



Test Monitoring Center

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MEMORANDUM: 03-019

DATE: April 7, 2003

TO: Charlie Leverett, Chairman, Sequence VIB Surveillance Panel

FROM: Richard Grundza

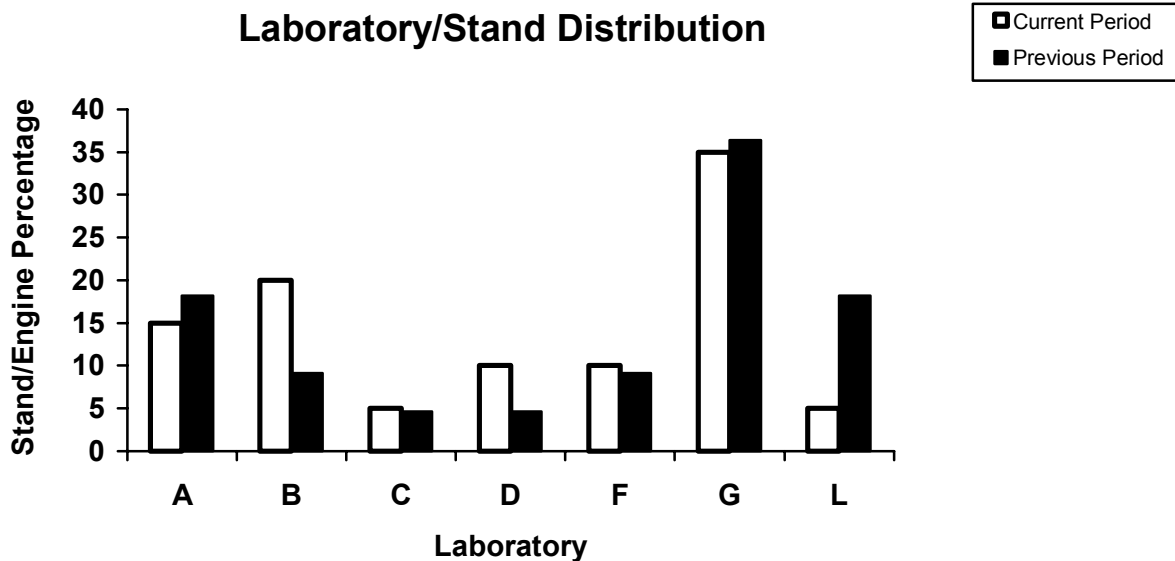
SUBJECT: Sequence VIB Test Results from October 1, 2002 through March 31, 2003

The following is a summary of Sequence VIB reference tests that were reported to the Test Monitoring Center during the period October 1, 2002 through March 31, 2003.

Lab and Stand Summary

	Reported Data During Period	Calibrated as of 03/31/2003
Laboratories	7	6
Stand/Engine Combinations	20	13

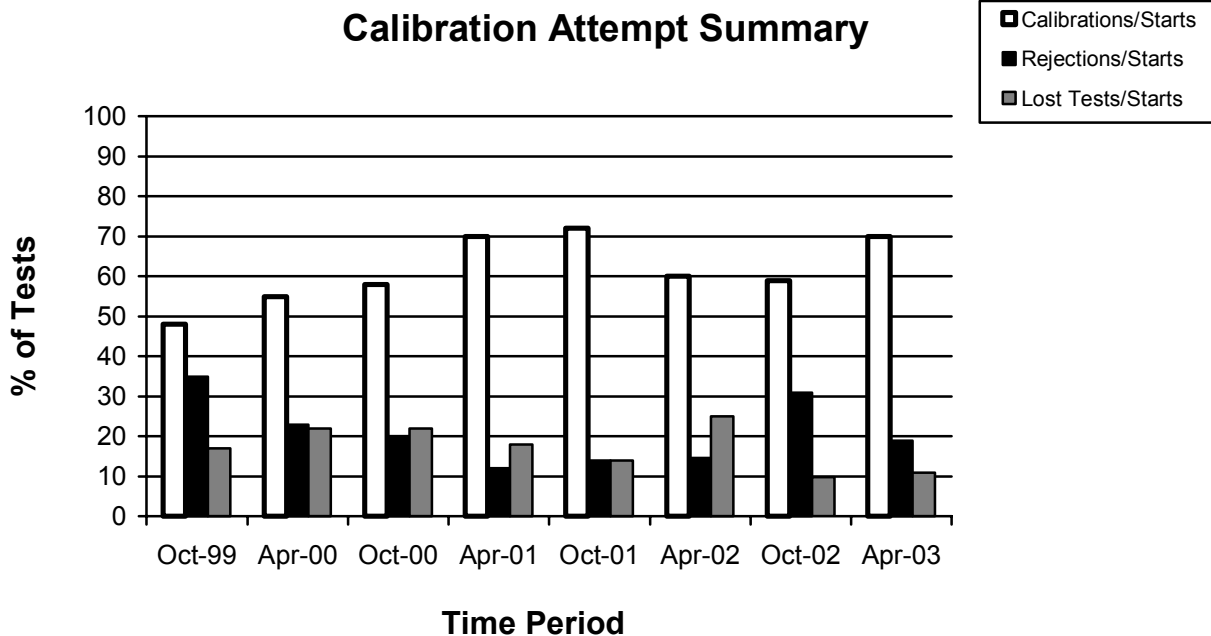
The following chart shows the laboratory stand/engine distribution for data reported during this report period:



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	34
Failed Acceptance Criteria	OC	9
Operationally Invalid (Laboratory Judgement)	LC	3
Aborted	XC	1
Abandoned Engine	MC	1
Total		48

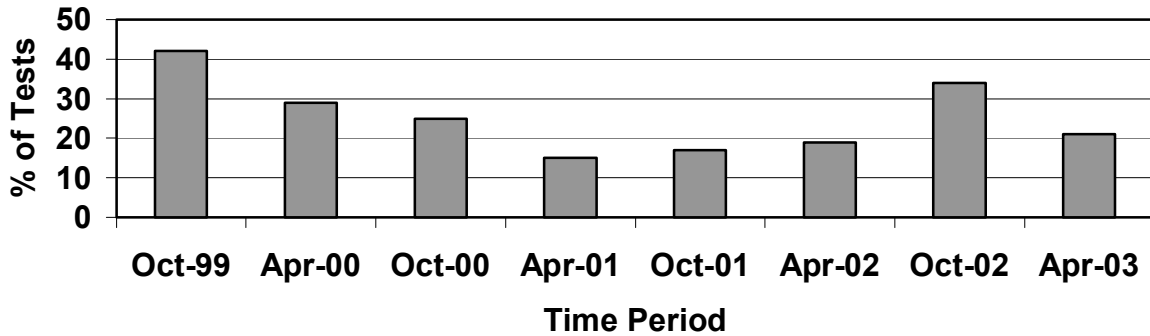
Attempted calibration tests are depicted graphically below by report period:



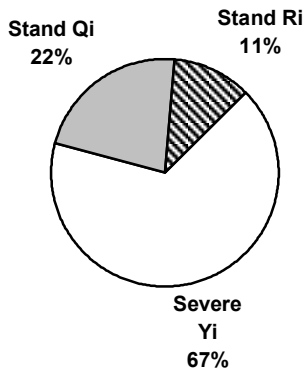
The calibration per start rate has improved with respect to the previous two periods. The rejected per start rate has decreased and lost test per start rate has changed little this report period, when compared to the previous report period.

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

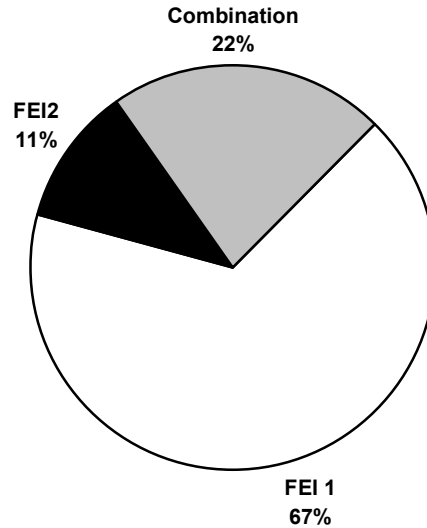
Rejected Operationally Valid Tests



Distribution of LTMS Stand Alarms

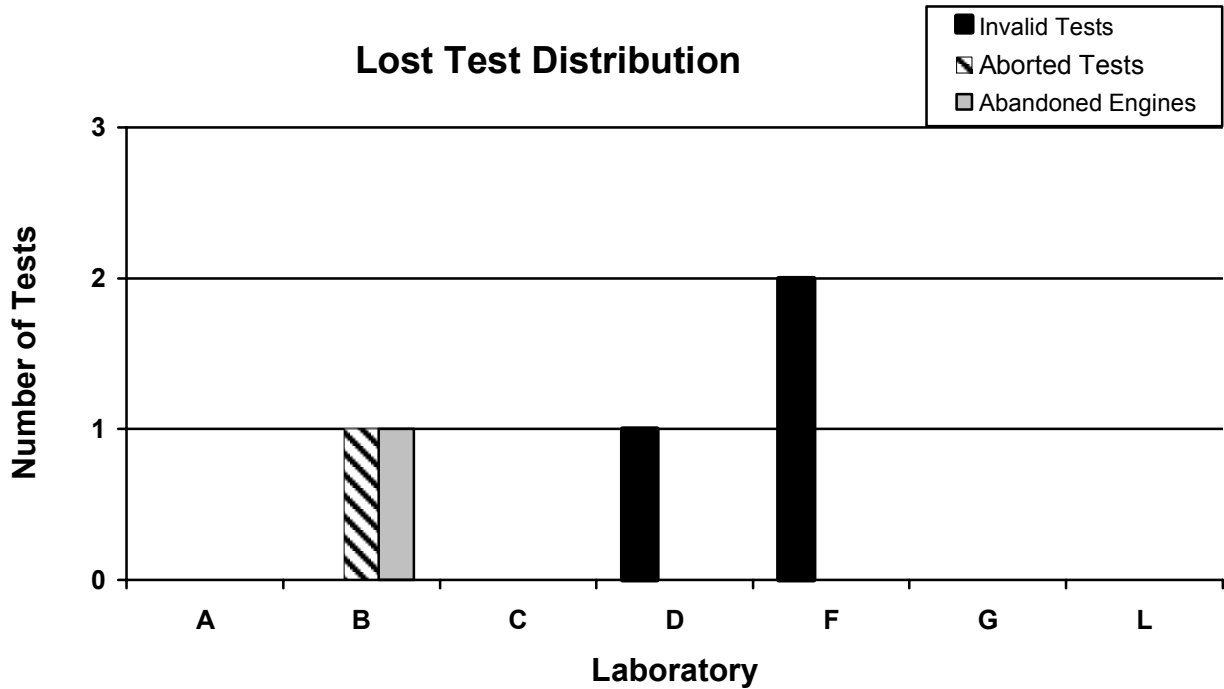


Distribution of Stand Alarms by Parameter

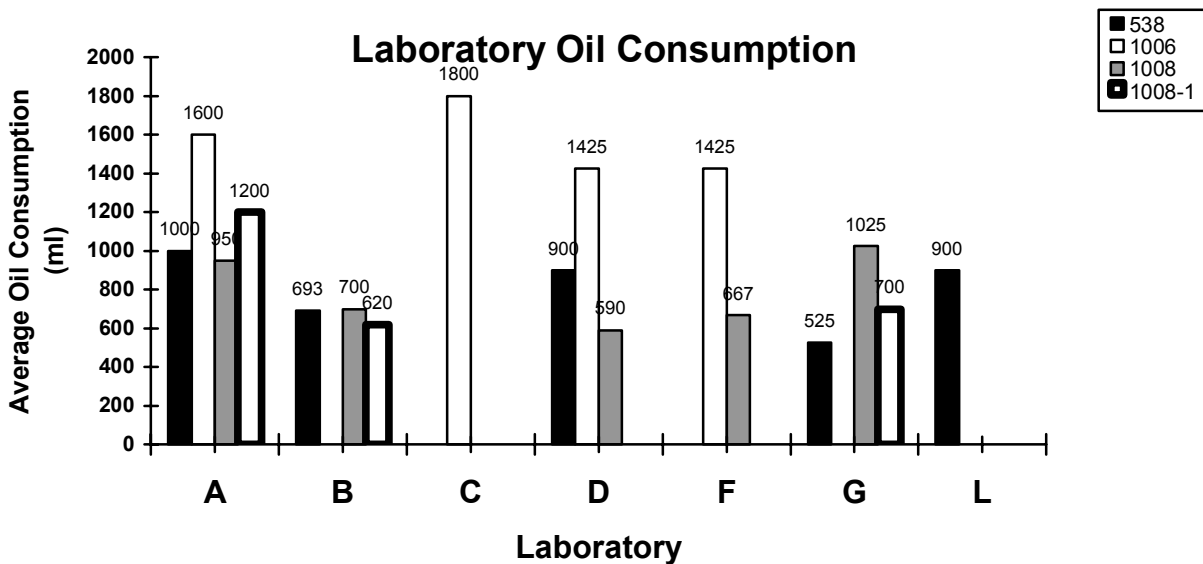


There were six tests rejected for FEI Shewhart (Yi) severe, two tests rejected for EWMA precision alarm (Qi), and one test rejected for Shewhart precision alarm (Ri). There has never been a LTMS deviation written for Sequence VIB.

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).

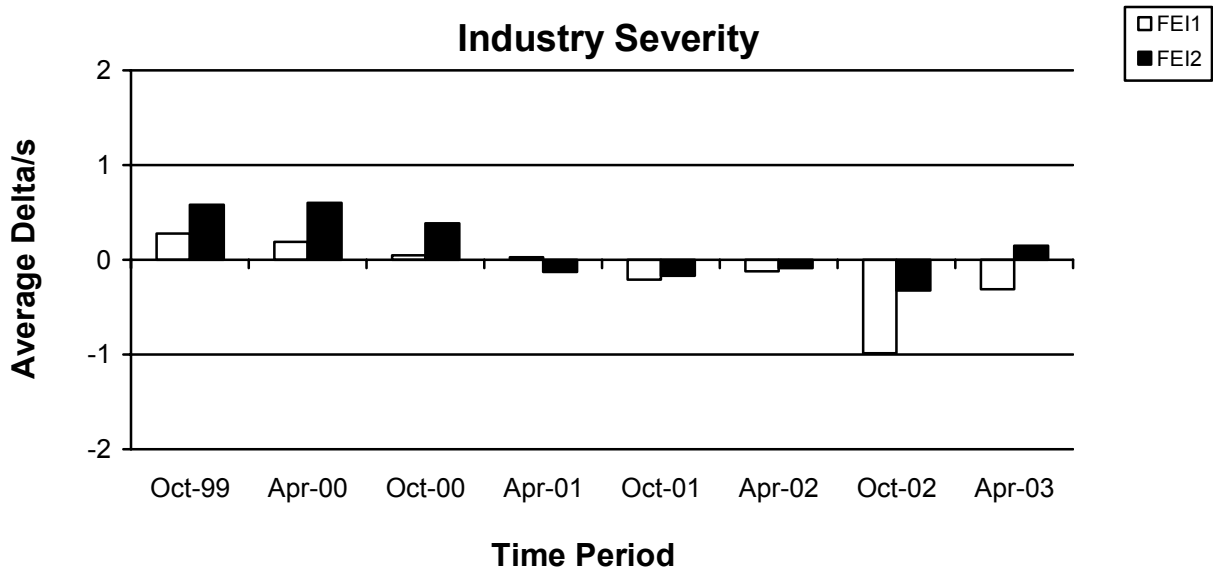


The average oil consumption by oil and laboratory are depicted graphically below. Shown below is a summary of the average oil consumption for all laboratories reporting data this report period.

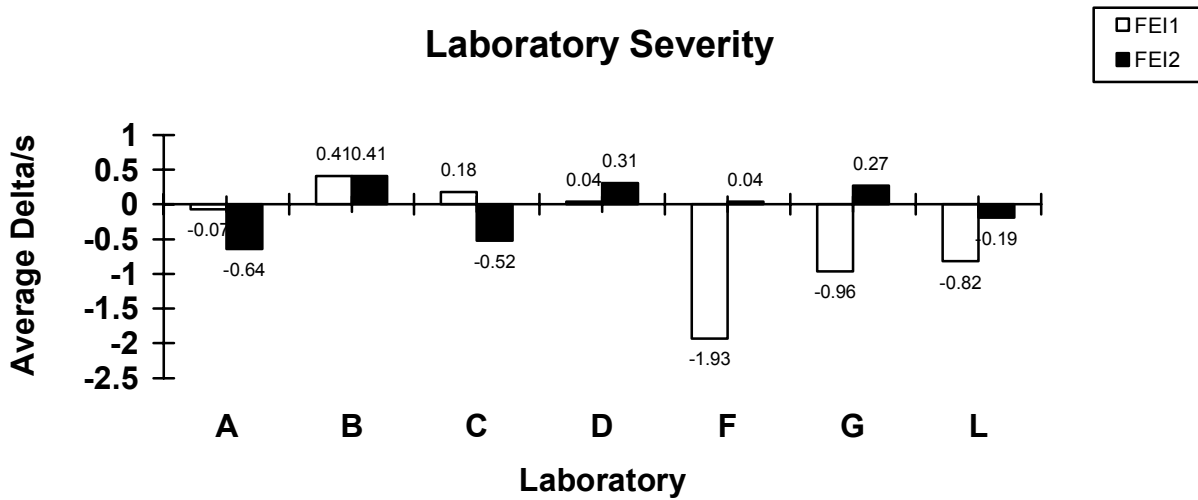


TEST SEVERITY AND PRECISION

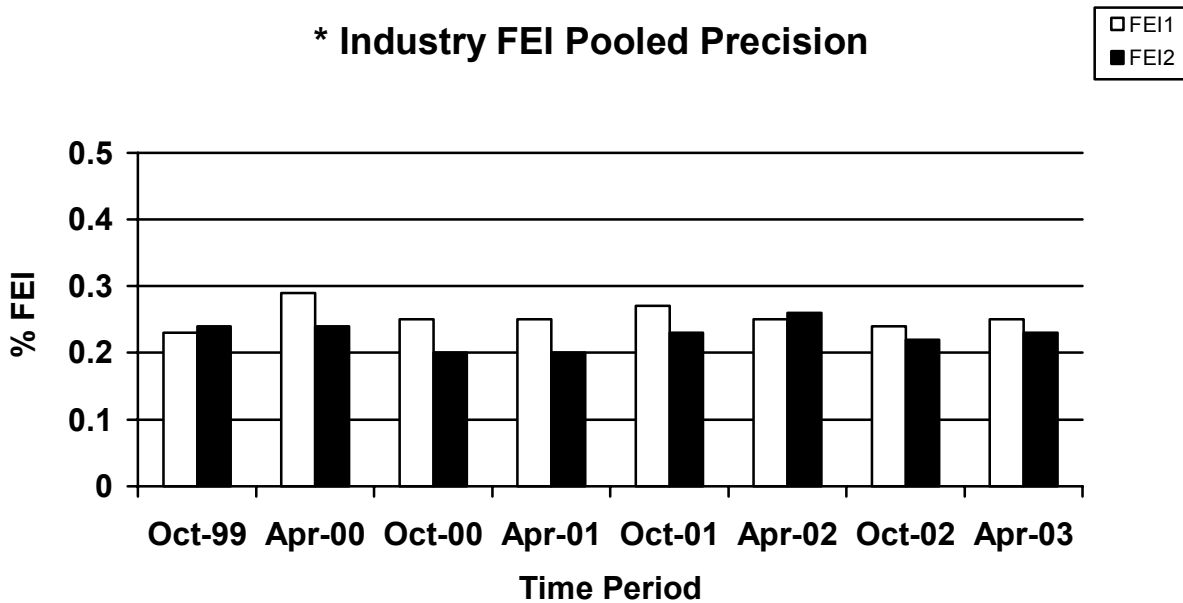
The industry mean Δ/s for FEI1 and FEI2, for this report period are -0.31 severe and 0.15 mild, respectively. FEI1 was severe of target for this report period, while FEI2 was mild for the period.



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 0.25 and 0.23 (pooled s), respectively. Precision for both FEI1 and FEI2 has shown little change this report period.



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

INDUSTRY CONTROL CHARTS

FEI1

FEI1 severity began the period in control. Towards the end of the period FEI1 severity sounded a warning and two action alarms, which quickly cleared. Severity remained in control status for the rest of the period. The alarms appeared to have been caused by three tests on new engines, reported consecutively. FEI1 precision also began the period in control. Shortly after the beginning of the year, FEI1 precision sounded a one test action alarm, which cleared for one test, followed by a series of five warning and one action alarms. FEI1 precision was in control for seven tests before two warning and an action alarm sounded. At the end of the period, FEI1 precision sounded a warning alarm. 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

There were four severity EWMA warning alarms this report period as illustrated in Figure 2. Precision began the period in control, but quickly sounded a series of four action and a warning alarm. The precision chart cleared for a test, sounded a warning alarm, cleared for a test and sounded two warning alarms. The chart then came into control for the remainder of the period. Much like FEI1, severity trends 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	1006-2	1007	1008	1008-1
A	2	1	0	0	7	3	0
B	2	2	0	0	2	0	1
C	0	2	2	0	2	2	0
D	2	1	3	0	5	1	1
F	2	1	0	0	3	0	2
G	4	1	1	0	3	0	0
L	2	1	0	0	5	2	1
TMC	260	184	0	*	**	***	****

* 5,154 Gallons (Multiple test area usage)

** 478 Gallons (Multiple test area usage)

*** 29 Gallons (Multiple test area usage)

**** 2472 Gallons (Multiple test area usage)

Reblends of reference oils 1006 (1006-2) and 1008 (1008-1) have been obtained. The VIB panel elected not to introduce reference oil 1006-2 into the LTMS. Test targets for reference oil 1008-1, based on ten tests, have been generated (see TMC Memorandum 02-116). Targets will be updated at twenty and thirty tests. Three donated tests have been started on reference oil 539. Test acceptance targets will be generated on the first five donated tests, and updated when ten, twenty, and thirty tests on this oil have been completed.

LAB VISITS

Four lab visits were conducted during this report period.

INFORMATION LETTERS

Information Letter 03-1 was issued this report period. This information letter updated Test Method D6837 to incorporate Information Letter 02-1 and to remove remedial statements from the method. TMC Memorandum 02-095 was issued October 16, 2002. This memo updated targets for reference oil 538. TMC Memorandum 02-116 was issued on November 14, 2002. This memo updated the targets for reference oil 1008-1. TMC Memorandum 03-004 was issued January 22, 2003. This memo advised the panel of a potential negative on the information letter to remove certain oil analysis parameters. TMC Memorandum 03-005 was issued February 5, 2003. This memo documented attempts to correlate oil analysis parameters with FE11 and FE12.

SUMMARY

Severity for FEI1 was severe for this report period.

Severity for FEI2 trended mild for this report period.

FEI1 and FEI2 precision has shown little change when compared to the last report period.

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

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

The percentage of statistically rejected tests per starts has shown little change when compared to previous periods.

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-04-2003.pdf>

Sequence VIB Semiannual Report
List of Attachments

- Table 1 is a historic statistical summary for reference oils through March 31, 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 04/01/03

OIL CODE 1006				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
228	FEI1	1.40	0.29	0.61 - 2.50
228	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
234	FEI1	1.82	0.24	1.18 - 2.47
234	FEI2	1.24	0.21	0.58 - 1.74
OIL CODE 1008-1				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
14	FEI1	1.87	0.25	1.55 - 2.36
14	FEI2	1.31	0.22	0.87 - 1.68
OIL CODE 538				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
40	FEI1	1.64	0.27	0.89 - 2.40
40	FEI2	1.46	0.15	1.19 - 1.93
608	TOTAL			

TABLE 1A

SEQUENCE VIB
 OPERATIONALLY VALID DATA SET
 DATA FROM 10/01/02 THRU 03/31/03

OIL CODE 1006				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
6	FEI1	1.17	0.22	0.92 - 1.44
6	FEI2	0.42	0.38	-0.16 - 0.89
OIL CODE 1008				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
12	FEI1	1.76	0.27	1.18 - 2.22
12	FEI2	1.30	0.21	0.94 - 1.67
OIL CODE 1008-1				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
8	FEI1	1.84	0.26	1.57 - 2.18
8	FEI2	1.31	0.22	0.87 - 1.59
OIL CODE 538				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
17	FEI1	1.90	0.28	1.36 - 2.40
17	FEI2	1.60	0.23	1.19 - 1.93

43 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	High oil consumption	1	20.0%
B	Dyno control problems	1	40.0%
	Abandon engine	1	
F	High oil consumption	1	40.0%
	Excessive downtime	1	

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

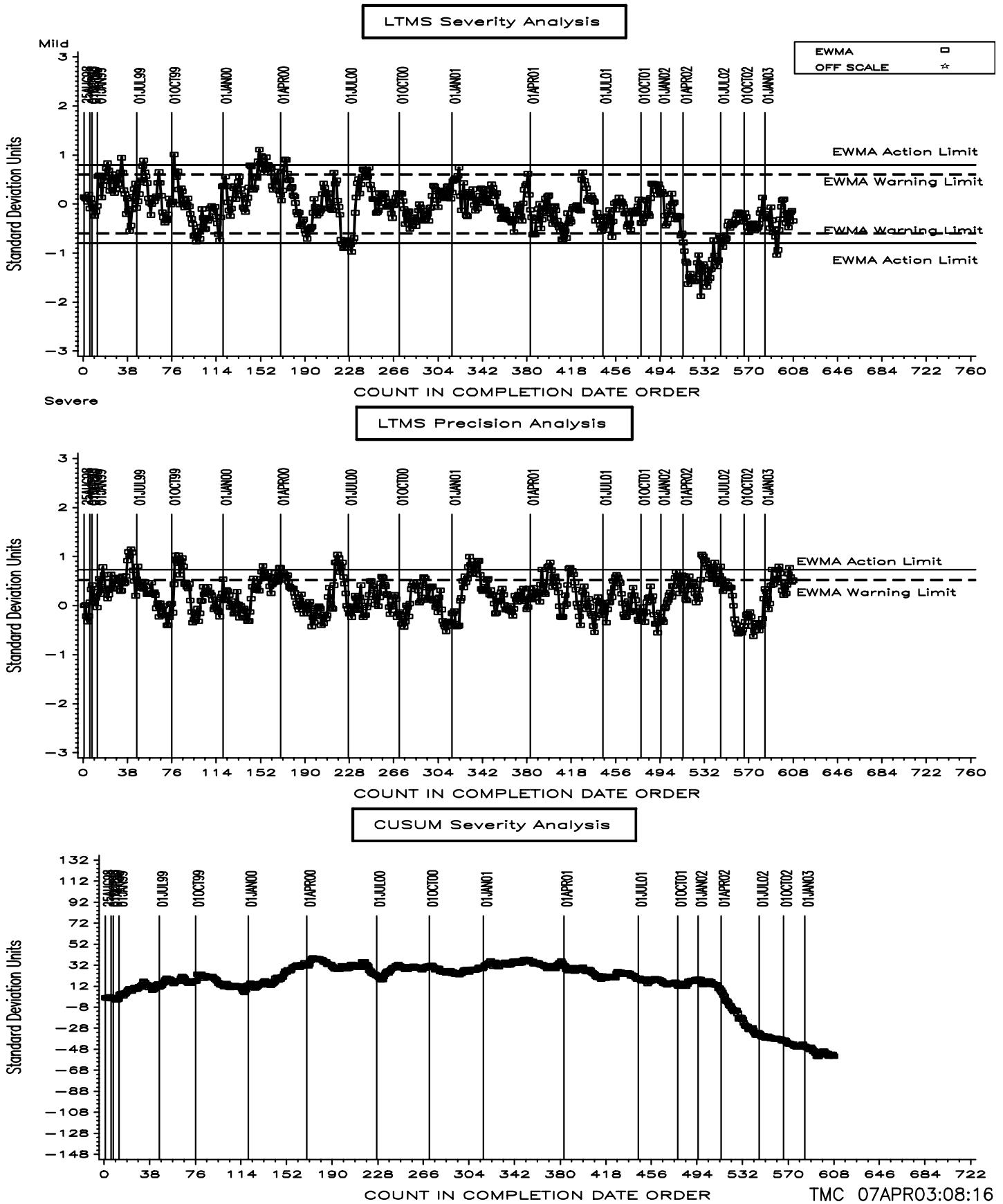
Sequence VIB Timeline

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 remedial statements	

VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE I (%)

Figure 1



VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE II (%)

Figure 2

