MPR

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CALCULATION TITLE PAGE

Client: PSEG Nuclear LLC	Page 1 of 13 plus 58 appendix pages
Project: Hope Creek Decontamination Port	Task No. 1108-0502-0002-00
Title: Reactor Recirc Vibration Data Analysis	Calculation No. H-1-BB-CDC-2065

Preparer / Date	Checker / Date	Reviewer & Approver / Date	Rev. No.
4/2/2005 Randolph C. Trench	04/02/2005 Rossnyev Alvarado	04/02/2005 R. Alvarado for Edward Bird	0

QUALITY ASSURANCE DOCUMENT

This document has been prepared, checked, and reviewed/approved in accordance with the Quality Assurance requirements of 10CFR50 Appendix B, as specified in the MPR Quality Assurance Manual.

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RECORD OF REVISIONS

Calculation No.	Prepared By	Checked By	Page: 2
H-1-BB-CDC-2065			

Revision	Affected Pages	Description
0	All	Initial Issue

Note: *The revision number found on each individual page of the calculation carries the revision level of the calculation in effect at the time that page was last revised.*

Table of Contents

1.0 PURPOSE

The purpose of this calculation is to provide an analysis of vibration data collected in 2004 and early 2005 for the Hope Creek Loop A and Loop B Recirculation System piping, on the suction side of the reactor recirculation pumps. The purpose for this analysis is also to determine if the vibration measured at these locations has changed with time.

2.0 SUMMARY OF RESULTS

In 2005, accelerations reported at the Loop B suction pipe elbow are about the same as they were in 2004. For Loop A, the reported 2005 accelerations for specific frequency ranges are greater than they were in 2004 in the axial and vertical directions. It is noted that the 2005 Loop A axial acceleration data shows an increasing trend with pump speed that appears to trend upwards, up to the highest pump speed analyzed. These 2005 Loop A axial accelerations are significantly greater than the corresponding accelerations reported in 2004, and significantly greater than the same location in Loop B (in 2004 and in 2005).

3.0 DISCUSSION

3.1 Approach

To determine if the vibration experienced in the recirculation system has changed with time, a comparison is made of the vibration measured in 2004 to that measured in early 2005. Section 4 describes how the data was collected and analyzed, and provides the results of the comparison. Section 5 lists references. Appendices A and B contain data from early 2005 used in this calculation that, as of the date of preparation of this calculation, are not readily available elsewhere at PSEG Nuclear.

3.2 Information to be Verified

PSEG Nuclear personnel verbally communicated information pertaining to the location of accelerometers on the recirc loop piping for the 2005 data measurements. Formal documentation of this information should be reviewed to ensure that the accelerometer locations and directions shown in Table 4-1 of this calculation are correct.

Data presented in Appendix A for early 2005 was provided on a preliminary basis from Structural Integrity Associates via transfer over the internet. When this data is formally

provided, this calculation should be reviewed to verify that the data used herein is the same as the data in the formal SIA transmittal.

The Data Acquisition forms in Appendix B are not official records. When official records become available, the data from Table 4-3 should be reviewed to verify that all information used matches the official records.

4.0 ANALYSIS OF VIBRATION DATA COLLECTED IN 2004 AND EARLY 2005

4.1 Data Collection in 2004

During the plant outage that started in March 2004, PSEG Nuclear installed accelerometers to measure piping vibration in the Hope Creek recirculation loops. Of specific interest for this calculation, accelerometers were installed on the Loop A and Loop B recirculation pump suction piping elbows upstream of the pump suction isolation valves 1BB-HV-F023A and -F023B. At each location, three accelerometers were mounted on horizontal piping to detect pipe accelerations in three orthogonal directions: along the pipe axis, perpendicular to the pipe axis in the horizontal direction, and in the vertical direction. Figure 4-1 shows the location of these accelerometers.

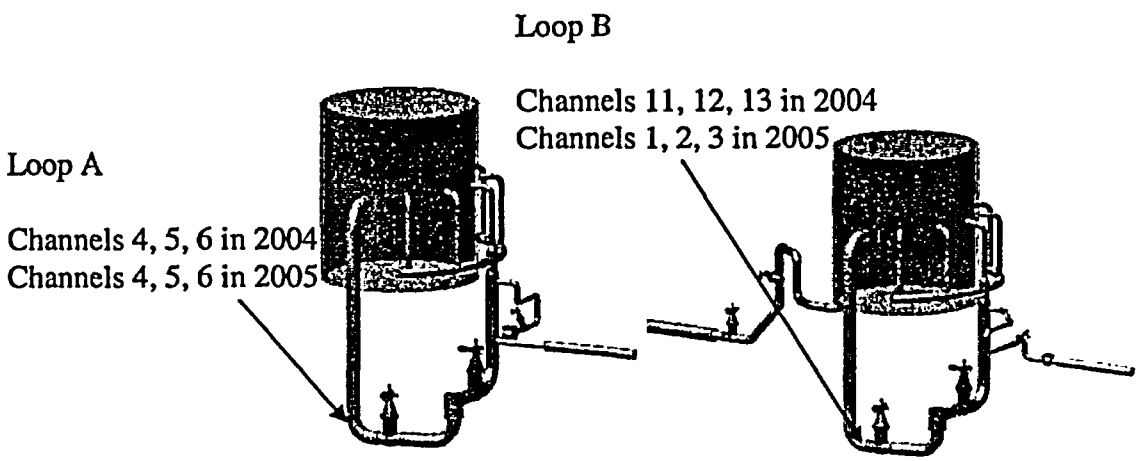


Figure 4-1.
Location of Accelerometers on Hope Creek Recirculation System Piping

As the plant restarted following the March 2004 outage, accelerometer readings at each accelerometer were obtained at varying power levels. The accelerations were recorded for a 120

second time interval during each occasion. In addition, test personnel recorded plant conditions such as pump running speeds and core thermal power level.

The recorded data was transmitted to Structural Integrity Associates (SIA) personnel, who performed Fast Fourier Transforms (FFT) of the time domain acceleration data to produce FFT plots of the accelerations as a function of frequency for each accelerometer. For most of the data collection events, SIA personnel provided plots showing the acceleration versus frequency FFT response for each accelerometer, plus calculated peak-to-peak displacement results.

SIA compiled the results of the measurements taken in 2004 in Reference 1. The SIA report concluded that the vibration occurred chiefly at multiples of the pump running speeds, with the highest amplitudes occurring at 5 and 10 times the pump running speed. The pumps have five vane impellers, so the 5X and 10X frequencies represent multiples of the pump vane passing frequency.

4.2 Data Collection in Early 2005

In February and March 2005, PSEG Nuclear again collected vibration data from the recirculation loops at varying plant power levels and recirculation pump speeds. The 2005 data was collected using accelerometers located at the recirc Loop A and Loop B suction line elbows, as shown in Figure 4-1. PSEG Nuclear personnel report that the 2005 locations are the same as the 2004 locations. Note that for the 2005 data, a different accelerometer channel numbering system was used. Table 4-1 shows the correlation between the accelerometer channel numbers used in 2004 and 2005.

Table 4-1.
Accelerometer Channel Numbers Used in 2004 and 2005

Location	Direction	2004 Channel Number	2005 Channel Number
Loop A Suction Elbow	Axial	4	4
	Vertical	6	5
	Perpendicular	5	6
Loop B Suction Elbow	Axial	12	1
	Vertical	11	2
	Perpendicular	13	3

References for Table 4-1:

- For 2004 data, see Reference 1.
- For 2005 data, PSEG Nuclear personel provided the above information verbally. See Section 3.2..

For the data collected in 2005, SIA personnel produced FFT plots showing the vibration accelerations as a function of frequency. As in 2004, the 2005 FFT plots show that the accelerations occur mainly at frequencies which are multiples of the pump running speed, especially the 5X frequencies. Excerpts from the preliminary analyses performed by SIA for this data are provided in Appendix A to this calculation. Note that this information from SIA is available only in preliminary form at the time of this calculation (see Section 3.2).

4.3 Comparison of Data from 2004 and Early 2005

The decontamination port that was found leaking in March 2005 has a calculated first mode natural frequency of about 122 Hz, as documented in Reference 2. Of interest in this calculation is the vibration that occurs at or near this natural frequency. Since this natural frequency is in the range of the pump vane passing frequency at full power operation (which is typically on the order of 125 Hz), this calculation will analyze the vibrations that were measured at the vane passing frequency at or near full power.

Note that the Hope Creek recirculation pumps are variable speed pumps. Pump speeds increase during power ascensions and can vary during full power operation if needed to maintain steady power output. Vibration data was collected in 2004 and 2005 at a variety of recirc pump running speeds. In this calculation, the comparison of 2004 to 2005 data will take into consideration the pump running speed when the data was collected.

Table 4-2 shows the acceleration magnitudes reported by SIA for 2004 at the pump vane passing speed frequency, measured using the three accelerometers on the Loop A suction elbow and the three accelerometers on the Loop B suction elbow. Table 4-3 shows the similar data obtained in early 2005. Figures 4-2 and 4-3 provide comparisons of the data in graphical form.

Table 4-2.
Accelerations Measured at Vane Passing Frequency in 2004

Data Recording File Date and Time	Power Level	Pump A Speed rpm	Pump B Speed rpm	Pump A 5X Freq Hz	Pump B 5X Freq Hz	Ch 4 2004 Loop A Recirc In-Line	Ch 5 2004 Loop A Recirc Perpendicular	Ch 6 2004 Loop A Recirc Vertical	Ch 11 2004 Loop B Recirc Vertical	Ch 12 2004 Loop B Recirc In-Line	Ch 13 2004 Loop B Recirc Perpendicular
4/17/04 8:26 PM	1168 MWth	478	458	39.8	38.2	0.0046	0.0015	0.0071	0.0052	0.0040	0.0010
4/18/04 4:33 AM	1245 MWth	582	582	48.5	48.5	0.0040	0.0063	0.0110	0.0080	0.0125	0.0045
4/18/04 10:02 PM	1477 MWth	910	912	75.8	76.0	0.0135	0.0160	0.0360	0.0150	0.0090	0.0180
4/19/04 10:44 AM	1481 MWth	1000	996	83.3	83.0	0.0068	0.0330	0.0090	0.0250	0.0250	0.0530
4/22/04 4:55 PM	2054 MWth	1034	1036	86.2	86.3	0.0560	0.0830	0.0640	0.0280	0.0310	0.0380
4/29/04 12:21 PM	2472 MWth	940	936	78.3	78.0	0.0150	0.0170	0.0200	0.0250	0.0080	0.0260
4/25/04 4:47 PM	2502 MWth	938	927	78.2	77.3	0.0150	0.0180	0.0220	0.0220	0.0090	0.0260
4/29/04 7:01 PM	2637 MWth	1034	1030	86.2	85.8	0.0380	0.0760	0.0510	0.0250	0.0290	0.0320
4/23/04 2:25 PM	2682 MWth	1048	1046	87.3	87.2	0.0700	0.0740	0.0680	0.0510	0.0590	0.0700
4/23/04 11:46 AM	2682 MWth	1048	1046	87.3	87.2	0.0690	0.0730	0.0670	0.0520	0.0600	0.0700
4/29/04 11:40 PM	2683 MWth	1076	1074	89.7	89.5	0.1460	0.0620	0.1050	0.0720	0.1080	0.0340
4/25/04 4:02 PM	2727 MWth	1105	1096	92.1	91.3	0.1500	0.0730	0.0840	0.0510	0.0900	0.0080
4/30/04 4:21 AM	2790 MWth	1170	1162	97.5	96.8	0.0750	0.0390	0.0680	0.0680	0.1180	0.0130
4/24/04 1:42 AM	2902 MWth	1282	1278	106.8	106.5	0.0680	0.0660	0.0410	0.0600	0.0530	0.0650
4/24/04 8:03 AM	2987 MWth	1235	1230	102.9	102.5	0.0210	0.0470	0.0290	0.0430	0.0450	0.0260
4/30/04 9:15 AM	3001 MWth	1236	1232	103.0	102.7	0.0240	0.0450	0.0320	0.0410	0.0470	0.0230
4/25/04 3:59 AM	3040 MWth	1296	1296	108.0	108.0	0.0750	0.1150	0.0300	0.0660	0.0560	0.0740
4/24/04 12:50 PM	3060 MWth	1305	1300	108.8	108.3	0.1080	0.1300	0.0400	0.0610	0.0580	0.0720
5/1/04 1:50 AM	3089 MWth	1374	1374	114.5	114.5	0.0280	0.0660	0.0155	0.0220	0.0130	0.0370
4/30/04 10:02 PM	3092 MWth	1352	1350	112.7	112.5	0.0420	0.0570	0.0152	0.0260	0.0140	0.0350
4/30/04 6:02 PM	3094 MWth	1330	1328	110.8	110.7	0.0590	0.0720	0.0160	0.0450	0.0370	0.0400
4/30/04 12:40 PM	3103 MWth	1310	1302	109.2	108.5	0.0750	0.1200	0.0250	0.0700	0.0580	0.0780
5/1/04 4:48 AM	3113 MWth	1416	1408	118.0	117.3	0.0175	0.0600	0.0110	0.0320	0.0040	0.0290
5/1/04 11:46 AM	3129 MWth	1470	1468	122.5	122.3	0.0300	0.0171	0.0580	0.0710	0.0290	0.0350
5/1/04 11:46 AM	3133 MWth	1482	1468	123.5	122.3	0.0350	0.0370	0.0900	0.1080	0.0350	0.0670
5/1/04 11:46 AM	3143 MWth	1508	1498	125.7	124.8	0.0320	0.0460	0.1380	0.1190	0.0460	0.0950
5/1/04 11:46 AM	3143 MWth	1508	1498	125.7	124.8	0.0310	0.0240	0.1780	0.1300	0.0500	0.1000
5/1/04 9:43 AM	3151 MWth	1454	1452	121.2	121.0	0.0240	0.0130	0.0430	0.0600	0.0370	0.0290
5/2/04 2:53 AM	3222 MWth	1420	1418	118.3	118.2	0.0105	0.0430	0.0098	0.0400	0.0180	0.0250
5/12/04 9:07 AM	3330 MWth	1502	1494	125.2	124.5	0.0470	0.0330	0.0930	0.0600	0.0920	0.0700
5/3/04 2:26 PM	3331 MWth	1482	1474	123.5	122.8	0.0390	0.0270	0.0900	0.0920	0.0280	0.0540
5/2/04 7:19 AM	3338 MWth	1458	1454	121.5	121.2	0.0290	0.0172	0.0530	0.0650	0.0380	0.0320
5/13/04 9:07 AM	3299 MWth	1474	1466	122.8	122.2	0.0380	0.0190	0.0840	0.0700	0.0220	0.0320
5/14/04 2:44 AM	3336 MWth	1496	1500	124.7	125.0	0.0360	0.0350	0.1500	0.0860	0.1050	0.0620

Notes for Table 4-2:

1. Data obtained from Reference 1.
2. All accelerations are averages calculated from 120 seconds of recorded data. Accelerations are expressed in units of g's rms.
3. Pump A and Pump B 5X frequency is calculated based on pump running speed. All other data is from Reference 1.

Table 4-3.
Accelerations Measured at Vane Passing Frequency in 2005

Data Recording Date and Time	Power Level	Pump A Speed (rpm)	Pump B Speed (rpm)	Pump A 5X Freq (Hz)	Pump B 5X Freq (Hz)	Ch 1 2005 Loop B Recirc In-Line	Ch 2 2005 Loop B Recirc Vertical	Ch 3 2005 Loop B Recirc Perpendicular	Ch 4 2005 Loop A Recirc In-Line	Ch 5 2005 Loop A Recirc Vertical	Ch 6 2005 Loop A Recirc Perpendicular
1/15/05 3:32	0	840	945	70.0	78.8	0.0060	0.0050	0.0050	0.0030	0.0075	0.0016
1/27/05 5:06	158 MWe	480	945	40.0	78.8	0.0030	0.0030	0.0000	0.0095	0.0020	0.0062
1/31/05 8:14	531 MWe	885	840	73.8	70.0	0.0350	0.0100	0.0000	0.0310	0.0141	0.0030
2/1/05 8:47	740MWe	873	840	72.8	70.0	0.0380	0.0130	0.0000	0.0280	0.0130	0.0060
2/1/05 14:31	768 MWe	930	930	77.5	77.5	0.0070	0.0150	0.0000	0.0250	0.0180	0.0090
2/4/05 11:26	833 MWe	1128	1128	94.0	94.0	0.0610	0.0350	0.0000	0.0700	0.0460	0.1030
2/7/05 0:19	905 MWe	1197	1197	99.8	99.8	0.0800	0.0610	0.0000	0.0710	0.0220	0.0630
2/7/05 15:20	1027 MWe	1344	1344	112.0	112.0	0.0200	0.0320	0.0260	0.0070	0.0220	0.0490
2/10/05 2:46	1061 MWe	1300	1300	108.3	108.3	0.0520	0.0540	0.0780	0.0450	0.1520	0.1000
2/10/05 9:27	94%	1350	1350	112.5	112.5	0.0200	0.0300	0.0000	0.0070	0.0152	0.0390
2/10/05 20:56	1103 MWe	1422	1422	118.5	118.5	0.0290	0.0360	0.0310	0.0300	0.0350	0.0110
2/11/05 3:08	1126 MWe	1436	1436	119.7	119.7	0.0560	0.0230	0.0010	0.0310	0.0330	0.0150
2/11/05 8:26	1152.6 MWe	1461	1461	121.8	121.8	0.0690	0.0460	0.0020	0.1300	0.0890	0.0330
2/11/05 16:12	1160 MWe	1466	1478	124.6	122.9	0.0650	0.0650	0.0000	0.1400	0.0180	0.0370
2/11/05 21:23	1160 MWe	1510	1480	125.8	123.3	0.0700	0.0750	0.0020	0.2000	0.0420	0.0600
2/12/05 2:31	1154 MWe	1496	1480	124.8	123.3	0.0700	0.0720	0.0070	0.1900	0.0350	0.0370

Notes for Table 4-3:

1. All acceleration data is from Appendix A to this calculation. Pump running speeds shown in light highlight and bold font above are inferred from the frequency plots in Appendix A.

2. Power levels and running speeds shown in dark highlighting are taken from Appendix B Data Acquisition forms.

3. All accelerations are averages calculated from 120 seconds of recorded data. Accelerations are expressed in units of g's rms.

4. Pump A and Pump B 5X frequency is calculated based on pump running speed.

5. The Channel 3 accelerometer worked intermittently in 2005. For periods when the accelerometer was out of service, the above table shows a zero for measured acceleration.

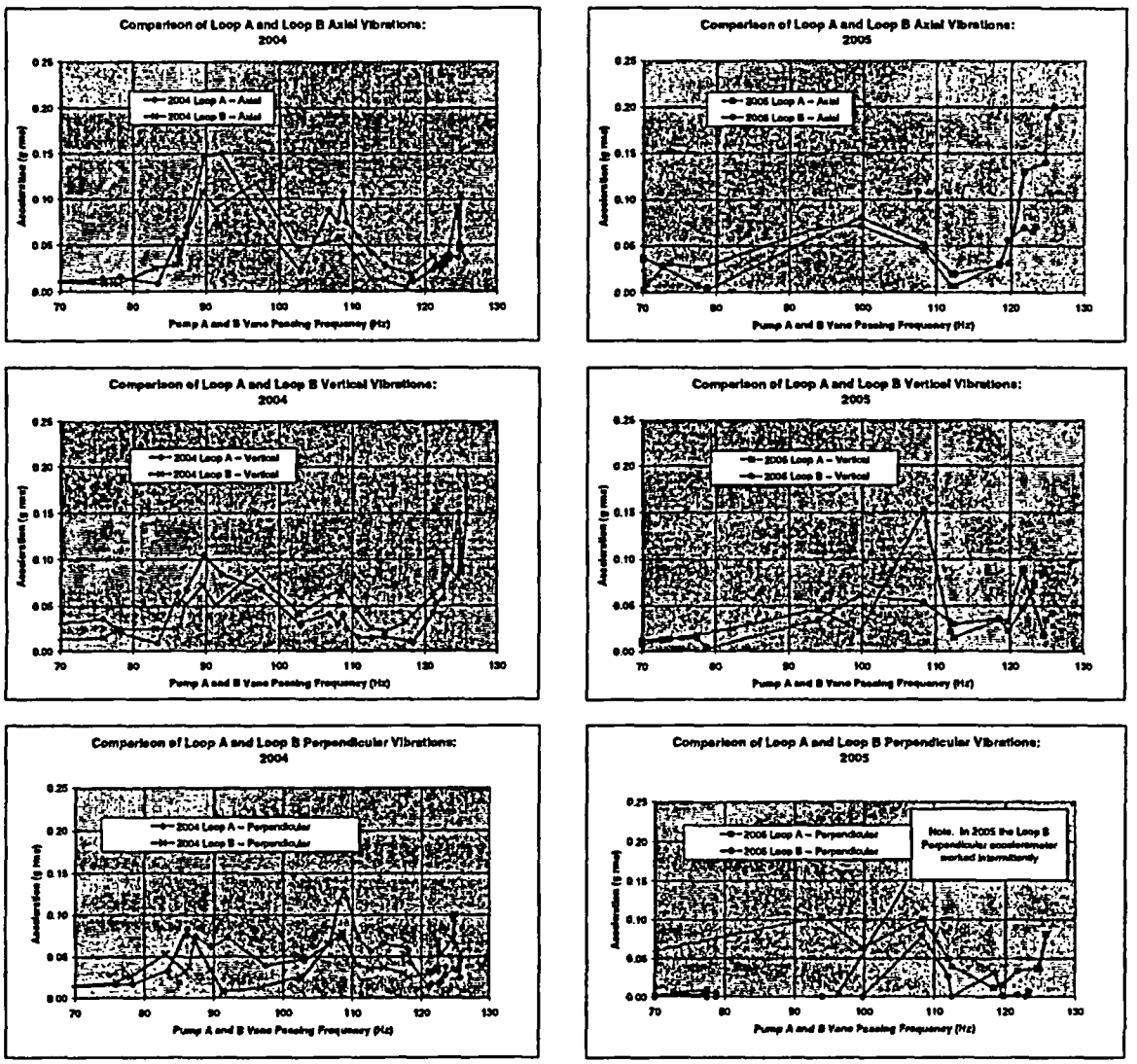


Figure 4-2.
Comparison of Loop A Vibrations to Loop B Vibrations

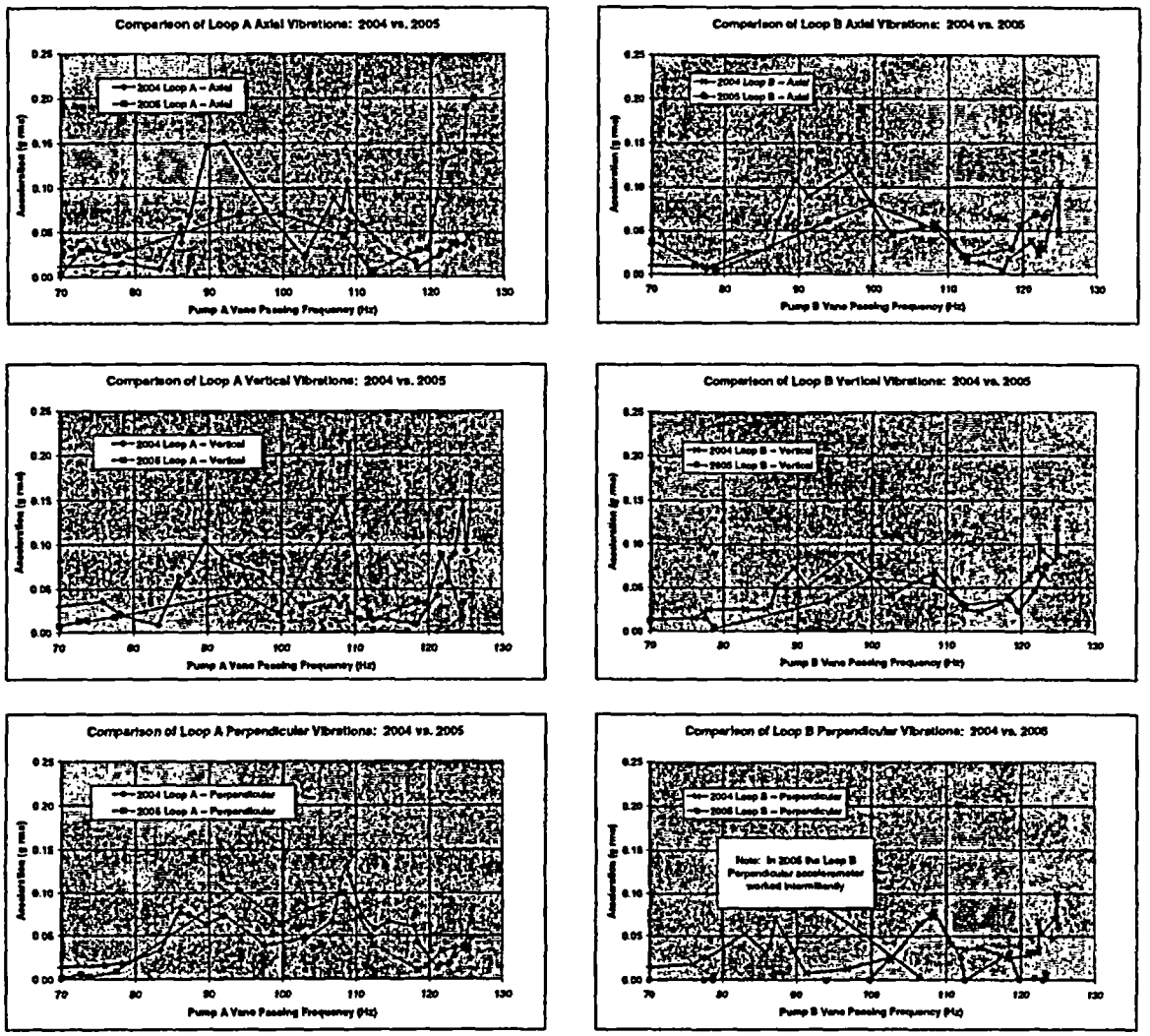


Figure 4-3.
Comparison of 2004 Vibrations to 2005 Vibrations

4.4 Results of Comparison

The following observations are made based on the data in these tables and graphs:

- In 2004, there was little difference between the accelerations measured in Loop A and Loop B.
- In 2005, the Loop A axial and vertical accelerations increased relative to the comparable 2005 Loop B accelerations in certain frequency ranges. Specifically:
  - The Loop A axial acceleration reported in 2005 is double the Loop B acceleration at about 123.3 Hz. The Loop A accelerations recorded at higher vane passing speeds continue to increase. (No data was recorded for Loop B vane passing frequencies higher than about 123.3 Hz in 2005, so whether this trend occurs for Loop B also cannot be determined.)
  - The Loop A vertical acceleration reported in 2005 is about triple the Loop B acceleration at 108.3 Hz. At higher and lower frequencies in 2005, the vertical acceleration in Loop A compares more closely with the comparable acceleration in Loop B.
- For frequencies above 100 Hz, the 2005 Loop B accelerations are about the same as the 2004 Loop B accelerations. For the 90-100 Hz range, the 2005 accelerations were lower than in 2004.
- The 2005 Loop A accelerations are higher in specific frequency ranges than they were in 2004 in Loop A. Specifically:
  - The Loop A axial acceleration reported in 2005 is about four times higher than it was in 2004 at the highest frequency.
  - The Loop A vertical acceleration reported in 2005 is about three times higher than it was in 2004 at 108.3 Hz. At higher and lower frequencies in 2005, the vertical acceleration in Loop A compares more closely with the comparable acceleration in 2004.

Overall, the results can be summarized as follows:

In 2005, accelerations reported at the Loop B suction pipe elbow are about the same as they were in 2004. For Loop A, the reported 2005 accelerations are greater than they were in 2004 in the axial and vertical directions, for specific frequency ranges. It is noted that the 2005 Loop A axial

acceleration data shows an increasing trend with pump speed that appears to trend upwards, up to the highest pump speed analyzed. These 2005 Loop A axial accelerations are significantly greater than the corresponding accelerations reported in 2004, and significantly greater than the same location in Loop B (in 2004 and in 2005).

5.0 REFERENCES

1. Hope Creek Recirculation System Vibration Data Reduction. San Jose, CA.: Structural Integrity Associates, Inc., May 2004. HC-06-301, Revision 0.

2. MPR Calculation Attachment 16 to C0142, Natural Frequency of Loop 'B' Port, Revision 1.

A

Acceleration Data Collected in Early 2005

This appendix provides a copy of all the 2005 vibration data used in this report. The data in this appendix was provided by electronic transfer from SIA, and represents all the FFT plots provided by SIA via this transfer for Channels 1 through 6. Where available, the narrative description prepared by SIA for each data set is also provided in this appendix. Note that at the time of this calculation, SIA had not prepared narratives for all data sets, nor had they transmitted FFT plots for all data sets that had been collected. This appendix includes all the information that is available in FFT format at the time of the preparation of this appendix.

Specifically, the following data sets are provided:

- Data from File HC-Recirc-0PL-Jan15-0332
- Data from File HC23-Recirc-Spec-Jan27-0506
- Data from File HC50-Recirc-Spec-Jan31-0814
- Data from File HC65-Recirc-Spec-Feb1-0847
- Data from File HC70-Recirc-Spec-Feb1-1431
- Data from File HC76-Recirc-Spec-Feb4-1126
- Data from File HC80-Recirc-Spec-Feb7-0019
- Data from File HC90-Recirc-Spec-Feb7-1520
- Data from File HC94-Recirc-Spec-Feb10-0927
- Data from File HC92-Recirc-Spec-Feb10-1254 (FFT plots are 20050210024629)
- Data from File HC96-Recirc-Spec-Feb10-2056
- Data from File HC100-Recirc-Accel-Spec-Feb11-0619 (FFT plots are 20050211082600)
- Data from File HC98-Recirc-Accel-Spec-Feb11-1000 (FFT plots are 20050211030844)
- Data from File HC100-Recirc-Accel-Spec-Feb11-1612
- Data from File HC100-Recirc-Accel-Spec-Feb11-2123
- Data from File HC100-Recirc-Accel-Spec-Feb12-0231

Note: The contents of this appendix were prepared by SIA. The signatures of the MPR preparer and MPR checker on the following pages denote that this information is applicable to this calculation. The MPR preparer and the MPR checker did not prepare or check the SIA information presented in this appendix.

Note: The following pages indicate that the Channels 1-3 accelerometers are on the Loop A piping and that the Channels 4-6 accelerometers are on the Loop B Piping. This is incorrect; see Table 4-1 and Section 3.2 for additional information.

Data from File HC-Recirc-0PL-Jan15-0332

January 15, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050115033210.dta — 0 Power Level, Recirc. Pumps on
Data Acquisition System: PVMS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

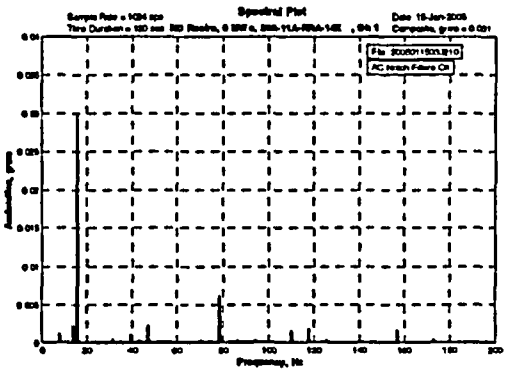
Channel layout is shown below:

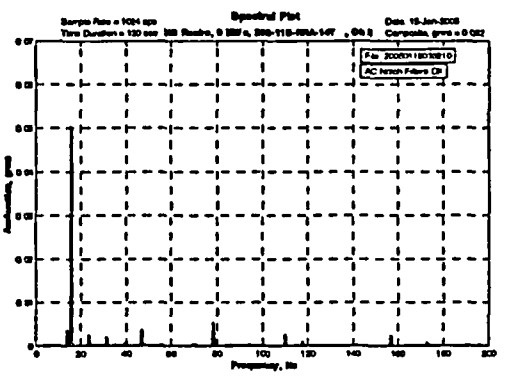
Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = '202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = 202-38A-RRB-930X, Y and Z
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F050A- PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

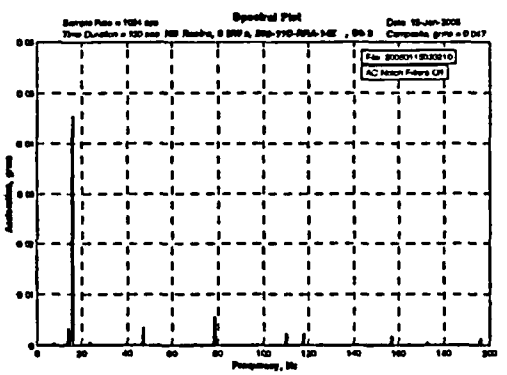
General Observations:
All channels show three discrete frequencies and multiples thereof; 7.75, 14 and 15.75 Hz

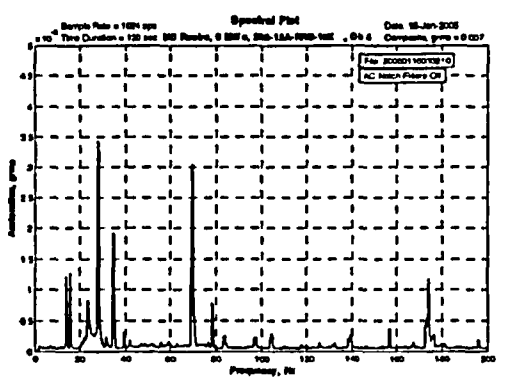
Initial Assessment of data:

- Channel 1-3 looks similar now, they show multiple pump speeds (like Pecirc Pumps A & B, ~840 and 945 rpm)
- Channels 11, 12, 15, 28 and 62 have a some DC component and/or increase in low frequency amplitudes. Maybe okay with higher S/N ratio
- Channels 21, 43, 44 and 45 appear to have no signal
- Channel 31 has some signal content, but noise floor is high
- Channel 27 should be a prox probe, but spectra looks like an accel channel
- Channel 56 data looks like a prox probe, which it should be (s/b)
- Channel 63 accelerometer data has frequency content and does not look like channel 56

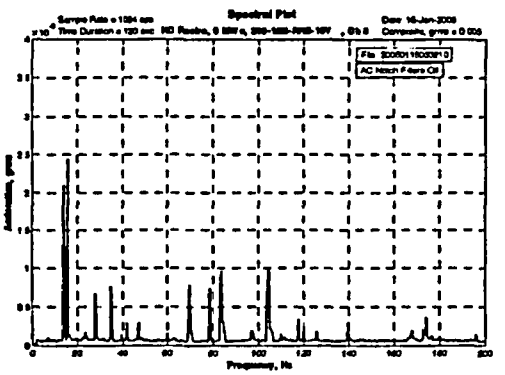


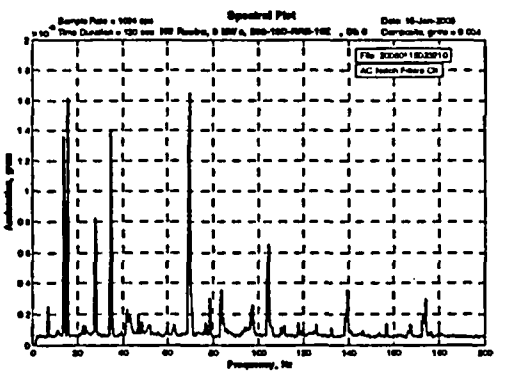






Appendix A to Calculation No.	Prepared By	Checked By	Page: A-5
H-1-BB-CDC-2065			Revision: 0





Appendix A to Calculation No.	Prepared By	Checked By	Page: A-6
H-1-BB-CDC-2065			Revision: 0

Data from File HC23-Recirc-Spec-Jan27-0506

January 27, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050127050630.dta — 158MWe, 23% Power Level
Data Acquisition System: — VDAS
Sample rate (sps): — 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = '202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

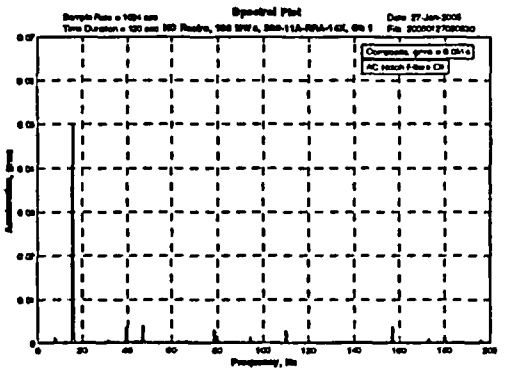
Inspection of the time histories revealed all time histories uniform – no transients or electrical spikes. All channels showed discrete frequencies and multiples of ~8 and 15.75 Hz.

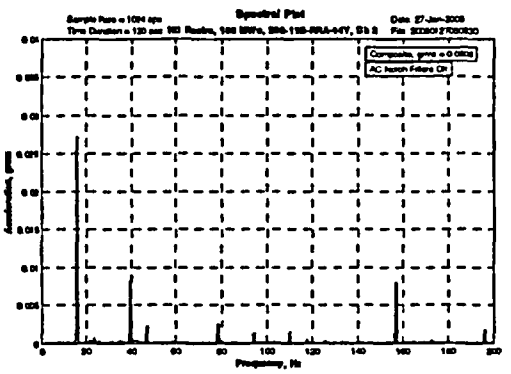
Note: 8 and 15.75 hz represents 480 and 945 rpm, respectively.

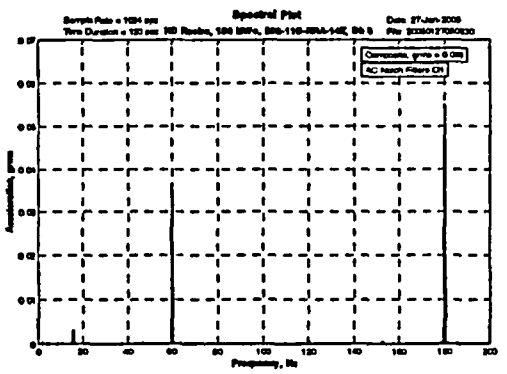
Initial Assessment of Data:

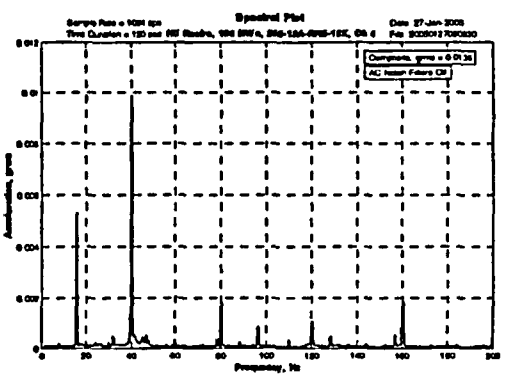
- Channel 3, 20, 21, 53 and 55 have AC noise only – no signal content observed
- Channel 31 and 62 have low S/N – has frequency content, but high noise floor and low overall magnitudes.
- Channels 16 and 17 show a discrete 20 hz frequency, especially ch 17.
- Proximity Probes: Channels 27, 56 and 63 are active and have frequency content similar to their valve accels (F060A, F077 and F060A. Ch 56 has a higher noise floor and lower signal.
- Channel 58 has some DC component and/or increase in low frequency (<10 hz) amplitudes. It has a low S/N, therefore, it maybe okay at higher power levels.

Appendix A to Calculation No.	Prepared By	Checked By	Page: A-8
H-1-BB-CDC-2065			Revision: 0

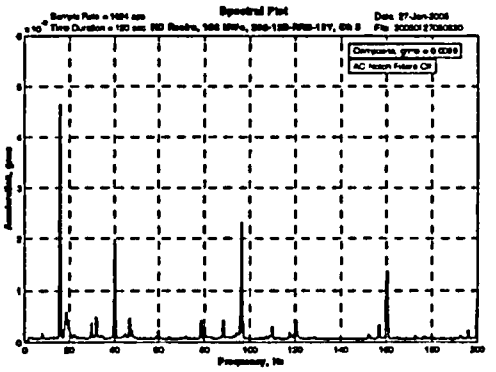


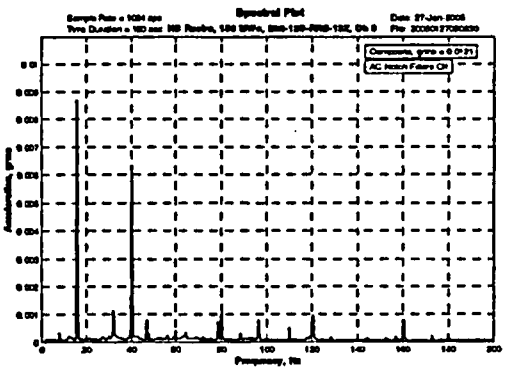






Appendix A to Calculation No.	Prepared By	Checked By	Page: A-9
H-1-BB-CDC-2065			Revision: 0





Data from File HC50-Recirc-Spec-Jan31-0814

January 31, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050131081425.set — 531 MWe, 50% Power Level
Data Acquisition System: — VDAS
Sample rate (sps): — 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = '202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 5 had an mean offset of 0.071 g (observation, no impact)
- Ch 13(x) had significant amplitude activity during time history; amplitude variations from 0.018 to 0.05 g's. Ch 15(z) had some variation, but to a lower extent (0.022 – 0.04).
- Ch 21, 31 and 62 had a transient spike at the beginning of the time history. All spectra will be taken from 2-120 seconds to eliminate the transient.
- Ch 23, 28, 36, 46, 48, 51 and 54 showed an amplitude shift at 30 seconds. Ch 50 and 55 to a lesser extent. Amplitude shift was small, but noticeable.

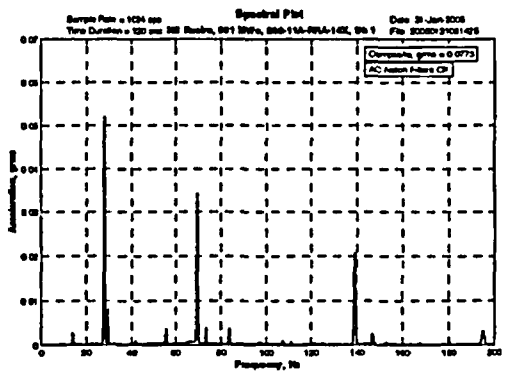
Inspection of the spectra plots revealed the following:

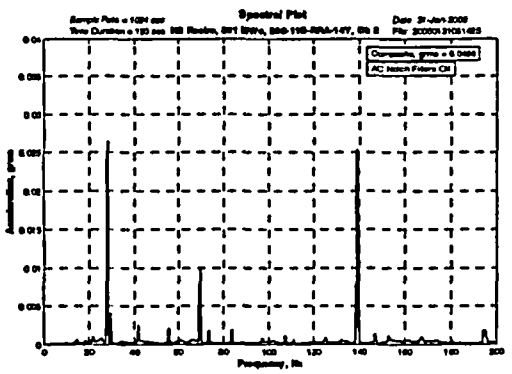
- All channels showed discrete frequencies and multiples of 14 and several higher multiples (28, 41,75, 55.5, 69.75, 83.75, 139 and 195.5).
- Noted 14.75 hz in ch 10 and higher.

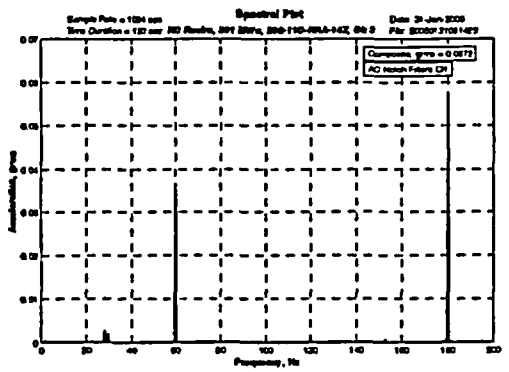
Note: 14 hz is 840 rpm and 14.75 hz is 885 rpm (accuracy 0.25 hz = 15 rpm).

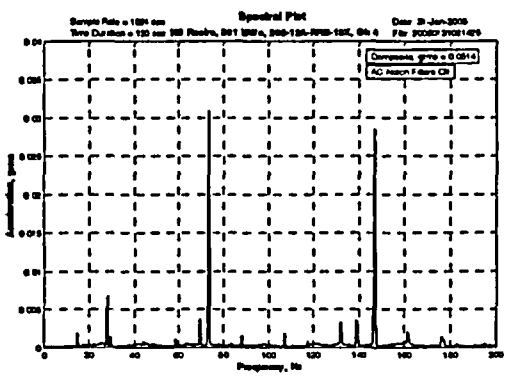
Initial Assessment of Data:

- Channel 3 and 34 have AC noise only – no signal content observed
- Channel 21, 31 and 62 have low S/N – has frequency content, but high noise floor and low overall magnitudes. Ch 21 has the lowest S/N ratio.
- Channel 17 shows a discrete 20 hz frequency.
- Proximity Probes: Channels 27 and 63 are active and have frequency content similar to their valve accels (F060A and F060A). Ch 56 (F077) has a very smooth and dense time history and a very high amplitude at 139 hz.
- Channel 58 DC component is no minor. DC content has disappeared with the higher amplitude (higher power level and higher S/N ratio).









Appendix A to Calculation No.	Prepared By	Checked By	Page: A-13
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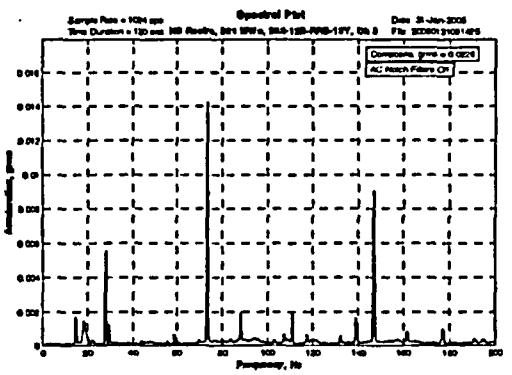
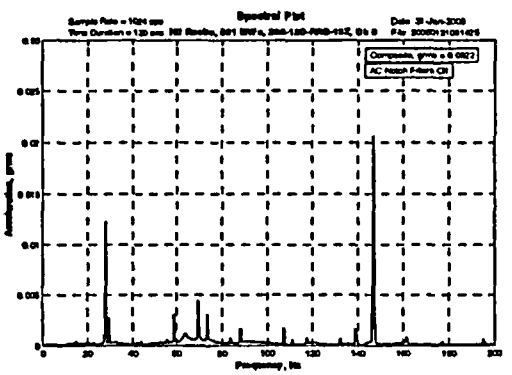




Data from File HC65-Recirc-Spec-Feb1-0847

February 1, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050201084703.dta — 740 MWe, 65% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 13(x) had significant amplitude activity during time history; amplitude variations from 0.03 to 0.08 g's. Ch 15(z) had some variation, but to a lower extent (0.03 – 0.045).
- Ch 21, 31 and 62 have a transient spikes at the beginning of the time history.
- Ch 23, 28, 36, 46, 48, 51 and 54 showed a smooth time history for this power level (step change at 50%). No issues identified for this time history.

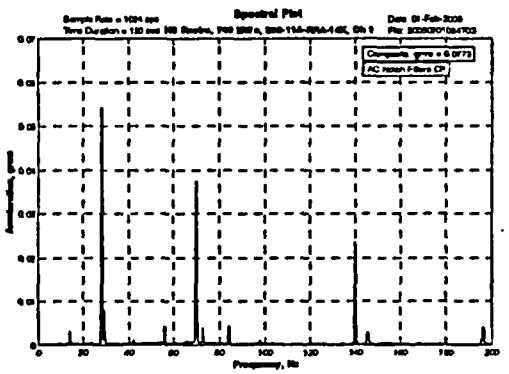
Inspection of the spectra plots revealed the following:

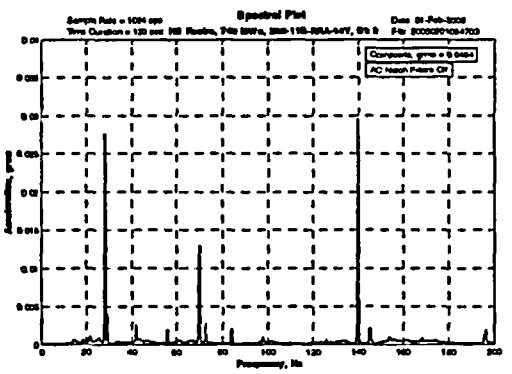
- All spectra were taken from 2-120 seconds to eliminate the transient.
- All channels showed discrete frequencies and multiples of 14 and 14.55 hz identified including several higher multiples (28, 70, 72.75, 139.75 and 145.75).

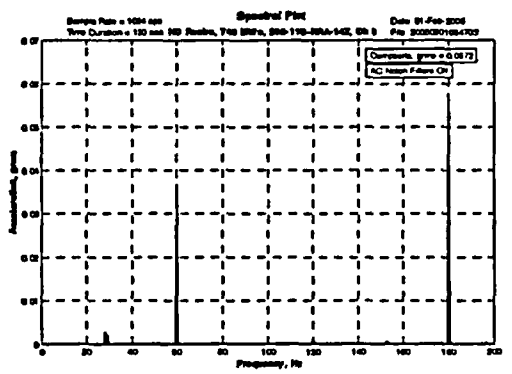
Note: 14 hz is 840 rpm and 14.55 hz is 873 rpm (Recirc. Pump speeds).

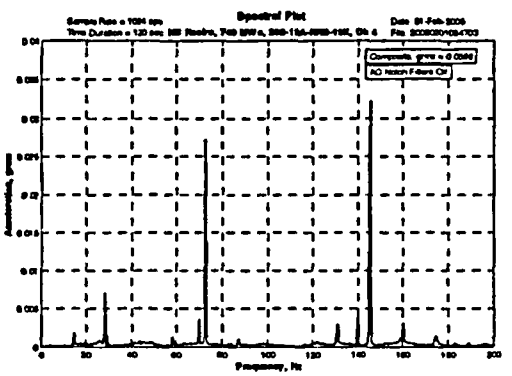
Initial Assessment of Data:

- Channel 3 and 34 have AC noise only – no signal content observed
- Channel 21, 31 and 62 have low S/N – has frequency content, but high noise floor and low overall magnitudes. Ch 21 has the little/no signal content.
- Channel 17 shows a high, discrete 20 hz frequency.
- Proximity Probes: Channels 27 and 63 are active and have frequency content similar to their valve accels (F060A and F060A). Ch 56 (F077) has a very smooth and dense time history and a very high amplitude at 139.75 hz (a 10X multiple of pump speed; this pump has a 5 or 10 blade impeller).
- Channel 58 DC component is minor. DC content has disappeared with the higher amplitude (higher power level and higher S/N ratio).

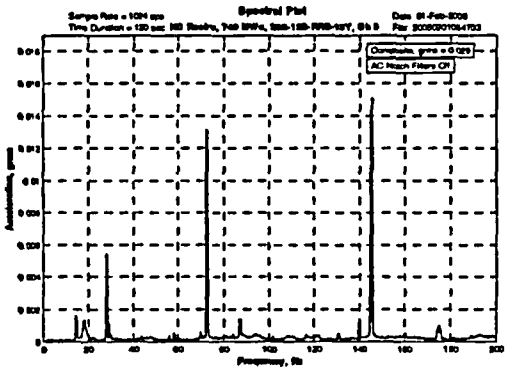


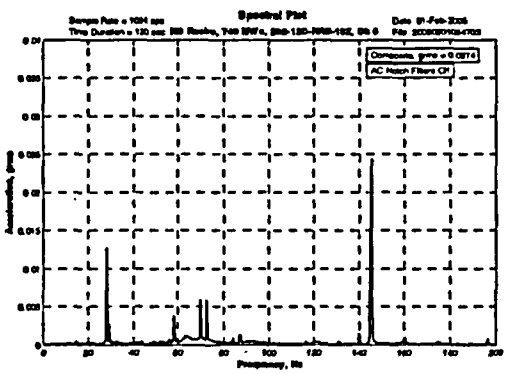






Appendix A to Calculation No.	Prepared By	Checked By	Page: A-17
H-1-BB-CDC-2065			Revision: 0





Data from File HC70-Recirc-Spec-Feb1-1431

February 2, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050201143117.dta — 768 MWe, 70% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 3, 14, 15 and 34 had dense, uniform time histories, indicating AC noise or a single, predominant frequency present.
- Ch 11 had burst amplitude activity during 1st 40 seconds of time history; amplitude variations from 0.044 to 0.062 g's. Small amplitude change.
- Ch 21, 31 and 62 have a transient spikes at t = 0 seconds.
- All other channels - no issues identified for this time history.

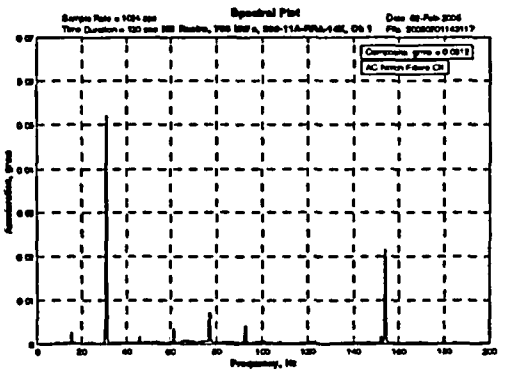
Inspection of the spectra plots revealed the following:

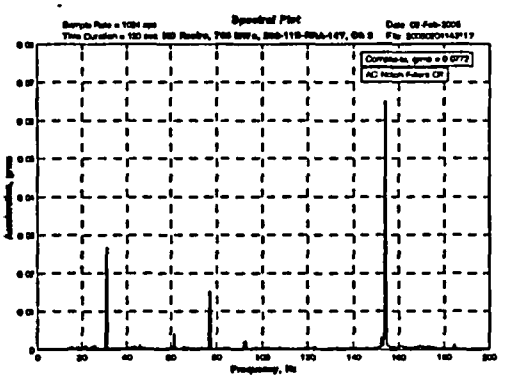
- All spectra were taken from 2-120 seconds to eliminate the transient.
- All channels showed discrete frequencies and multiples of 15.5 hz identified including several higher multiples (i.e. 77 & 154 hz).

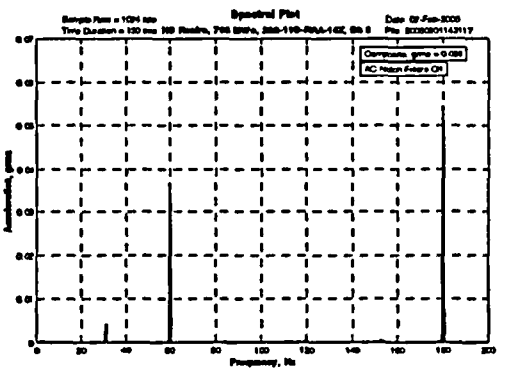
Note: 15.5 hz is 930 rpm (Recirc. Pump speeds).

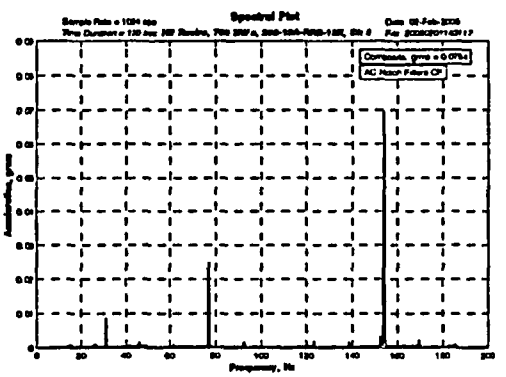
Initial Assessment of Data:

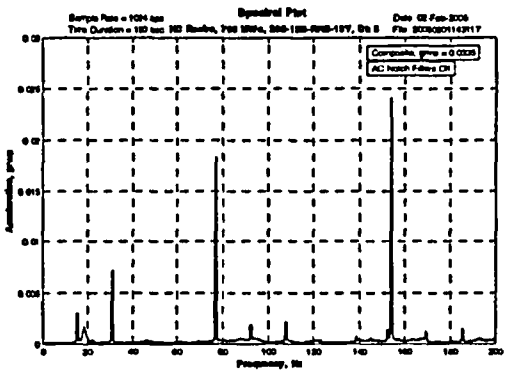
- Channels 3, 21 and 34 had AC noise only – no signal content observed.
- Channels 31 and 62 had low S/N – has limited frequency content and low overall magnitudes.
- Channel 17 shows a high, discrete 19.5 hz frequency.
- Proximity Probes: Channels 27, 56 and 63 are active and have frequency content similar to their valve accels (F060A and F060A). Pump speed multiple are observed 15.5 hz (a 5x and 10x multiple of pump speed).
- Channel 58 and 62 had a slight DC component. Overall amplitude is low, poor S/N.

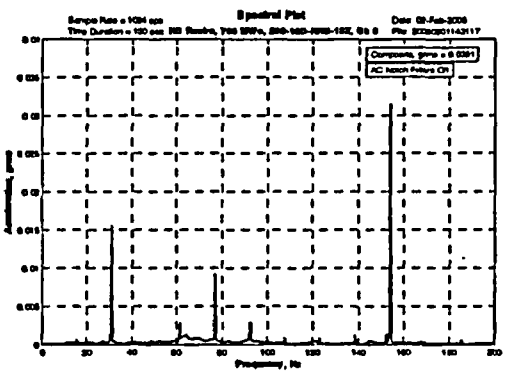












Data from File HC76-Recirc-Spec-Feb4-1126

February 4, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050204112651.dta — 833 MWe, 76% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 3 and 34 had dense, uniform time histories, indicating AC noise or a single, predominant frequency present.
- Several channels had amplitude burst activity, but no observed impact.
- Ch 21 and 31 have a transient spikes at t = 0 seconds. Ch 62 had small spike at t = 0 seconds.
- All other channels - no issues identified for this time histories

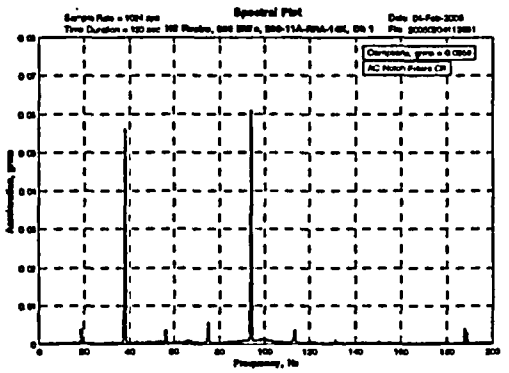
Inspection of the spectra plots revealed the following:

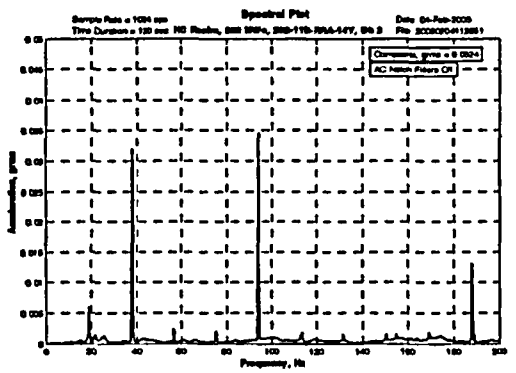
- All spectra were taken from 2-120 seconds to eliminate the transient.
- All channels showed discrete frequencies 18.75, 37.5, 94, 131.5 and 188 hz. 94 and 188 are 5x and 10x of pump speed. 188/10 = 18.8 hz.

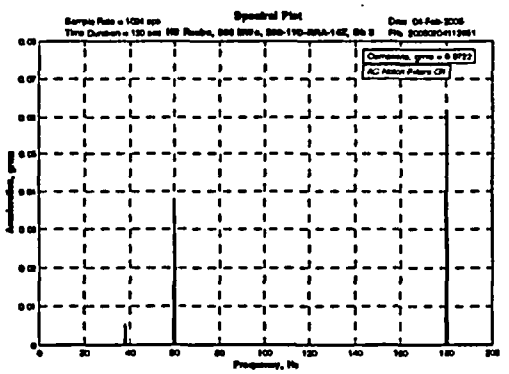
Note: 18.8 hz is 1128 rpm (Recirc. Pump speeds).

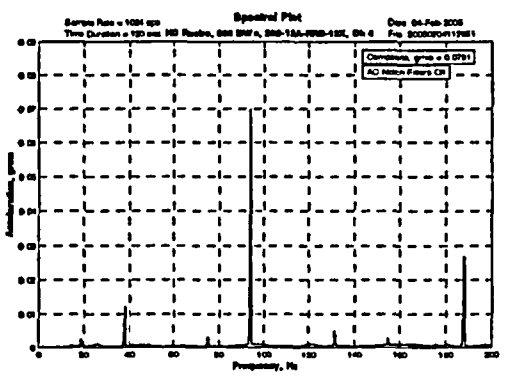
Initial Assessment of Data:

- Channels 3 and 34 had AC noise only – no signal content observed.
- Channels 21 and 31 had low S/N – has limited frequency content and low overall magnitudes.
- Channel 62 had moderate frequency content - some noise floor, no AC and low amplitudes.
- Proximity Probes: Channels 27, 56 and 63 are active and have frequency content similar to their valve accels (F060A and F060A). Pump speed multiple are observed 18.75 hz (a 5x and 10x multiple of pump speed).
- Channel 58 and 62 had a very slight DC component. Overall amplitudes are low, but getting larger.









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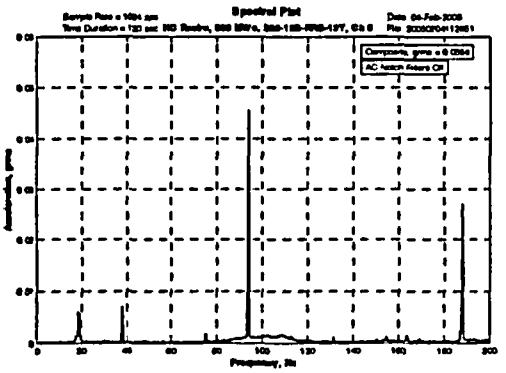
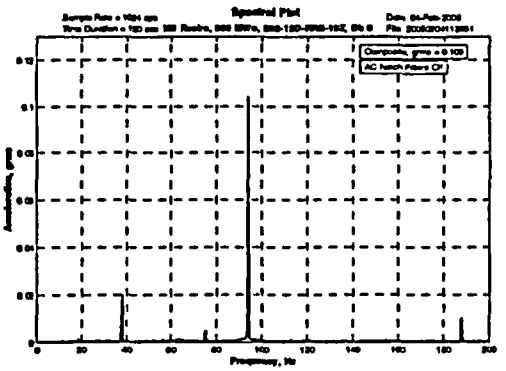




Data from File HC80-Recirc-Spec-Feb7-0019

February 7, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050207001949.dta — 905 MWe, 80% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 3 and 34 had dense, uniform time histories, indicating AC noise or a single, predominant frequency present.
- Several channels had amplitude burst activity, but no observed impact.
- Ch 21 and 31 have a transient spikes at t = 0 seconds.
- All other channels - no issues identified for this time histories

Inspection of the spectra plots revealed the following:

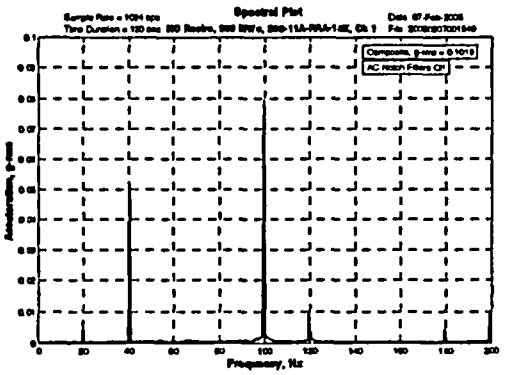
- All spectra were taken from 2-120 seconds to eliminate the transient.
- All channels showed discrete frequencies 20, 40, 99.75 and 199.5 hz. 99.75 and 199.5 are 5x and 10x of pump speed. 199.5/10 = 19.95 hz.

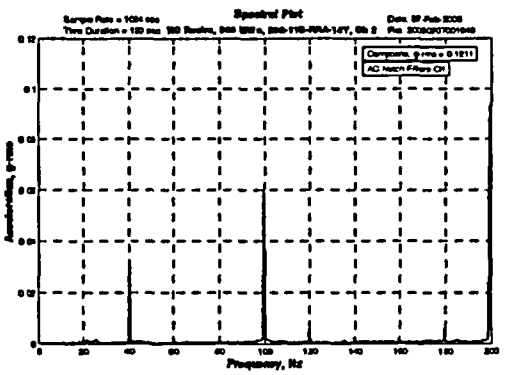
Note: 19.95 hz is 1197 rpm (Recirc. Pump speeds).

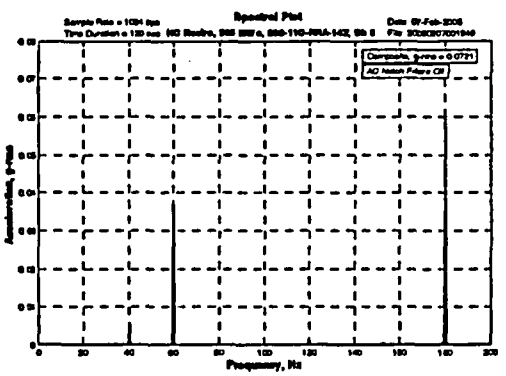
Initial Assessment of Data:

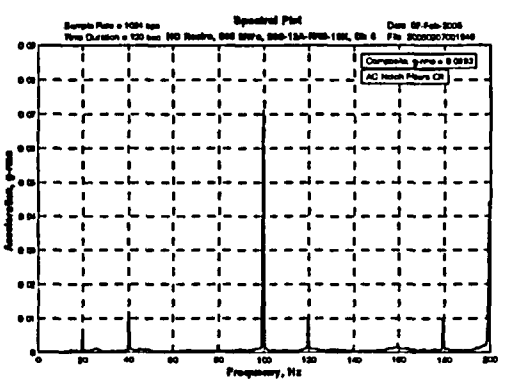
- Channels 3 and 34 had AC noise only – no signal content observed.
- Channels 21 and 31 had low S/N – have limited frequency content and low overall magnitudes. Ch 21 has a moderate noise floor.

- Proximity Probes: Channels 27, 56 and 63 are active and have frequency content similar to their valve accels (F060A and F060A). Pump speed multiple are observed ~20 hz (a 5x and 10x multiple of pump speed). Channel 27 has a high DC shift at <7 hz (has mean component).
- Channel 62 has a low overall amplitude.


Spectral Plot
Frequency, Hz


Spectral Plot
Frequency, Hz


Spectral Plot
Frequency, Hz


Spectral Plot
Frequency, Hz

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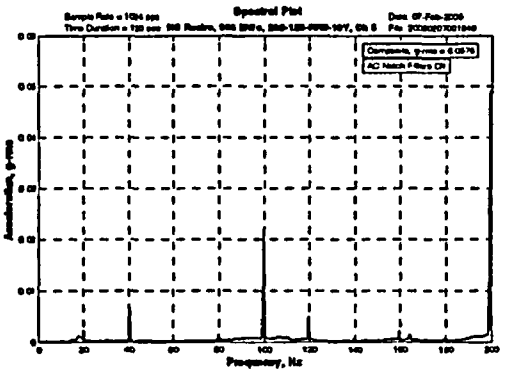
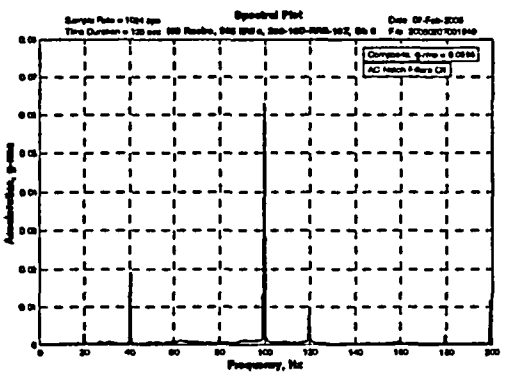




Data from File HC90-Recirc-Spec-Feb7-1520

February 7, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050207152000.dta 1027 MWe, 90% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

General Observations:

Inspection of the time histories revealed the following:

- Ch 3 and 34 had expected time histories (form and density). Channels now look active. This is a change since 80% power level.
- Several channels had amplitude burst activity, but no observed impact.
- Ch 21 and 31 have a transient spikes at t = 0 seconds.
- Ch 46, 47 and 62 have a transient spikes throughout time history.
- All other channels - no issues identified for this time histories

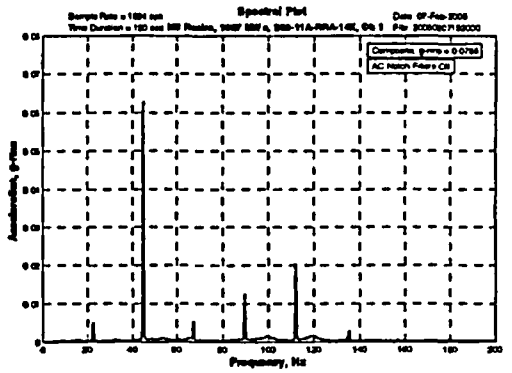
Inspection of the spectra plots revealed the following:

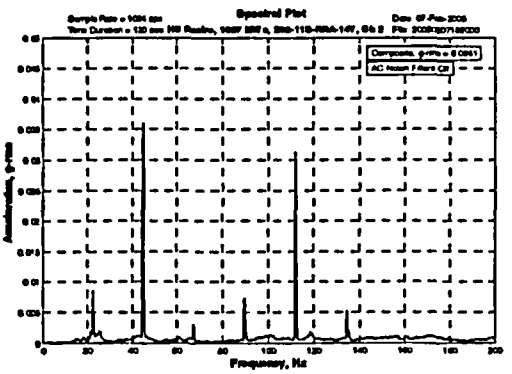
- All spectra were taken from 2-120 seconds to eliminate the transient.
- All channels showed discrete frequencies 22.5, 45 and 112 hz. 112 is 5x of pump speed. 112/5 = 22.4 hz or 1344 rpm.

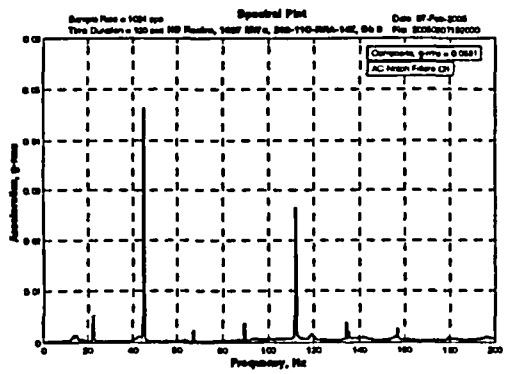
Initial Assessment of Data:

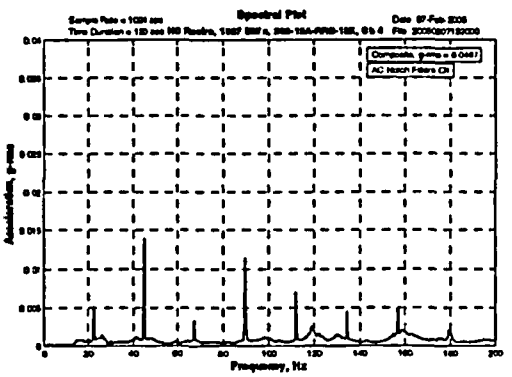
- Channels 3 and 34 now have frequency content – changed since 80% power.
- Channel 17 still shows a 20 frequency – it remains constant with power level.
- Channels 21 and 31 had low S/N – have limited frequency content and low overall magnitudes. Ch 21 has a high noise floor.

- Proximity Probes: Channels 27, 56 and 63 are active and have frequency content similar to their valve accels. Pump speed multiple are observed ~22.4 hz (a 5x multiple of pump speed).
- Channel 55 has a limited frequency content and high AC content.
- Channel 46, 47 and 62 has some noise floor. Channel 62 had a high DC content.









Appendix A to Calculation No.	Prepared By	Checked By	Page: A-33
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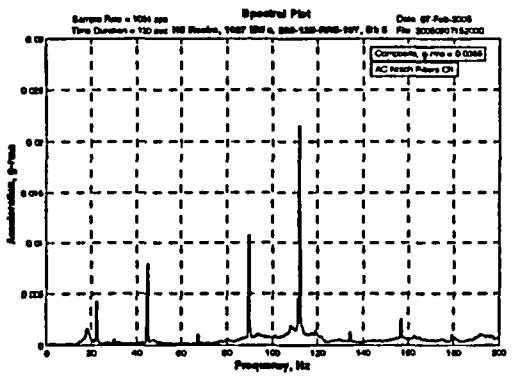
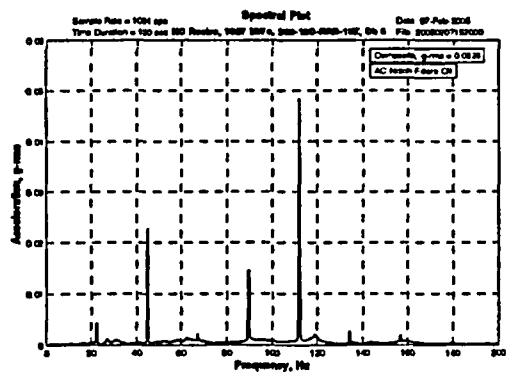




Data from File HC94-Recirc-Spec-Feb10-0927

February 10, 2005

Hope Creek Recirc Data Analysis

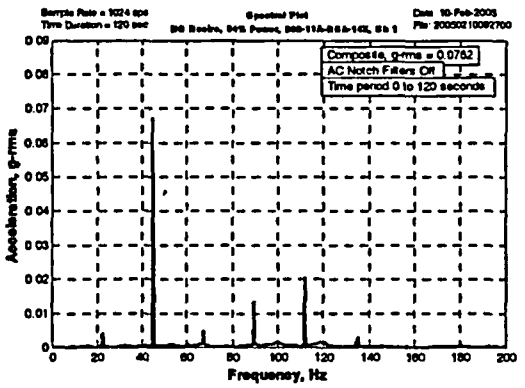
Data File Name: 20050210092700.dta 94% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

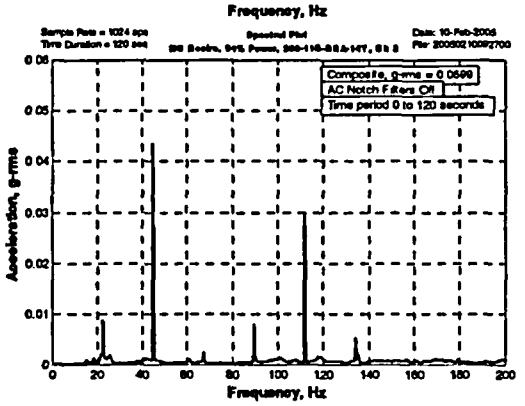
Number of Channels of Data: 64

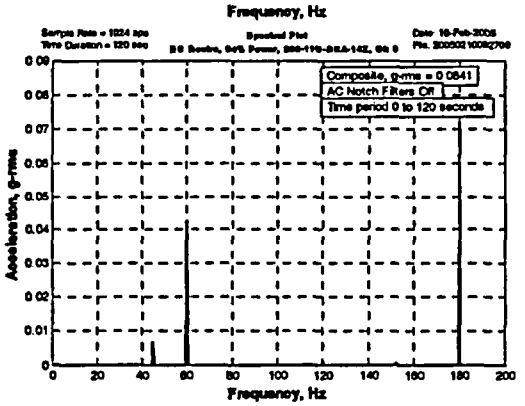
- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

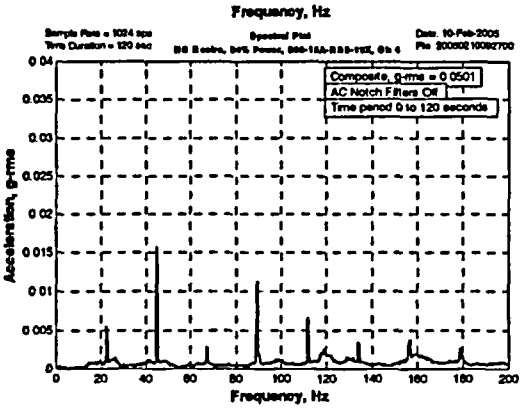
Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ


Composite, g-rms = 0.0782
AC Notch Filters Off
Time period 0 to 120 seconds
Acceleration, g-rms
Frequency, Hz


Composite, g-rms = 0.0599
AC Notch Filters Off
Time period 0 to 120 seconds
Acceleration, g-rms
Frequency, Hz


Composite, g-rms = 0.0841
AC Notch Filters Off
Time period 0 to 120 seconds
Acceleration, g-rms
Frequency, Hz


Composite, g-rms = 0.0501
AC Notch Filters Off
Time period 0 to 120 seconds
Acceleration, g-rms
Frequency, Hz

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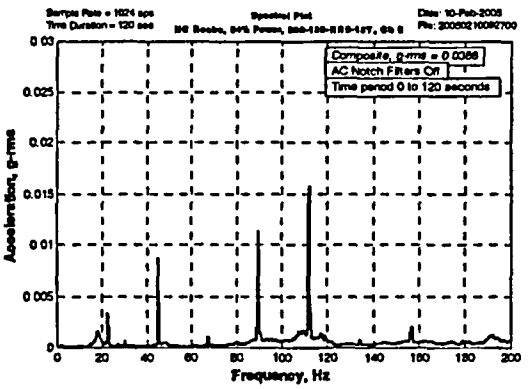

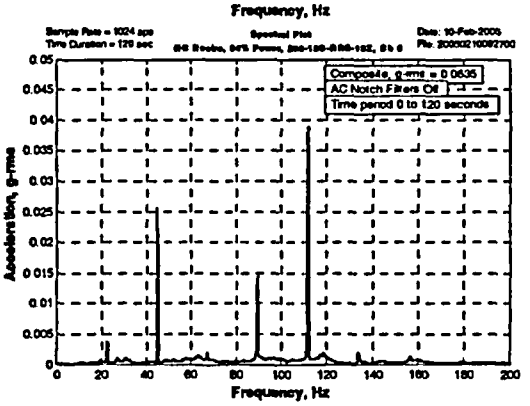

Appendix A to Calculation No.	Prepared By	Checked By	Page: A-37
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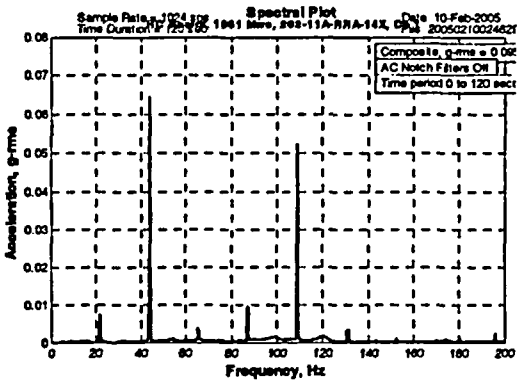
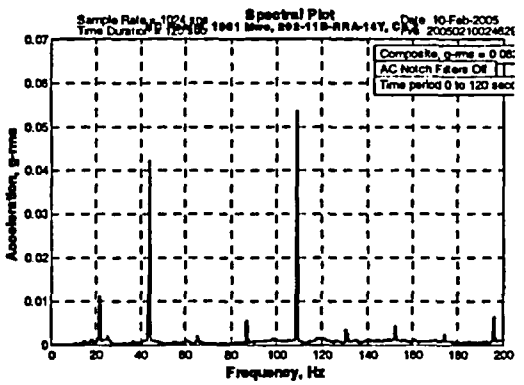
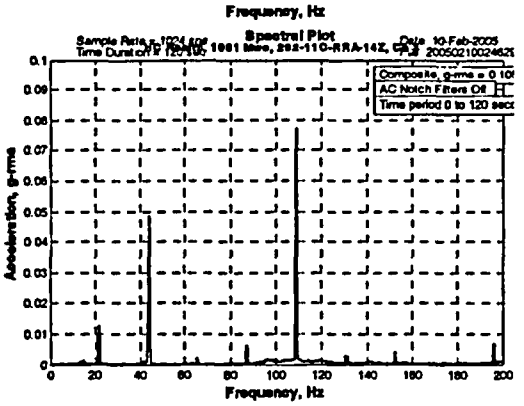
Data from File HC92-Recirc-Spec-Feb10-1254







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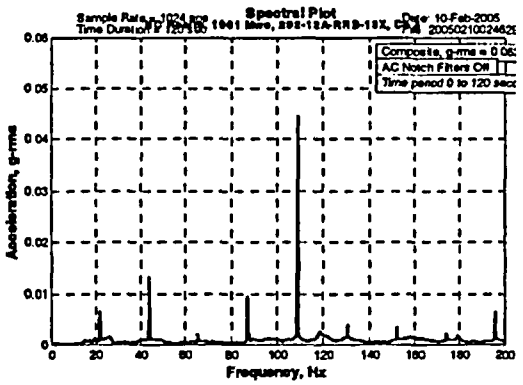

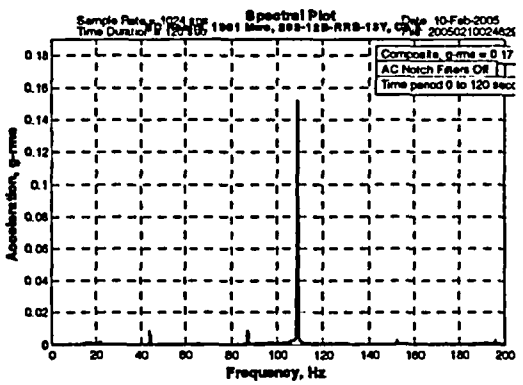

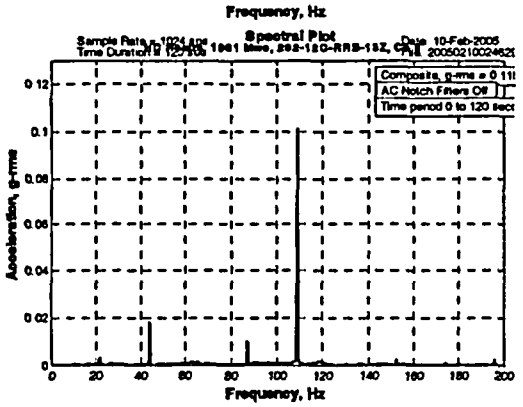

Data from File HC96-Recirc-Spec-Feb10-2056

February 10, 2005

Hope Creek Recirc Data Analysis

Data File Name: 20050210205640.dta 96% Power Level
Data Acquisition System: VDAS
Sample rate (sps): 1024

Number of Channels of Data: 64

- 61 Channels of accelerometer data
- 3 Channels of Proximity Probe Data

Channel Layout:

Chan 1-3 = 202-11A-RRA-14X, Y and Z
Chan 4-6 = 202-12A-RRB-13X, Y and Z
Chan 7-9 = 202-30A-RRA-110X. Y and Z
Chan 10-12 = 202-31A-RRA-621X, Y and Z
Chan 13-15 = 202-32A-RRA-130X, Y and Z
Chan 16 & 17 = 202-33A-RRA-97X and Z
Chan 18-20 = 202-18A-RHRA-602X, Y and Z
Chan 21-23 = 202-19A-RHRB-515NX, Y and Z
Chan 24-26 = 202-42A-F060A-706X, Y and Z
Chan 27 = 202-43A-F060A-PP (proximity probe)
Chan 28-30 = 202-34A-RHRB-603X, Y and Z
Chan 31-33 = 202-23A-RRA-323X, Y and Z
Chan 34-36 = 202-24A-RRB-323X, Y and Z
Chan 37-39 = 202-35A-RRB-110X, Y and Z
Chan 40-42 = 202-36A-RRB-614X, Y and Z
Chan 43-45 = spare channels – no signal
Chan 46 & 47 = 202-39A-RRB-160X and Y
Chan 48 & 49 = 202-40A-RHRB-196Y and Z
Chan 50-52 = 202-37A-F060B-LSX, Y and Z
Chan 53-55 = 202-44A-F077-LSX, Y and Z
Chan 56 = 202-44D-F077- PP (proximity probe)
Chan 57-61 = 202-41A-RRB-M1 thru M5
Chan 62 = 202-45A-F050A-OPX
Chan 63 = 202-45B-F060B-PP (proximity probe)
Chan 64 = 202-45C-F050A-OPZ

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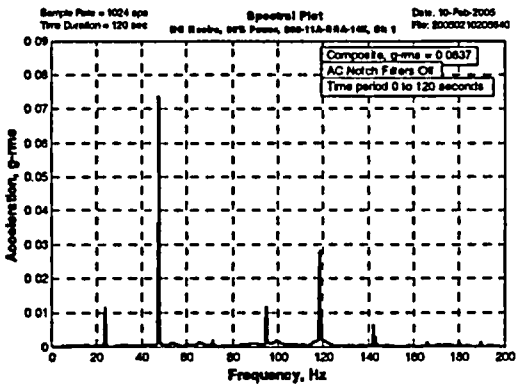
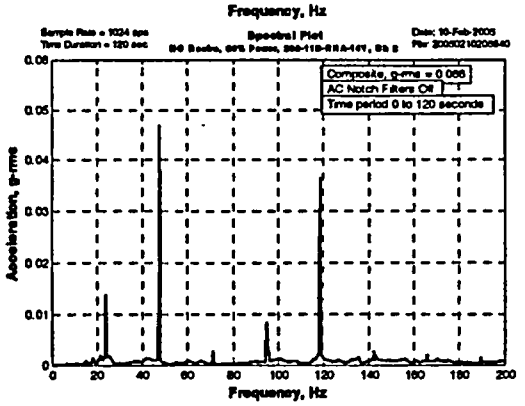
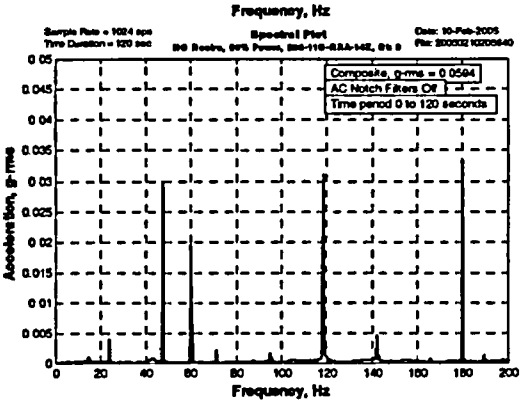
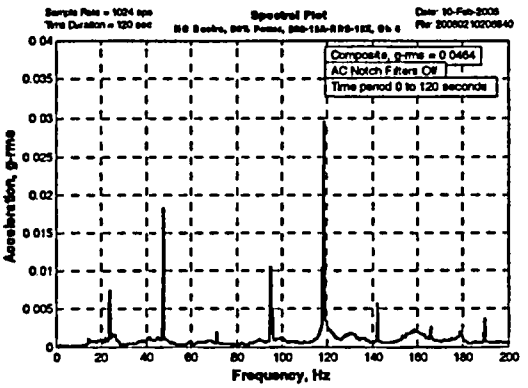
H-1-BB-CDC-2065			Revision: 0









Appendix A to Calculation No.	Prepared By	Checked By	Page: A-41
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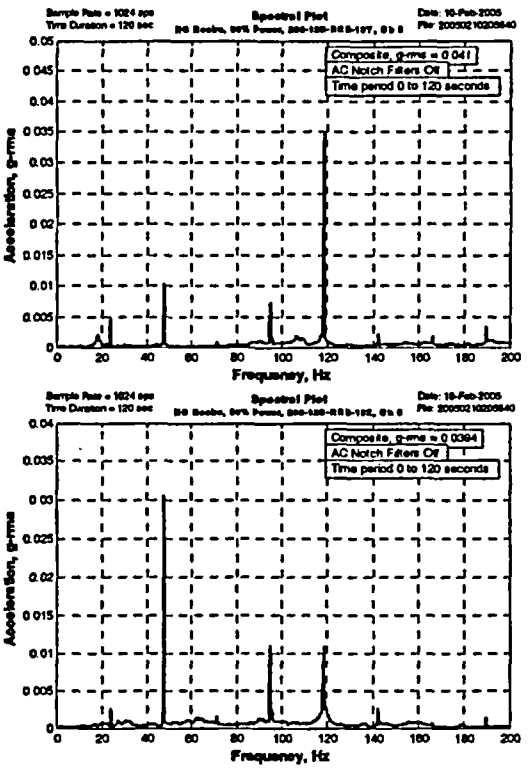
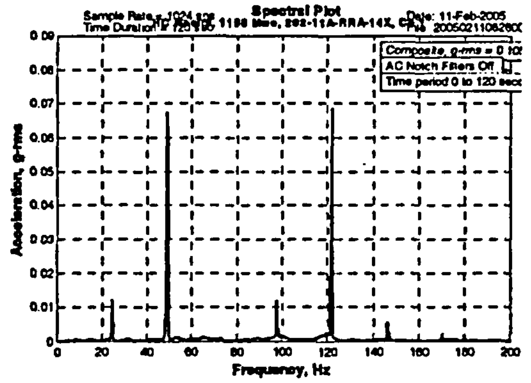
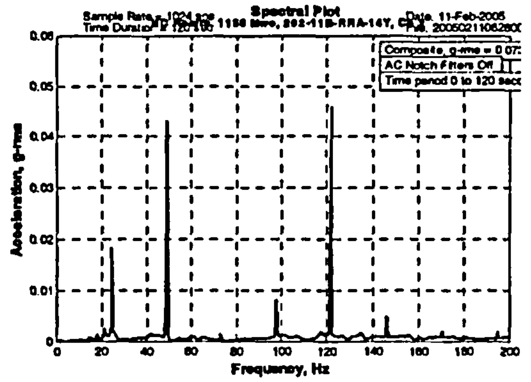
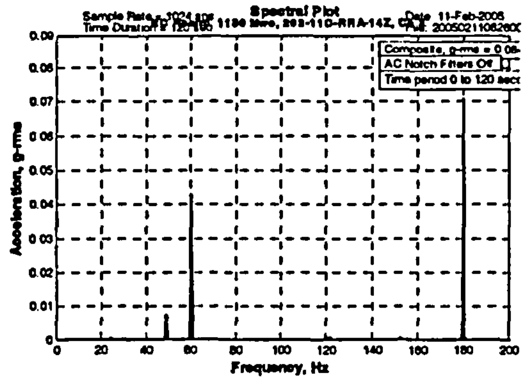


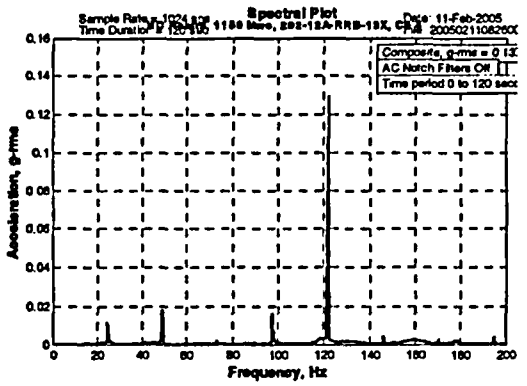
Appendix A to Calculation No. H-1-BB-CDC-2065	Prepared By	Checked By	Page: A-42 Revision: 0

Data from File HC100-Recirc-Accel-Spec-Feb11-0619








Spectral Plot
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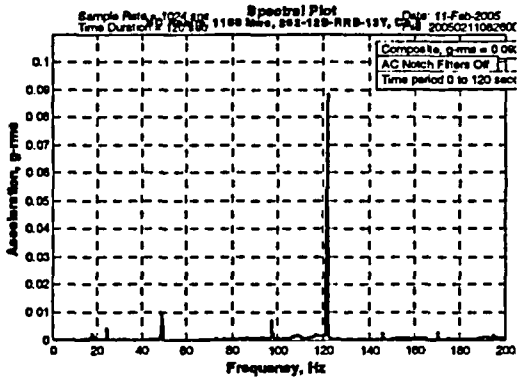
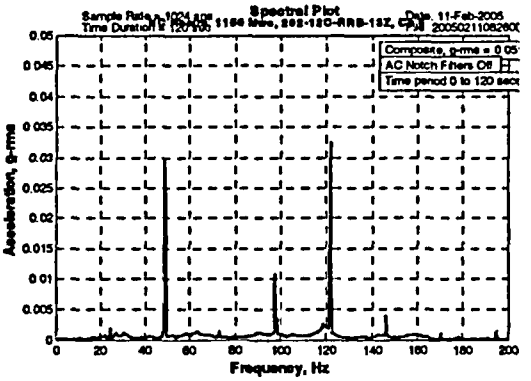
AC Notch Filters Off
Time period 0 to 120 sec
Acceleration, g-rms
Frequency, Hz


Spectral Plot
Composite, g-rms = 0.09
AC Notch Filters Off
Time period 0 to 120 sec
Acceleration, g-rms
Frequency, Hz


Spectral Plot
Composite, g-rms = 0.05
AC Notch Filters Off
Time period 0 to 120 sec
Acceleration, g-rms
Frequency, Hz

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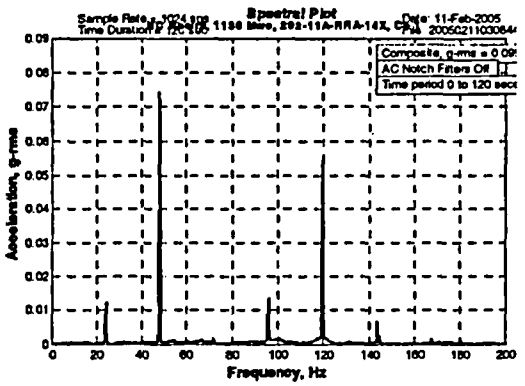
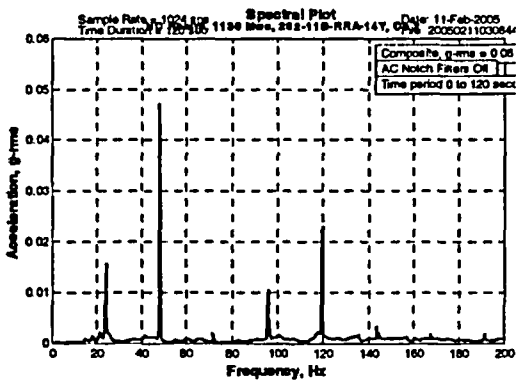
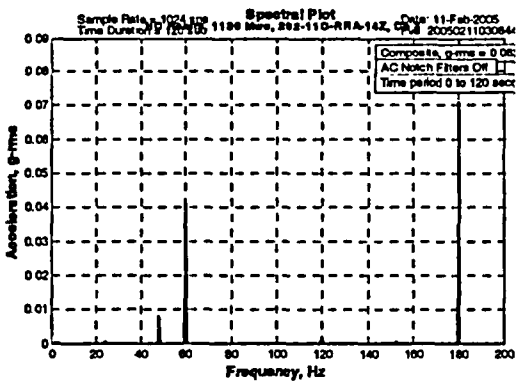
Data from File HC98-Recirc-Accel-Spec-Feb11-1000







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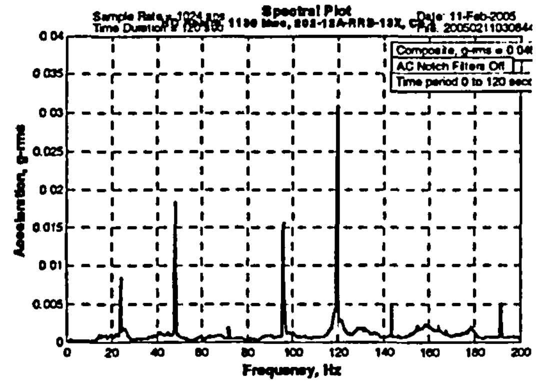

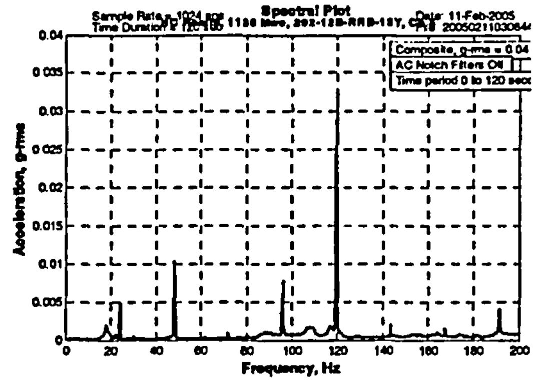

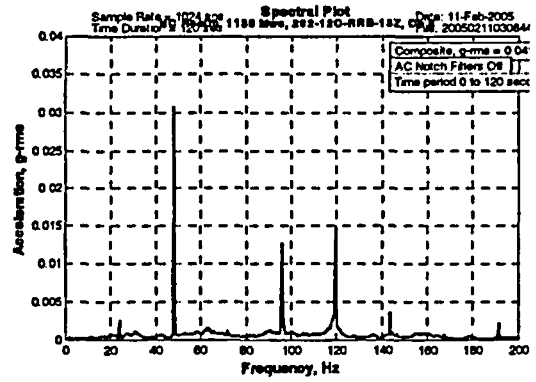

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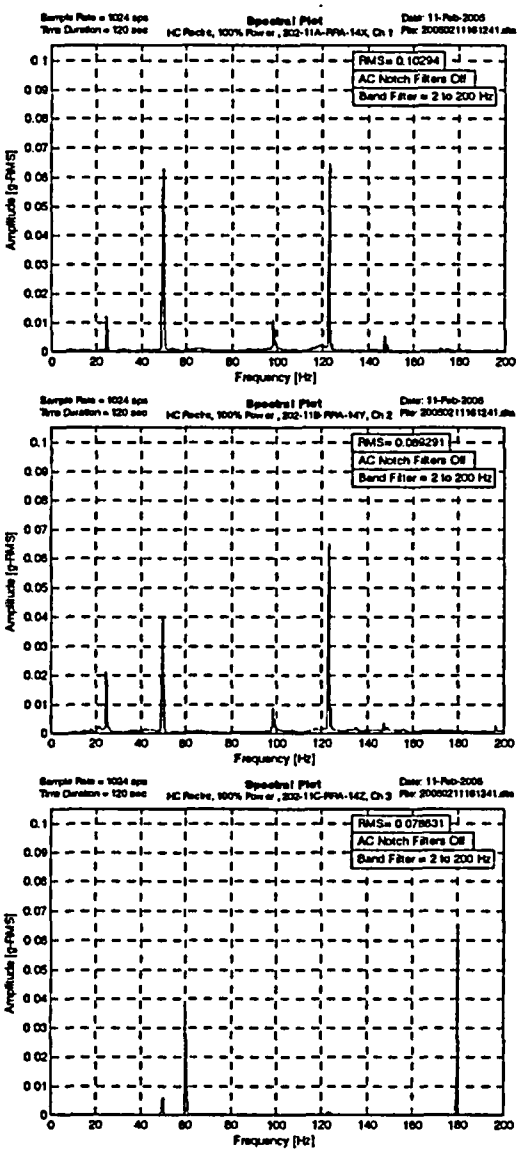
Data from File HC100-Recirc-Accel-Spec-Feb11-1612



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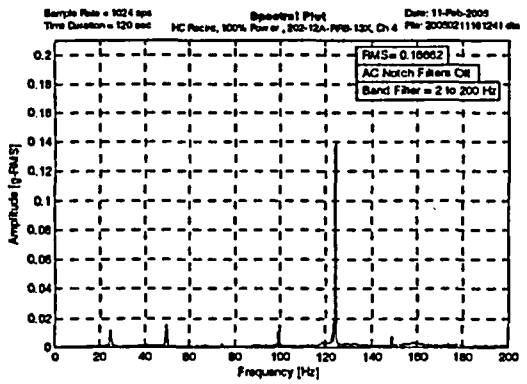

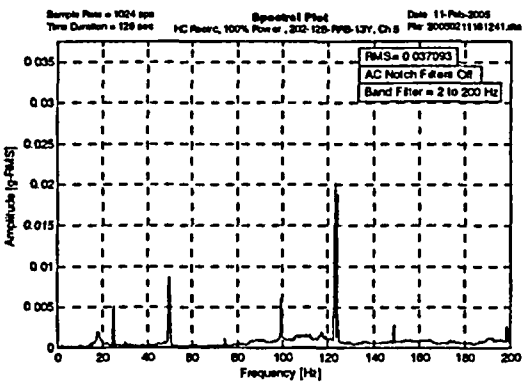

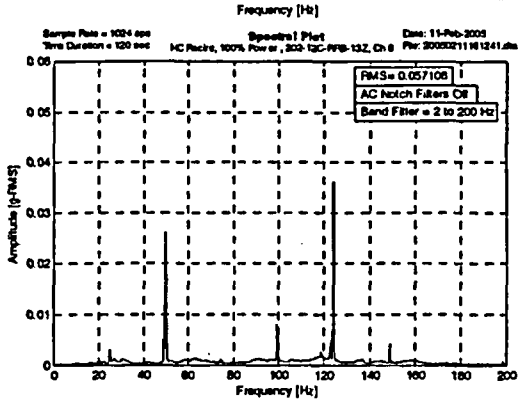

Appendix A to Calculation No.	Prepared By	Checked By	Page: A-48
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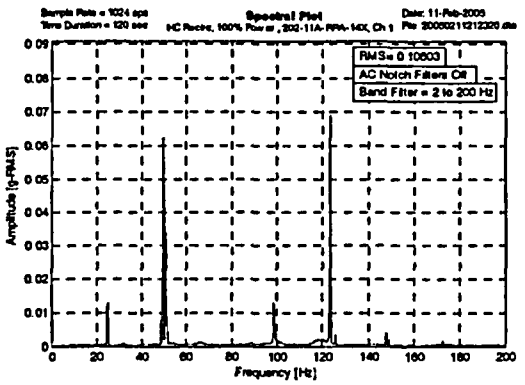
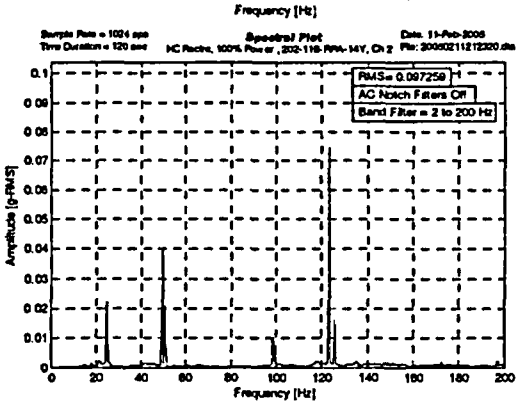
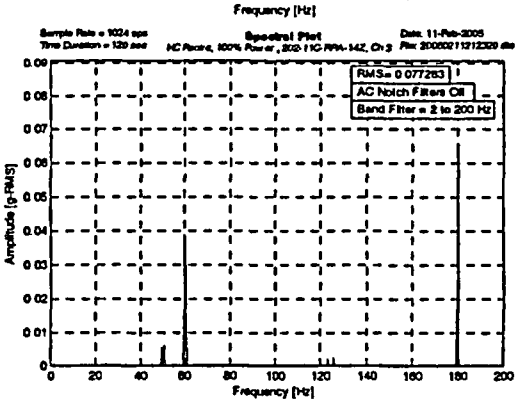
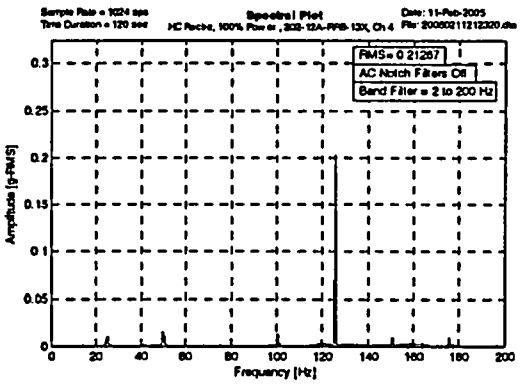
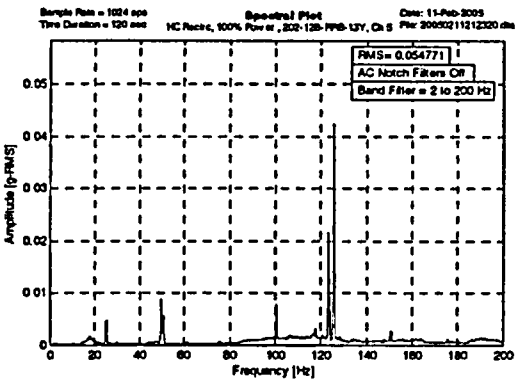
Data from File HC100-Recirc-Accel-Spec-Feb11-2123

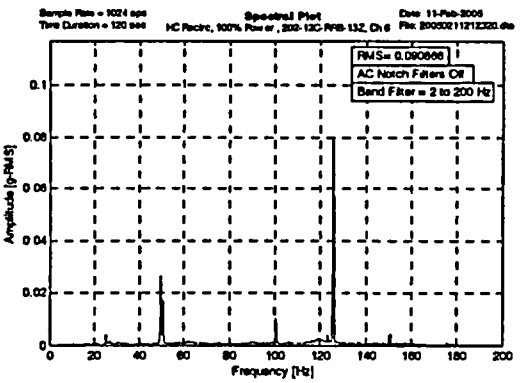







RMS= 0.21267
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]


RMS= 0.054771
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]


RMS= 0.090868
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]

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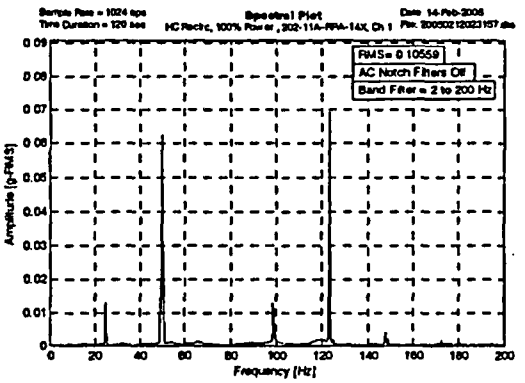
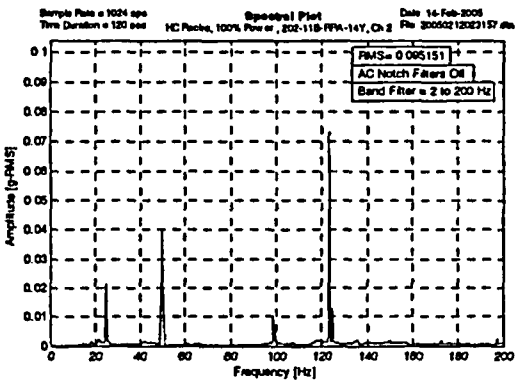
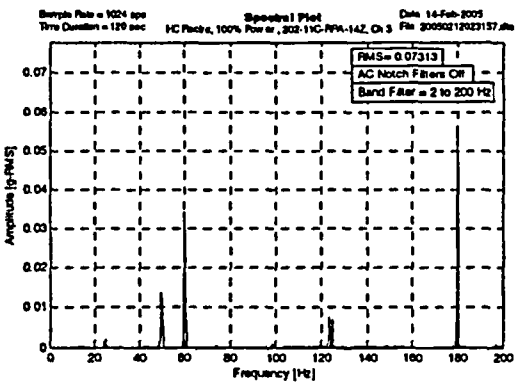
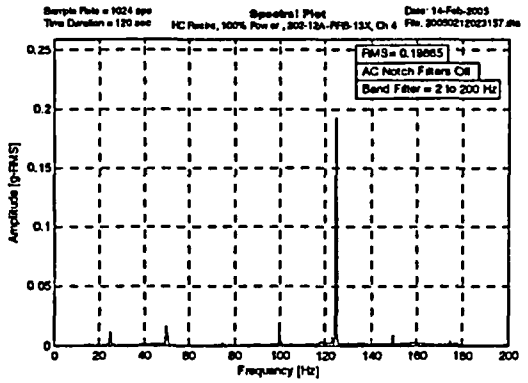
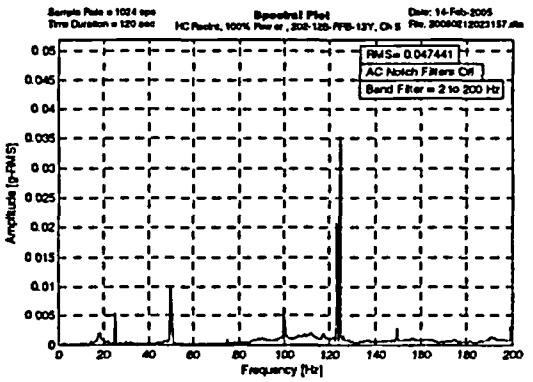
Data from File HC100-Recirc-Accel-Spec-Feb12-0231

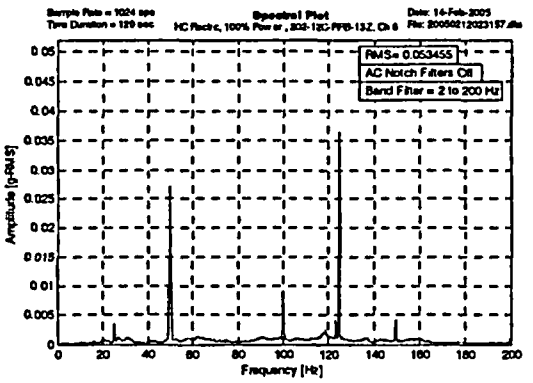







Spectral Plot
RMS = 0.19865
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]


Spectral Plot
RMS = 0.047441
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]


Spectral Plot
RMS = 0.053455
AC Notch Filters Off
Band Filter = 2 to 200 Hz
Amplitude [g-RMS]
Frequency [Hz]

B

Plant Data Acquisition Forms for 2005 Data

For data collected in 2005, plant personnel filled out data acquisition forms for each data set. This appendix presents copies of available forms provided by PSEG Nuclear for the following data collections:

Date	Approximate Time
2/10/05	2043
2/11/05	0300
2/11/05	0821
2/11/05	1612
2/11/05	2123
2/12/05	0235

The forms are from Procedure HC.ER-AP.BB-0002(Z), Attachment 1. For each of the data sets listed above, the first page of the data acquisition form is provided in the following pages.

Note: The contents of this appendix were prepared by PSEG Nuclear. The signatures of the MPR preparer and MPR checker denote that this information is applicable to this calculation. The MPR preparer and the MPR checker did not prepare or check the PSEG Nuclear information presented in this appendix.

Appendix B to Calculation No.	Prepared By	Checked By	Page: B-2
H-1-BB-CDC-2065			Revision: 0

Date: ___2/10/2005____ Time: ___2043 HRs___

CRIDs Terminal (group 30)

Feedwater Flow : ___13.99__ x 10^6 lb/hr (B2030)

Steam Flow : ____14.13____ x 10^6 lb/hr (A212)

CTP_3215_ MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: ___999.9__ psig (B5019)

Generator Output _1103__MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE

Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	(1422) 85 % (SIC-R621A)	(1422) 85 % (SIC-R621B)
Recirc Pump Dp:	_____150_ psid (SIC-R612A)	____160__ psid (SIC-R612B)
Recirculation Loop Flow:	__48_ MLB/HR (FI-R611A-B21)	_47__MLB/HR (FI-R611B-B21)

Core Plate Dp: _14.2_ psid (PDR-R613-B21)

Core Flow: _95.3__ x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): P. Kordziel_____
Initial

Design Engineering Review of Results: SAT

Data was reviewed and concurred by Gary Luh (NUGGL), Design Engineering, on Feb. 11, 2005

_____
Design Engineer Sign/Date

Appendix B to Calculation No.	Prepared By	Checked By	Page: B-3
H-1-BB-CDC-2065			Revision: 0

Date: ___2/11/05_____ Time: ____0300____

CRIDs Terminal (group 30)

Feedwater Flow : ___14.26___ x 10^6 lb/hr (B2030)

Steam Flow : ____14.46____ x 10^6 lb/hr (A212)

CTP_3267_ MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: ___1001___ psig (B5019)

Generator Output _1126_MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE

Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	(1436) 85 % (SIC-R621A)	(1436) 85% % (SIC-R621B)
Recirc Pump Dp:	_____151_ psid (SIC-R612A)	____152___ psid (SIC-R612B)
Recirculation Loop Flow:	__48_ MLB/HR_ (FI-R611A-B21)	__48__MLB/HR (FI-R611B-B21)

Core Plate Dp: _14.6__ psid (PDR-R613-B21)

Core Flow: _96__ x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): P. Kordziel_____
Initial

Design Engineering Review of Results: SAT

Data was reviewed and concurred by Gary Luh, Design Engineering, on Feb. 11, 2005

_____
Design Engineer Sign/Date

Appendix B to Calculation No.	Prepared By	Checked By	Page: B-4
H-1-BB-CDC-2065			Revision: 0

Date: 2/11/05 Time: 08:21

CRIDs Terminal (group 30)

Feedwater Flow : 14.588 x 10^6 lb/hr (B2030)

Steam Flow : 14.749 x 10^6 lb/hr (A212)

CTP3332.4 MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: 1004.1 psig (B5019)

Generator Output 1152.6 MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE

Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	89(1461 rpm) % (SIC-R621A)	88(1461 rpm) % (SIC-R621B)
Recirc Pump Dp:	160 psid (SIC-R612A)	170 psid (SIC-R612B)
Recirculation Loop Flow:	49 MLB/HR (FI-R611A-B21)	48 MLB/HR (FI-R611B-B21)

Core Plate Dp: 14.9 psid (PDR-R613-B21)

Core Flow: 97.27 x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): _____
Initial

Design Engineering Review of Results: SAT/UNSAT_____

_____
Design Engineer Sign/Date

Appendix B to Calculation No.	Prepared By	Checked By	Page: B-5
H-1-BB-CDC-2065			Revision: 0

Date: ___2/11/05_____ Time: ____1612___

CRIDs Terminal (group 30)
Feedwater Flow : ___14.64___ x 10^6 lb/hr (B2030)

Steam Flow : ____14.77_____ x 10^6 lb/hr (A212)

CTP_3330 MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: ___1001__ psig (B5019)

Generator Output __1150_MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE
Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	(1495) 89__ % (SIC-R621A)	(1475) 88_ % (SIC-R621B)
Recirc Pump Dp:	_____170_ psid (SIC-R612A)	_____170___ psid (SIC-R612B)
Recirculation Loop Flow:	___50__ MLB/HR (FI-R611A-B21)	_____48___MLB/HR (FI-R611B-B21)

Core Plate Dp: __15.3_ psid (PDR-R613-B21)

Core Flow: _98.7_ x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): P. Kordziel_____
Initial

Design Engineering Review of Results: prelim **SAT**

Design Engineer Sign/Date

NOTES:

1600 HOURS 2/11/05 PUMP SPLIT DATA
REVIEWED BY system Engineering as sat. Design Engineering will review on Monday 2/14.

Appendix B to Calculation No.	Prepared By	Checked By	Page: B-6
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Date: ___2/11/05_____ Time: ____2123 HRS____

CRIDs Terminal (group 30)

Feedwater Flow : ___14.53___ x 10^6 lb/hr (B2030)

Steam Flow : ____14.7____ x 10^6 lb/hr (A212)

CTP_3330 MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: ___1001__ psig (B5019)

Generator Output _1150__MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE

Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	(1510) 90 % (SIC-R621A)	(1480) 88 % (SIC-R621B)
Recirc Pump Dp:	_____170_ psid (SIC-R612A)	_____170_ psid (SIC-R612B)
Recirculation Loop Flow:	___51_ MLB/HR (FI-R611A-B21)	___48__MLB/HR (FI-R611B-B21)

Core Plate Dp: __15.5_ psid (PDR-R613-B21)

Core Flow: __99.3_ x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): P Kordziel_____.
Initial

Design Engineering Review of Results: prelim - **SAT**

_____
Design Engineer Sign/Date

Date: ___2/12/05___ Time: ____0235_____

CRIDs Terminal (group 30)

Feedwater Flow : ___14.6____ x 10^6 lb/hr (B2030)

Steam Flow : ____14.7_____ x 10^6 lb/hr (A212)

CTP_3323 MWt (HC.OP-FT.BB-0001 – Attach 1)

Reactor Pressure: __1001____ psig (B5019)

Generator Output __1154__MWe (A225) or (HC.OP-FT.BB-0001 – Attach 1)

NOTE

Data can be obtained from HC.OP-FT.BB-0001(Q), Jet Pump Data Collection, taken at data collection time. Coordinate with the Control Room and Reactor Engineer.

10C651	Loop A	Loop B
Recirc Pump Speed:	(1498) 89 % (SIC-R621A)	(1480) 88 % (SIC-R621B)
Recirc Pump Dp:	_____170 psid (SIC-R612A)	_____170__ psid (SIC-R612B)
Recirculation Loop Flow:	___50_ MLB/HR (FI-R611A-B21)	___48__MLB/HR (FI-R611B-B21)

Core Plate Dp: _15.4__ psid (PDR-R613-B21)

Core Flow: __99 x 10^6 lb/hr (FR-R613-B21)

Data is obtained from VDAS (system/field engineering): P. Kordziel____
Initial

Design Engineering Review of Results: **SAT**
Results reviewed/concurred with as sat. John Barkhamer (per telecon)

_____
Design Engineer Sign/Date