



Test Monitoring Center

6555 Penn Avenue
Pittsburgh, PA 15206-4489

MEMORANDUM: 03-008

DATE: February 5, 2003

TO: Charlie Leverett, Chairman, Sequence VIB Surveillance Panel

FROM: Richard Grundza

SUBJECT: Correlation of Oil Analyticals with FEI1 and FEI2

Recently, a request was made of the Test Monitoring Center by the Sequence VIB Surveillance Panel Chair to determine if any correlation exists between FEI parameters and the various oil analysis parameters required in Section 12.2. This request has been completed and the results of this analysis are documented in the following sections. None of the parameters analyzed correlated with either FEI1 or FEI2 results, though some correlation was noted with High Temperature High shear when correlated with FEI2.

High Temperature High Shear

Figures 1 and 2 plot High Temperature High Shear (HTHS) versus FEI1 and FEI2. Regression analysis was conducted on HTHS results versus both FEI1 and FEI2, providing r^2 values of 0.110 and 0.158 respectively. However, when reviewing the plots, it appears that two distinct groups are evident, one group providing results from 2.5 to 4 centipoise and a second group providing results from 5.5 to 9 centipoise. Figures 1A and 1B plot the HTHS versus FEI1 for both groups. Regression analysis performed on HTHS and FEI1 yielded an r^2 value of 0.200 for the 5.5 to 9 centipoise group and an r^2 value of 0.078 for the 2.5 to 4 centipoise group. Figures 2A and 2B plot the HTHS versus FEI2 for both groups. Regression analysis performed on HTHS and FEI2 yielded an r^2 value of 0.646 for the 5.5 to 9 centipoise group and an r^2 value of 0.199 for the 2.5 to 4 centipoise group. It should be noted that the 2.5 to 4 centipoise group consists of two labs, while the other group contains the remaining five labs. There also appears to be some confusion as to what temperature HTHS is to be run. Section 11.5.20 specifies 100°C, but Test Method D4683 specifies it be run at 150°C. Both labs in 2.5 to 4 centipoise group are running at 150°C, while the other labs are running at 100°C.

Cold Crankcase Simulator Viscosity

Figures 3 and 4 plot Cold Crankcase Simulator Viscosity (CCS) versus FEI1 and FEI2. Regression analysis was conducted on CCS results versus both FEI1 and FEI2 resulted in r^2 values of 0.007 and 0.142, respectively.

Friction Coefficient by HFRR

Figures 5 and 6 plot Friction Coefficient by HFRR (FCHFRR) results versus FEI1 and FEI2. Regression analysis conducted on FCHFRR results versus both FEI1 and FEI2 gave r^2 values of 0.046 and 0.007, respectively.

Fuel Dilution

Figures 7 and 8 plot Fuel dilution results versus FEI1 and FEI2. Regression analysis conducted on Fuel Dilution results versus both FEI1 and FEI2 provided r^2 values of 0.001 and 0.019, respectively.

Oxidation and Nitration by Infrared

Figures 9 and 10 plot Oxidation by Infrared results versus FEI1 and FEI2 and Figures 11 and 12 plot Nitration by Infrared results versus FEI1 and FEI2. Regression analysis conducted on Oxidation results versus both FEI1 and FEI2 resulted in r^2 values of 0.061 and 0.151, respectively. Regression analysis of Nitration versus FEI1 and FEI2 yielded r^2 values of 0.004 and 0.015, respectively.

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Attachments

c: Sequence VIB Surveillance Panel

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/memos/mem03-008.pdf>

Figure 1

SEQUENCE VIB
Plot of HTHS Results Versus FEI1

HIGH TEMPERATURE HIGH SHEAR

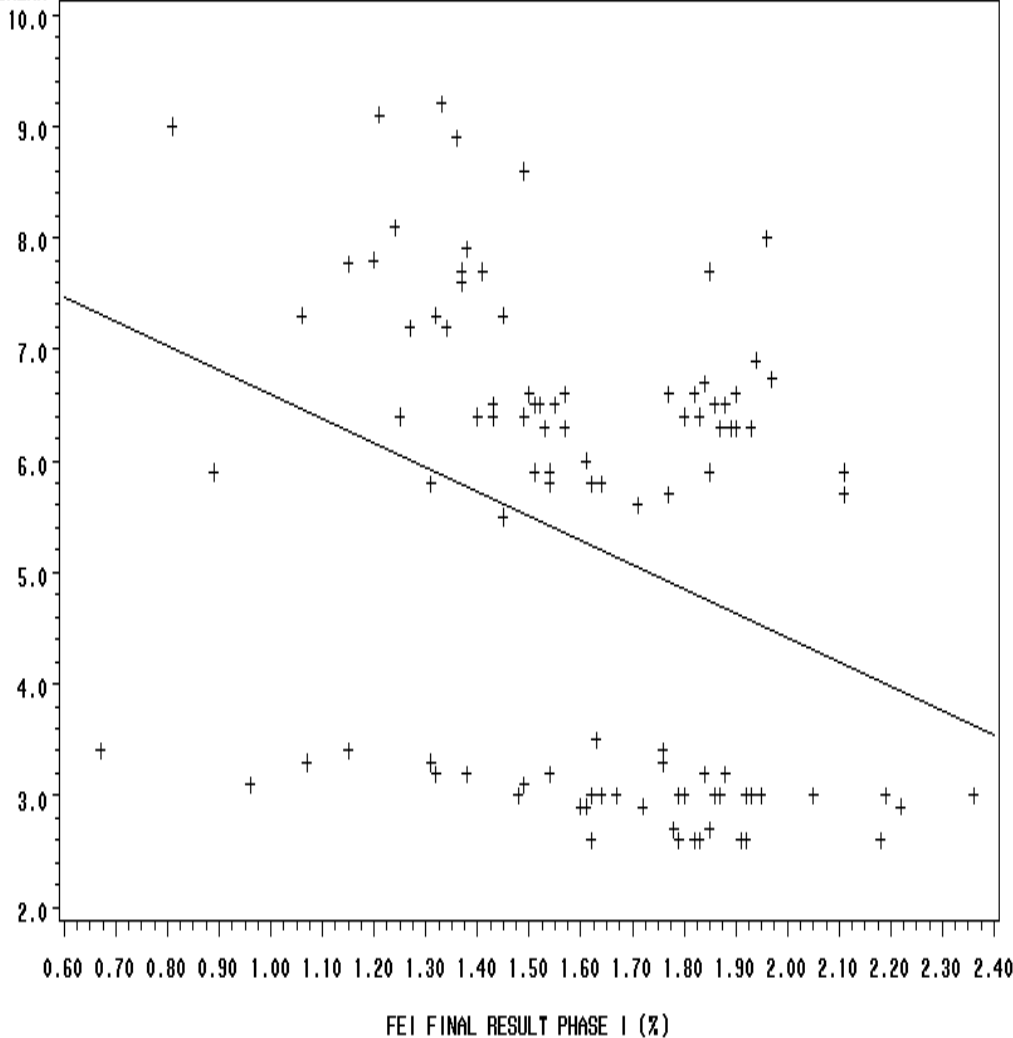


Figure 1A

SEQUENCE VIB
Plot of HTHS Versus FEI1, for Group Providing Results from 5.8 to 9.0

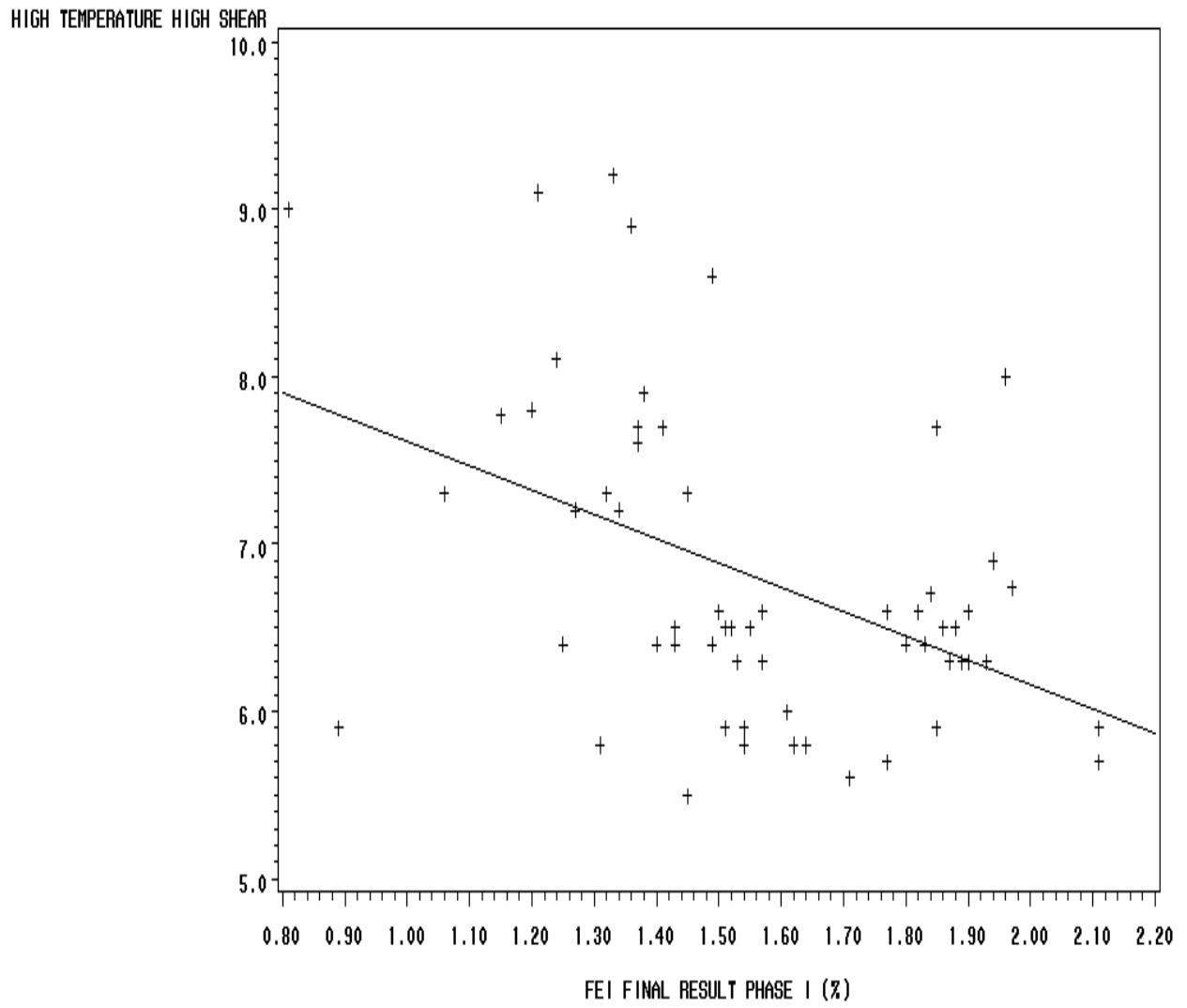


Figure 1B

SEQUENCE VIB
Plot of HTHS Versus FEI1, for Group Providing Results from 2.5 to 4.0

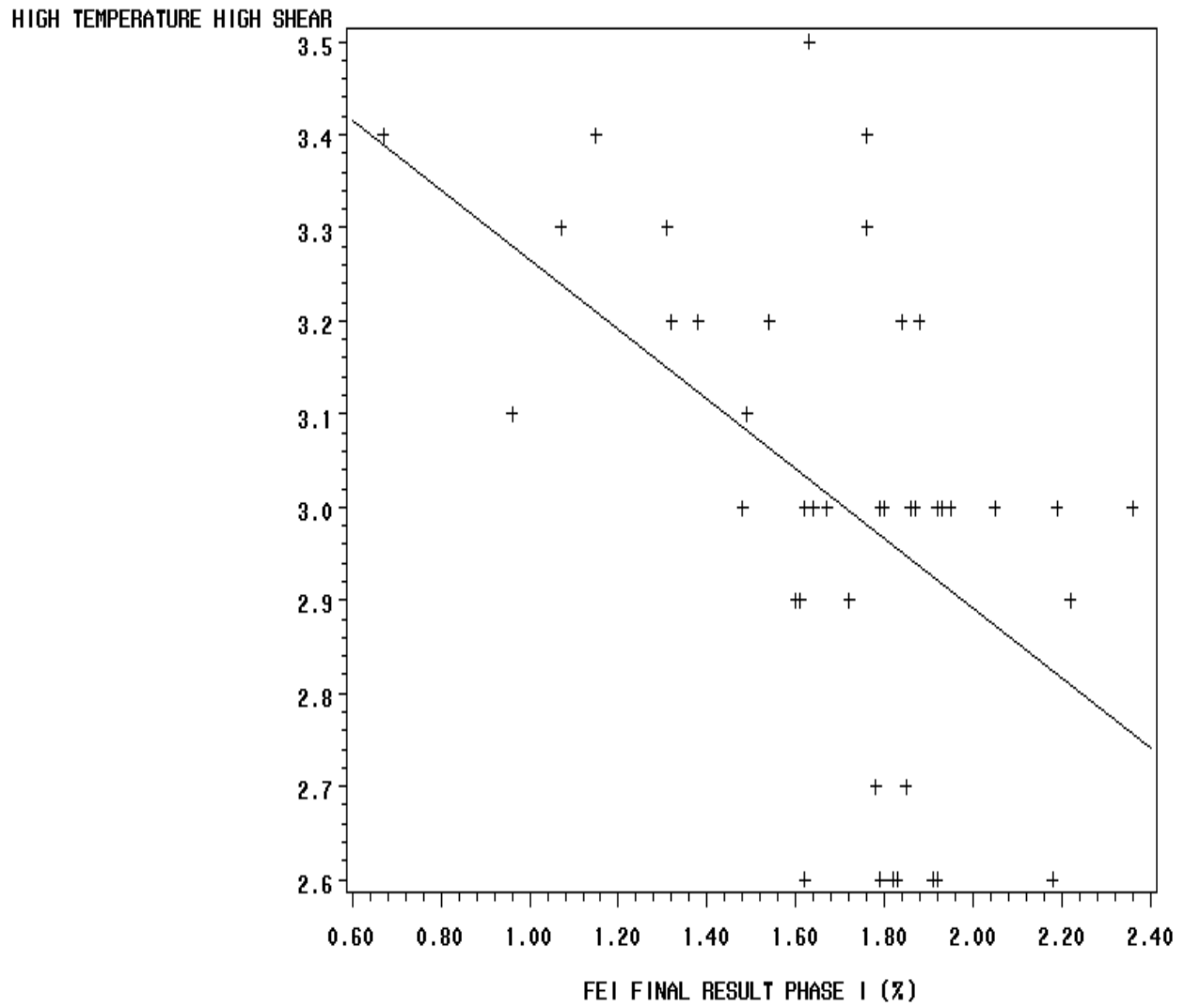


Figure 2A

SEQUENCE VIB
Plot of HTHS Versus FEI2, for Group Providing Results from 5.6 to 9.0

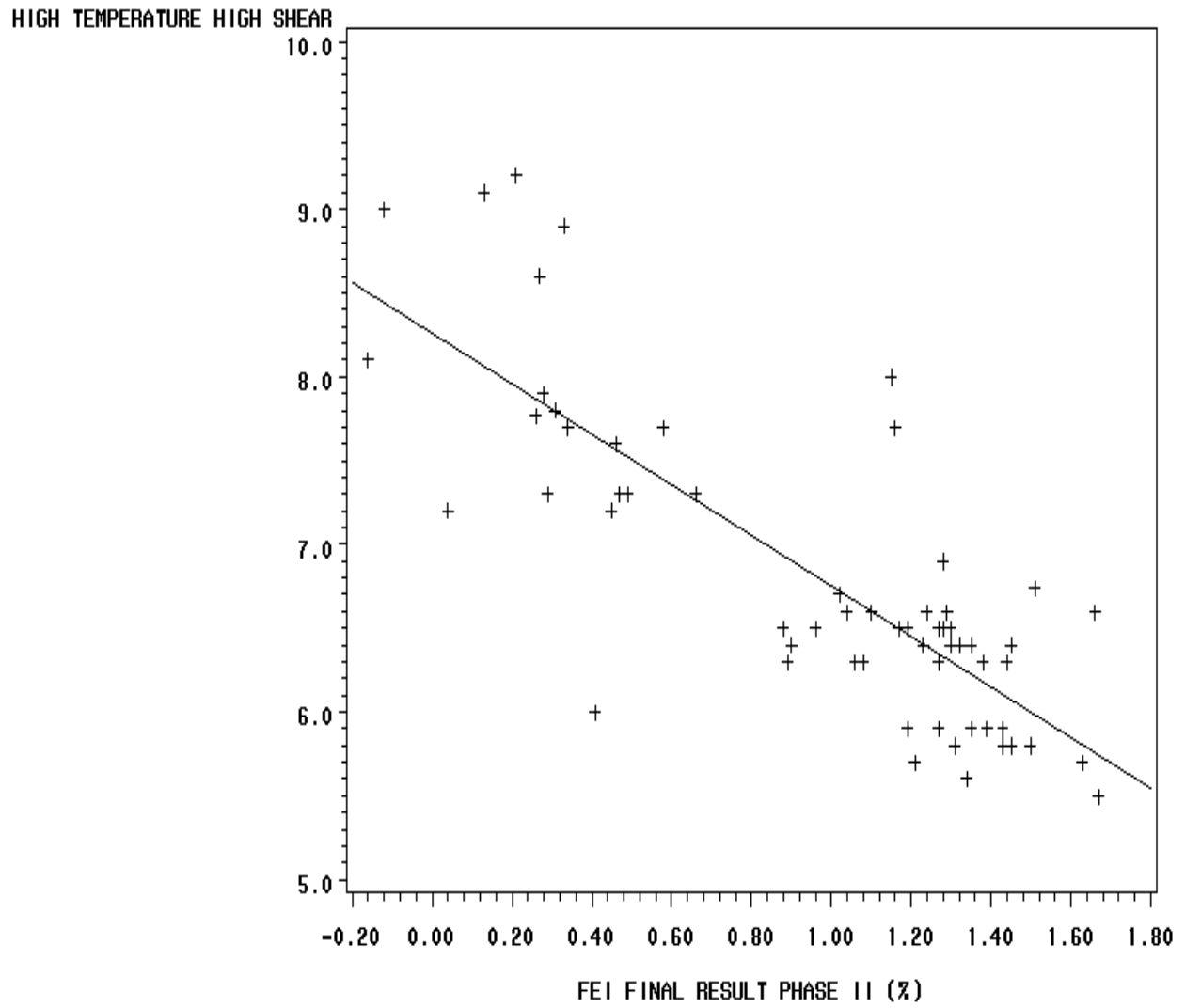


Figure 2B

SEQUENCE VIB
Plot of HTHS Versus FEI2, for Group Providing Results from 2.5 to 4.0

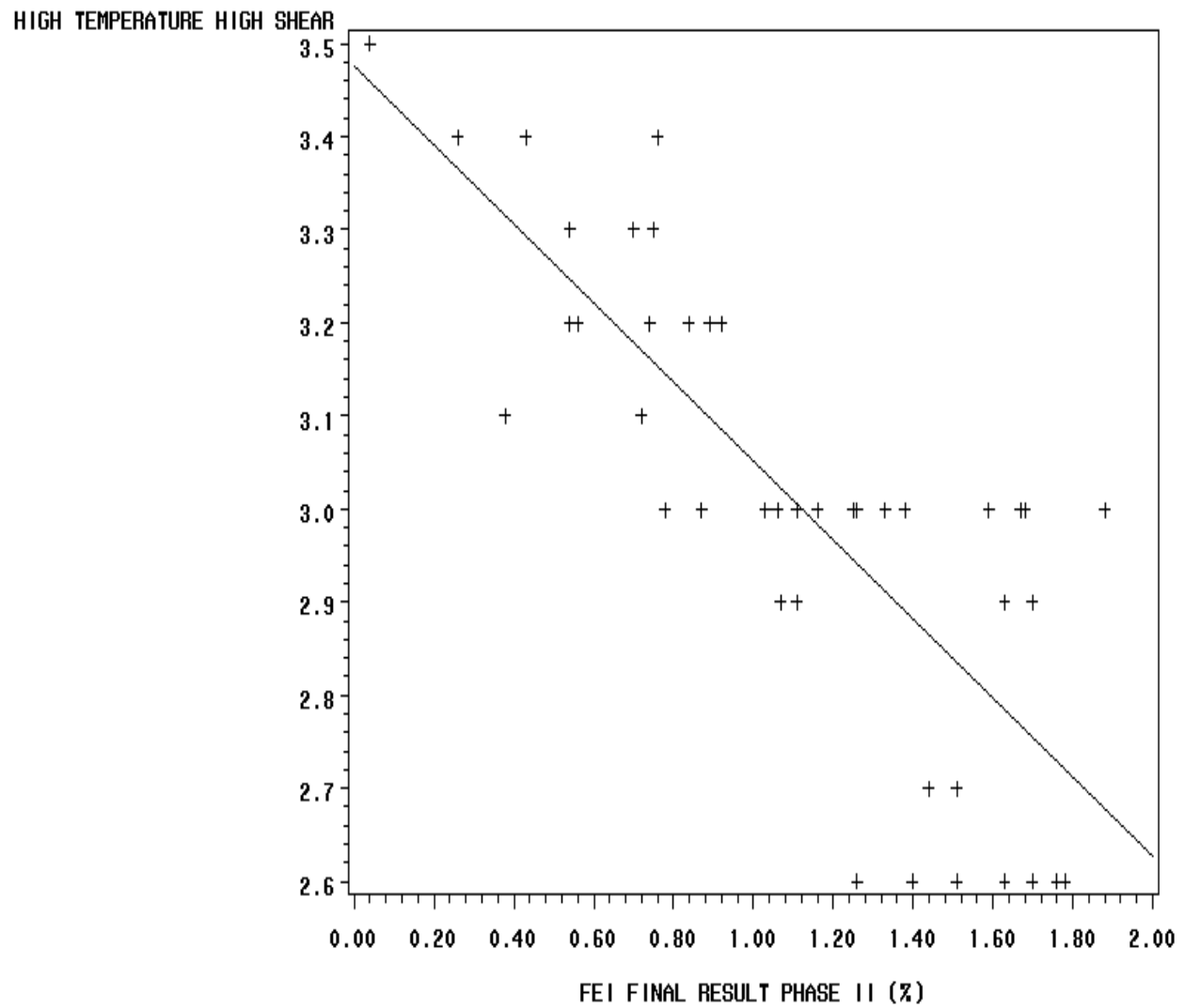


Figure 3

SEQUENCE VIB
Plot of Cold Crankcase Simulator Viscosity Versus FE11

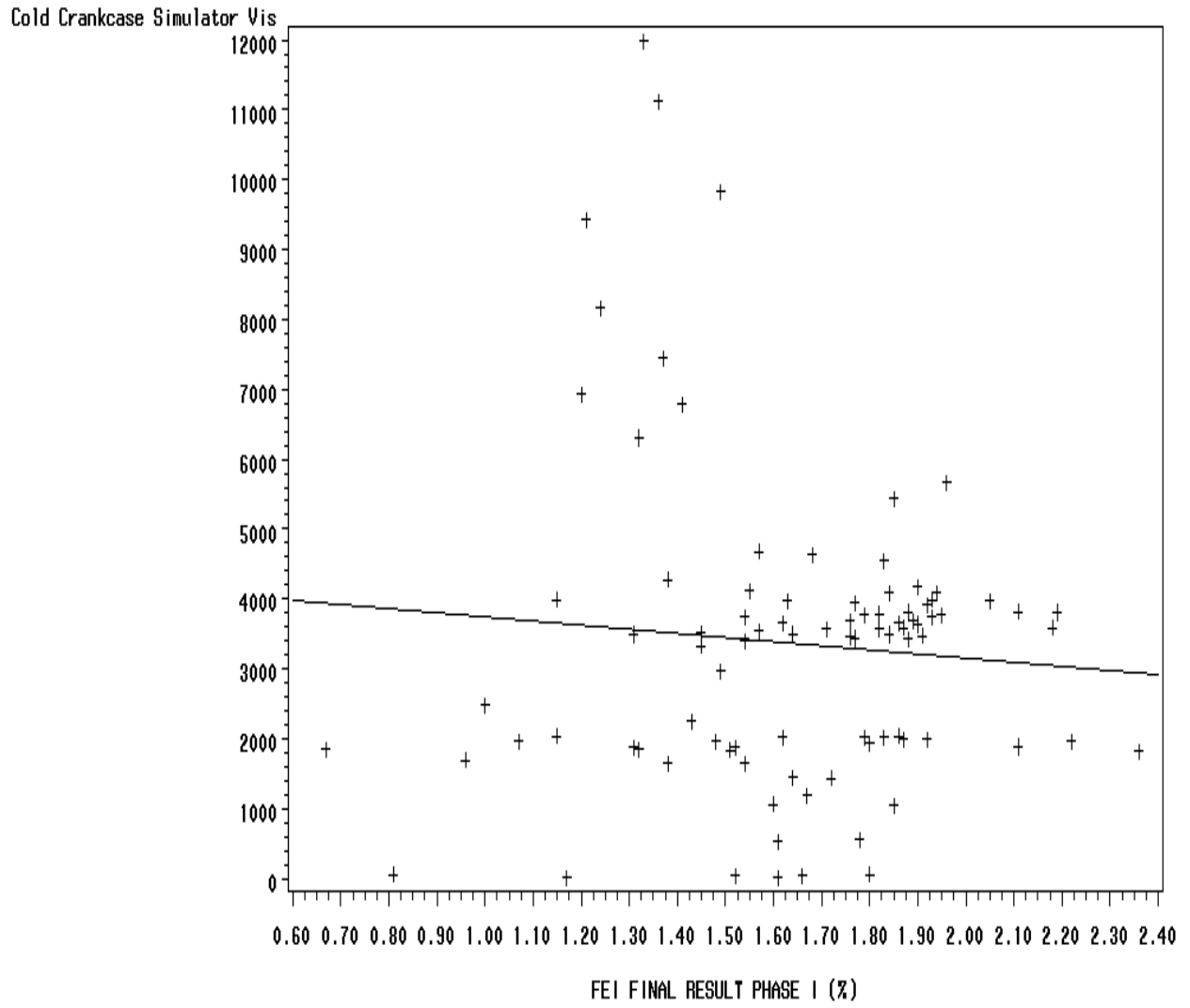


Figure 4

SEQUENCE V1B
Plot of Cold Crankcase Simulator Viscosity Versus FE12

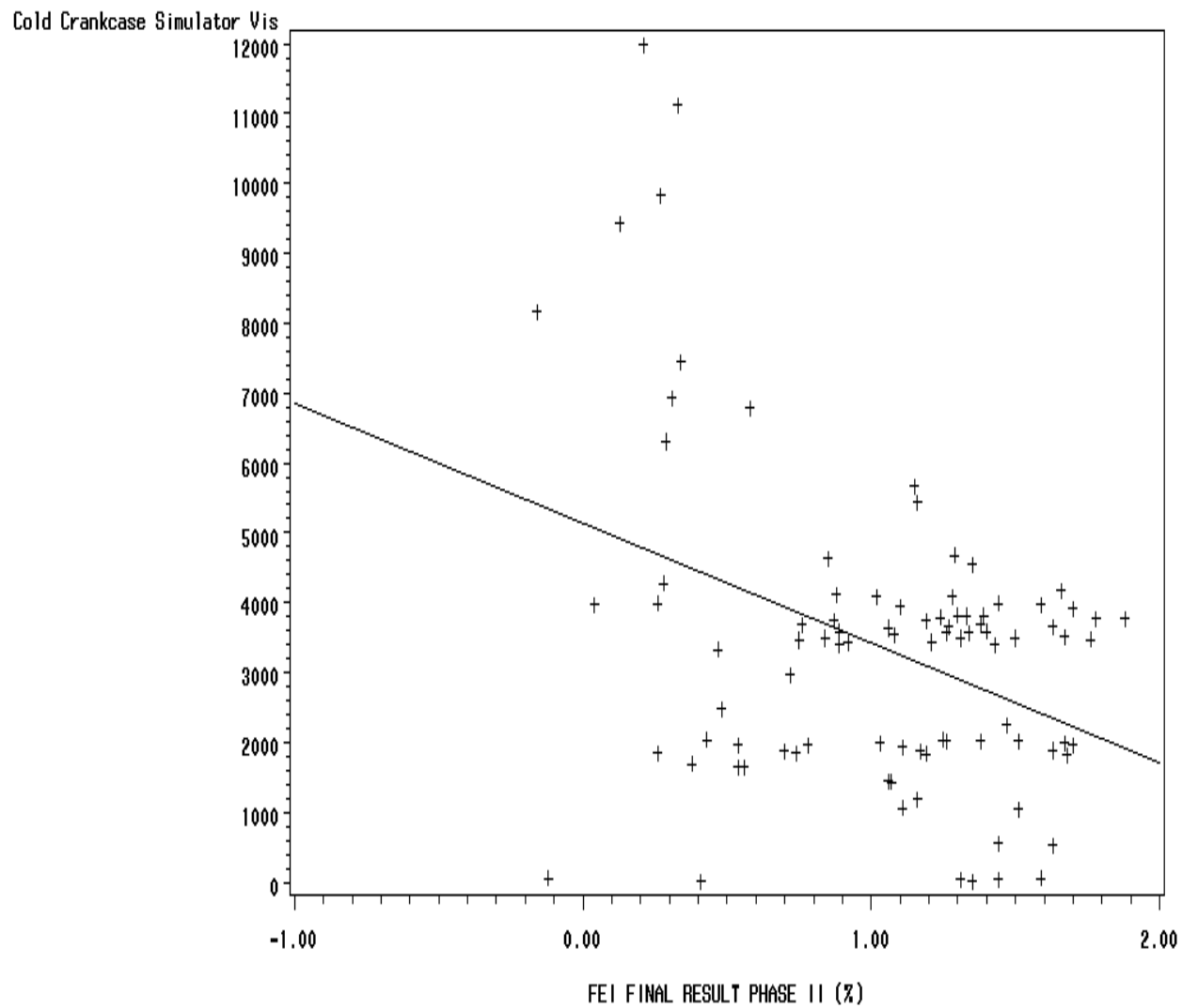


Figure 5

SEQUENCE VIB
Plot of FCHFR Results Versus FEI1

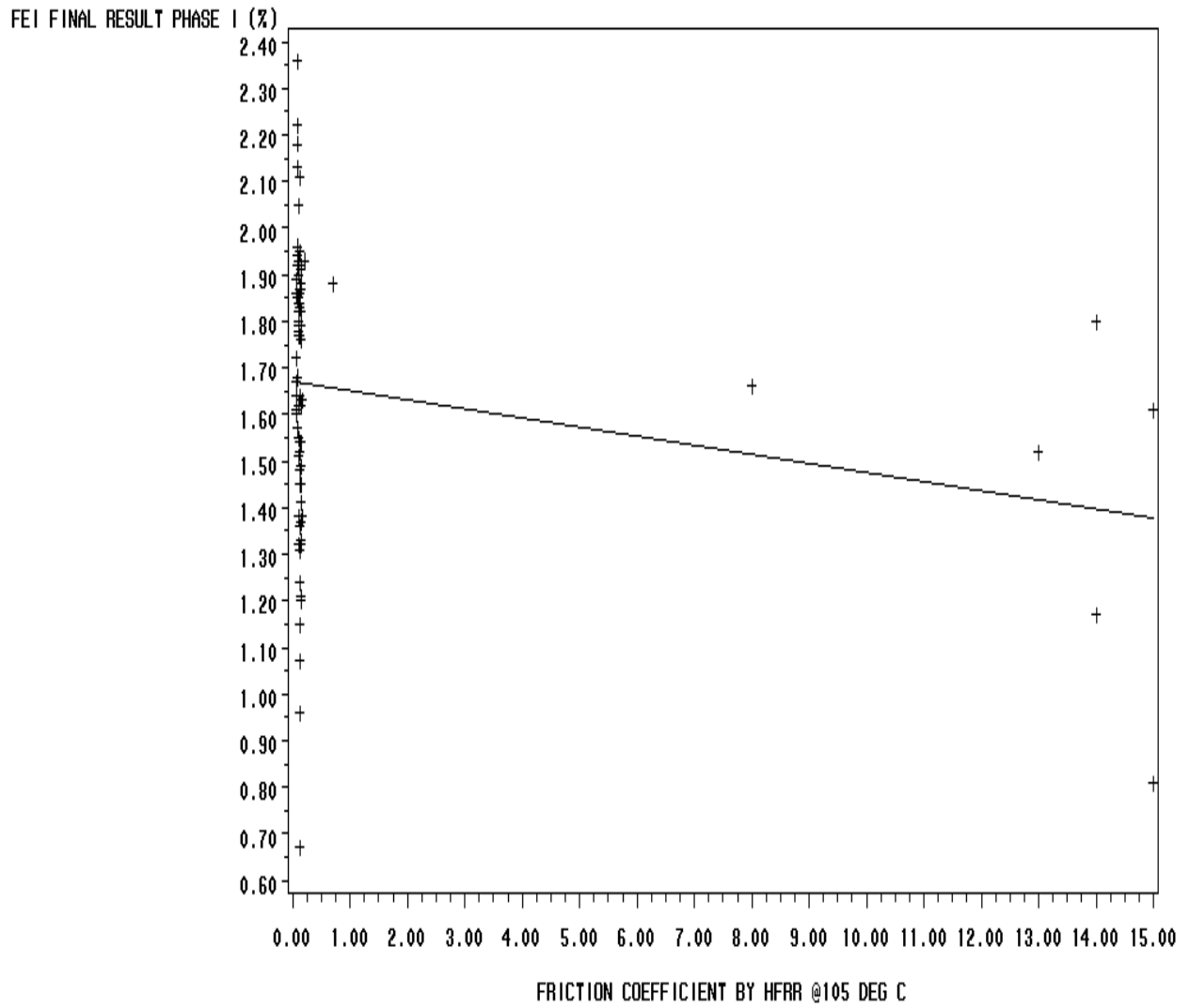


Figure 6

SEQUENCE VIB
Plot of FCHFR Results Versus FEI2

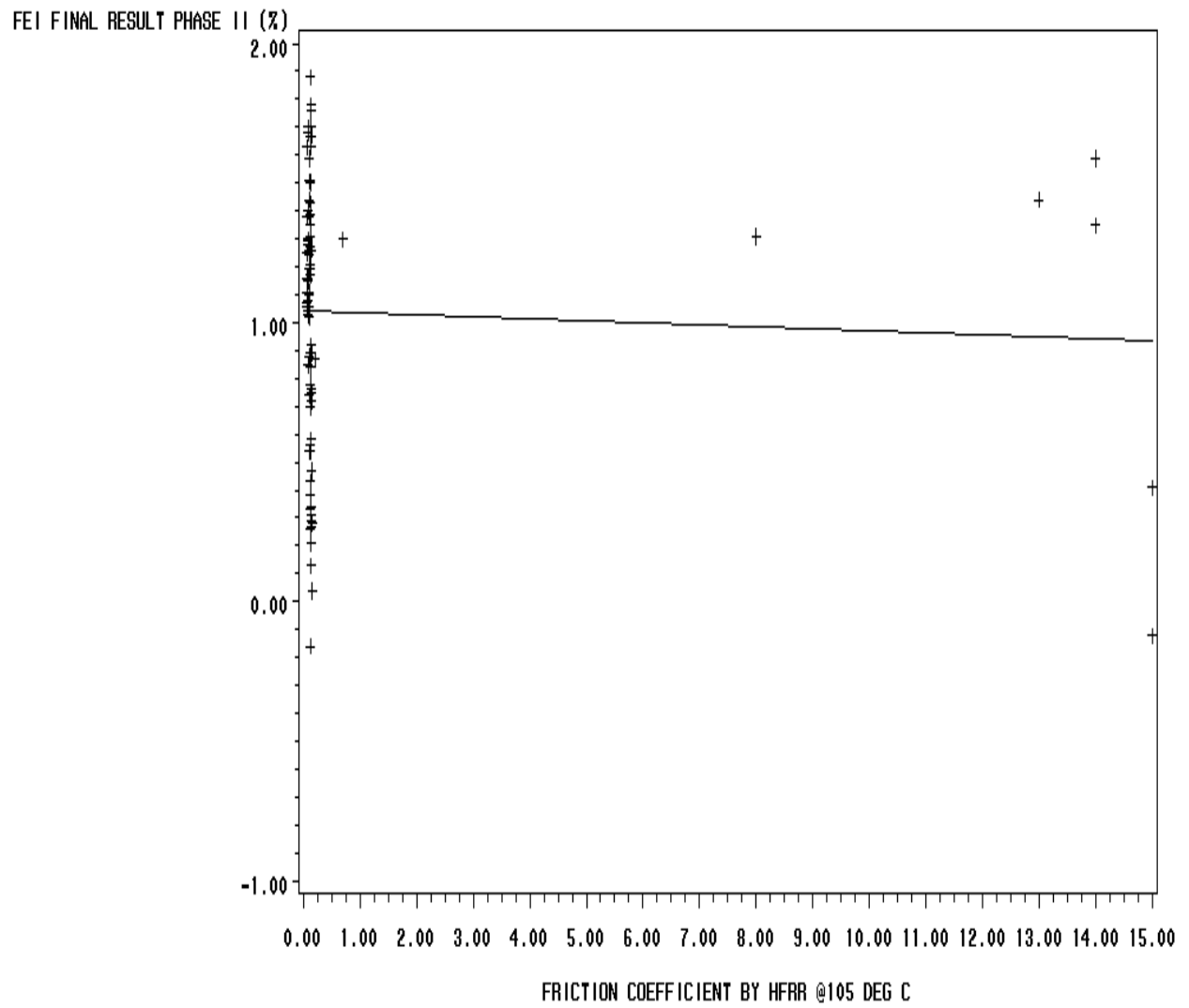


Figure 7

SEQUENCE VIB
Plot of Fuel Dilution Versus FEI1

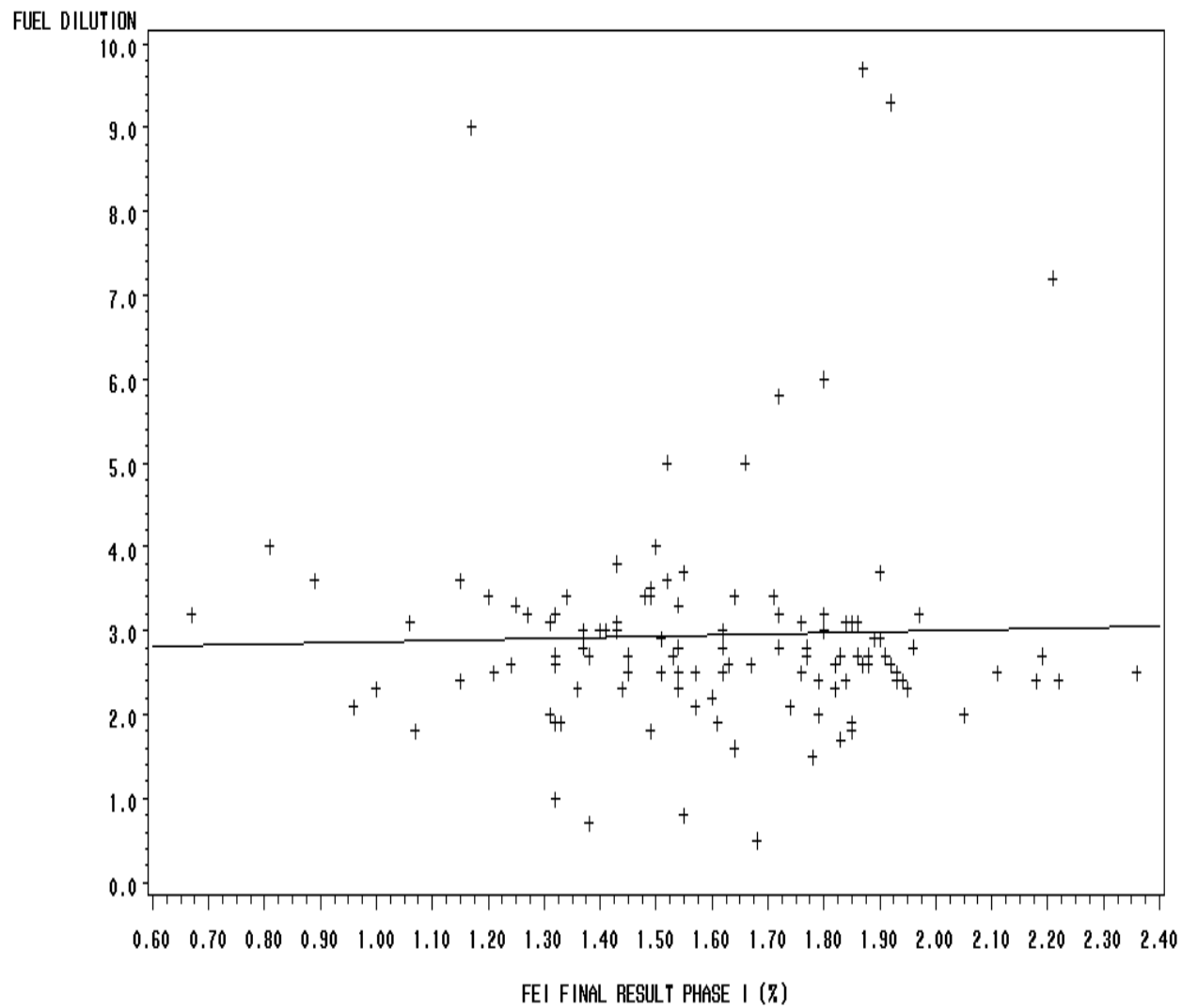


Figure 8

SEQUENCE VIB
Plot of Fuel Dilution Versus FEI2

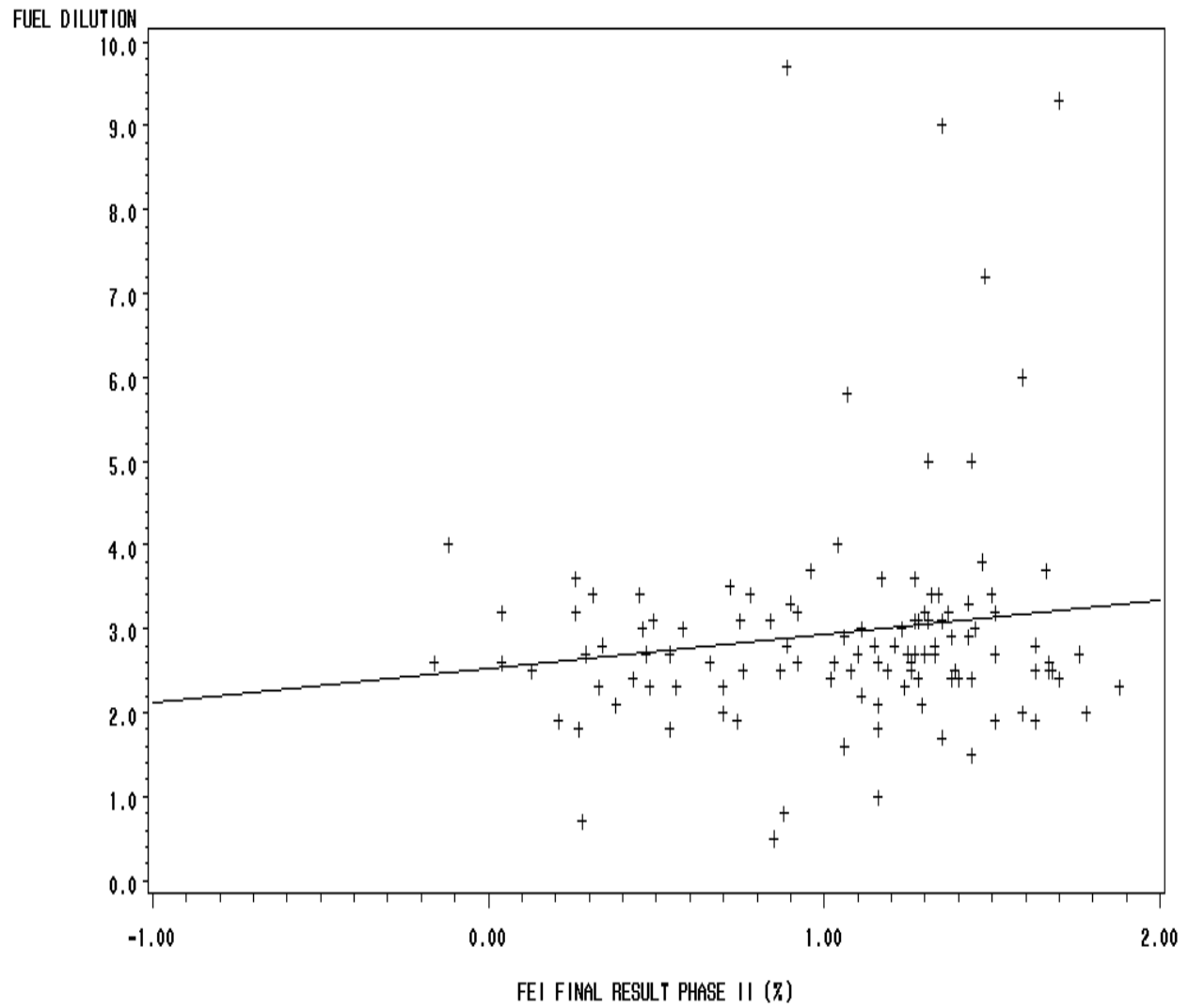


Figure 10

SEQUENCE V1B
Plot of Oxidation by Infrared Versus FE12

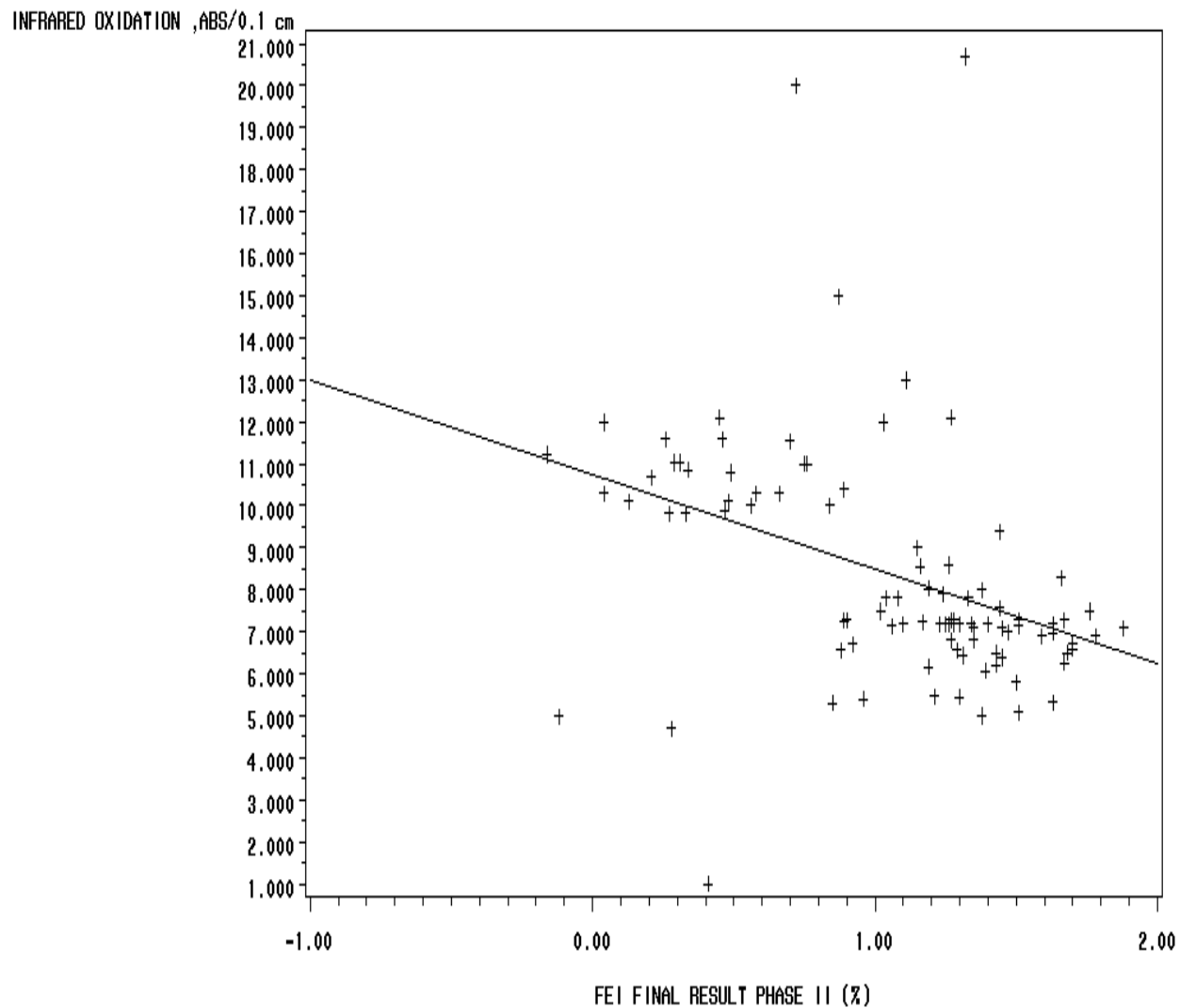


Figure 11

SEQUENCE VIB
Plot of Nitration by Infrared Versus FE11

