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

MEMORANDUM: 02-020

DATE: April 15, 2002

TO Charlie Leverett, Chairman, Sequence VIA/VIB Surveillance Panel

FROM: Richard Grundza

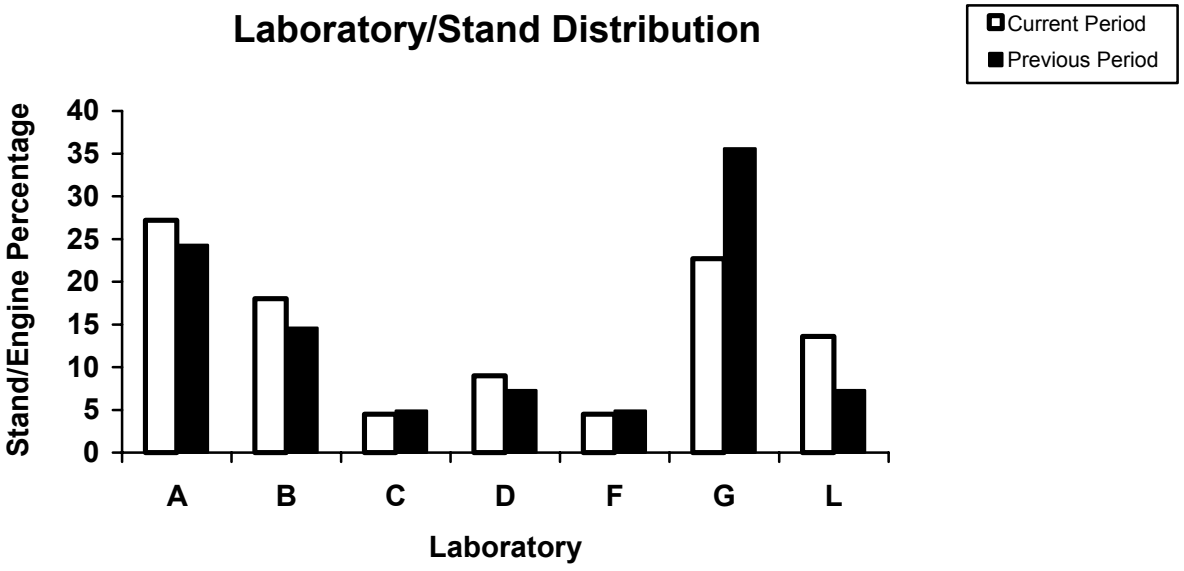
SUBJECT: Sequence VIB Test Results from October 1, 2001 through March 31, 2002

The following is a summary of Sequence VIB reference tests that were reported to the Test Monitoring Center during the period October 1, 2001 through March 31, 2002.

Lab and Stand Summary

	Reported Data During Period	Calibrated as of 03/31/2002
Laboratories	7	4
Stand/Engine Combinations	22	9

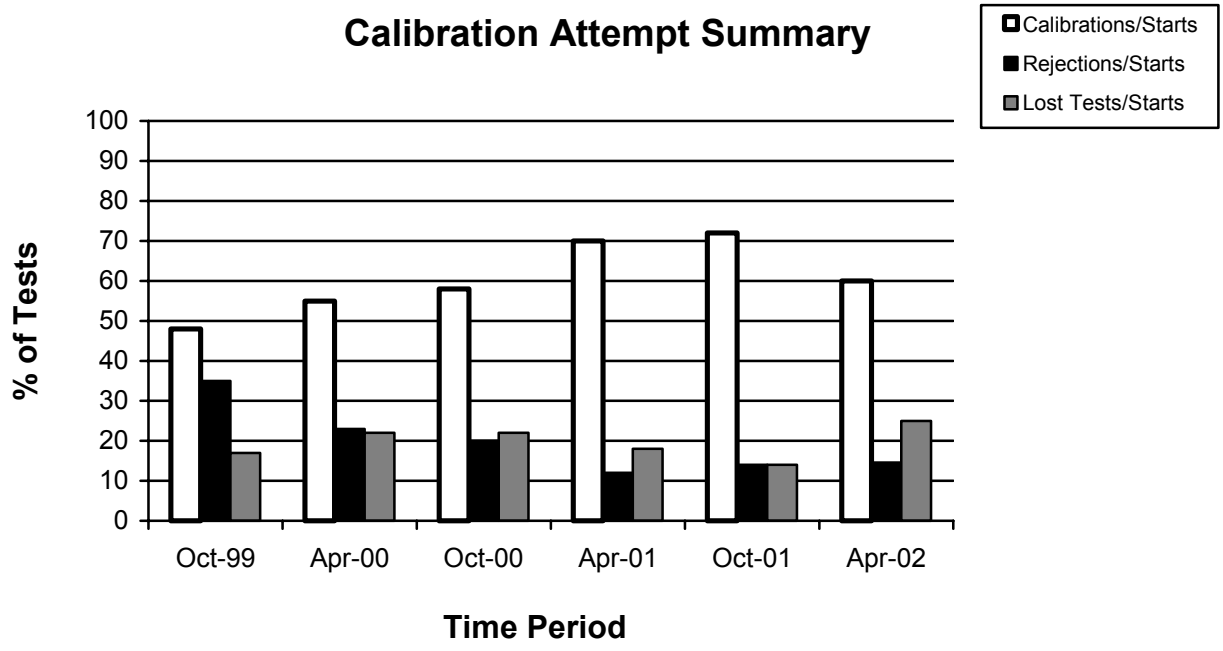
The following chart shows the laboratory stand/engine distribution for data reported during this report period:



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

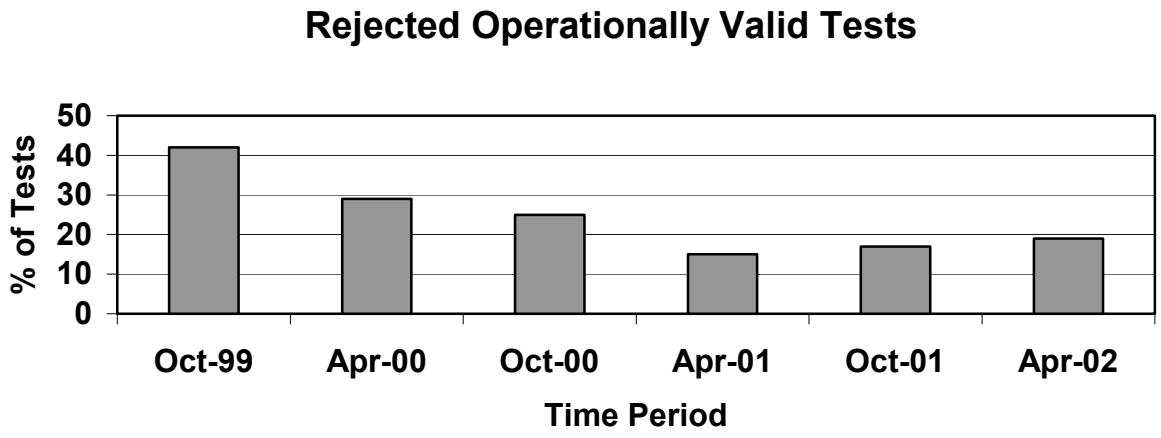
	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	29
Failed Acceptance Criteria	OC	7
Operationally Invalid (Laboratory Judgement)	LC	2
Operationally Invalid (Laboratory & TMC Judgement)	RC	1
Aborted	XC	5
Tests Lost Due to Abandoned Engines	MC	4
VIC Shakedown Tests	NN	2
Total		50

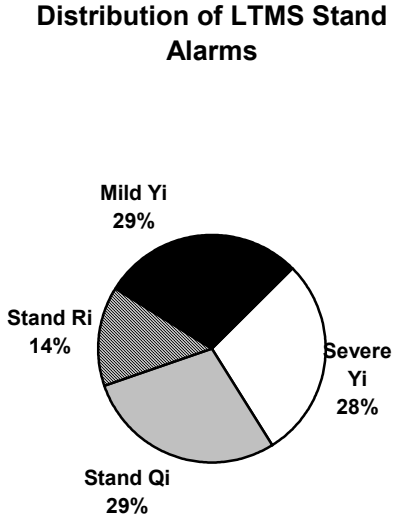
Attempted calibration tests are depicted graphically below by report period:

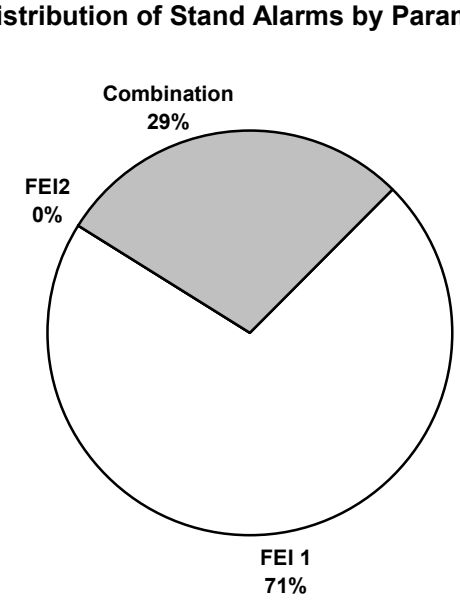


The calibration per start rate has decreased this report period. The rejected per start rate has shown little change and lost test per start rate has increased this report period.

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

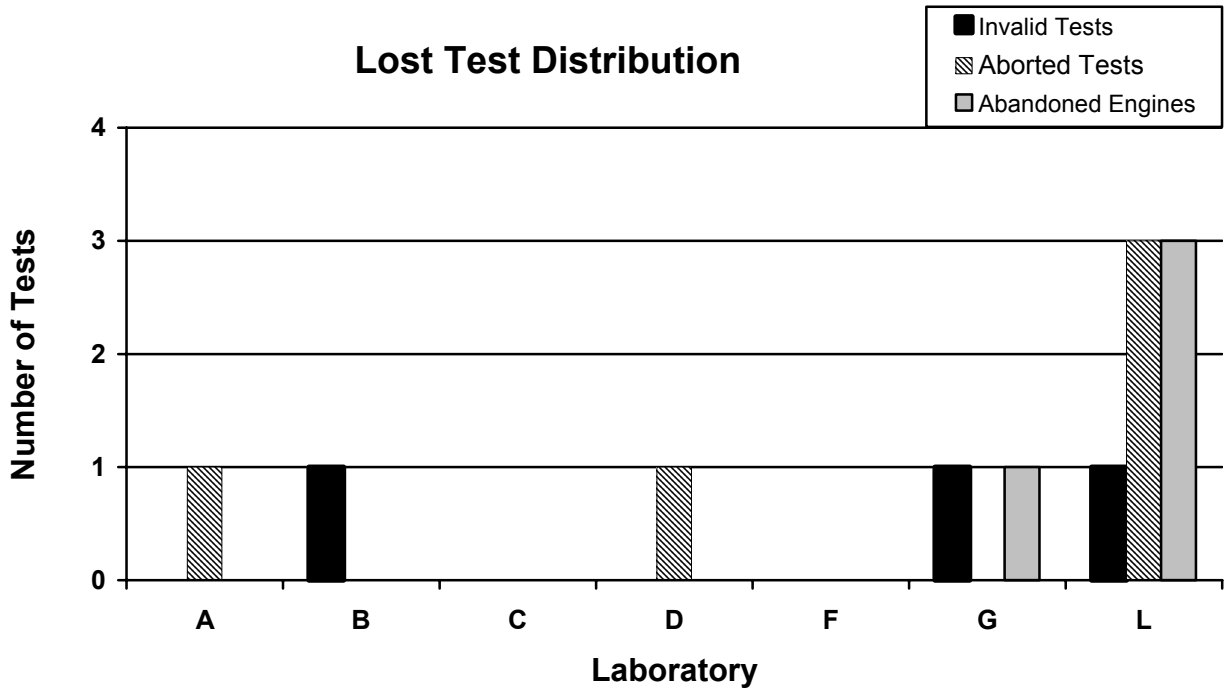




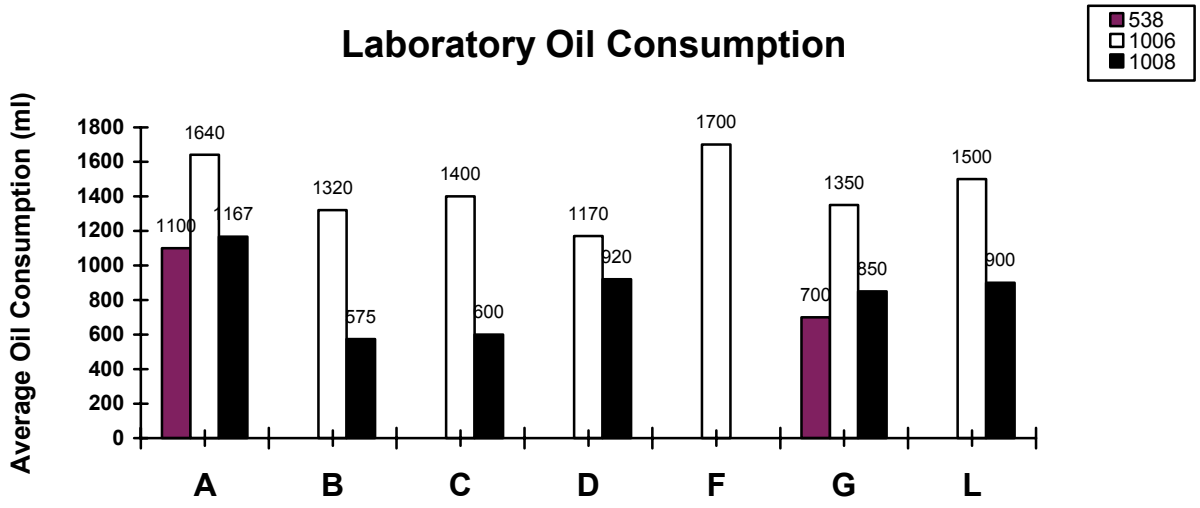


There were two tests rejected for FEI Shewhart (Yi) severe, two tests rejected for FEI Shewhart (Yi) mild, two tests rejected for EWMA precision alarm (Qi), and one test rejected for Shewhart precision alarm (Ri). There has never been an LTMS deviation written for Sequence VIB.

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).

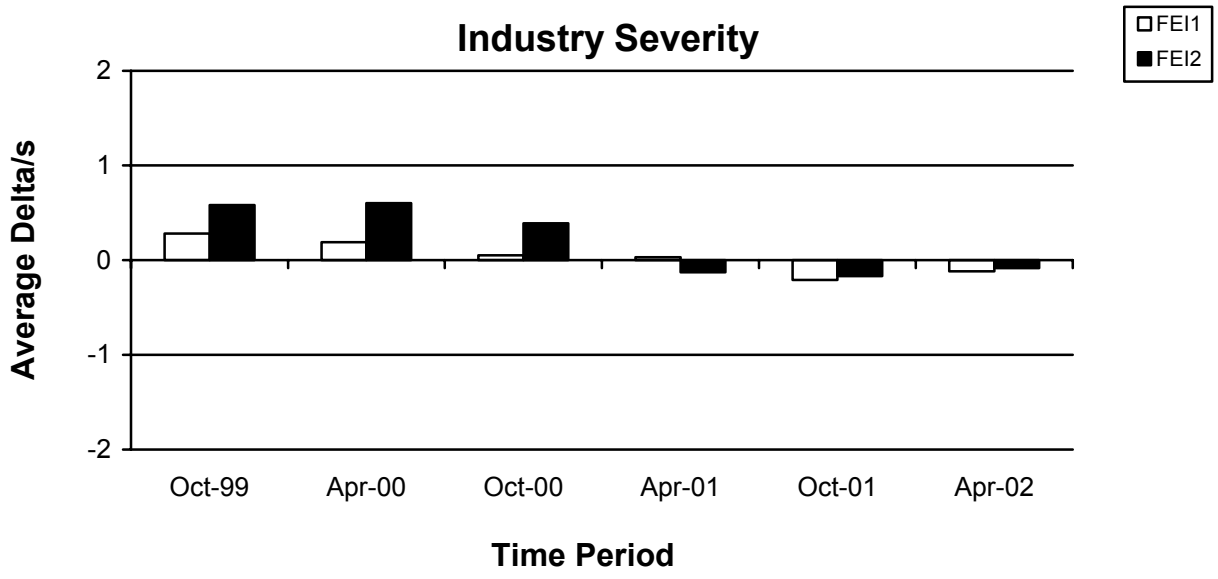


The average oil consumption by oil and laboratory are depicted graphically below. Shown below is a summary of the average oil consumption for all laboratories reporting data this report period.

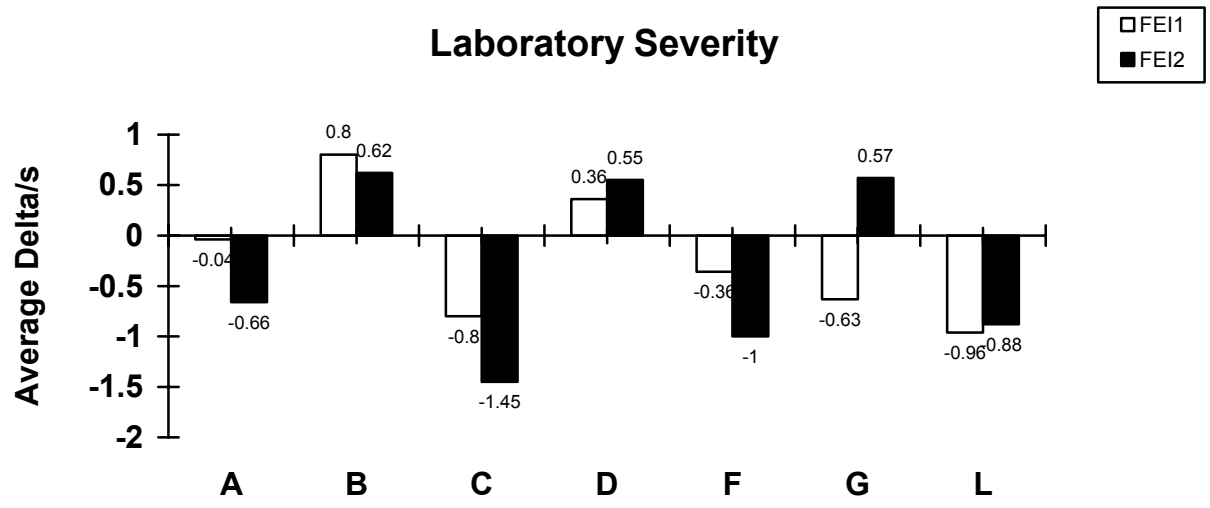


TEST SEVERITY AND PRECISION

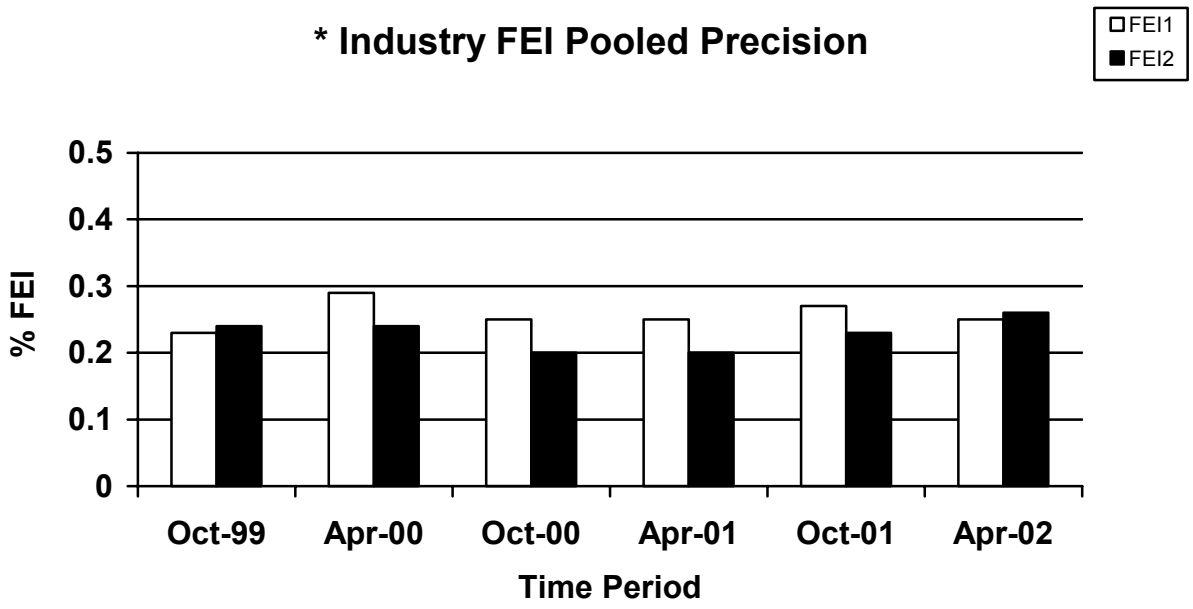
The industry mean Δ/s for FEI1 and FEI2, for this report period are -0.12 severe and -0.08 severe, respectively. FEI1 and FEI2 severity are slightly severe of target for this report period.



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



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

INDUSTRY CONTROL CHARTS

FEI1

There were two severity EWMA warning alarms and three precision alarms (all warning) triggered this report period as illustrated in Figure 1. The precision alarms appear to be related to a mix of new engines that have a tendency to produce severe results and older engines that are near the end of the calibration life that give mild results. The severity alarms, which occurred at the end of the period, were the result of two tests on new engines, -2.909 and -0.364 Δ/s from target, reported concurrently.

FEI2

There was one severity warning alarm and three precision alarms (all warning) this report period as illustrated in Figure 2. The severity EWMA alarm occurred when back-to-back results 2.182 and 2.091 Δ/s were reported The precision alarms appear to be related to a mix of new engines that have a tendency to produce severe results and older engines that are near the end of their calibration life that give mild results.

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	6	0	3	0	7	3	0
B	1	0	2	0	2	4	0
C	0	0	4	0	2	4	0
D	0	0	7	0	5	7	0
F	0	0	6	0	3	6	0
G	3	0	7	0	3	9	0
L	2	0	1	0	5	2	0
TMC	524	1090	0	*	**	***	****

* 5,246 Gallons (Multiple test area usage)
** 543 Gallons (Multiple test area usage)
*** 74 Gallons (Multiple test area usage)
**** 2750 Gallons (Multiple test area usage)

The following table addresses the potential for re-blending the current Sequence VIB reference oils.

	1006	1007	1008
Viscosity Grade	5W30	5W30	5W30
Additional Re-blends	Yes[1]	No	Yes[1]

[1] Currently two re-blends of reference oil 1006 (1006-1 and 1006-2) and a re-blend of 1008 (1008-1) are in the TMC inventory.

LAB VISITS

Three lab visits were conducted during this report period.

INFORMATION LETTERS

There were four information letters issued this report period. Information Letter 01-3, Sequence Number 10, was issued on October 5, 2001. Information Letter 01-4, Sequence Number 11, was issued on November 29, 2001. Information Letter 01-5, Sequence Number 12, was issued on December 7, 2001. Finally, Information Letter 02-1, Sequence Number 13, was issued April 5, 2002. Items changed with these information letters are documented in the Sequence VIB timeline (Table 3).

SUMMARY

Severity for FEI1 and FEI2 were slightly severe for this report period and compare well to historic data.

FEI1 and FEI2 precision has shown little change 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 changed little this report period.

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

REG/reg

Attachments

c: Sequence VIA/VIB Surveillance Panel
Sequence VIA/VIB Test Engineers
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/semiannualreports/vib-04-2002.pdf

Sequence VIB Semiannual Report
List of Attachments

-- Table 1 is a historic statistical summary for reference oils through March 31, 2002.

-- 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 04/01/02

OIL CODE 1006

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
210	FEI1	1.41	0.30	0.61 - 2.50
210	FEI2	0.53	0.26	-.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
208	FEI1	1.83	0.24	1.19 - 2.47
208	FEI2	1.23	0.21	0.58 - 1.74

OIL CODE 538

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
3	FEI1	1.70	0.36	1.43 - 2.11
3	FEI2	1.48	0.09	1.39 - 1.57

513 TOTAL

TABLE 1A

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

OIL CODE 1006

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
18	FEI1	1.48	0.27	0.81 - 1.88
18	FEI2	0.49	0.29	-.12 - 0.92

OIL CODE 1008

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
15	FEI1	1.80	0.17	1.51 - 2.13
15	FEI2	1.26	0.21	0.88 - 1.66

OIL CODE 538

N	TEST PARAMETER	MEAN	s	REPORTED RANGE
3	FEI1	1.70	0.36	1.43 - 2.11
3	FEI2	1.48	0.09	1.39 - 1.57

36 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
A	High Oil Consumption	1	8.3%
D	Oil Loss	1	8.3%
B	Off Test Time Exceeded, Bad Coils	1	8.3%
G	Shorted Ignition Wire	1	
	Reference Sequence Interrupted	1	16.6%
L	Plugs and Injectors Not Replaced	1	58.3%
	Fuel Management System Failure, Low Battery Voltage	1	
	Oil Galley and Oil Circulating Temperature Thermocouples Switched	1	
	Abandon Engine	4	

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 of Use 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

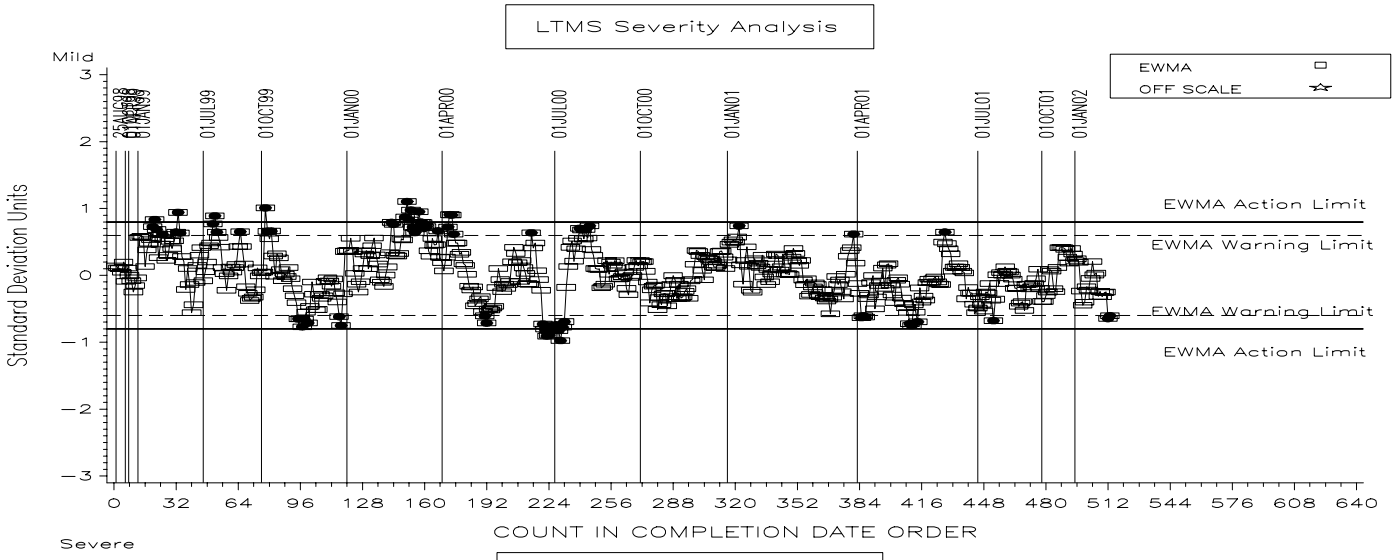
Sequence VIB Timeline

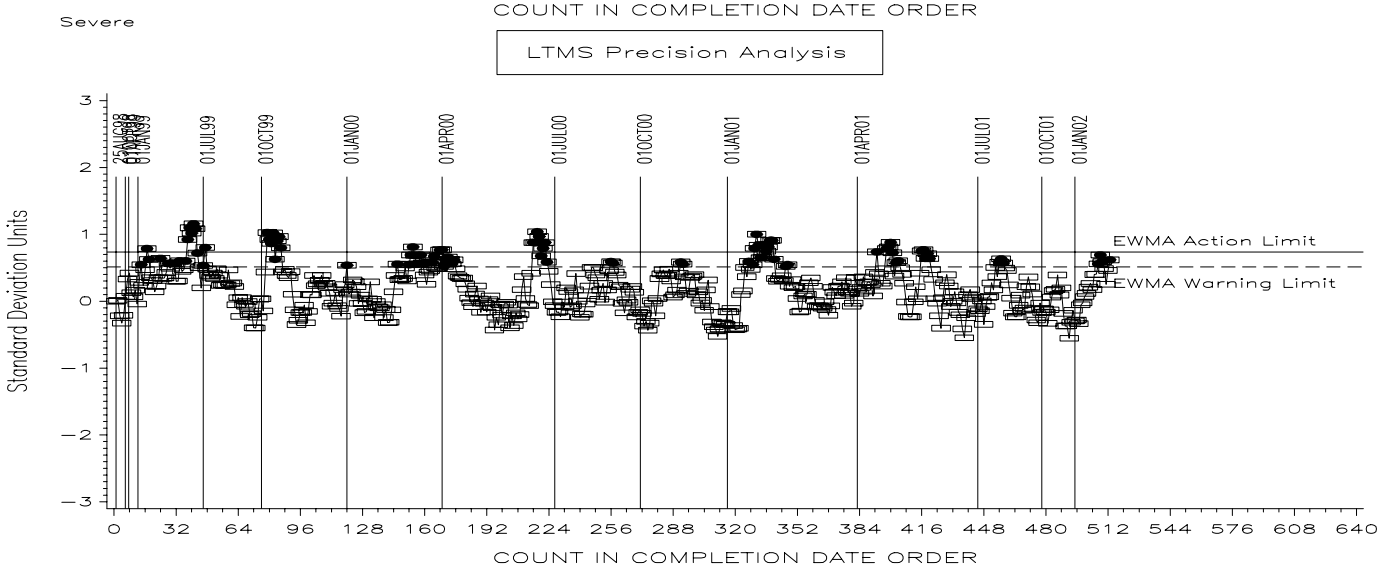
Date	Item Changed	Information Letter
20000801	A Task Force Was Appointed by the VIB Surveillance Panel to Address Lab To Lab Differences with Oil Consumption and FEI Severity. Information Letter 00-4 was a result of the Lab Visit Discrepancies.	
20000915	Increase Oil Charge to 6.0 Liters	00-4
20000915	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

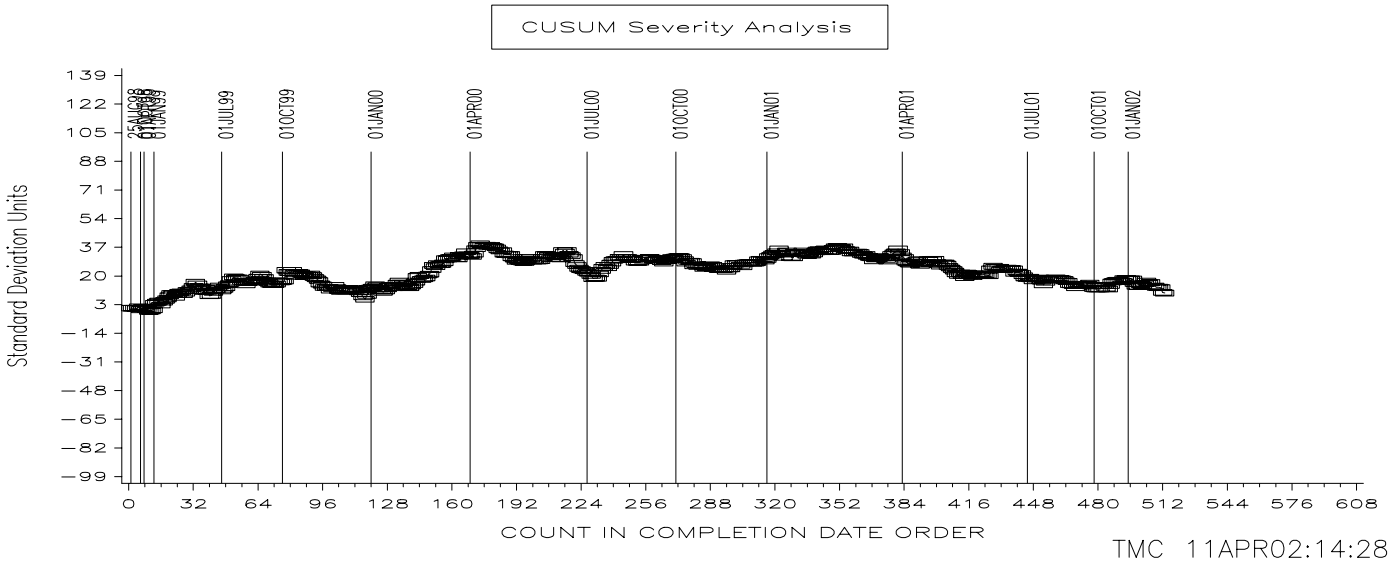
SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE I (%)

Figure 1







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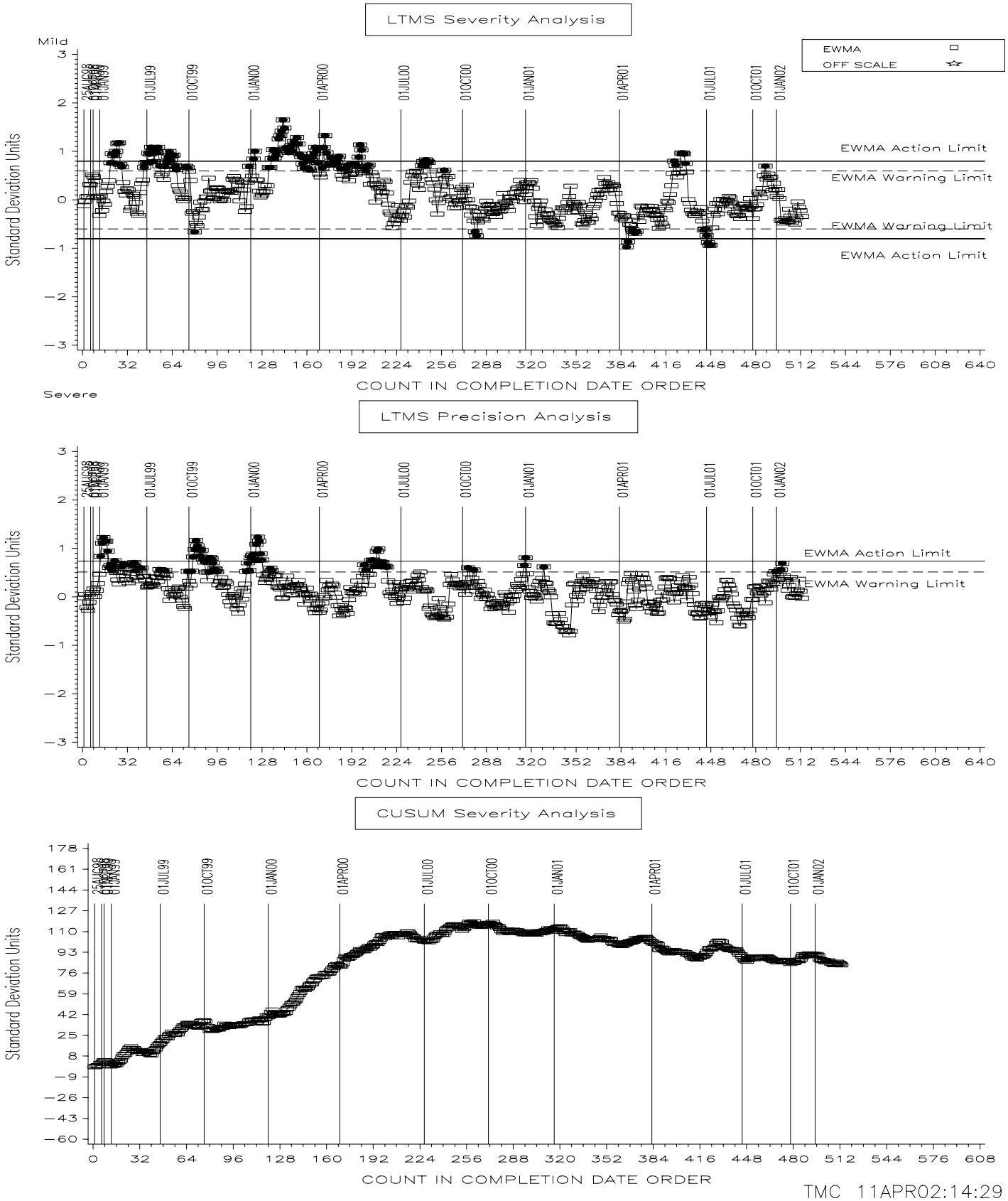
SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE II (%)

Figure 2



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