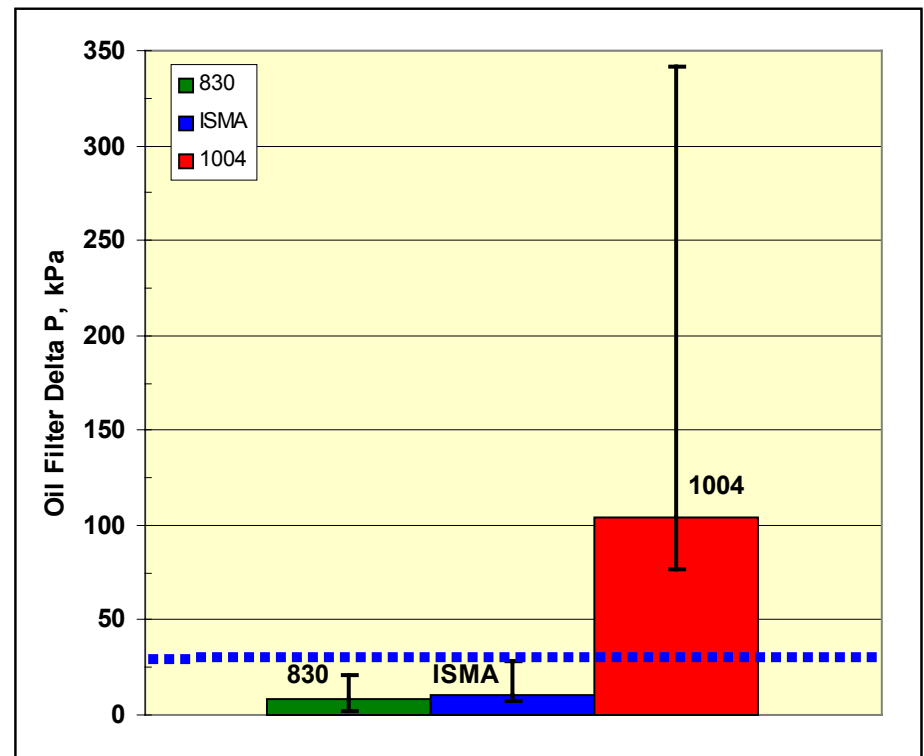


OFDP



ISM Oil Filter Delta P (Uncorrected)

- Data at EOT is too scattered
- Consider using OFDP @ 150 hrs
- Uncorrected data shows clear discrimination



Surveillance Panel Actions

- **By mid-January**
- **Run an additional 4 tests on 830-2 at the current test conditions (6.5% soot targeted)**
 - In progress @ 4 labs
- **Upon completion of the tests review the data and determine preliminary soot correction for crossheads and other parameters were applicable, evaluate 150-hr OFDP, and review sludge ratings.**

Issues

- **ISM correlation with M11-EGR**
- **ISM Test inclusion in PC-10**
 - **Issue before HDEOCP today**

Recommendation

- **In view of the finding “of the ISM Development Task Force and the Cummins Surveillance Panel that the ISM test does show the ability to differentiate oils with acceptable precision on wear and filter plugging,” the ISM test should be advanced for inclusion in the PC-10 category.**

Next Steps

- **Re-do statistics**
 - Agreed upon outlier rejection criteria
 - Soot corrections
 - OFDP revised calculations
 - i.e. @ 150 hrs.
 - 4 more reference runs
- **Target to have data by mid-January**
- **Proposed CI-4 limits relate 830 values & St Dev from M11 EGR limits**
- **PC-10**
 - CHWL, ASWL
 - OFDP
 - Sludge
 - TRWL
 - Used Oil Properties
 - Merit system ?

ISB Status

- **Four Test Mini Matrix in progress**
- **Finish runs and analyze data for Dec ASTM meeting**