Test Monitoring Center
6555 Penn Avenue
Pittsburgh, PA 15206-4489
(412) 365-1000

MEMORANDUM: 03-090

DATE: October 3, 2003

TO Charlie Leverett, Chairman, Sequence VIB Surveillance Panel

FROM: Richard Grundza

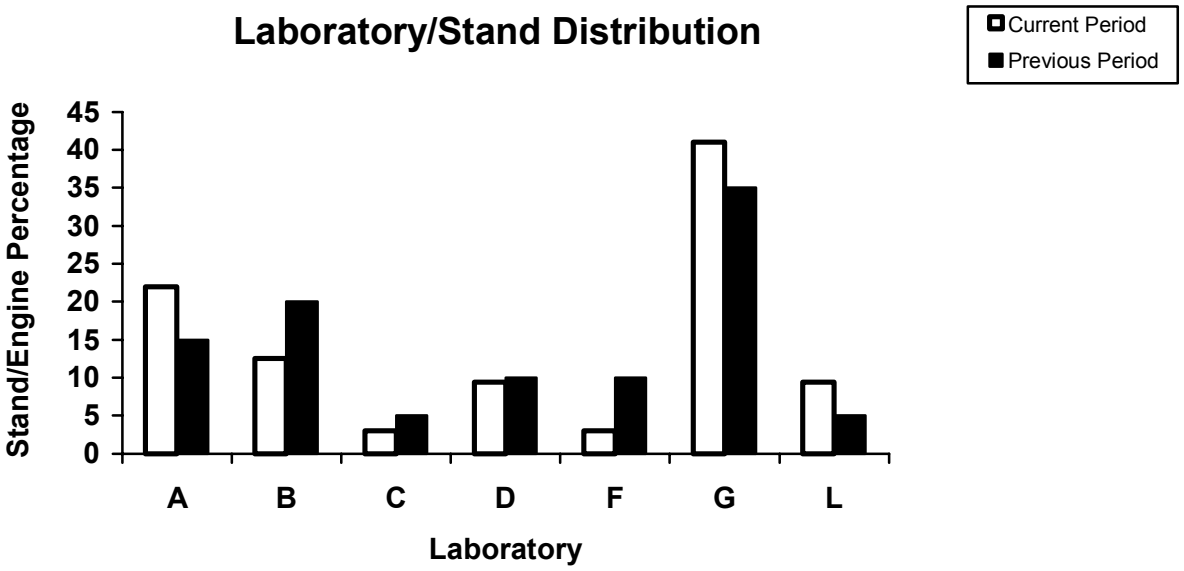
SUBJECT: Sequence VIB Test Results from April 1, 2003 through September 30, 2003

The following is a summary of Sequence VIB reference tests that were reported to the Test Monitoring Center during the period April 1, 2003 through September 30, 2003.

Lab and Stand Summary

	Reported Data During Period	Calibrated as of 09/30/2003
Laboratories	7	6
Stand/Engine Combinations	32	20

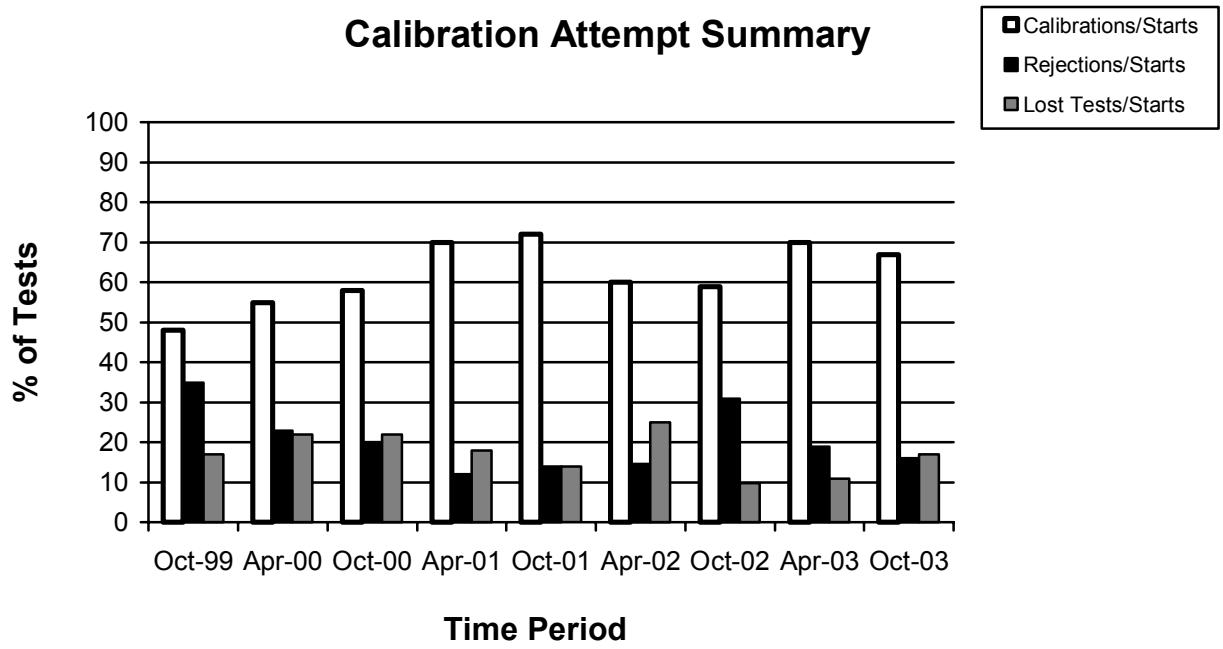
The following chart shows the laboratory stand/engine distribution for data reported during this report period:



The following summarizes the status of the reference oil tests reported to the TMC this report period.

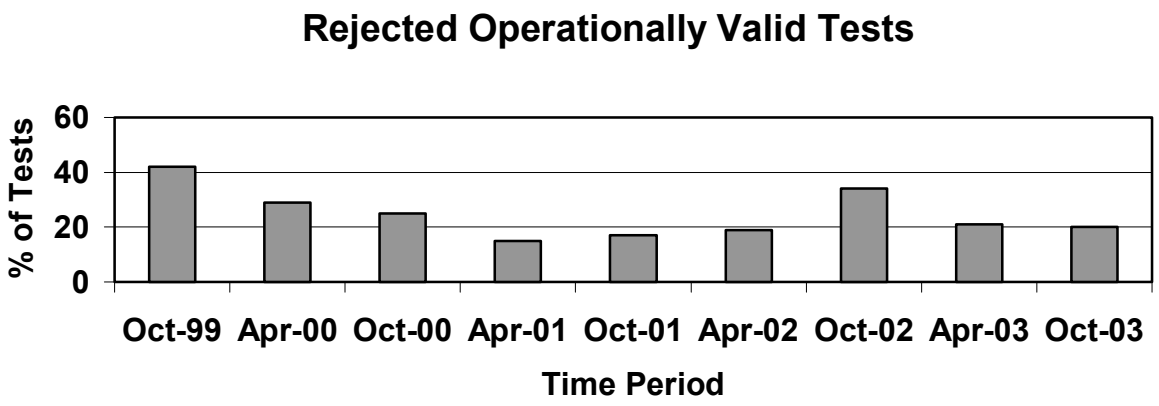
	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	56
Failed Acceptance Criteria	OC	14
Operationally Invalid (Laboratory Judgement)	LC	2
Aborted	XC	5
Abandoned Engine	MC	7
Total		84

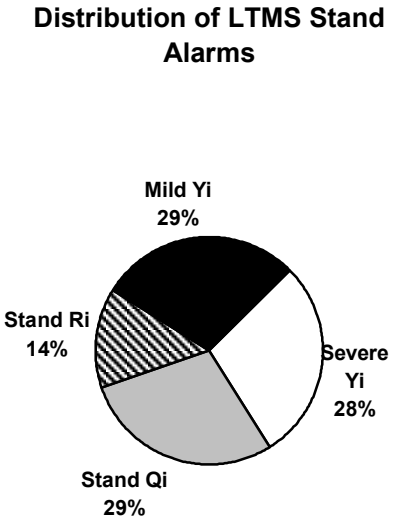
Attempted calibration tests are depicted graphically below by report period:

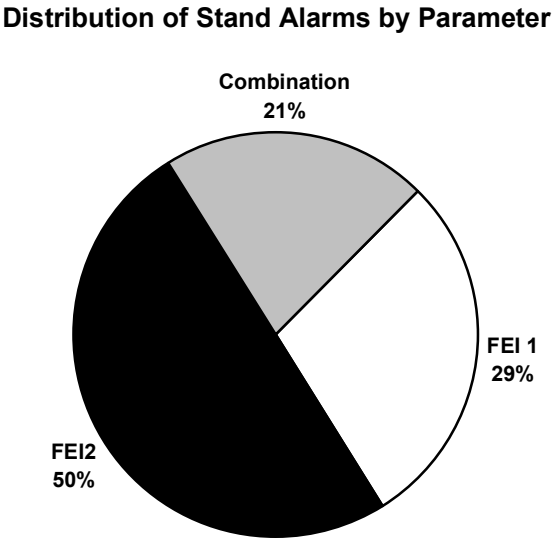


The calibration per start rate has decreased slightly with respect to the previous period. The rejected per start rate has decreased and lost test per start rate has increased, when compared to the previous report period.

The percentage of tests failing the acceptance criteria for operationally valid tests decreased slightly this report period. The percentages are depicted graphically below.

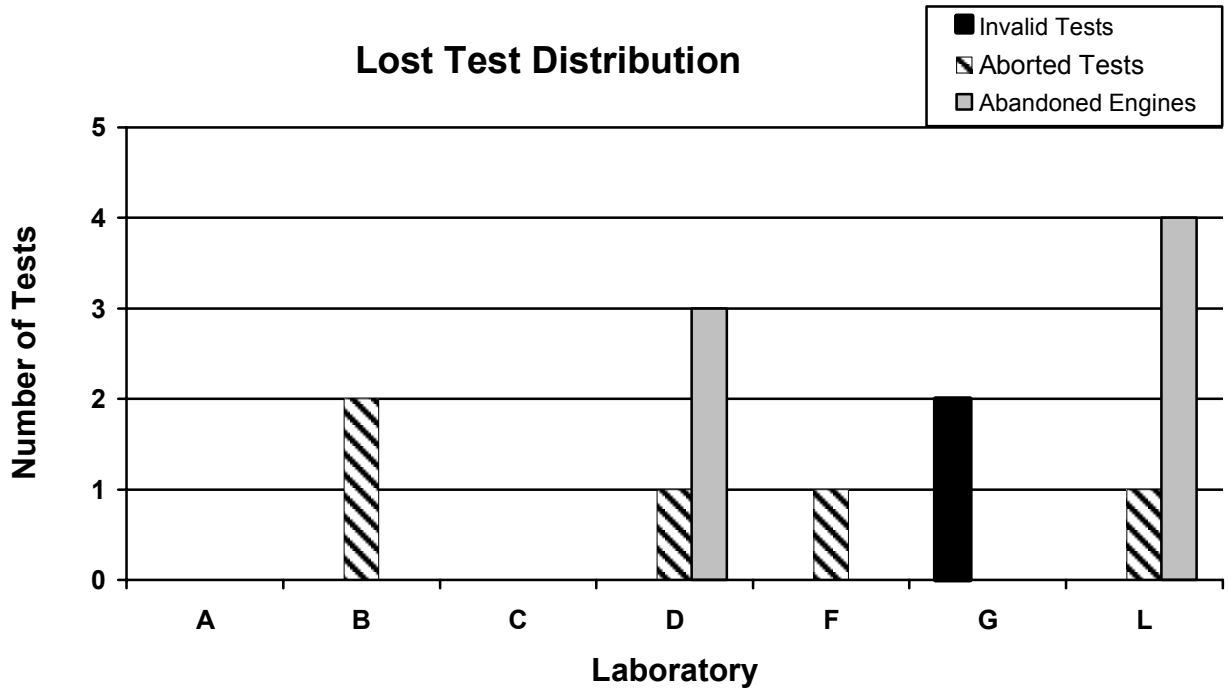




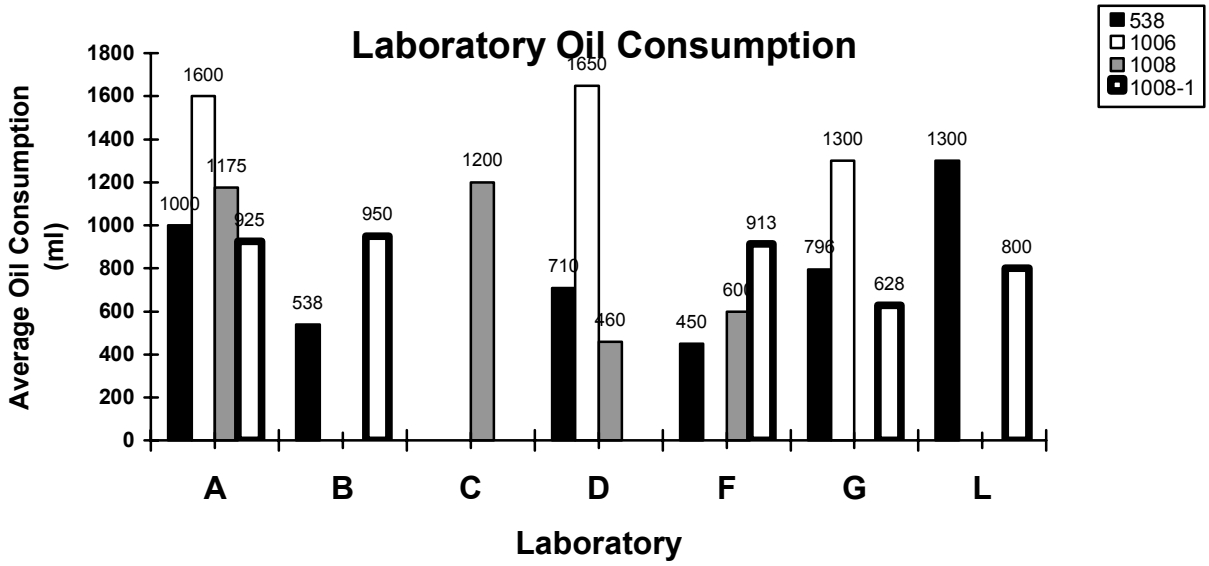


There were four tests rejected for FEI Shewhart (Yi) severe, four tests rejected for FEI Shewhart (Yi) mild, four tests rejected for EWMA precision alarm (Qi), and two tests rejected for Shewhart precision alarm (Ri). There has not been a LTMS deviation written for Sequence VIB to date.

The laboratory distribution of lost tests is shown below. A detailed list of reasons for tests declared operationally invalid, aborted or lost due to abandoned engines is shown in Table 2 (See Attachment).

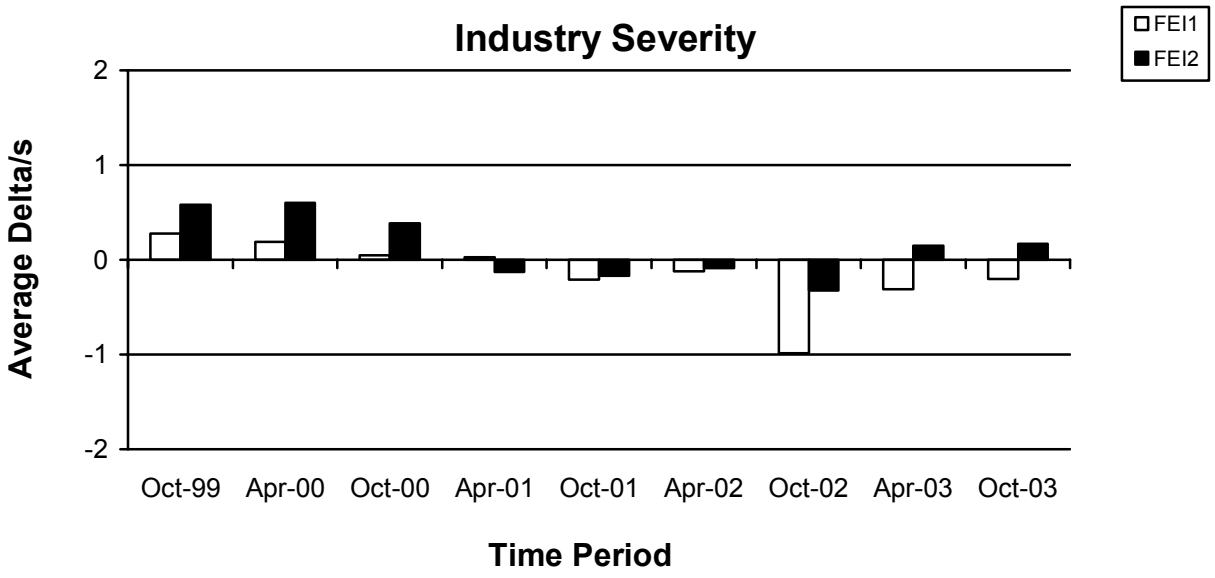


The average oil consumption by oil and laboratory are depicted graphically below. Shown below is a summary of the average oil consumption for all laboratories reporting data this report period.

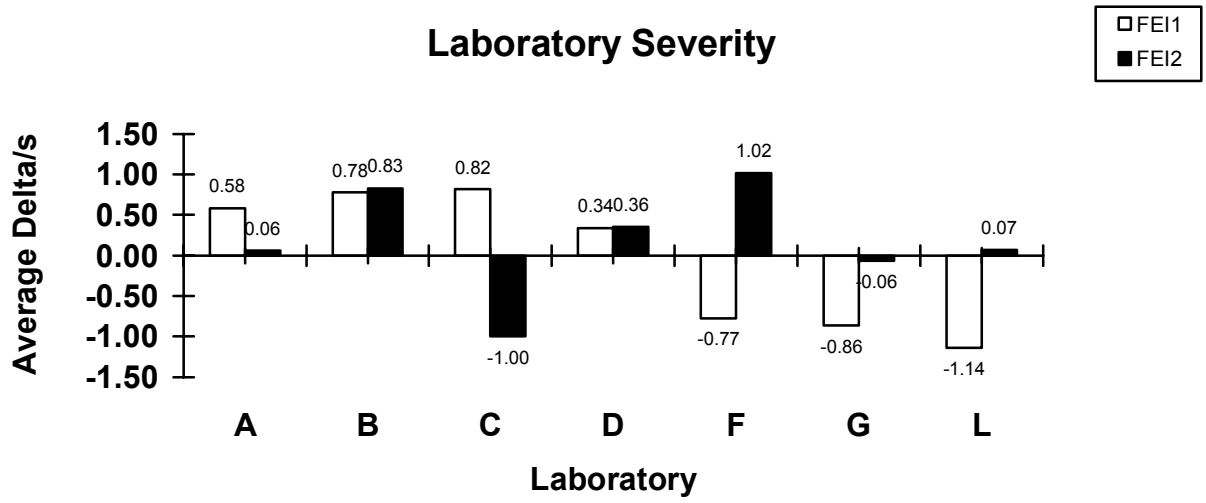


TEST SEVERITY AND PRECISION

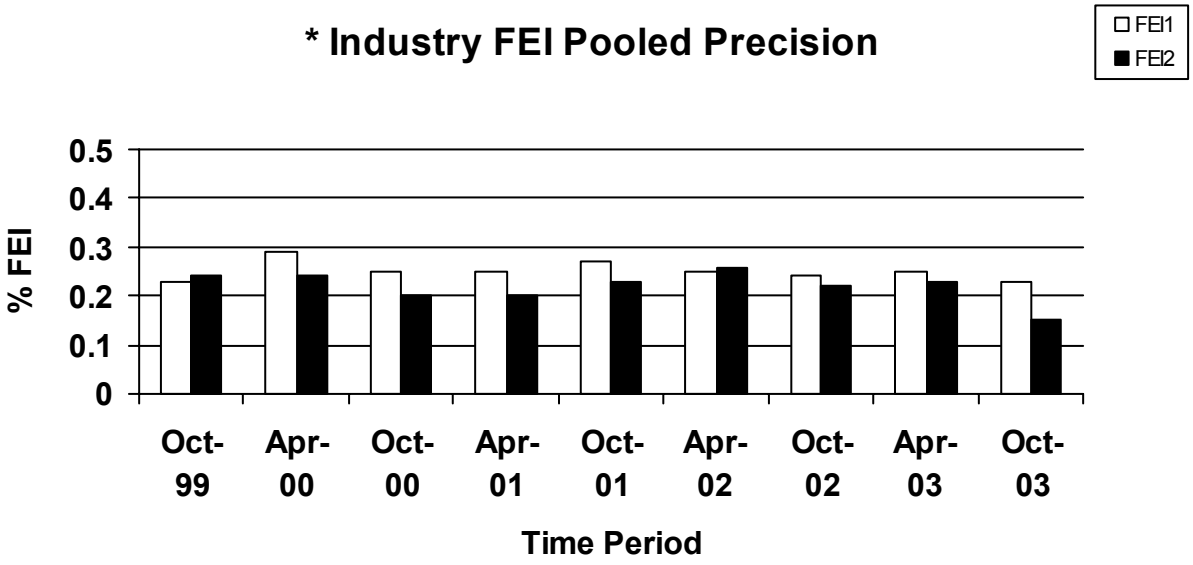
The industry mean Δ/s for FEI1 and FEI2, for this report period are -0.20 severe and 0.17 mild, respectively.



Shown below is a summary of the average FEI Δ/s for all laboratories reporting data this report period.



The industry precision estimates for FEI1 and FEI2 for this report period are 0.23 and 0.15 (pooled s), respectively. Precision for both FEI1 and FEI2 have improved with respect to the previous period and compare well with historical estimates.



*Precision estimates are calculated by pooling oil and stand/engine combination.

INDUSTRY CONTROL CHARTS

FEI1

Figure 1 shows FEI1 severity began the period in control. Seven tests into the period, FEI1 severity sounded a warning and an action alarm, which cleared for three tests before sounding a warning alarm. The charts then clear for a test and sound a warning alarm followed by a series of six action alarms. The charts clear for one test and sound a warning alarm. With the exception of two isolated warning alarms, the industry control charts remained in control status for the rest of the period. The alarms appeared to have been caused by results from two new engines, reported consecutively. FEI1 precision also began the period in control, but sounded a series of three warning alarms four tests into the period. The alarm event clears for two tests, sounds a warning alarm, clears for a test and sounds another alarm, clears for two tests and then sounds another warning alarm. The charts remain clear for the next ten tests, when a series of eight warning and one action alarms sound. Precision is in control for the next thirteen tests, after which a series of sixteen action and three warning alarms sound. After this event, the charts come back into control for the remaining for tests in the period. Precision alarms appeared to be the result of a number of severe tests from new/stand engines, intermixed with on target to mild results from existing stands.

FEI2

Severity began the period in alarm, which continues for eight tests before clearing. With the exception of two additional warnings, Figure 2 shows severity in control for the remainder of the period. Precision began the period in control, but quickly sounded a series of three warning alarms. These alarms clear and a one test warning alarm sounds. The charts remain clear before sounding a warning and action

alarm. With the exception of one warning alarm, the charts remain in control for the remainder of the period. Much like FEI1, severity trends and precision alarms observed during the period are a result of a relatively large number of tests reported on new engines, which tended to be more severe.

REFERENCE OILS

The following table quantifies reference oils by the number of tests remaining at the TMC and each laboratory. Sequence VIB reference oils are shipped in quantities of 5 gallons per test.

LAB	538	539	1006	1007	1008	1008-1
A	5	1	0	7	0	5
B	6	1	0	2	0	5
C	0	1	2	2	1	0
D	3	0	0	0	3	0
F	2	1	0	3	0	1
G	6	2	0	3	0	6
L	2	1	0	5	0	3
TMC	212	182	0	*	**	***

* 483 Gallons (Multiple test area usage)
** 29 Gallons (Multiple test area usage)
*** 2424 Gallons (Multiple test area usage)

Test targets for reference oil 1008-1, based on thirty tests, have been generated (see TMC Memorandum 03-067). Seven donated tests have been started on reference oil 539. The panel has not agreed to set targets for this oil as of this report. This issue will be addressed in the near future.

LAB VISITS

Three lab visits were conducted during this report period. Any discrepancies noted during these visits have been identified to the laboratory and the appropriate corrective actions taken have been documented.

INFORMATION LETTERS

Information Letter 03-2 was issued this report period. This information letter updated Test Method D6837 to remove the requirements to conduct HTHS, INI, INO, CCS and FC by HFRR from the test method. Information Letter 03-3 was issued on August 15, 2003. This letter added reference to the fuel specification in Table 1 and replaced Aliphatic Naphtha with a solvent meeting ASTM D235, Type II, Class C requirements. TMC Memorandum 03-057 and 03-067 were issued updating test targets for reference oil 1008-1 at twenty and thirty tests, respectively.

SUMMARY

Severity for FEI1 was severe for this report period.

Severity for FEI2 trended mild for this report period.

FEI1 and FEI2 precision has improved when compared to the last report period.

The percentage of calibrations per starts has decreased this report period.

The percentage of lost tests per starts has increased this report period.

The percentage of statistically rejected tests per starts has decreased this report period.

The percentage of operationally valid tests rejected statistically has decreased this report period.

REG/reg

Attachments

c: Sequence VIB Surveillance Panel
Sequence VIB Test Engineers
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/semiannualreports/vib-10-2003.pdf

Sequence VIB Semiannual Report
List of Attachments

-- Table 1 is a historic statistical summary for reference oils through September 30, 2003.

-- Table 1A is a statistical summary for reference oils for the current report period.

-- Table 2 is a summary of lost tests due to operationally invalid, aborted, abandoned engines or lost due to BC shift exceeding the test limits.

-- Table 3 is the Sequence VIB Timeline.

-- Figure 1 graphically present the Industry control charts for FEI1.

-- Figure 2 graphically present the Industry control charts for FEI2.

TABLE 1

SEQUENCE VIB
OPERATIONALLY VALID DATA SET
DATA PRIOR TO 10/01/03

OIL CODE 1006

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
233	FEI1	1.40	0.29	0.61 - 2.50
233	FEI2	0.52	0.27	-.36 - 1.23

OIL CODE 1007

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
92	FEI1	0.75	0.30	0.24 - 2.11
92	FEI2	0.45	0.27	-.55 - 1.25

OIL CODE 1008

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
241	FEI1	1.82	0.24	1.18 - 2.47
241	FEI2	1.24	0.21	0.58 - 1.74

OIL CODE 1008-1

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
40	FEI1	1.86	0.29	1.24 - 2.45
40	FEI2	1.27	0.22	0.87 - 1.83

OIL CODE 538

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
72	FEI1	1.79	0.31	0.86 - 2.40
72	FEI2	1.57	0.22	1.07 - 2.15

678 TOTAL

TABLE 1A

SEQUENCE VIB
OPERATIONALLY VALID DATA SET
DATA FROM 04/01/03 THRU 09/30/03

OIL CODE 1006

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
5	FEI1	1.49	0.26	1.05 - 1.69
5	FEI2	0.56	0.12	0.37 - 0.66

OIL CODE 1008

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
7	FEI1	1.87	0.27	1.45 - 2.19
7	FEI2	1.28	0.18	1.06 - 1.48

OIL CODE 1008-1

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
26	FEI1	1.86	0.31	1.24 - 2.28
26	FEI2	1.25	0.22	0.87 - 1.83

OIL CODE 538

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
32	FEI1	1.85	0.32	0.86 - 2.28
32	FEI2	1.64	0.24	1.07 - 2.15

70 TOTAL

Table 2

Lost Tests Summary

Tests declared operationally invalid, aborted or lost due to abandoned engines are summarized below by laboratory, reason, number of lost tests, and percent of lost tests:

LAB	REASON	Tests Lost	% of Tests Lost
D	Downtime (Power failure)	1	28.6%
	Abandon engine	3	
B	Downtime (Power failure)	1	
	Temperature control problems	1	14.3%
G	Fuel flow measurement error	1	
	High oil consumption	1	14.3%
F	Computer problems	1	7.1%
L	Lost oil/oil leak	1	
	Abandon engine	4	35.7%

Sequence VIB Timeline

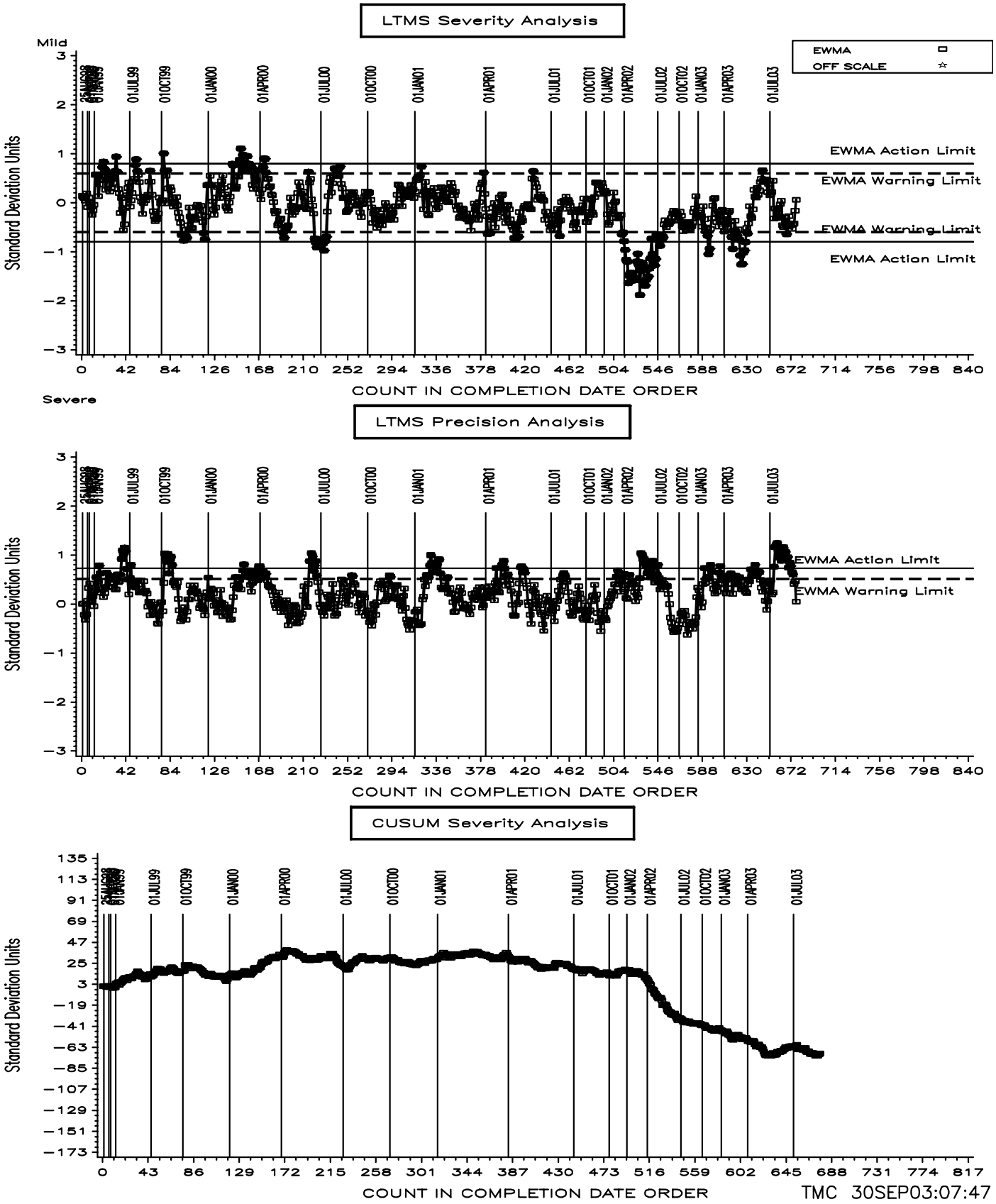
Date	Item Changed	Information Letter
19990809	Reference oil 1006 targets updated	
19990809	Reference oil 1007 targets updated	
19990809	Reference oil 1008 targets updated	
19990924	Calibration requirements	99-1
19990924	Alternative Cooling system	99-1
19990924	Fuel injection flow procedure	99-1
19990924	Requirement for use of maintenance log	99-1
19990924	Coolant flow measurement device calibration revision	99-1
19990924	Preparation procedure for oil charge	99-1
19990924	Recording compression pressures	99-1
19990924	Ignition timing checks	99-1
19990924	Valve stem seal replacements	99-1
19990924	Alternative Racor oil filter (LFS-62) use approved	99-1
19990924	Engine serial number added to report	99-1
19991015	Invalid test BC shift limits of –0.5 to 0.8% added	99-2
19991015	Tests terminated due to an FEI result are not permitted	99-2
19991015	Section 11.5.17.3 deleted – Manual data logging no longer required	99-2
19991015	Exhaust back pressure calibration prior to calibration test added	99-2
19991015	Instrumentation calibration requirements	99-2
19991015	Use of Eaton 37KW (50hp) dry gap dynamometer approved	99-2
19991015	New flush oil (BCFHD) and flush oil procedure	99-2
19991015	Micro motion model CMF010 mass flow meter approved	99-2
19991015	Kinematic viscosity measurements on new reference oils permitted	99-2
19991015	Report form editorial change for LABVALID made	99-2
19990924	Valve stem seal revised part number	99-3
20000207	Oil sight glass calibration	00-1
20000207	Revised Figure A2.22 – Oil Level Marker Ruler	00-1
20000207	Revised flush effectiveness procedure	00-1
20000207	Coolant flush procedure	00-1
20000207	Oil consumption validity interpretation	00-1
20000207	Load cell temperature specification	00-1
20000410	Valve Spring Replacement	00-2
20000524	Eliminate Baseline Shift Criteria	00-3
20000601	Maximum Allowable Oil Consumption Test Limit	00-3
20000601	Oil Sample Location Defined	00-3
20000601	Revised Blow-by and Crankcase Ventilation System	00-3
20000807	Fuel Injector Calibration Flow Rate Specification Added	00-3
20000807	Dynamometer Replacement During a test is not permitted	00-3
20000807	Engine Break-in Stand Requirements	00-3
20000807	Removal of Ford Wiring Harness Diagram	00-3
20000807	Addition of Alternative Injector Wiring Harness Part Numbers	00-3
20000807	Addition of Alternative HEGO Sensor Part Numbers	00-3
20000807	Addition of Alternative Throttle Body Adapter Part Number	00-3
20000807	Visteon EEC Control Module	00-3
20000901	Barometric Pressure added to report packet as record only	00-3

Sequence VIB Timeline

Date	Item Changed	Information Letter
20000801	A Task Force Was Appointed by the VIB Surveillance Panel to Address Lab To Lab Differences with Oil Consumption and FEI Severity. Information Letter 00-4 was a result of the Lab Visit Discrepancies.	
20000915	Increase Oil Charge to 6.0 Liters	00-4
20000915	Revise Oil Level/Sight Glass Calibration Procedure	00-4
20000915	Oil Pan Oil Level Requirement	00-4
20001116	Reduced Calibration Frequency	01-1
20001117	Validity Interpretation During BSFC Measurement Cycle	01-1
20001117	Reporting Stage Restarts or Any Test Time Deviations	01-1
20001117	Alternate HEGO Sensor Part Number	01-1
20001117	Revisions to New Engine Cyclic Break-in	01-1
20010301	Revisions to Test Length Calculation and Reporting Format	01-1
20010301	Additional Oil Analysis Requirements	01-1
20010822	Allowed Timing Chain Tensioner with Subsequent Reference Oil Test	01-2
20010822	Defined Maximum Total Test Length as 150 h	01-2
20010822	Defined Off Test Time and Allows No More Than 2 h of Off Time During Phase I and II Aging	01-2
20010822	Added Reference to Ford 543 Engine Assembly Manual	01-2
20010822	Refined Oil Analysis Procedure for HTHS, CCS Viscosity, Friction Coefficient by HFRR, Fuel Dilution and Infrared for Oxidation & Nitration	01-2
20010822	Correction of Company Suppliers in X1.3 and X1.19	01-2
20011005	Pressurization of Engine Coolant System to 69±13.8 kPa	01-3
20011005	Deleted Requirement to Measure Blowby	01-3
20011005	Revised Load Cell Temperature Delta for 3°C to 6°C in 6.4.2.3	01-3
20011005	Corrected Fuel Supplier Name and Address in Section 7.2 and Footnote 15	01-3
20011129	Added Provisions for VIBSJ Test	01-4
20011207	Revised AFR limits from 14.25:1 - 15.25:1 to 14.00:1 – 15.00:1	01-5
20020405	Allowed Replacement of Timing Chain as Part of Tensioner Assembly	02-1
20020405	Revised Procedure to Require Viscosity Measurements for Both Reference and Non Reference Oils	02-1
20020712	Reference oil 538 targets updated (n=20)	
20021016	Reference oil 538 targets updated (n=30)	
20021114	Reference oil 1008-1 initial targets generated (n=10)	
20030327	Updated Test Method D6837 to incorporate info letter 02-1 and remove	03-1
	remedial statements	
20030521	Reference oil 1008-1 initial targets generated (n=20)	
20030618	Dropped requirements to monitor HTHS, CCS, FC by HFRR and INI and	03-2
	INO	
20030703	Reference oil 1008-1 initial targets generated (n=30)	
20040101	Added reference to fuel spec, replaced Aliphatic Naphtha with Type II Class	03-3
	C solvent	

SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

Figure 1



SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE II (%)

Figure 2