HI-SPEED INDUSTRIAL SERVICE

QualiTest® Diagnostics

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May 30th, 2023

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The following is a summary of findings from the WEEK 3 and WEEK 4 vibration survey at the H2O2 Plant and the monthly H2 survey that was performed on May 26th, 2023.

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.

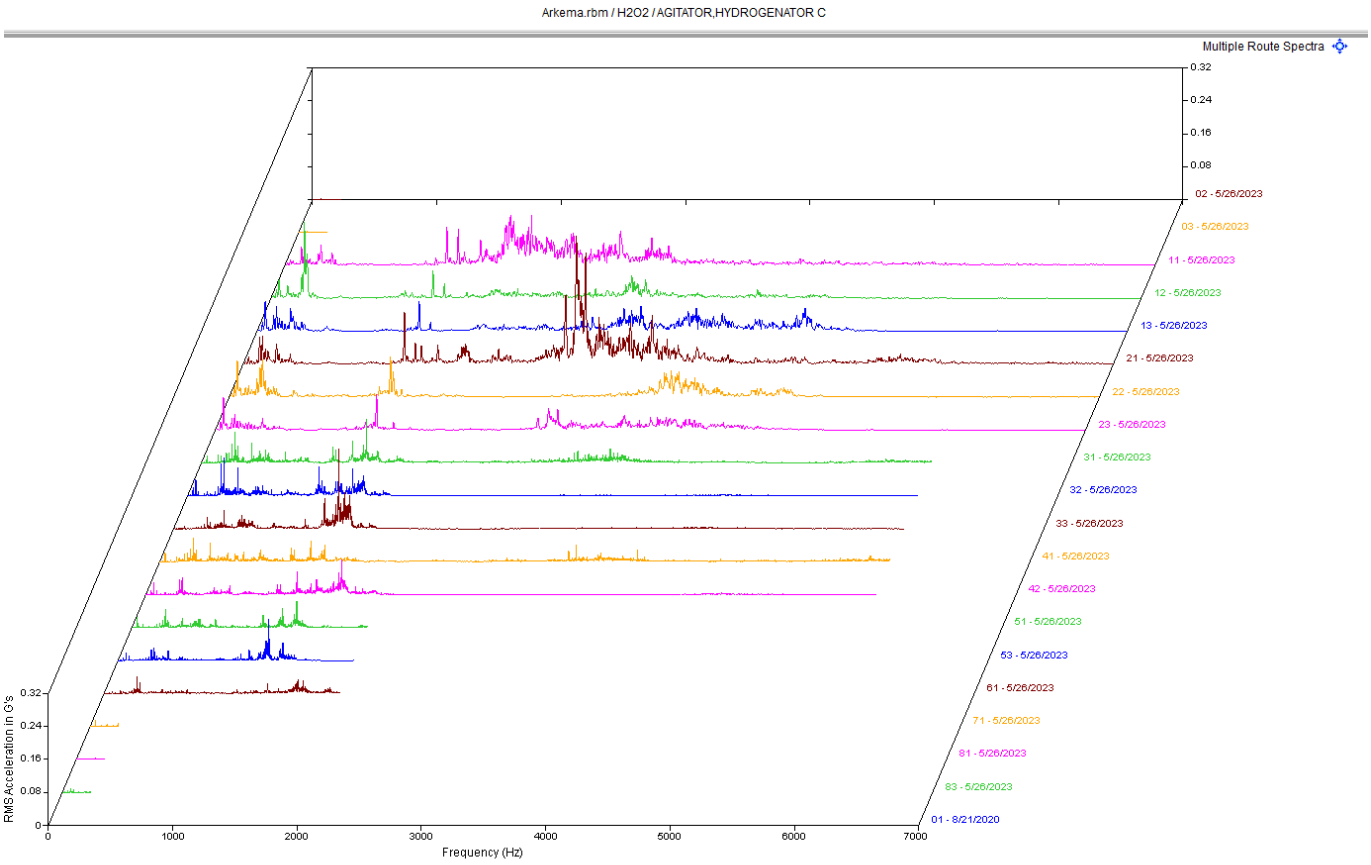
CLASS II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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

Defect Summary

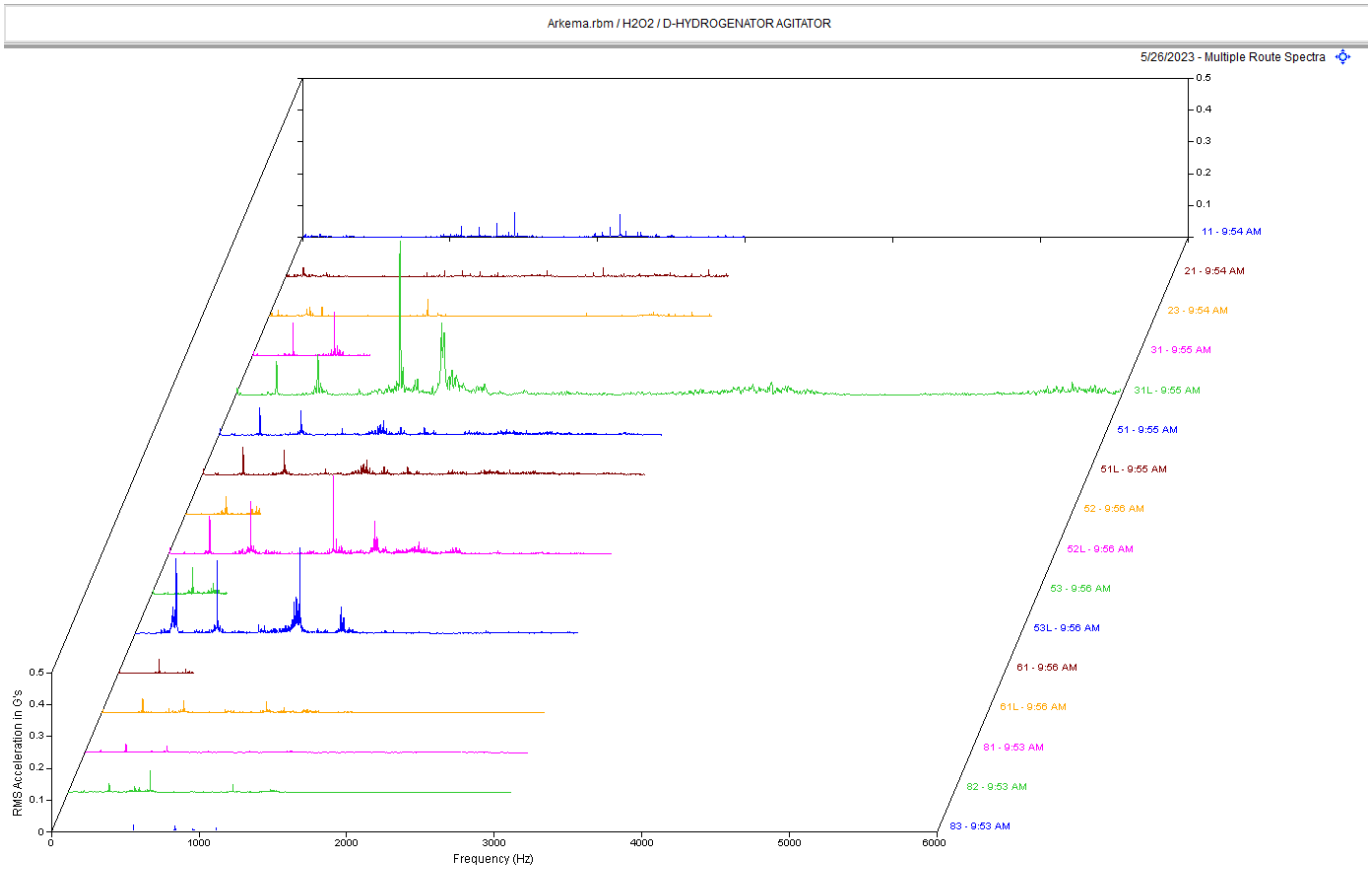
Agitator, Hydrogenator C CLASS II



Observation:
Data above is a multipoint spectral waterfall. Notice the noise floor in the motor data. Data points labeled 11-23.

Recommendation:
Motor data does show a slightly lower amount of noise but still suggests a possible lubrication issue in the motor. Motor may also have some light bearing defects. For now, it is recommended that the motor has an adequate amount of grease.

Agitator, Hydrogenator D CLASS I



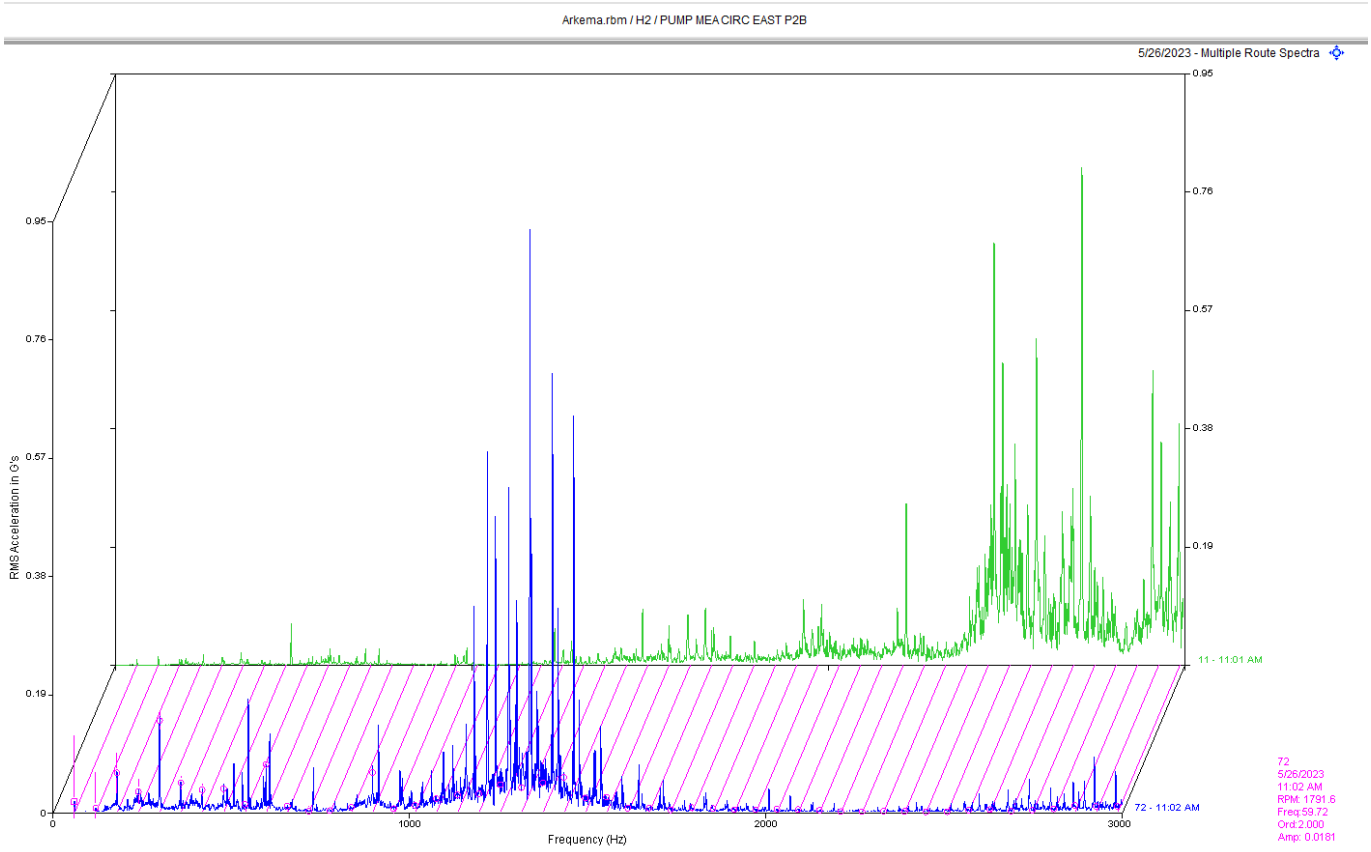
Observation:

Data above is a multipoint spectral waterfall. Notice the noise floor in the motor data. Data points labeled 31L through 53L are gearbox data points.

Recommendation:

Gearbox spectral data shows signs of gear issues such as heavy tooth load and or wear/misalignment. This looks to be low level at this time. We will monitor this closely.

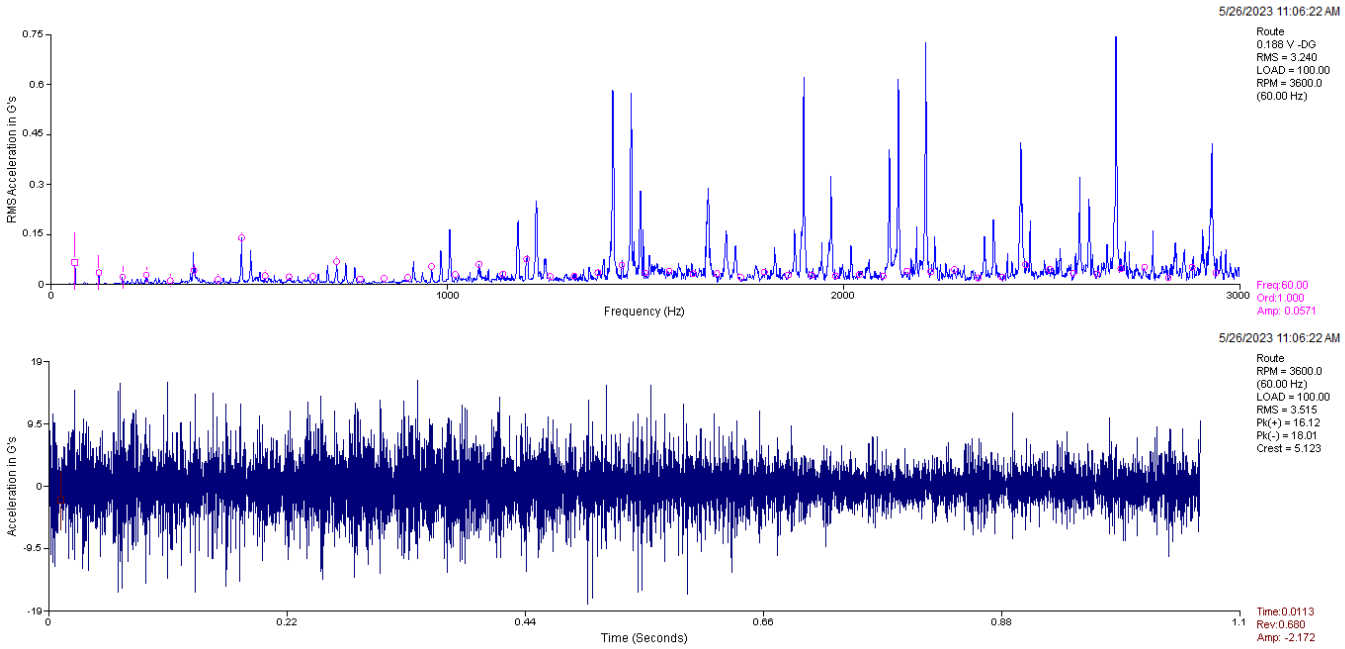
MEA Circ Pump East CLASS III



Observation:
Data above is the Motor outboard horizontal and the pump inboard vertical. Data shows non-synchronous peaks.

Recommendation:
Data indicates defects are present in the motor and pump. Unit will need attention soon.

H2 FD Fan CLASS III



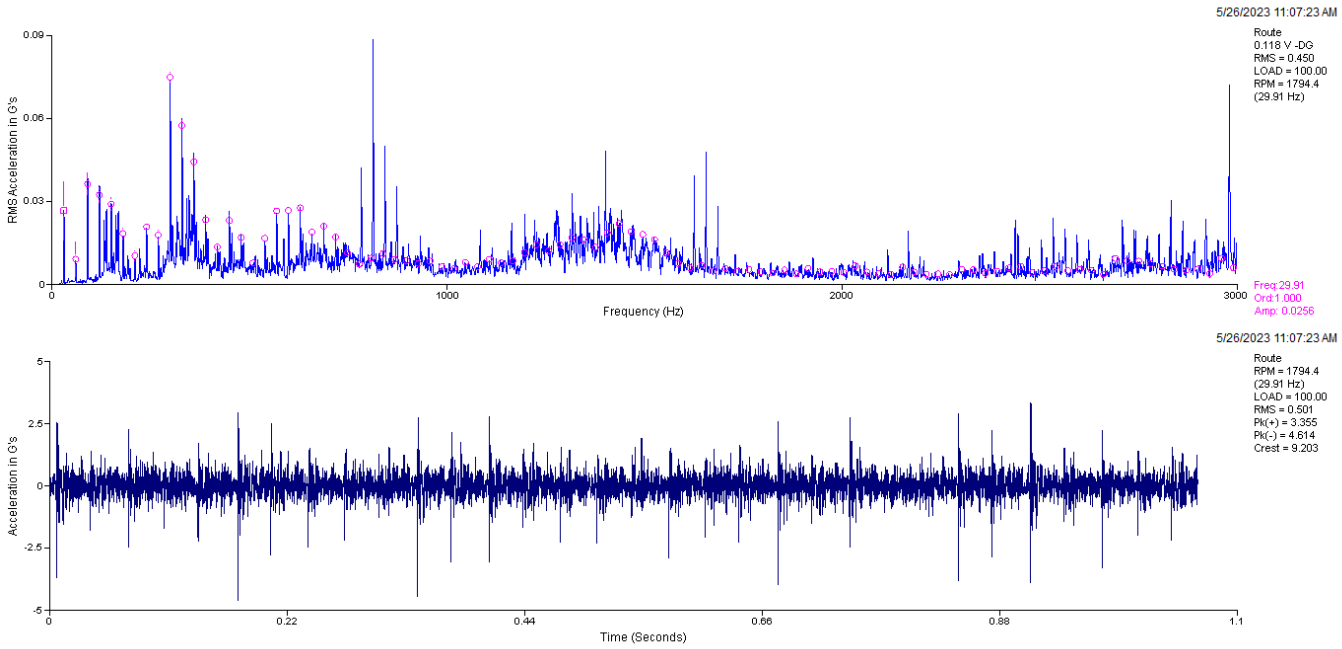
Observation:

Data above is the fan outboard horizontal (fan end bearing). Data shows non-synchronous peaks throughout the spectrum. Waveform shows some impacting with amplitude of over 34 G's peak to peak.

Recommendation:

Data indicates defects are present in the fan bearings particularly the outboard bearing. Fan bearings will need attention soon.

H2 ID Fan CLASS III



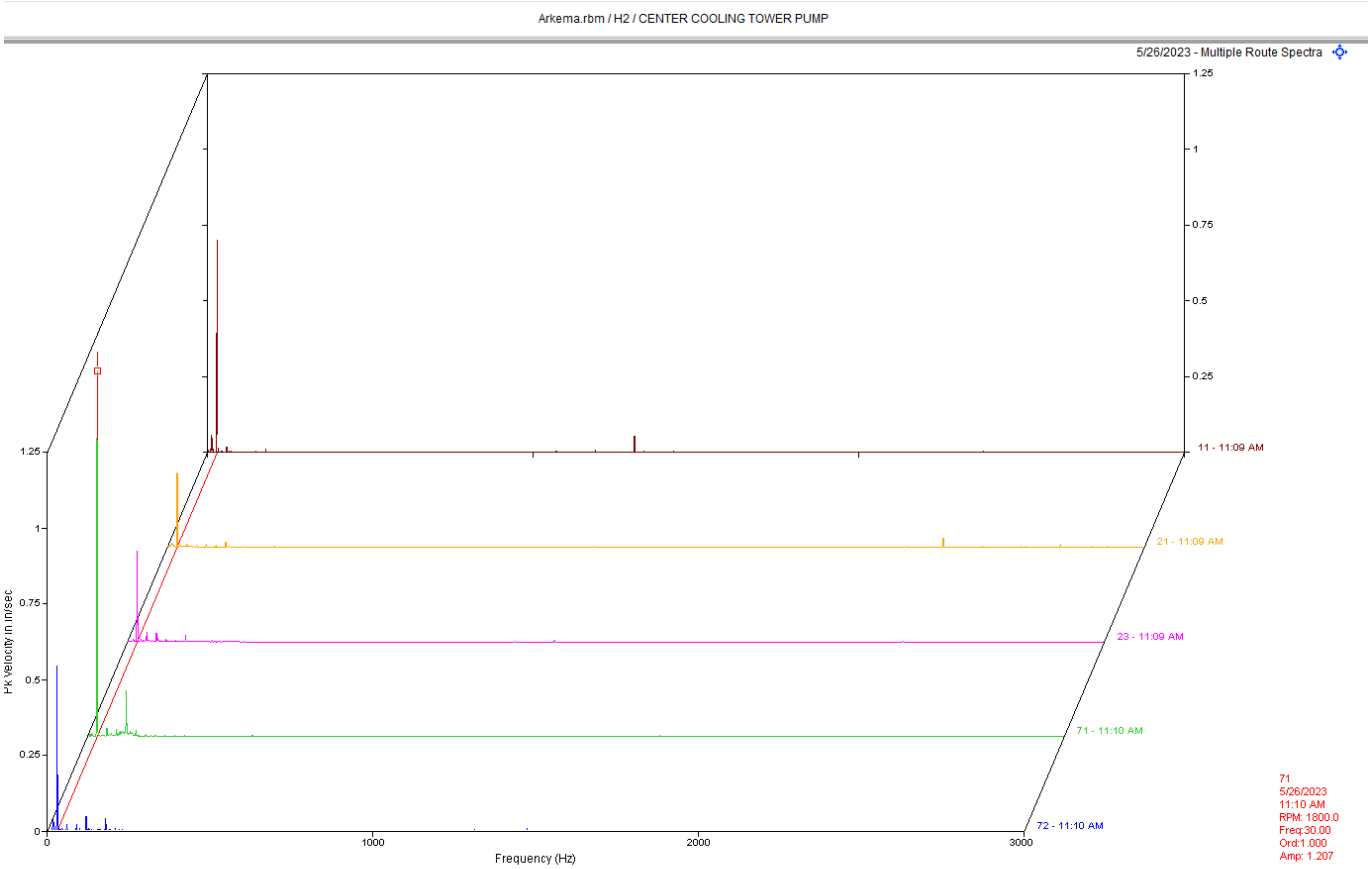
Observation:

Data above is the fan inboard horizontal (coupling end bearing). Data shows both synchronous and non-synchronous peaks throughout the spectrum. Waveform shows some impacting with amplitude of over 34 G's peak to peak.

Recommendation:

Data indicates mechanical looseness and defects are present in the fan bearings particularly the intboard bearing. Fan bearings will need attention soon.

H2 Center Cooling Tower Pump CLASS II



Observation:

Data above is a multi-point spectra of the motor and pump.. Data shows a high vibration at 1 x rpm with some harmonics.

Recommendation:

All three cooling tower motors/pumps have base issues. They were not installed correctly. Bases need to be leveled and fastened properly to the concrete. There should not be gaps between the base frame and the concrete pad. The bases also need to epoxy grouted. Because the bases are not installed correctly, there is excessive vibration, especially in the motor verticals. Ensure bases are leveled, fastened properly, and grouted in as soon as time allows.

Abbreviated Last Measurement Summary

Station: PEROXIDE
Route No. 3: ARK WK 3

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
XSTORPMP - X STORAGE PUMP	(26-May-23)	
	OVERALL LEVEL	1-20 KHz
11	.047 In/Sec	.542 G-s
21	.054 In/Sec	.521 G-s
23	.051 In/Sec	.608 G-s
71	.110 In/Sec	.258 G-s
72	.038 In/Sec	.396 G-s
YSTORPMP - Y STORAGE PUMP	(26-May-23)	
	OVERALL LEVEL	1-20 KHz
11	.170 In/Sec	.808 G-s
21	.156 In/Sec	.701 G-s
23	.063 In/Sec	.569 G-s
71	.167 In/Sec	.252 G-s
72	.056 In/Sec	.148 G-s
2130-1old - C Concentrator Vacuum Pump	(26-May-23)	
	OVERALL LEVEL	1-20 KHz
11	.074 In/Sec	.515 G-s
21	.085 In/Sec	.614 G-s
23	.137 In/Sec	.300 G-s
71	.163 In/Sec	1.875 G-s
81	.194 In/Sec	.667 G-s
83	.157 In/Sec	1.115 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(26-May-23)	
	OVERALL LEVEL	1-20 KHZ
02	.040 In/Sec	.032 G-s
03	.046 In/Sec	.029 G-s
11	.074 In/Sec	.973 G-s
12	.129 In/Sec	.351 G-s
13	.135 In/Sec	.562 G-s
21	.093 In/Sec	1.458 G-s
22	.167 In/Sec	.464 G-s
23	.134 In/Sec	.379 G-s
31	.073 In/Sec	.500 G-s
32	.119 In/Sec	.453 G-s
33	.062 In/Sec	.845 G-s
41	.069 In/Sec	.384 G-s
42	.080 In/Sec	.429 G-s
51	.063 In/Sec	.261 G-s
53	.047 In/Sec	.250 G-s
61	.060 In/Sec	.327 G-s
71	.055 In/Sec	.284 G-s
81	.020 In/Sec	.349 G-s
83	.041 In/Sec	.276 G-s
57 - A/B Concentr Vac Pmp-var RPM	(26-May-23)	
	OVERALL LEVEL	1-20 KHz
11	.069 In/Sec	.359 G-s
12	.060 In/Sec	.281 G-s
21	.053 In/Sec	.537 G-s
23	.075 In/Sec	.379 G-s
71	.128 In/Sec	.585 G-s
81	.317 In/Sec	.799 G-s
83	.124 In/Sec	.602 G-s

2130-1 - FLASH VAP VAC PUMP-var speed (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.059 In/Sec	.626 G-s
12	.065 In/Sec	.428 G-s
21	.059 In/Sec	.616 G-s
22	.101 In/Sec	.363 G-s
23	.071 In/Sec	.245 G-s
71	.311 In/Sec	1.169 G-s
72	.215 In/Sec	1.220 G-s
81	.225 In/Sec	1.529 G-s
82	.189 In/Sec	1.019 G-s
83	.159 In/Sec	.923 G-s

C-203 - C-203 Comp (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.089 In/Sec	3.313 G-s
12	.033 In/Sec	.989 G-s
21	.057 In/Sec	2.289 G-s
22	.040 In/Sec	1.205 G-s
23	.019 In/Sec	.371 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.094 In/Sec	6.110 G-s
72M	.047 In/Sec	1.554 G-s
73M	.062 In/Sec	1.514 G-s
81M	.056 In/Sec	10.54 G-s
82M	.039 In/Sec	2.352 G-s
71F	.043 In/Sec	1.989 G-s
72F	.062 In/Sec	.994 G-s
73F	.054 In/Sec	.654 G-s
81F	.034 In/Sec	8.408 G-s
82F	.045 In/Sec	1.433 G-s

C-202 - C-202 Comp (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.102 In/Sec	3.832 G-s
12	.166 In/Sec	1.712 G-s
21	.066 In/Sec	1.011 G-s
22	.061 In/Sec	.510 G-s
23	.041 In/Sec	.117 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.063 In/Sec	5.470 G-s
72M	.043 In/Sec	.817 G-s
73M	.092 In/Sec	1.084 G-s
81M	.057 In/Sec	8.478 G-s
82M	.073 In/Sec	1.793 G-s
71F	.029 In/Sec	3.865 G-s
72F	.075 In/Sec	1.168 G-s
73F	.034 In/Sec	.998 G-s
81F	.049 In/Sec	2.874 G-s
82F	.071 In/Sec	1.727 G-s

new AC - INSTRUMENT AIR COMPRESSOR (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.091 In/Sec	.876 G-s
12	.100 In/Sec	1.190 G-s
13	.063 In/Sec	.590 G-s
21	.078 In/Sec	1.430 G-s
22	.069 In/Sec	1.694 G-s
23	.048 In/Sec	1.442 G-s
	OVERALL LEVEL	1-20 KHZ
71F	.092 In/Sec	5.145 G-s
72F	.103 In/Sec	3.325 G-s
73F	.128 In/Sec	4.871 G-s
81F	.107 In/Sec	6.523 G-s
82F	.305 In/Sec	6.330 G-s
83F	.157 In/Sec	4.855 G-s
71M	.122 In/Sec	7.666 G-s
72M	.166 In/Sec	11.92 G-s
73M	.130 In/Sec	11.06 G-s
81M	.154 In/Sec	5.131 G-s

	82M	.105 In/Sec	3.034 G-s
	83M	.221 In/Sec	8.642 G-s

9002-10 - D-HYDROGENATOR AGITATOR (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.068 In/Sec	.211 G-s
21	.085 In/Sec	.293 G-s
23	.077 In/Sec	.118 G-s
	OVERALL LEVEL	1-20 KHZ
31	.195 In/Sec	.901 G-s
31L	.219 In/Sec	1.038 G-s
	OVERALL LEVEL	1-20 KHz
51	.225 In/Sec	.287 G-s
51L	.225 In/Sec	.287 G-s
52	.070 In/Sec	.887 G-s
52L	.248 In/Sec	.548 G-s
53	.189 In/Sec	.697 G-s
53L	.139 In/Sec	.791 G-s
61	.132 In/Sec	.174 G-s
61L	.133 In/Sec	.174 G-s
81	.042 In/Sec	.033 G-s
82	.037 In/Sec	.085 G-s
83	.042 In/Sec	.032 G-s

NTC-SF - N CT-SOUTH FAN, N TWR (26-May-23)

	OVERALL LEVEL	1-20 KHz
1	.393 In/Sec	.534 G-s
2	.215 In/Sec	.512 G-s
3	.178 In/Sec	.486 G-s
	OVERALL LEVEL	1-20 KHZ
4	.212 In/Sec	.372 G-s
5	.015 In/Sec	.0012 G-s
6	.282 In/Sec	.508 G-s

NCT - NF - N CT -NORTH FAN, N TWR (26-May-23)

	OVERALL LEVEL	1-20 KHz
7	.340 In/Sec	.687 G-s
8	.211 In/Sec	.470 G-s
9	.170 In/Sec	.356 G-s
	OVERALL LEVEL	1-20 KHZ
10	.174 In/Sec	.333 G-s
11	.214 In/Sec	.295 G-s
12	.173 In/Sec	.386 G-s

530-01 - PUMP,N.COOLING TWR,NORTH (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.306 In/Sec	.561 G-s
12	.200 In/Sec	.487 G-s

530-02 - PUMP,N.COOLING TWR,MIDDLE (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.156 In/Sec	.526 G-s
12	.183 In/Sec	.701 G-s

530-03 - PUMP,N.COOLING TWR,SOUTH (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.302 In/Sec	.285 G-s
12	.230 In/Sec	.217 G-s

548-7 - IRON-FREE H2O BOOSTER PUMP (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.029 In/Sec	.921 G-s
21	.035 In/Sec	.817 G-s
23	.050 In/Sec	1.036 G-s
71	.033 In/Sec	.131 G-s
72	.028 In/Sec	.217 G-s

STC-NF - S CT - NORTH FAN, S TWR (26-May-23)

	OVERALL LEVEL	1-20 KHz
1	.272 In/Sec	.799 G-s

	2	.232 In/Sec	.420 G-s
	3	.183 In/Sec	.288 G-s
		OVERALL LEVEL	1-20 KHZ
	4	.099 In/Sec	.371 G-s
	5	.146 In/Sec	.498 G-s

STC-MF - S CT - MID FAN, S TWR (26-May-23)

	OVERALL LEVEL	1-20 KHz
1	.267 In/Sec	.540 G-s
2	.212 In/Sec	.128 G-s
3	.126 In/Sec	.167 G-s
	OVERALL LEVEL	1-20 KHZ
4	.110 In/Sec	.277 G-s
5	.115 In/Sec	.430 G-s
6	.122 In/Sec	.513 G-s

STC-SF - S CT - SOUTH FAN, S TWR (26-May-23)

	OVERALL LEVEL	1-20 KHz
1	.188 In/Sec	.371 G-s
2	.256 In/Sec	.232 G-s
3	.200 In/Sec	.105 G-s
	OVERALL LEVEL	1-20 KHZ
4	.139 In/Sec	.489 G-s
5	.110 In/Sec	.468 G-s
6	.348 In/Sec	.655 G-s

SCT-1 - SOUTH CT PUMP - EAST (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.062 In/Sec	1.657 G-s
21	.064 In/Sec	1.636 G-s
23	.075 In/Sec	1.173 G-s
71	.083 In/Sec	.517 G-s
72	.059 In/Sec	.647 G-s

SCT-2 - SOUTH CT PUMP - MID (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.055 In/Sec	1.334 G-s
21	.036 In/Sec	1.262 G-s
23	.091 In/Sec	1.167 G-s
71	.078 In/Sec	.543 G-s
72	.042 In/Sec	.602 G-s

SCT-3 - SOUTH CT PUMP - WEST (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.050 In/Sec	1.311 G-s
21	.039 In/Sec	.402 G-s
23	.063 In/Sec	.605 G-s
71	.080 In/Sec	.809 G-s
72	.086 In/Sec	.801 G-s

Station: HYDROGEN
Route No. 1: H2 MONTHLY

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD

P2B - PUMP MEA CIRC EAST P2B (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.107 In/Sec	5.438 G-s
21	.090 In/Sec	4.839 G-s
23	.152 In/Sec	1.459 G-s
71	.153 In/Sec	3.648 G-s
72	.181 In/Sec	2.627 G-s

P1A - PUMP BFW WEST P1A (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.075 In/Sec	.956 G-s
21	.072 In/Sec	.819 G-s
23	.086 In/Sec	.685 G-s

71	.116 In/Sec	.897 G-s
72	.089 In/Sec	.275 G-s
81	.088 In/Sec	.550 G-s
82	.077 In/Sec	.246 G-s
83	.071 In/Sec	.484 G-s

C2 - FD BLOWER C2 (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.126 In/Sec	.547 G-s
21	.123 In/Sec	.722 G-s
23	.071 In/Sec	.298 G-s
71	.099 In/Sec	3.482 G-s
81	.188 In/Sec	5.683 G-s

C1 - ID -BLOWER C1 (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.109 In/Sec	.338 G-s
21	.114 In/Sec	.285 G-s
23	.123 In/Sec	.104 G-s
71	.118 In/Sec	.878 G-s
72	.078 In/Sec	.848 G-s
81	.288 In/Sec	2.707 G-s
82	.244 In/Sec	.701 G-s

CTPC - CENTER COOLING TOWER PUMP (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	.733 In/Sec	1.405 G-s
21	.264 In/Sec	1.933 G-s
23	.320 In/Sec	.908 G-s
71	1.263 In/Sec	.878 G-s
72	.575 In/Sec	.504 G-s

CTPW - WEST COOLING TOWER PUMP (26-May-23)

	OVERALL LEVEL	1-20 KHz
11	1.517 In/Sec	.942 G-s
21	.262 In/Sec	1.625 G-s
23	.234 In/Sec	.649 G-s
71	.157 In/Sec	4.344 G-s
72	.294 In/Sec	1.001 G-s

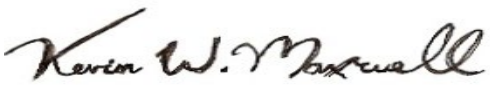
Clarification Of Vibration Units:

Acc --> G-s PK

Vel --> In/Sec PK

As always, it has been a pleasure to serve Arkema. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



ISO Certified Vibration Analyst, Category III

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