

ISM Task Force Report HDEOCP

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October 8, 2003
Chicago, IL



Scope

- Scope – To develop a lubricant performance test on a Cummins ISM test platform that can discriminate and provide a quality assessment of motor oils in a similar manner as the current M11 test (that includes both the M11 EGR and M11 HST). The ISM test development will consider the following parameters for lubricant quality evaluation:

Primary Parameters

Crosshead weight loss

Top Ring weight loss

Injector adjusting screw wt. loss

Sludge

Oil filter delta P

Secondary Parameters

Liner wear

Rocker hat weight loss

Push tube scuffing

Bearing wear

Intake and Exhaust screws

Objectives

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1. Draft of test procedure 10/3
2. Finalize matrix plan 10/3
3. Begin matrix testing 11/03

ISM Test Conditions:

| Parameter | Unit | A (Soot) | B (Rated) |
|------------------------------------|---------------|-----------------|-------------|
| Stage Length | H | 50 | 50 |
| Engine Speed | r/min | 1800 | 1600 |
| Torque | N·m (lb·ft) | 1300 (960) | 1930 (1424) |
| Fuel Rate | Kg/hr (lb/hr) | 58 (128) | 64.4 (142) |
| Intake Manifold Air Temperature | °C (°F) | 80 (176) | 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) |

150 hr soot: 5.0% - 6.0%

9/5/03 Task Force Mtg. Summary

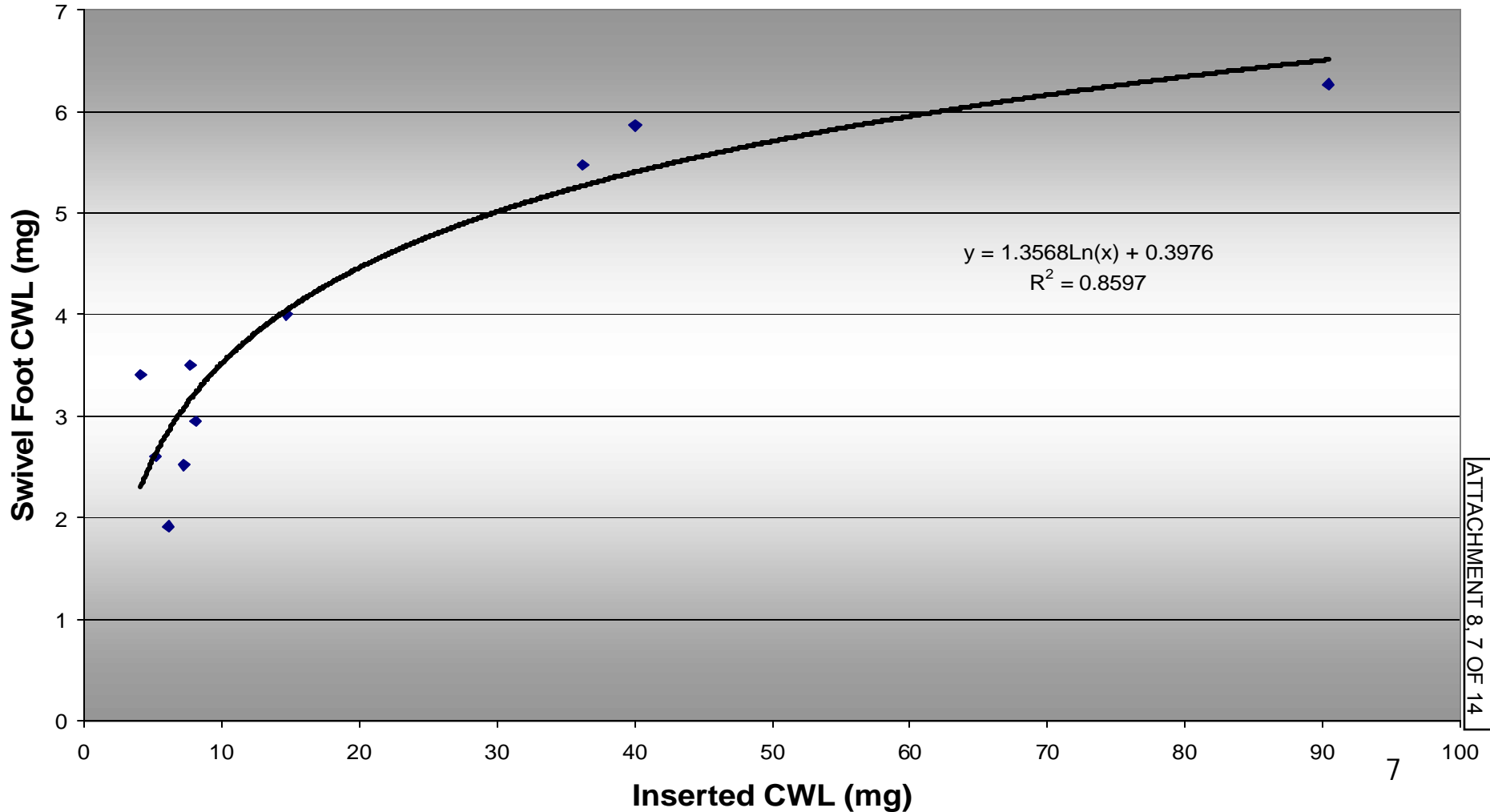
- ISM test is planned to replace the M11 EGR and M11 HST.
 - The ISM test will have two sets of limits
 - 1 set for alternate pass/fail in the M11 HST
 - 1 set for alternate pass/fail in the M11 EGR
- The ISM test is proposed to be 200 hours in length and run on a similar cycle to the M11 EGR test
- Target level soot is 5.0% at 150 hours
- The ISM test will run on 500 ppm S fuel and use double wire screen filters

Comments and Questions

- The ISM test will be carried forward into PC10
- Can the labs get additional rebuild parts for the M11 HST/EGR?
- Does Cummins have any data to share that indicates that the ISM will generate wear?

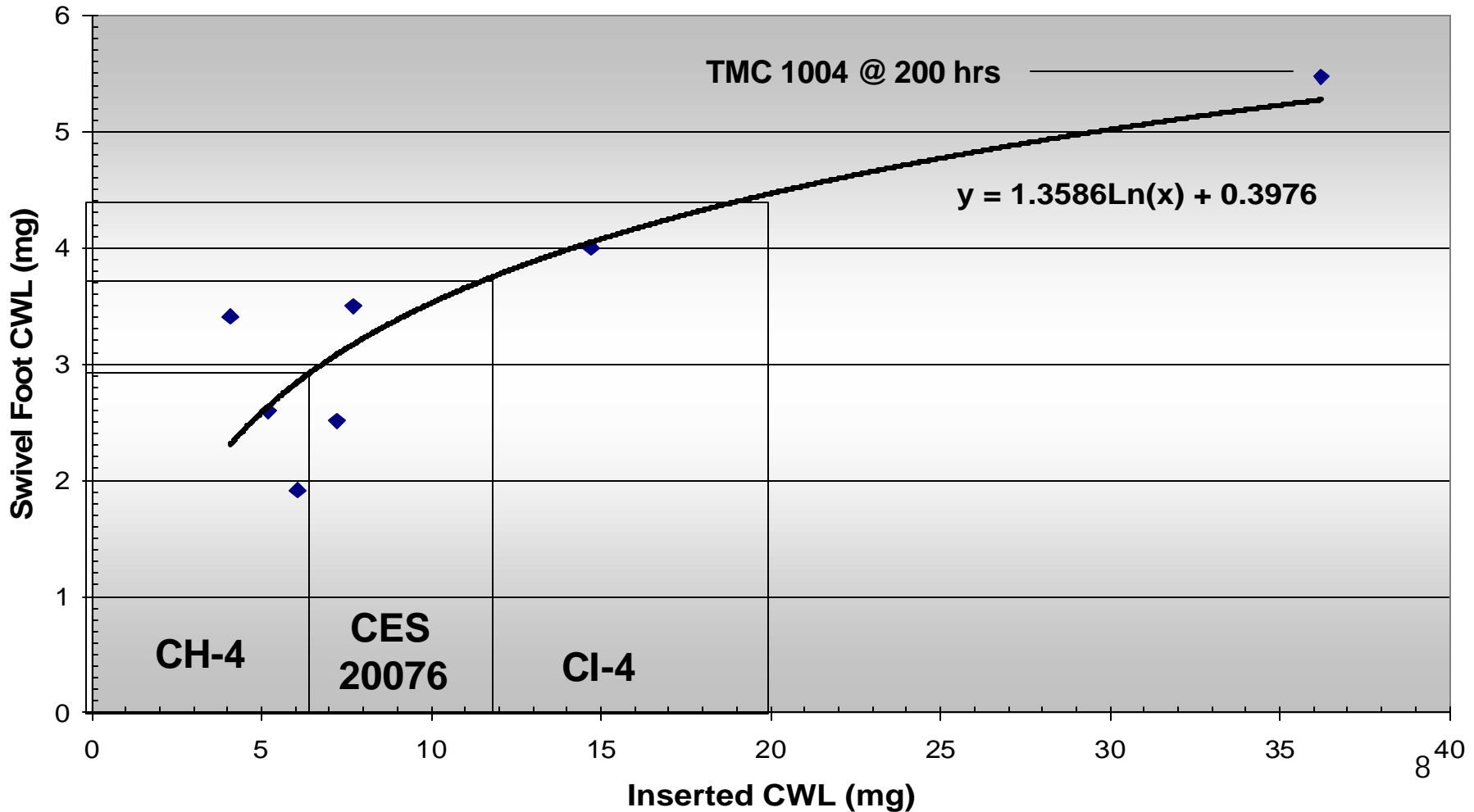
Swivel Foot Rockers vs Inserted Rockers

CWL Correlation



Swivel Foot Rockers vs Inserted Rockers

CWL Correlation



Proposed Matrix

- Test in Stages
- Use Decision Points
- Use a range of oils
 - TMC 1004, TMC 1005 and TMC 830-2
 - Covers M11 HST and M11 EGR range
- Stage 1
 - First four tests will test two poor oils and two excellent oils in four labs. Cummins will provide funding for parts and fuel for these tests.

Proposed Matrix

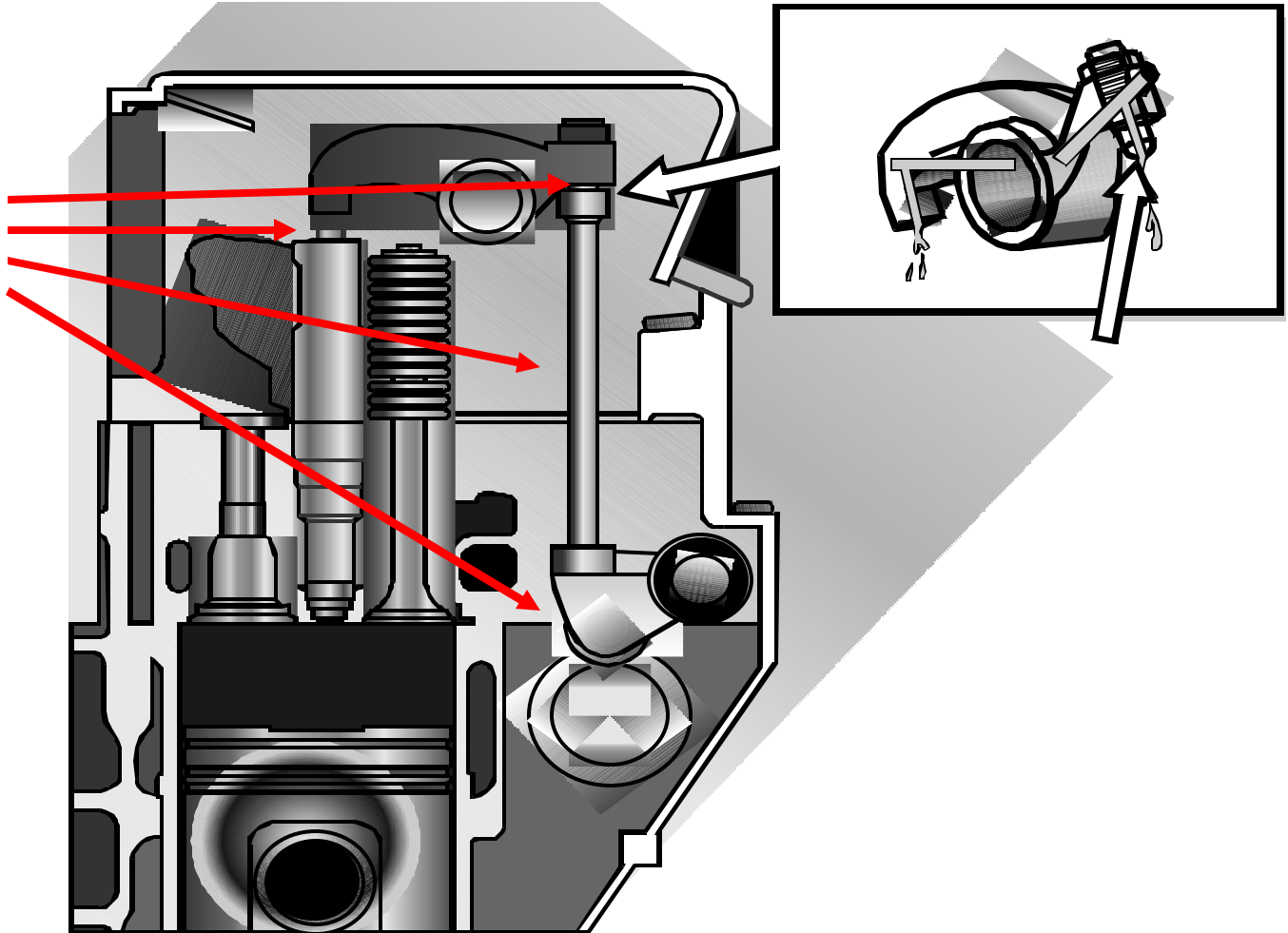
- Is there discrimination?
 - No? Stop the matrix
- Is the discrimination similar to the M11 EGR?
 - No? Stop the matrix
- Stage 2
 - 2 borderline oils and 2 good oils in four labs. Cummins will provide parts for these tests.
- Is the correlation similar to the M11 EGR?
 - No? Stop the matrix
 - Somewhat? Run the reference oil twice in each lab
 - Yes? Run the reference oil once in each lab

Matrix Summary

- Minimum number of tests for a successful matrix: 12 tests
- Maximum number of tests for a successful matrix: 16 tests
- Minimum number of tests for comfort: 4

Injector Adjusting Screw Wear

ISM engine test will also insure good oil performance for other valve train components. This parameter will only be added for PC10 requirements.



*Drawing courtesy of Jim McGeehan, ChevronTexaco (SAE 1999-01-1525)

Injector adjusting screw weight loss



CH4/SJ Oil

21 mg wear

CG-4/SJ Oil

64 mg wear

CG-4/SJ Oil

145 mg wear

*Photo and data courtesy of Jim McGeehan, ChevronTexaco (SAE 1999-01-1525)

Proposals to the TF by OEM

- **PROPOSAL:** The target be moved to 5.5% - 6.0% to better emulate a 200 hour length M11 EGR test.