HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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The following is a summary of findings from the WEEK 4 vibration survey at the H2O2 Plant that was performed on June 27th, 2022. C-201,202, and 203 showed some elevated rotor bar vibrations this survey likely due to heavier compressor load.

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.

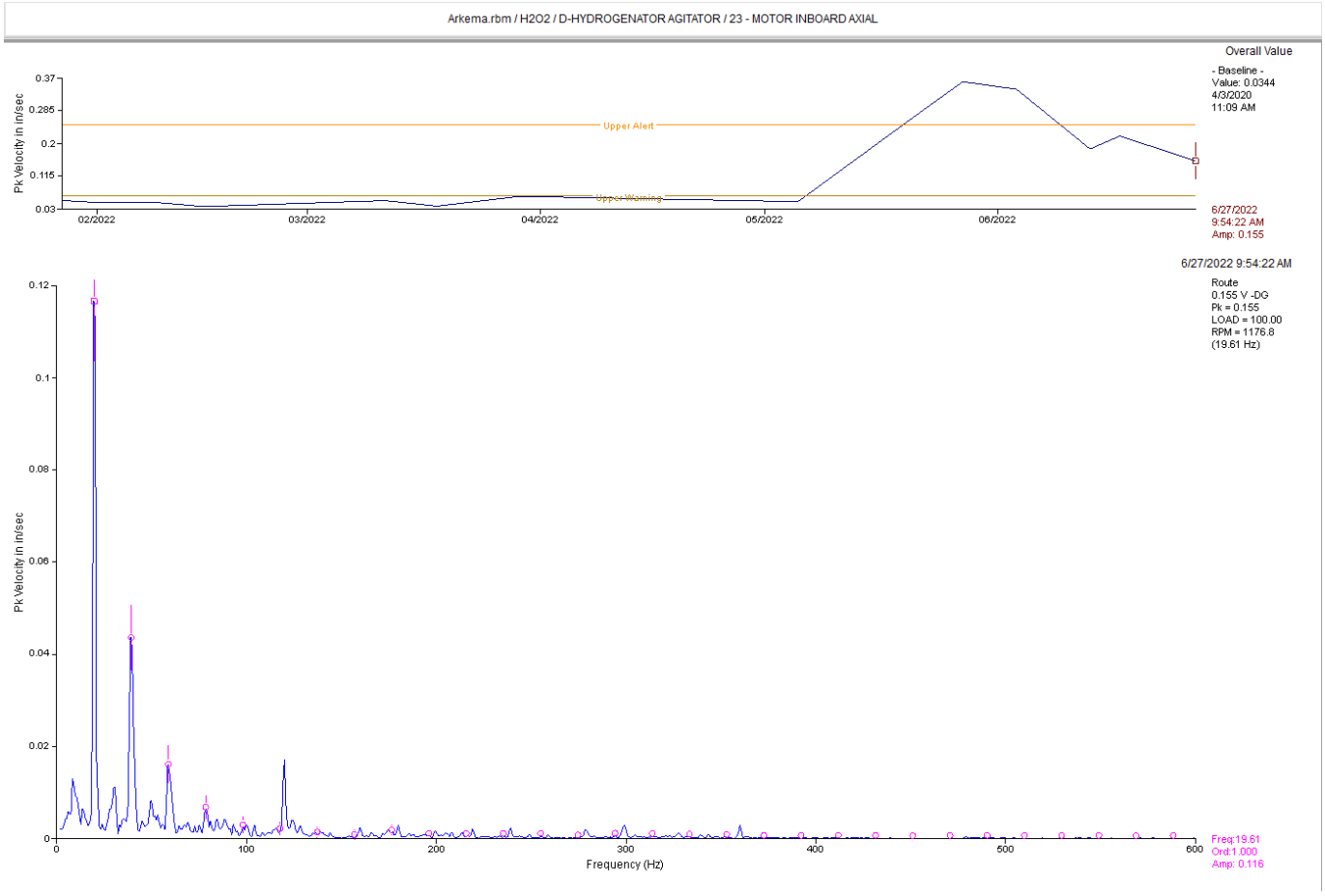
CLASS II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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

D Hydrogenator Agitator CLASS II



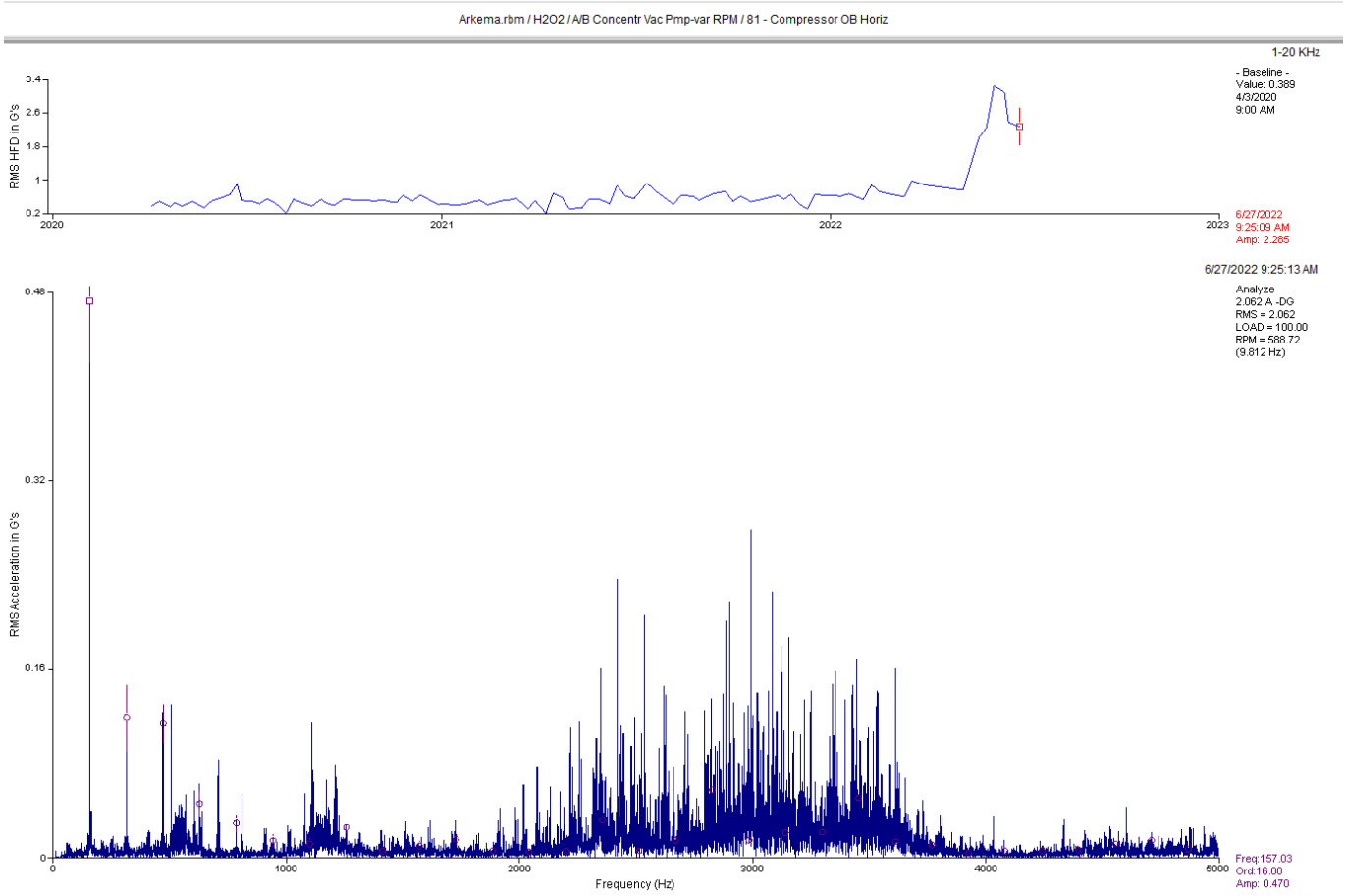
Observation:

Motor axial is still slightly higher than normal. Gearbox does have physical torsional type movement and may be causing some of the motor axial vibration. Data shown is motor inboard axial. Dominant vibration is at 1 x motor rpm with a 2 x and small 3 x rpm peak.

Recommendation:

Ensure motor/gearbox does not have misalignment. Inspect couplings and drive shaft for issues. Gearbox also seemed to have excessive movement while taking data. This is causing excessive axial movement of the jack shaft. Inspect structure/gearbox mounts for signs of fatigue, cracks, etc. Agitator shaft may be bent. Inspect for shaft run-out when time allows.

A/B Concentrator Vacuum Pump CLASS II



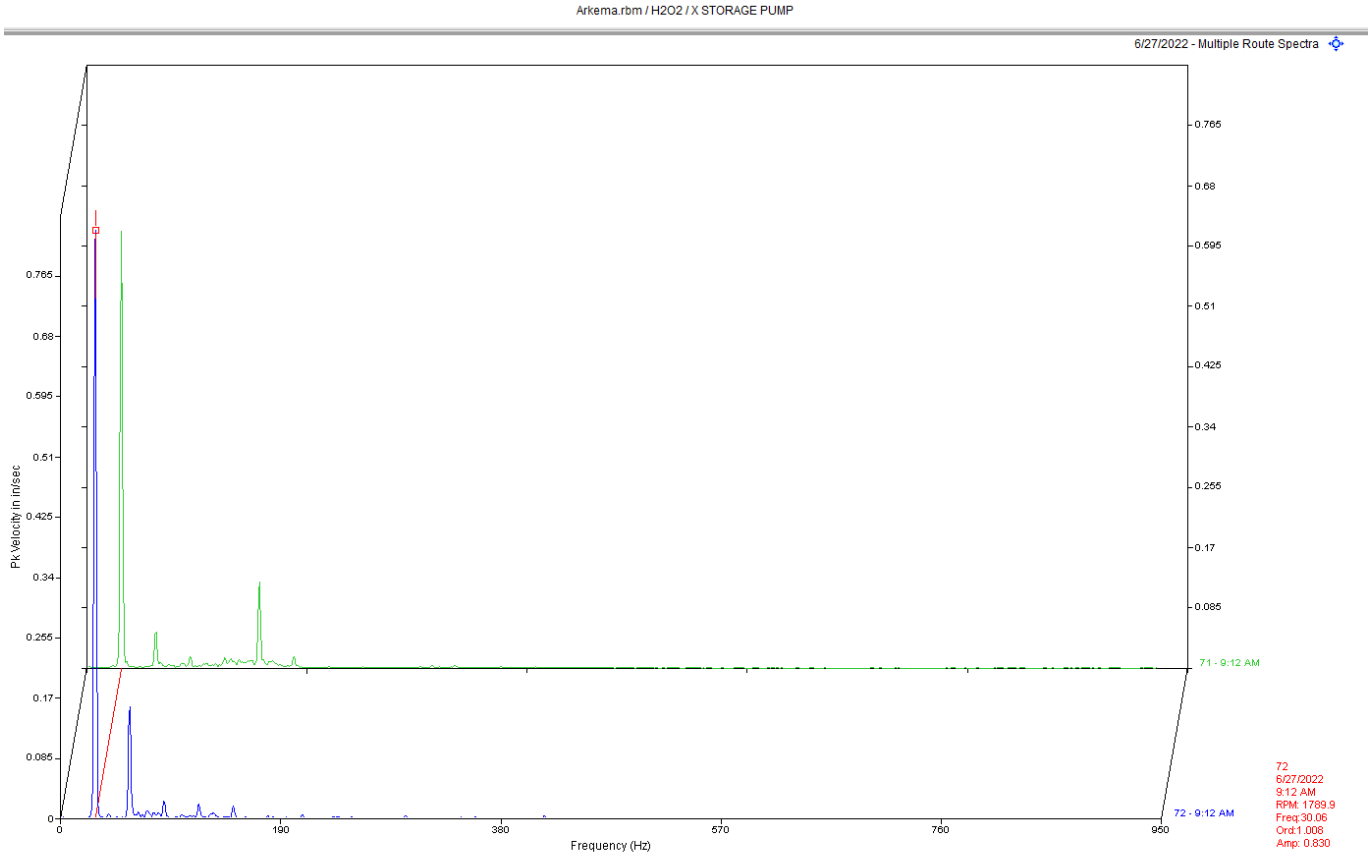
Observation:

Data above is the outboard pump bearing horizontal. Peaks in spectrum are 16 x rpm and harmonics there of which are related to vane pass. There is also quite a bit of non-synchronous vibration as well. Trend data of POH shows increased amplitude.

Recommendation:

Pump has elevated vane pass vibrations which is likely due to process flow issues. Pump bearings still appear to have defects according to the spectral data. Pump may need to be replaced in the upcoming months.

X Storage Pump CLASS III



Observation:

Spectral data above is the pump horizontal and vertical. Amplitude is .87 ips-pk at the pump vertical. Horizontal is .65 ips- pk. Dominant 1 x rpm vibration present in both spectra.

Recommendation:

Data indicates possible imbalance of the pump or coupling issue. Inspect couplings and alignment soon. Also inspect all fasteners If vibration persists, the pump impeller may be out of balance or have other internal issues.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 6: ARKEMA WK4

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.056 In/Sec	.459 G-s
21 - Motor IB HOR	.064 In/Sec	.716 G-s
23 - Motor IB AXIAL	.179 In/Sec	.190 G-s
71 - Compressor IB HOR	.127 In/Sec	1.786 G-s
81 - Compressor OB Horiz	.164 In/Sec	1.084 G-s
83 - Compressor OB Axial	.098 In/Sec	1.433 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHZ
11 - C Hydro Agitator MOTOR OB HORIZ	.068 In/Sec	.852 G-s
12 - C Hydro Agitator MOTOR OB VERT	.055 In/Sec	1.037 G-s
13 - C Hydro Agitator Motor OB Axial	.068 In/Sec	.505 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.069 In/Sec	.828 G-s
22 - C Hydro Agitator MOTOR IB VERT	.085 In/Sec	.835 G-s
23 - C Hydro Agitator Motor IB Axial	.066 In/Sec	.667 G-s
31 - C Hydro Agitator GrBx In Horizon	.062 In/Sec	.280 G-s
32 - C Hydro Agitator GrBx In VERT	.064 In/Sec	.453 G-s
33 - C Hydro Agitator GrBx In Axial	.036 In/Sec	.274 G-s
41 - C HY AG GBX INPUT OUTBOARD HZ	.051 In/Sec	.758 G-s
42 - C HY AG GBX INPUT OUTBOARD VERT	.059 In/Sec	.448 G-s
51 - C Hydro GrBx shaft 2 Top HZ E-W	.049 In/Sec	.140 G-s
53 - C Hydro GrBx shaft 2 Top AXIAL	.155 In/Sec	.374 G-s
61 - C Hydro GrBx shaft 2 BOT HZ E-W	.026 In/Sec	.176 G-s
71 - C Hydro GrBx OUTPUT TOP HZ E-W	.039 In/Sec	.165 G-s
81 - C Hydro GrBx OUTPUT BOT HZ E-W	.023 In/Sec	.196 G-s
83 - C Hydro GrBx OUTPUT Top Axial	.046 In/Sec	.256 G-s
57 - A/B Concentr Vac Pmp-var RPM	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.067 In/Sec	.296 G-s
12 - Motor OB VERT	.058 In/Sec	.565 G-s
21 - Motor IB HOR	.069 In/Sec	.417 G-s
23 - Motor IB AXIAL	.058 In/Sec	.366 G-s
71 - Compressor IB HOR	.106 In/Sec	.392 G-s
81 - Compressor OB Horiz	.267 In/Sec	3.230 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.038 In/Sec	.334 G-s
12 - Motor OB VERT	.029 In/Sec	.530 G-s
21 - Motor IB HOR	.035 In/Sec	.487 G-s
22 - Motor IB VERT	.035 In/Sec	.474 G-s
23 - Motor IB AXIAL	.045 In/Sec	.333 G-s
71 - Compressor IB HOR	.061 In/Sec	.609 G-s
72 - Compressor IB VERT	.055 In/Sec	.370 G-s
81 - Compressor OB Horiz	.075 In/Sec	1.218 G-s
82 - Compressor OB VERT	.067 In/Sec	1.337 G-s
C-203 - C-203 Comp	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.083 In/Sec	3.507 G-s
12 - MOTOR OB VERT	.032 In/Sec	.878 G-s
21 - MOTOR IB HOR	.060 In/Sec	1.748 G-s
22 - MOTOR IB VERT	.098 In/Sec	3.656 G-s
23 - MOTOR IB AXIAL	.066 In/Sec	2.928 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.050 In/Sec	2.365 G-s

72M - COMP MALE SHAFT IB VERT	.040 In/Sec	2.404 G-s
73M - COMP MALE SHAFT IB AXIAL	.047 In/Sec	4.454 G-s
81M - COMP MALE SHAFT OB HOR	.064 In/Sec	9.952 G-s
82M - COMP MALE SHAFT OB VERT	.058 In/Sec	4.231 G-s
71F - COMP FEMALE SHAFT IB HOR	.036 In/Sec	3.468 G-s
72F - COMP FEMALE SHAFT IB VERT	.045 In/Sec	2.508 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.078 In/Sec	2.825 G-s
81F - COMP FEMALE SHAFT OB HOR	.028 In/Sec	4.324 G-s
82F - COMP FEMALE SHAFT OB VERT	.034 In/Sec	2.450 G-s

C-202 - C-202 Comp	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.090 In/Sec	4.060 G-s
12 - MOTOR OB VERT	.121 In/Sec	1.431 G-s
21 - MOTOR IB HOR	.065 In/Sec	.308 G-s
22 - MOTOR IB VERT	.108 In/Sec	2.910 G-s
23 - MOTOR IB AXIAL	.035 In/Sec	.608 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.045 In/Sec	4.506 G-s
72M - COMP MALE SHAFT IB VERT	.066 In/Sec	3.283 G-s
73M - COMP MALE SHAFT IB AXIAL	.074 In/Sec	3.571 G-s
81M - COMP MALE SHAFT OB HOR	.051 In/Sec	8.342 G-s
82M - COMP MALE SHAFT OB VERT	.050 In/Sec	3.383 G-s
71F - COMP FEMALE SHAFT IB HOR	.028 In/Sec	5.532 G-s
72F - COMP FEMALE SHAFT IB VERT	.071 In/Sec	2.720 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.061 In/Sec	3.524 G-s
81F - COMP FEMALE SHAFT OB HOR	.042 In/Sec	4.808 G-s
82F - COMP FEMALE SHAFT OB VERT	.053 In/Sec	2.910 G-s

C-201 - C-201 Comp	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.160 In/Sec	5.361 G-s
12 - MOTOR OB VERT	.149 In/Sec	5.930 G-s
21 - MOTOR IB HOR	.101 In/Sec	1.822 G-s
22 - MOTOR IB VERT	.119 In/Sec	4.560 G-s
23 - MOTOR IB AXIAL	.077 In/Sec	3.243 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.055 In/Sec	5.642 G-s
72M - COMP MALE SHAFT IB VERT	.052 In/Sec	3.055 G-s
73M - COMP MALE SHAFT IB AXIAL	.070 In/Sec	3.011 G-s
81M - COMP MALE SHAFT OB HOR	.064 In/Sec	8.399 G-s
82M - COMP MALE SHAFT OB VERT	.053 In/Sec	6.989 G-s
71F - COMP FEMALE SHAFT IB HOR	.034 In/Sec	2.715 G-s
72F - COMP FEMALE SHAFT IB VERT	.056 In/Sec	3.554 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.087 In/Sec	4.130 G-s
81F - COMP FEMALE SHAFT OB HOR	.058 In/Sec	13.49 G-s
82F - COMP FEMALE SHAFT OB VERT	.057 In/Sec	4.455 G-s

new AC - INSTRUMENT AIR COMPRESSOR	(27-Jun-22)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.115 In/Sec	1.660 G-s
12 - MOTOR OB VERT	.116 In/Sec	2.170 G-s
13 - MOTOR OB AXIAL	.054 In/Sec	.883 G-s
21 - MOTOR IB HOR	.118 In/Sec	1.997 G-s
22 - MOTOR IB VERT	.061 In/Sec	1.178 G-s
23 - MOTOR IB AXIAL	.050 In/Sec	1.560 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.192 In/Sec	8.304 G-s
72M - COMP MALE SHAFT IB VERT	.128 In/Sec	3.432 G-s
73M - COMP MALE SHAFT IB AXIAL	.152 In/Sec	4.746 G-s
81M - COMP MALE SHAFT OB HOR	.104 In/Sec	3.132 G-s
82M - COMP MALE SHAFT OB VERT	.321 In/Sec	7.742 G-s
83M - COMP MALE SHAFT OB AXIAL	.141 In/Sec	3.402 G-s
71F - COMP FEMALE SHAFT IB HOR	.203 In/Sec	8.852 G-s
72F - COMP FEMALE SHAFT IB VERT	.205 In/Sec	11.19 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.183 In/Sec	7.510 G-s
81F - COMP FEMALE SHAFT OB HOR	.107 In/Sec	3.151 G-s
82F - COMP FEMALE SHAFT OB VERT	.352 In/Sec	8.161 G-s
83F - COMP FEMALE SHAFT OB AXIAL	.259 In/Sec	6.774 G-s

201-08A	- COMPRESSOR,NASH A 201-08A	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- Nash Compr A Motor OB Horiz	.042 In/Sec	.096 G-s
12	- Nash Compr A Motor OB Vertical	.052 In/Sec	.107 G-s
13	- Nash Compr A Motor OB Axial	.121 In/Sec	.138 G-s
21	- Nash Compr A Motor IB Horiz	.044 In/Sec	.073 G-s
22	- Nash Compr A Motor IB VERT	.066 In/Sec	.102 G-s
23	- Nash Compr A Motor IB AXIAL	.161 In/Sec	.298 G-s
71	- Nash Compr A COMP IB HORIZ	.160 In/Sec	.525 G-s
72	- Nash Compr A Compressor IB Verti	.163 In/Sec	.412 G-s
73	- Nash Compr A COMP IB AXIAL	.109 In/Sec	.261 G-s
81	- Nash Compr A COMP OB HORIZ	.142 In/Sec	.142 G-s
82	- Nash Compr A Compressor OB Verti	.177 In/Sec	.112 G-s
83	- Nash Compr A Compressor OB Axial	.095 In/Sec	.156 G-s
202-05	- NASH SEAL LIQUID PUMP-A	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZ	.014 In/Sec	.199 G-s
21	- MOTOR INBOARD HORIZ	.014 In/Sec	.167 G-s
23	- MOTOR INBOARD AXIAL	.016 In/Sec	.238 G-s
71	- PUMP HORIZ	.020 In/Sec	.051 G-s
72	- PUMP VERT	.016 In/Sec	.048 G-s
9002-10	- D-HYDROGENATOR AGITATOR	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.114 In/Sec	.280 G-s
21	- MOTOR INBOARD HORIZONTAL	.065 In/Sec	.237 G-s
23	- MOTOR INBOARD AXIAL	.155 In/Sec	.280 G-s
		OVERALL LEVEL	1-20 KHZ
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.208 In/Sec	.917 G-s
31L	- GEARBOX INPUT SHAFT-N-S-LOW FRQ	.226 In/Sec	.961 G-s
		OVERALL LEVEL	1-20 KHz
51	- GEARBOX OUTPUT TOP E-W	.236 In/Sec	.177 G-s
51L	- GEARBOX OUTPUT TOP E-W- 100RPM	.209 In/Sec	.179 G-s
52	- GEARBOX TOP PLATE- N-S	.280 In/Sec	.335 G-s
52L	- GEARBOX OUTPUT TOP N-S 100RPM	.222 In/Sec	.366 G-s
53	- GEARBOX OUTPUT TOP -AXIAL	.043 In/Sec	.437 G-s
53L	- GEARBOX OUTPUT TOP AXIAL 100RPM	.025 In/Sec	.418 G-s
61	- GEARBOX OUTPUT BOTTOM E-W-HZ	.203 In/Sec	.245 G-s
61L	- GEARBOX OUTPUT BOTTOM-E-W 100RPM	.165 In/Sec	.553 G-s
XSTORPMP	- X STORAGE PUMP	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.375 In/Sec	.179 G-s
21	- MOTOR INBOARD HORIZONTAL	.465 In/Sec	.324 G-s
23	- MOTOR INBOARD AXIAL	.466 In/Sec	.238 G-s
71	- PUMP HORIZONTAL	.653 In/Sec	.182 G-s
72	- PUMP VERTICAL	.875 In/Sec	.205 G-s
YSTORPMP	- Y STORAGE PUMP	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.146 In/Sec	1.373 G-s
21	- MOTOR INBOARD HORIZONTAL	.126 In/Sec	.621 G-s
23	- MOTOR INBOARD AXIAL	.034 In/Sec	.466 G-s
71	- PUMP HORIZONTAL	.069 In/Sec	.282 G-s
72	- PUMP VERTICAL	.070 In/Sec	.325 G-s
RSTORPMP	- R STORAGE PUMP	(27-Jun-22)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.055 In/Sec	1.566 G-s
21	- MOTOR INBOARD HORIZONTAL	.033 In/Sec	.777 G-s
23	- MOTOR INBOARD AXIAL	.143 In/Sec	.249 G-s
71	- PUMP HORIZONTAL	.072 In/Sec	.357 G-s
72	- PUMP VERTICAL	.758 In/Sec	.124 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

HI-SPEED INDUSTRIAL SERVICE

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