ISB Task Force Report
HDEOCP

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Phoenix, AZ

ATTACHMENT 9, 1 OF 12

Scope

- Scope – To develop a lubricant performance test on a Cummins ISB test platform that can discriminate and provide a quality assessment of motor oils in a sliding tappet engine under cyclic conditions. The ISB test development will consider the following parameters for lubricant quality evaluation:

Primary Parameters	Secondary Parameters
Tappet Weight Loss	Push tube scuffing
Cam Lobe Wear	Sludge
Cam Journal Wear	Oil filter delta P
	Adjusting screw wt. loss
	Crosshead weight loss

Objectives

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1. Draft of test procedure 12/03
2. Test engines to six labs 1/04
3. Initiate matrix design 1/04
   - Full matrix required for BOI/VGRA
4. Begin matrix testing ?
   - Matrix must be finished by 3Q 2005

B Product Evolution

1997

Established Product
Over 2 Million put in Service
Great Reliability & Durability

B Mechanical

2002

4 Valve Head with Centered Injection
Full Authority Electronic Fuel System
No Adjust Overhead

ISB

Common Rail Fuel System
Rear Gear Train
Cooled EGR Emissions Control

ISB '02

Test Development

- The test method is derived from proven tests at Cummins and will have the same repeatability and discrimination
- Labs will receive 1 engine for shakedown and matrix testing
- Labs will receive all necessary parts for matrix testing
- This test will need to have completed matrix testing and be available to the industry by 3Q 2005

➢ Remember that sliding tappets will be used on the design of the 2007 engine

ISB Operating Conditions

- 2004 EPA Compliant ISB engine rated at 300 HP and 600 ft-lbs torque
  - 100 hours at 1600 RPM and 325 ft-lbs torque
    - 13 – 16 deg retarded timing to meet soot target
    - Soot target 3.5% at 100 hours
  - 250 hours engine wear cycle

ISB Operating Conditions

1.	Run at low idle		1.0 sec
2.	Ramp up to rated speed (2600 RPM) and full load (600 ft-lbs) within	2.5 sec	
3.	Run at rated speed and full load	6.0 sec	
4.	Lug the engine to low idle within		2.0 sec
5.	Low idle		1.0 sec
6.	Ramp up to torque peak speed (1600 RPM) and 75% rated torque within		2.5 sec
7.	Lug the engine to low idle within		2.0 sec
8.	Ramp up to torque peak speed (1600 RPM) and 75% rated torque within		2.5 sec
9.	Lug the engine to low idle within		2.0 sec
10.	Ramp up to torque peak speed (1600 RPM) and 75% rated torque within		2.5 sec
11.	Lug the engine to low idle within		2.0 sec
12.	Run at low idle		1.0 sec

ISB Test Conditions

Parameter	Unit	A (Soot)	B (Wear Cycle)
Stage Length	H	100	250
Engine Speed	r/min	1600	Variable
Torque	N·m (lb·ft)	(325)	Variable
Fuel Rate	Kg/hr (lb/hr)	(43)	Variable
Intake Manifold Air Temperature	°C (°F)	(110)	(110)
Coolant Out Temperature	°C (°F)	(200)	(200)
Oil Sump Temperature	°C (°F)	(205)	(205)

100 hr soot: 3.5 % target

ATTACHMENT 9, 8 OF 12

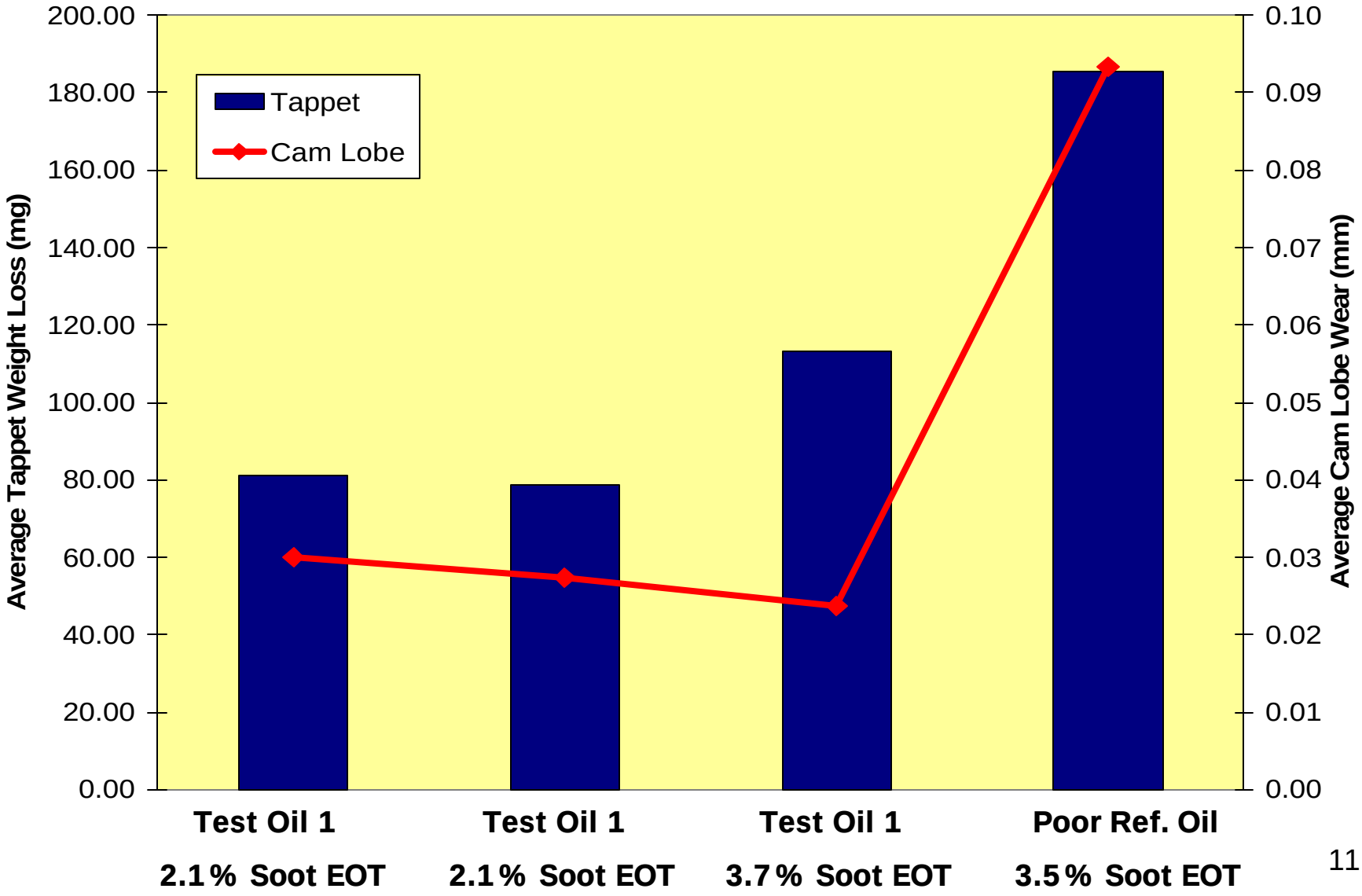
ISB Test Parameters

- Parameters to be rated
  - –Primary Parameters
    - •Tappet Wear
      - –mg wt loss
    - •Cam lobe wear
      - – mm wear
        - »ADCOLE measurement
        - »Cams will be pre and post measured by CPD
    - •Cam journal wear
      - – mm wear
        - »ADCOLE measurement

ISB Test Parameters

- Parameters to be rated
  - –Secondary Parameters
    - •Overhead wear
      - –Crosshead Weight Loss, mg loss
      - –Adjusting Screw Weight Loss, mg loss
      - –Push Tube Scuffing
    - •Other parameters
      - –Oil Filter Delta Pressure, kPa
      - –Sludge, rocker cover and oil pan

ISB '02 Repeatability / Discrimination



9/5/03 Task Force Mtg. Summary

- Reviewed ISB operation and hardware
- Q&A on performance and operation
- Established lab timing
- The ISB test will run on 15 ppm S fuel
- Developed scope and objectives
- Solicited membership
- Mark Sarlo of Southwest Research is the TF Chair