HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

September 21, 2020

Arkema

Subject: September week 3 vibration service report

Most of the machines surveyed were found to be in good condition except for the following:

QualiTest® uses a four-step rating system for defects.

Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

Class II: Defect (s) present that may cause problem in long term (2-6 months.). Repair during normal maintenance scheduling. Continue to monitor.

Class III; Defect (s) present that may cause failure in short term (less than 2 months.). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

Class IV; Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs

Hi-Speed Industrial Service tests and inspects industrial machinery and equipment and makes recommendations concerning maintenance and repairs based on its experience in the field of industrial repair and maintenance. The information contained herein is provided as an opinion only, not as a guaranty or warranty of the matters discussed herein.

This completes our assessment of your equipment for this survey. Thank you for your business and don't hesitate to call if you have any comments or questions.

Sincerely,

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Weekly Peroxide Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1
Vibrations appear to be normal this survey. No vibration is above 0.172"/sec velocity peak. No actions required.

Agitator, Hydrogenator C 7001-01
The highest motor overall vibrations are 0.172"/sec velocity peak for the inboard axial. Data shows multiple lower frequency harmonics of shaft speed as well as non-synchronous peaks in the upper frequencies. The bearings and fits in the replacement motor could be in some distress. A vibration at near 3x RPM is dominant and could possibly indicate a coupling or alignment issue.
Motor is rated a Class I Defect.

A/B Concentrator Vacuum Pump 57
This unit's motor vibration is still below 0.10"/sec velocity peak. The outboard pump bearing overall is 0.239"/sec peak velocity, with a dominant vibration at 16 orders, which is most likely blade pass. We will continue to watch for changes. **Rated a Class I Defect.**

Flash Vacuum Pump 2130-1
Vibrations appear to be normal this survey. All velocity measurements are below 0.10"/sec peak. No actions required.

Air Compressor C-201
Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. We will continue to monitor this unit for changes. **Rated a Class I Defect**. No actions required.

Air Compressor C-202
Rotor bar vibrations are low for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We are still watching an increase in acceleration for the compressor section. **Rated a Class I Defect**. No immediate actions required at this time.

Air Compressor C-203
Rotor bar vibrations are normal for this motor's history. The waterfall spectra clearly show that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. **Rated a Class I Defect**. No actions required.

Instrument Air Compressor
The male and female shaft vibrations still seem to show gear mesh and harmonics as well as a beat vibration occasionally. The male shaft inboard vertical overall vibration is at to 7 g's RMS. The dominant vibration appears to be the second gear mesh harmonic at near 2500 Hz. Two other harmonic vibrations at near 1500 and 1600 Hz are beating near 120 Hz. The beat is strong sometimes since the vibrations are close and of nearly equal amplitude. We are still watching this unit closely, and will be going forward. **Rated a Class I Defect for now.**

Air Compressor NASH A 201-08A
Highest vibration is still in the pump itself at just over 0.3"/sec velocity peak for the outboard vertical. The vibration spectrum is still dominated by a 20-order vibration, which is thought to be vane pass. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002-10
Vibration data shows an increase in vibrations this survey. Highest overall vibration is 0.363"/sec velocity peak for the gearbox top bearing plate in the N/S direction. We suspect some wear and eccentricity in the gearbox components. **Still rated a Class I Defect.**

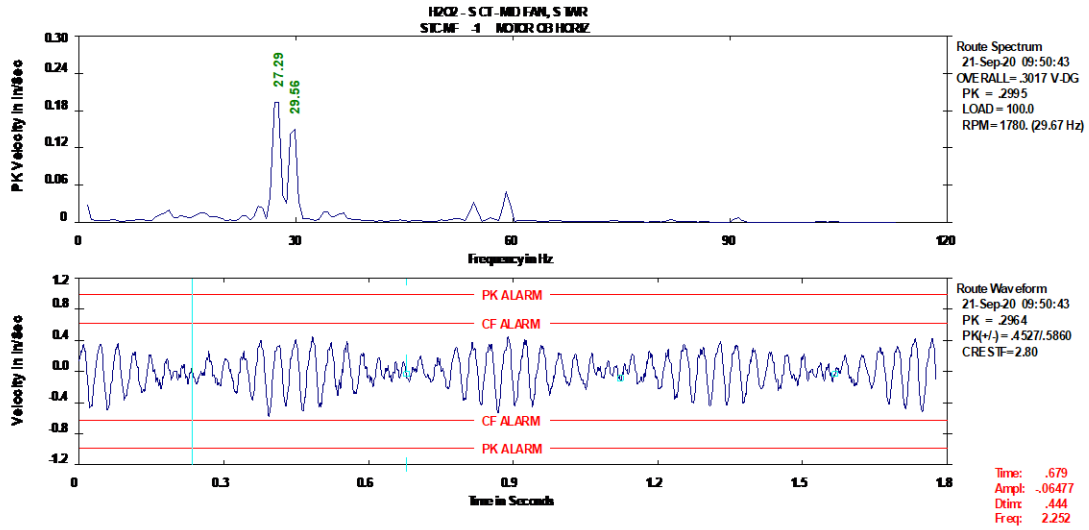
Monthly Equipment on report

South Cooling Tower North Fan

The north fan has an overall vibration at 0.38"/second peak velocity and some sidebands around discrete vibration peaks; however, the vibrations have not changed over time. We will keep an eye on this one also. The vibrations have not changed over time. **Rated a Class I Defect.**

South Cooling Tower Middle Fan

The unit has a beat vibration in the motor. We suspect a motor speed vibration is beating with blade pass. The unit was inspected recently so we will just update you from time to time. **Rated a Class I Defect.**



Time waveform shows a periodic vibration (Beat) every 444ms or so. Beat vibrations tend to beat up equipment.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 5: ARK WK 3
Report Date: 21-Sep-20 13:35

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(21-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.081 In/Sec	.343 G-s
21 - Motor IB HOR	.063 In/Sec	.451 G-s
23 - Motor IB AXIAL	.121 In/Sec	.141 G-s
71 - Compressor IB HOR	.121 In/Sec	1.029 G-s
81 - Compressor OB Horiz	.172 In/Sec	.878 G-s
83 - Compressor OB Axial	.095 In/Sec	1.696 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(21-Sep-20)	
	OVERALL LEVEL	1-20 KHZ
02 - DRIVESHAFT BRG-EAST-WEST	.047 In/Sec	.035 G-s
03 - DRIVESHAFT BRG-VERTICAL	.051 In/Sec	.063 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.098 In/Sec	.923 G-s
12 - C Hydro Agitator MOTOR OB VERT	.122 In/Sec	.771 G-s
13 - C Hydro Agitator Motor OB Axial	.165 In/Sec	.431 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.114 In/Sec	.250 G-s
22 - C Hydro Agitator MOTOR IB VERT	.162 In/Sec	.482 G-s
23 - C Hydro Agitator Motor IB Axial	.172 In/Sec	.463 G-s
31 - C Hydro Agitator GrBx In Horizon	.102 In/Sec	.526 G-s
32 - C Hydro Agitator GrBx In VERT	.088 In/Sec	.900 G-s
33 - C Hydro Agitator GrBx In Axial	.066 In/Sec	.574 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.057 In/Sec	.486 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.024 In/Sec	.690 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.045 In/Sec	.395 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.020 In/Sec	.372 G-s
53 - C Hydro Agitator GrBx Top Axial	.052 In/Sec	.393 G-s
57 - A/B Concentr Vac Pmp-var RPM	(21-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.047 In/Sec	.163 G-s
12 - Motor OB VERT	.055 In/Sec	.495 G-s
21 - Motor IB HOR	.080 In/Sec	.348 G-s
23 - Motor IB AXIAL	.051 In/Sec	.201 G-s
71 - Compressor IB HOR	.120 In/Sec	.844 G-s
81 - Compressor OB Horiz	.239 In/Sec	.561 G-s
83 - Compressor OB Axial	.051 In/Sec	1.243 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(21-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.041 In/Sec	.172 G-s
12 - Motor OB VERT	.040 In/Sec	.092 G-s
21 - Motor IB HOR	.041 In/Sec	.769 G-s

22	- Motor IB VERT	.045 In/Sec	.752 G-s
23	- Motor IB AXIAL	.062 In/Sec	.143 G-s
71	- Compressor IB HOR	.058 In/Sec	.430 G-s
72	- Compressor IB VERT	.070 In/Sec	.472 G-s
81	- Compressor OB Horiz	.077 In/Sec	.206 G-s
82	- Compressor OB VERT	.083 In/Sec	.377 G-s
83	- Compressor OB Axial	.039 In/Sec	.533 G-s

C-203	- C-203 Comp	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.135 In/Sec	5.097 G-s
12	- MOTOR OB VERT	.057 In/Sec	2.171 G-s
21	- MOTOR IB HOR	.113 In/Sec	4.320 G-s
22	- MOTOR IB VERT	.101 In/Sec	3.828 G-s
23	- MOTOR IB AXIAL	.028 In/Sec	.837 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.043 In/Sec	1.932 G-s
72M	- COMP MALE SHAFT IB VERT	.061 In/Sec	2.630 G-s
73M	- COMP MALE SHAFT IB AXIAL	.052 In/Sec	3.555 G-s
81M	- COMP MALE SHAFT OB HOR	.063 In/Sec	2.925 G-s
82M	- COMP MALE SHAFT OB VERT	.078 In/Sec	3.783 G-s
71F	- COMP FEMALE SHAFT IB HOR	.049 In/Sec	2.029 G-s
72F	- COMP FEMALE SHAFT IB VERT	.071 In/Sec	2.458 G-s
* 73F	- COMP FEMALE SHAFT IB AXIAL	.081 In/Sec	5.611 G-s
81F	- COMP FEMALE SHAFT OB HOR	.047 In/Sec	3.240 G-s
82F	- COMP FEMALE SHAFT OB VERT	.043 In/Sec	1.257 G-s

C-202	- C-202 Comp	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.041 In/Sec	.662 G-s
12	- MOTOR OB VERT	.128 In/Sec	1.834 G-s
21	- MOTOR IB HOR	.055 In/Sec	.659 G-s
22	- MOTOR IB VERT	.093 In/Sec	1.414 G-s
23	- MOTOR IB AXIAL	.043 In/Sec	.169 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.040 In/Sec	2.021 G-s
72M	- COMP MALE SHAFT IB VERT	.048 In/Sec	1.490 G-s
73M	- COMP MALE SHAFT IB AXIAL	.076 In/Sec	1.782 G-s
81M	- COMP MALE SHAFT OB HOR	.037 In/Sec	6.950 G-s
82M	- COMP MALE SHAFT OB VERT	.053 In/Sec	1.515 G-s
71F	- COMP FEMALE SHAFT IB HOR	.044 In/Sec	2.651 G-s
72F	- COMP FEMALE SHAFT IB VERT	.056 In/Sec	.968 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.074 In/Sec	4.891 G-s
81F	- COMP FEMALE SHAFT OB HOR	.060 In/Sec	4.742 G-s
82F	- COMP FEMALE SHAFT OB VERT	.046 In/Sec	.494 G-s

C-201	- C-201 Comp	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.105 In/Sec	2.671 G-s
12	- MOTOR OB VERT	.139 In/Sec	5.127 G-s
21	- MOTOR IB HOR	.084 In/Sec	1.083 G-s
22	- MOTOR IB VERT	.040 In/Sec	.372 G-s
23	- MOTOR IB AXIAL	.053 In/Sec	.550 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.044 In/Sec	1.969 G-s
72M	- COMP MALE SHAFT IB VERT	.033 In/Sec	.786 G-s
73M	- COMP MALE SHAFT IB AXIAL	.081 In/Sec	2.043 G-s

81M - COMP MALE SHAFT OB HOR	.033 In/Sec	6.022 G-s
82M - COMP MALE SHAFT OB VERT	.056 In/Sec	2.423 G-s
71F - COMP FEMALE SHAFT IB HOR	.052 In/Sec	2.863 G-s
72F - COMP FEMALE SHAFT IB VERT	.052 In/Sec	1.384 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.071 In/Sec	4.661 G-s
81F - COMP FEMALE SHAFT OB HOR	.055 In/Sec	1.840 G-s
82F - COMP FEMALE SHAFT OB VERT	.052 In/Sec	1.565 G-s

new AC - INSTRUMENT AIR COMPRESSOR (21-Sep-20)

	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.169 In/Sec	.760 G-s
12 - MOTOR OB VERT	.113 In/Sec	.520 G-s
13 - MOTOR OB AXIAL	.060 In/Sec	.547 G-s
21 - MOTOR IB HOR	.173 In/Sec	1.069 G-s
22 - MOTOR IB VERT	.077 In/Sec	.726 G-s
23 - MOTOR IB AXIAL	.057 In/Sec	.699 G-s
	OVERALL LEVEL	1-20 KHZ
71F - COMP FEMALE SHAFT IB HOR	.146 In/Sec	5.519 G-s
72F - COMP FEMALE SHAFT IB VERT	.184 In/Sec	2.776 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.167 In/Sec	4.973 G-s
81F - COMP FEMALE SHAFT OB HOR	.143 In/Sec	2.020 G-s
82F - COMP FEMALE SHAFT OB VERT	.219 In/Sec	5.796 G-s
83F - COMP FEMALE SHAFT OB AXIAL	.182 In/Sec	4.257 G-s
71M - COMP MALE SHAFT IB HOR	.110 In/Sec	3.878 G-s
72M - COMP MALE SHAFT IB VERT	.170 In/Sec	7.339 G-s
73M - COMP MALE SHAFT IB AXIAL	.139 In/Sec	5.623 G-s
81M - COMP MALE SHAFT OB HOR	.189 In/Sec	3.309 G-s
82M - COMP MALE SHAFT OB VERT	.231 In/Sec	2.860 G-s
83M - COMP MALE SHAFT OB AXIAL	.243 In/Sec	3.449 G-s

201-08A - COMPRESSOR,NASH A 201-08A (21-Sep-20)

	OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz	.078 In/Sec	.286 G-s
12 - Nash Compr A Motor OB Vertical	.084 In/Sec	.117 G-s
13 - Nash Compr A Motor OB Axial	.196 In/Sec	.150 G-s
21 - Nash Compr A Motor IB Horiz	.094 In/Sec	.136 G-s
22 - Nash Compr A Motor IB VERT	.114 In/Sec	.210 G-s
23 - Nash Compr A Motor IB AXIAL	.168 In/Sec	.136 G-s
71 - Nash Compr A COMP IB HORIZ	.170 In/Sec	.694 G-s
72 - Nash Compr A Compressor IB Verti	.272 In/Sec	.708 G-s
73 - Nash Compr A COMP IB AXIAL	.169 In/Sec	.208 G-s
81 - Nash Compr A COMP OB HORIZ	.181 In/Sec	.764 G-s
82 - Nash Compr A Compressor OB Verti	.308 In/Sec	.401 G-s
83 - Nash Compr A Compressor OB Axial	.155 In/Sec	.516 G-s

9002-10 - D-HYDROGENATOR AGITATOR (21-Sep-20)

	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.081 In/Sec	.098 G-s
21 - MOTOR INBOARD HORIZONTAL	.071 In/Sec	.130 G-s
23 - MOTOR INBOARD AXIAL	.044 In/Sec	.097 G-s
31 - GEARBOX INPUT SHAFT -HORIZONTAL	.203 In/Sec	.601 G-s
51 - GEARBOX TOP PLATE- E-W	.217 In/Sec	.188 G-s
52 - GEARBOX TOP PLATE- N-S	.363 In/Sec	.339 G-s
53 - GEARBOX OUTPUT TOP -VERTICAL	.136 In/Sec	.542 G-s
61 - GEARBOX BOTTOM E-W-HORIZONTAL	.128 In/Sec	.145 G-s
81 - AGIT INTERMED BRG @ SEAL- N-S	.050 In/Sec	.030 G-s
82 - AGIT INTERMED BRG @ SEAL- E-W	.038 In/Sec	.030 G-s

83	- AGIT INTERMED BRG @ SEAL- VERT	.037 In/Sec	.207 G-s
NTC-SF	- N CT-SOUTH FAN, N TWR	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.080 In/Sec	.424 G-s
2	- MOTOR IB HORIZ	.059 In/Sec	.443 G-s
3	- MOTOR IB AXIAL	.091 In/Sec	.497 G-s
		OVERALL LEVEL	1-20 KHZ
4	- GEARBOX INPUT HORIZONTAL	.076 In/Sec	.179 G-s
5	- GEARBOX VERTICAL	.0051 In/Sec	.0008 G-s
6	- GEARBOX AXIAL	.104 In/Sec	.208 G-s
6L	- GEARBOX AXIAL LOW FREQ	.137 In/Sec	.219 G-s
NCT - NF	- N CT -NORTH FAN, N TWR	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
7	- MOTOR OB HORIZ	.079 In/Sec	.542 G-s
8	- MOTOR IB HORIZ	.068 In/Sec	.282 G-s
9	- MOTOR IB AXIAL	.079 In/Sec	.274 G-s
		OVERALL LEVEL	1-20 KHZ
10	- GEARBOX INPUT HORIZONTAL	.145 In/Sec	.167 G-s
11	- GEARBOX VERTICAL	.102 In/Sec	.172 G-s
12	- GEARBOX AXIAL	.096 In/Sec	.186 G-s
530-02	- PUMP,N.COOLING TWR,MIDDLE	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOT TOP N-S	.097 In/Sec	.666 G-s
12	- MOTOR TOP E-W	.163 In/Sec	.773 G-s
530-03	- PUMP,N.COOLING TWR,SOUTH	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOT TOP N-S	.099 In/Sec	.447 G-s
12	- MOTOR TOP E-W	.133 In/Sec	.384 G-s
548-7	- IRON-FREE H2O BOOSTER PUMP	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.027 In/Sec	.303 G-s
21	- MOTOR INBOARD HORIZONTAL	.031 In/Sec	.644 G-s
23	- MOTOR INBOARD AXIAL	.047 In/Sec	.254 G-s
71	- PUMP HORIZONTAL	.084 In/Sec	.064 G-s
72	- PUMP VERTICAL	.029 In/Sec	.096 G-s
STC-NF	- S CT - NORTH FAN, S TWR	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.380 In/Sec	.682 G-s
2	- MOTOR IB HORIZ	.295 In/Sec	.254 G-s
3	- MOTOR IB AXIAL	.214 In/Sec	.110 G-s
		OVERALL LEVEL	1-20 KHZ
6	- GEARBOX AXIAL	.172 In/Sec	.359 G-s
4	- GEARBOX INPUT HORIZONTAL	.144 In/Sec	.457 G-s
STC-MF	- S CT - MID FAN, S TWR	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.302 In/Sec	.797 G-s
2	- MOTOR IB HORIZ	.253 In/Sec	.171 G-s
3	- MOTOR IB AXIAL	.135 In/Sec	.214 G-s
		OVERALL LEVEL	1-20 KHZ
6	- GEARBOX AXIAL	.099 In/Sec	.296 G-s

4	- GEARBOX INPUT HORIZONTAL	.145 In/Sec	.391 G-s
5	- GEARBOX VERTICAL	.102 In/Sec	.515 G-s

STC-SF	- S CT - SOUTH FAN, S TWR	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.227 In/Sec	.489 G-s
2	- MOTOR IB HORIZ	.255 In/Sec	.263 G-s
3	- MOTOR IB AXIAL	.265 In/Sec	.111 G-s
		OVERALL LEVEL	1-20 KHZ
6	- GEARBOX AXIAL	.162 In/Sec	.512 G-s
4	- GEARBOX INPUT HORIZONTAL	.157 In/Sec	.523 G-s
5	- GEARBOX VERTICAL	.180 In/Sec	.638 G-s

SCT-1	- SOUTH CT PUMP - EAST	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.030 In/Sec	.750 G-s
21	- MOTOR INBOARD HORIZONTAL	.040 In/Sec	1.013 G-s
23	- MOTOR INBOARD AXIAL	.049 In/Sec	.304 G-s
71	- PUMP HORIZONTAL	.157 In/Sec	.871 G-s
72	- PUMP VERTICAL	.129 In/Sec	.863 G-s

SCT-2	- SOUTH CT PUMP - MID	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.033 In/Sec	.492 G-s
21	- MOTOR INBOARD HORIZONTAL	.036 In/Sec	.907 G-s
23	- MOTOR INBOARD AXIAL	.048 In/Sec	.099 G-s
71	- PUMP HORIZONTAL	.110 In/Sec	.676 G-s
72	- PUMP VERTICAL	.104 In/Sec	1.076 G-s

SCT-3	- SOUTH CT PUMP - WEST	(21-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.034 In/Sec	1.174 G-s
21	- MOTOR INBOARD HORIZONTAL	.045 In/Sec	1.163 G-s
23	- MOTOR INBOARD AXIAL	.067 In/Sec	1.166 G-s
71	- PUMP HORIZONTAL	.168 In/Sec	.346 G-s
72	- PUMP VERTICAL	.141 In/Sec	.494 G-s

Clarification Of Vibration Units:

Acc	-->	G-s	PK
Vel	-->	In/Sec	PK

* - Indicates Data Has Date/Time Different From Machine Date/Time