HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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July 18th, 2023

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The following is a summary of findings from the June 2023 WEEK 1 vibration survey at the H2O2 Plant that was performed on July 7th, 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.

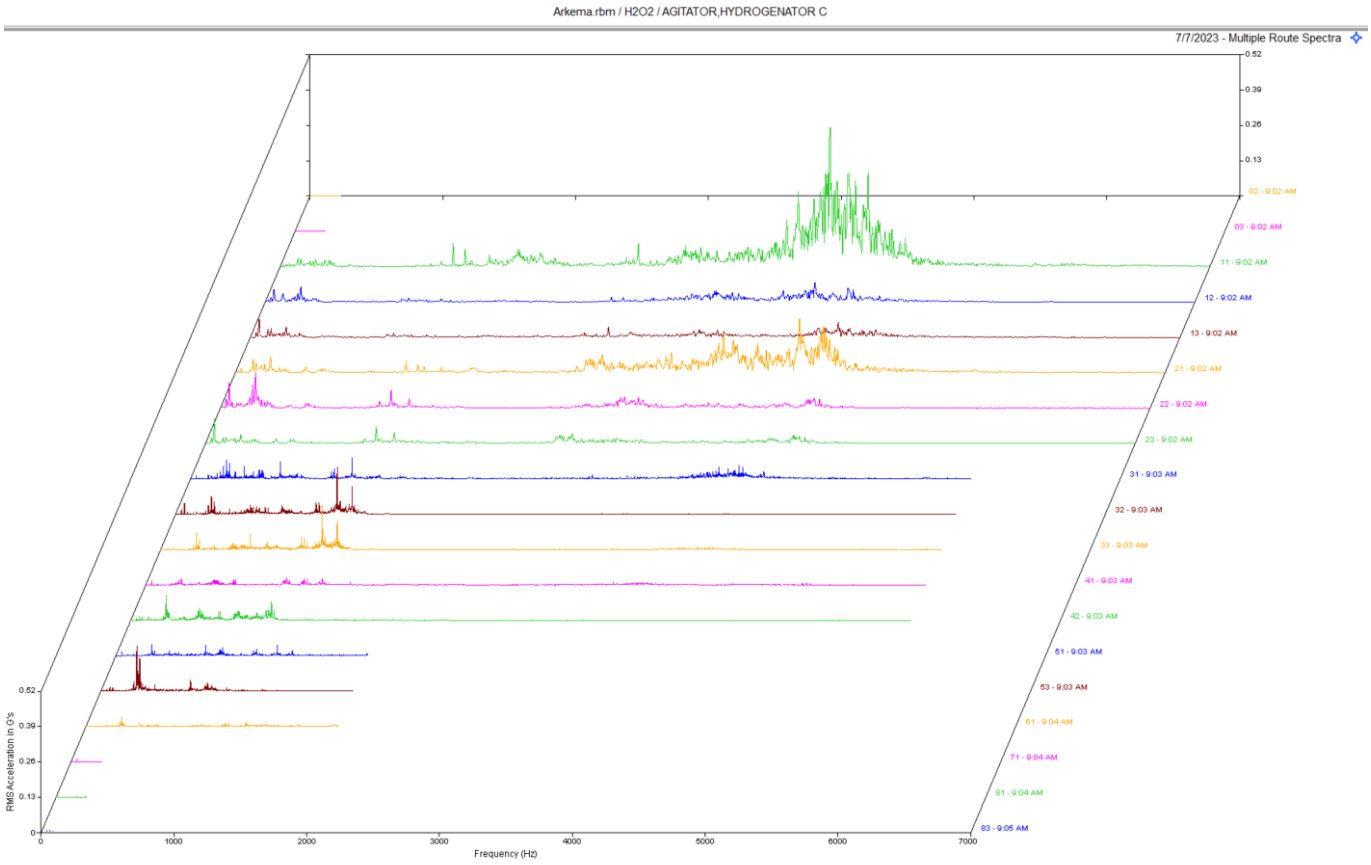
CLASS III; Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

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

WEEK 1 H2O2 Plant

Agitator, Hydrogenator C **CLASS I**



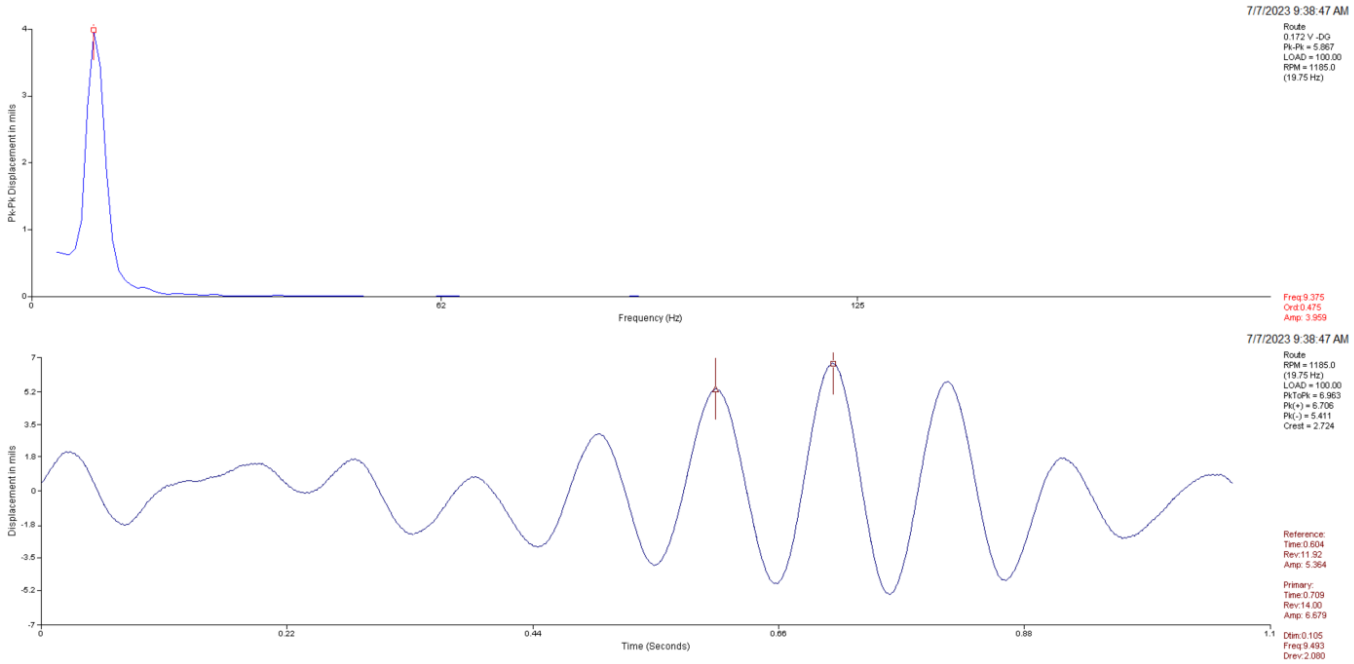
Observation:

Data above is a multipoint spectral waterfall. Data does show an increase in noise floor in the motor data. Data points labeled 11-23.

Recommendation:

Motor data still suggests a possible issue in the motor. May be rolling element defects in bearings. Still looks minor at this point and we are monitoring this closely.

D Hydrogenator Agitator CLASS II



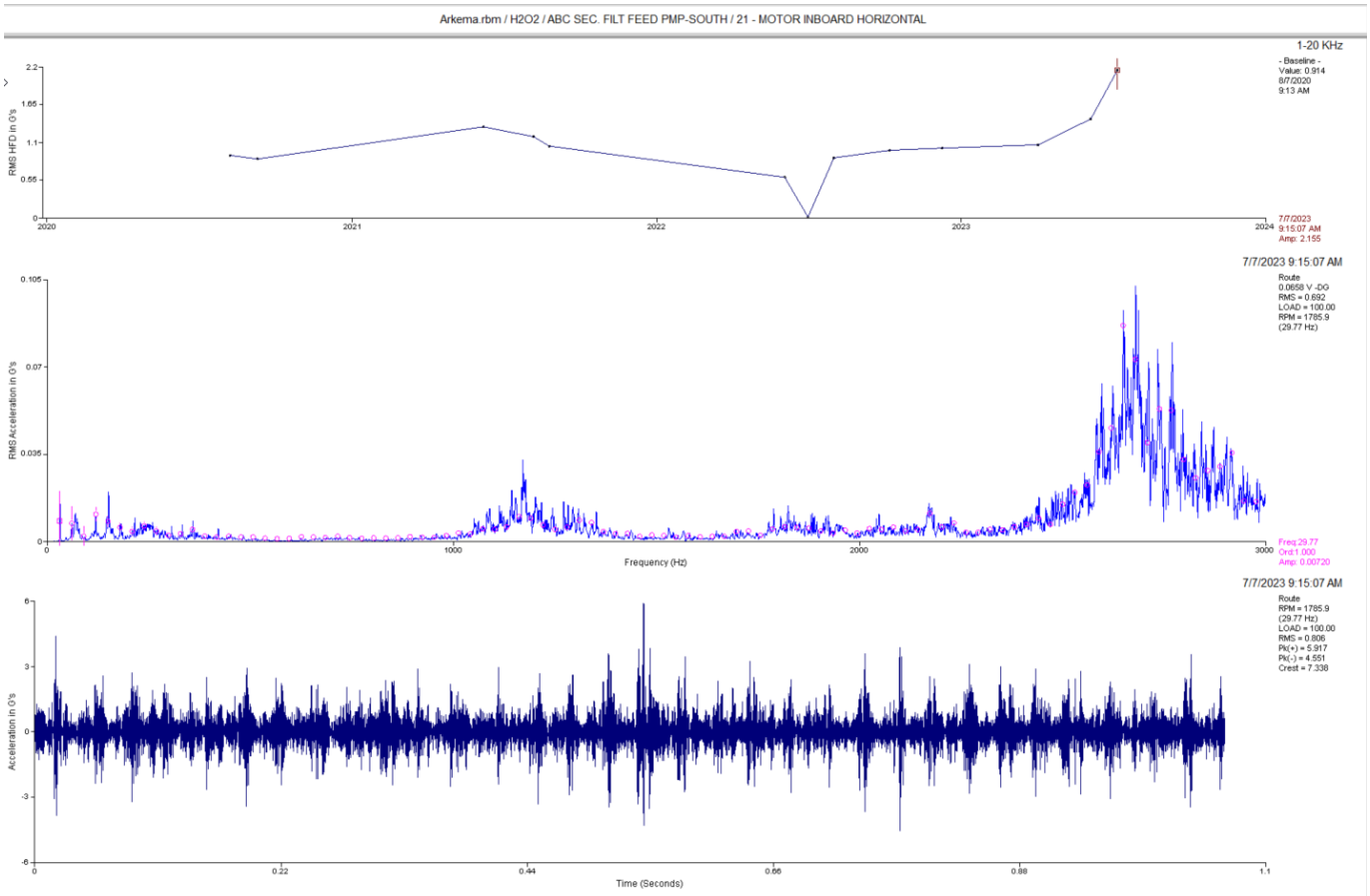
Observation:

Data above is output top radial direction (East-West). Displacement amplitudes are quite high. Waveform shows an amplitude of 11 mil peak-peak. There is quite a bit of low frequency vibration in the gear drive. Spectral and waveform data shows a dominant low frequency vibration that is likely a harmonic of output speed of the gearbox. Gearbox does appear to have visible torsional movement. The gear mesh vibration previously seen in the data appears to be lower this survey.

Recommendation:

Ensure output shaft does not excessive shaft defection. Check coupling hubs and shaft for run out using a dial indicator. Will continue to monitor closely.

ABC SEC Filtered Feed Pump SOUTH CLASS II



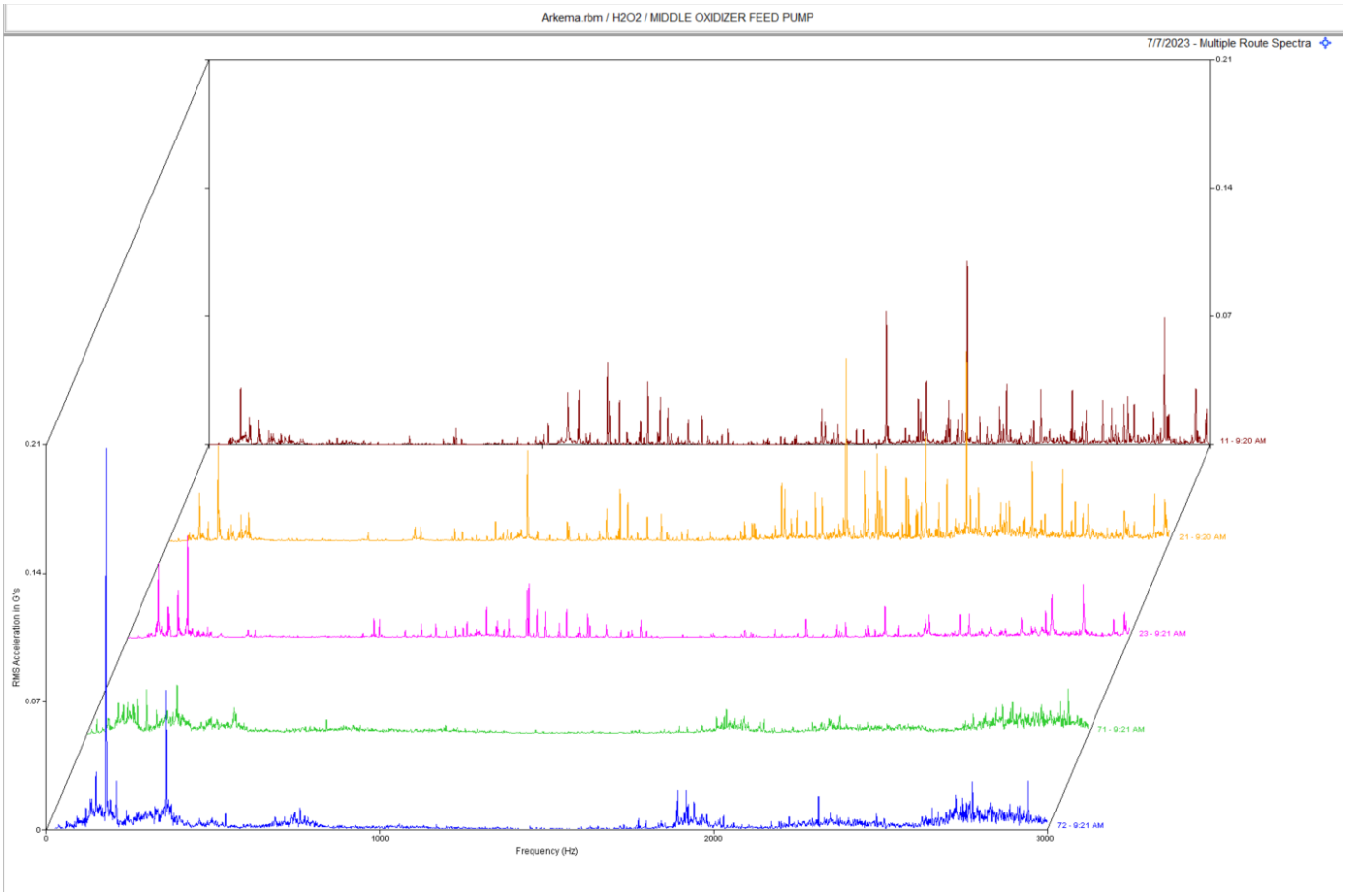
Observation:

Data above is the motor DE horizontal. Acceleration data shows an increase in amplitude, noise floor, and impacting in the time waveform.

Recommendation:

Motor data suggests defects are present in the motor bearings. Pump also has quite a bit of noise floor and signs of internal issues such as cavitation and possible bearing defects. Inspect motor and pump as scheduling allows.

Middle Oxidizer Feed Pump CLASS I



Observation:

Data above is multi-point spectra of the motor and pump. Points 11-23 are motor points. Non-synchronous peaks present at these points indicate bearing defects of the motor bearings.

Recommendation:

Motor data suggests defects are present in the motor bearings. Motor may need attention in the next few months.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 1: ARK WK 1

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(14-Jul-23)	
	OVERALL LEVEL	1-20 KHz
11	.099 In/Sec	.642 G-s
21	.088 In/Sec	.454 G-s
23	.126 In/Sec	.126 G-s
71	.144 In/Sec	1.967 G-s
81	.193 In/Sec	.469 G-s
83	.145 In/Sec	.975 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(14-Jul-23)	
	OVERALL LEVEL	1-20 KHZ
02	.047 In/Sec	.015 G-s
03	.049 In/Sec	.0087 G-s
11	.073 In/Sec	1.905 G-s
12	.121 In/Sec	.366 G-s
13	.112 In/Sec	.493 G-s
21	.087 In/Sec	1.528 G-s
22	.187 In/Sec	.326 G-s
23	.109 In/Sec	.301 G-s
31	.071 In/Sec	.468 G-s
32	.104 In/Sec	.550 G-s
33	.053 In/Sec	.169 G-s
41	.062 In/Sec	.238 G-s
42	.089 In/Sec	.569 G-s
51	.054 In/Sec	.171 G-s
53	.055 In/Sec	.054 G-s
61	.039 In/Sec	.285 G-s
71	.050 In/Sec	.216 G-s
81	.022 In/Sec	.311 G-s
83	.054 In/Sec	.188 G-s
57 - A/B Concentr Vac Pmp-var RPM	(14-Jul-23)	
	OVERALL LEVEL	1-20 KHz
11	.059 In/Sec	.431 G-s
12	.067 In/Sec	.196 G-s
21	.048 In/Sec	.430 G-s
23	.064 In/Sec	.143 G-s
71	.126 In/Sec	.931 G-s
81	.462 In/Sec	.785 G-s
83	.169 In/Sec	.313 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(14-Jul-23)	
	OVERALL LEVEL	1-20 KHz
11	.053 In/Sec	.404 G-s
12	.075 In/Sec	.124 G-s
21	.042 In/Sec	.677 G-s
22	.313 In/Sec	.122 G-s
23	.151 In/Sec	.094 G-s
71	.071 In/Sec	.461 G-s
72	.122 In/Sec	.643 G-s
81	.066 In/Sec	1.120 G-s
82	.074 In/Sec	.698 G-s
83	.050 In/Sec	.756 G-s
236-06 - HYDRO FD PUMP N 236-06 -2FLR	(07-Jul-23)	
	OVERALL LEVEL	1-20 KHz
11	.105 In/Sec	.125 G-s

	21	.064 In/Sec	1.059 G-s
7007-24	- ABC SEC. FILT FEED PMP-SOUTH	(07-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.045 In/Sec	.398 G-s
	21	.066 In/Sec	3.048 G-s
	23	.045 In/Sec	2.276 G-s
	71	.194 In/Sec	2.858 G-s
	72	.219 In/Sec	2.424 G-s
2130-6	- ABC SEC FILT FEED PUMP-NORTH	(07-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.029 In/Sec	.913 G-s
	21	.034 In/Sec	.695 G-s
	23	.032 In/Sec	1.853 G-s
	71	.152 In/Sec	1.132 G-s
	72	.109 In/Sec	1.306 G-s
9001-1	- EAST OXIDIZER FEED PUMP	(07-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.043 In/Sec	.554 G-s
	21	.050 In/Sec	.688 G-s
	23	.059 In/Sec	1.893 G-s
	71	.112 In/Sec	.772 G-s
	72	.124 In/Sec	.483 G-s
9001-2	- MIDDLE OXIDIZER FEED PUMP	(07-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.044 In/Sec	2.192 G-s
	21	.050 In/Sec	.576 G-s
	23	.061 In/Sec	.799 G-s
	71	.073 In/Sec	.380 G-s
	72	.122 In/Sec	.309 G-s
7016-11	- WEST OXIDIZER FEED PUMP	(07-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.030 In/Sec	1.373 G-s
	21	.029 In/Sec	1.313 G-s
	23	.023 In/Sec	1.678 G-s
	71	.109 In/Sec	.539 G-s
	72	.085 In/Sec	.498 G-s
C-203	- C-203 Comp	(14-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.038 In/Sec	1.306 G-s
	12	.026 In/Sec	.598 G-s
	21	.028 In/Sec	1.019 G-s
	22	.018 In/Sec	.140 G-s
	23	.024 In/Sec	.427 G-s
		OVERALL LEVEL	1-20 KHZ
	71M	.052 In/Sec	2.947 G-s
	72M	.042 In/Sec	.867 G-s
	73M	.074 In/Sec	1.458 G-s
	81M	.046 In/Sec	6.418 G-s
	82M	.040 In/Sec	1.217 G-s
	71F	.046 In/Sec	3.594 G-s
	72F	.050 In/Sec	.805 G-s
	73F	.034 In/Sec	.718 G-s
	81F	.043 In/Sec	12.46 G-s
	82F	.037 In/Sec	.837 G-s
C-202	- C-202 Comp	(14-Jul-23)	
		OVERALL LEVEL	1-20 KHz
	11	.085 In/Sec	3.332 G-s
	12	.154 In/Sec	1.672 G-s
	21	.068 In/Sec	.476 G-s
	22	.064 In/Sec	.342 G-s
	23	.046 In/Sec	.331 G-s
		OVERALL LEVEL	1-20 KHZ
	71M	.056 In/Sec	5.218 G-s

72M		.030 In/Sec	.659 G-s
73M		.085 In/Sec	.800 G-s
81M		.042 In/Sec	8.206 G-s
82M		.046 In/Sec	.877 G-s
71F		.044 In/Sec	14.21 G-s
72F		.059 In/Sec	1.530 G-s
73F		.059 In/Sec	2.644 G-s
81F		.044 In/Sec	7.815 G-s
82F		.051 In/Sec	1.529 G-s

C-201 - C-201 Comp (07-Jul-23)

	OVERALL LEVEL	1-20 KHz
11	.104 In/Sec	2.417 G-s
12	.061 In/Sec	.864 G-s
21	.106 In/Sec	.869 G-s
22	.038 In/Sec	.332 G-s
23	.064 In/Sec	.288 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.058 In/Sec	5.528 G-s
72M	.037 In/Sec	.630 G-s
73M	.067 In/Sec	.735 G-s
81M	.036 In/Sec	7.267 G-s
82M	.031 In/Sec	1.000 G-s
71F	.055 In/Sec	4.113 G-s
72F	.049 In/Sec	1.241 G-s
73F	.045 In/Sec	.943 G-s
81F	.093 In/Sec	20.85 G-s
82F	.058 In/Sec	1.884 G-s

new AC - INSTRUMENT AIR COMPRESSOR (14-Jul-23)

	OVERALL LEVEL	1-20 KHz
11	.092 In/Sec	1.135 G-s
12	.096 In/Sec	.602 G-s
13	.045 In/Sec	.395 G-s
21	.072 In/Sec	1.339 G-s
22	.089 In/Sec	1.687 G-s
23	.046 In/Sec	.656 G-s
	OVERALL LEVEL	1-20 KHZ
71F	.089 In/Sec	6.158 G-s
72F	.097 In/Sec	1.520 G-s
73F	.069 In/Sec	1.420 G-s
81F	.120 In/Sec	4.015 G-s
82F	.333 In/Sec	1.672 G-s
83F	.257 In/Sec	1.443 G-s
71M	.091 In/Sec	8.545 G-s
72M	.107 In/Sec	2.167 G-s
73M	.103 In/Sec	1.803 G-s
81M	.127 In/Sec	5.859 G-s
82M	.282 In/Sec	2.501 G-s
83M	.120 In/Sec	2.074 G-s

201-08A - COMPRESSOR,NASH A 201-08A (14-Jul-23)

	OVERALL LEVEL	1-20 KHz
11	.072 In/Sec	.138 G-s
12	.044 In/Sec	.097 G-s
13	.137 In/Sec	.105 G-s
21	.048 In/Sec	.145 G-s
22	.085 In/Sec	.211 G-s
23	.124 In/Sec	.209 G-s
71	.166 In/Sec	.479 G-s
72	.148 In/Sec	.141 G-s
73	.134 In/Sec	.156 G-s
81	.153 In/Sec	.184 G-s
82	.180 In/Sec	.155 G-s
83	.123 In/Sec	.208 G-s

9002-10 - D-HYDROGENATOR AGITATOR (14-Jul-23)

	OVERALL LEVEL	1-20 KHz
11	.070 In/Sec	.255 G-s
21	.069 In/Sec	.248 G-s

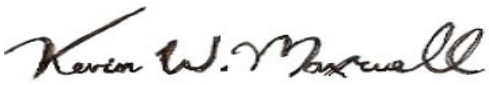
23	.078 In/Sec	.064 G-s
	OVERALL LEVEL	1-20 KHZ
31	.148 In/Sec	.878 G-s
31L	.132 In/Sec	.904 G-s
	OVERALL LEVEL	1-20 KHz
51	.276 In/Sec	.252 G-s
51L	.276 In/Sec	.252 G-s
52	.067 In/Sec	.326 G-s
52L	.237 In/Sec	.565 G-s
53	.207 In/Sec	.194 G-s
53L	.090 In/Sec	.602 G-s
61	.168 In/Sec	.304 G-s
61L	.111 In/Sec	.304 G-s
81	.040 In/Sec	.038 G-s
82	.026 In/Sec	.076 G-s
83	.036 In/Sec	.017 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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