HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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November 8, 2023

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Arkema
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The following is a summary of findings from the November 2023 WEEK 1 vibration survey at the H2O2 Plant that was performed on October 13, 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.

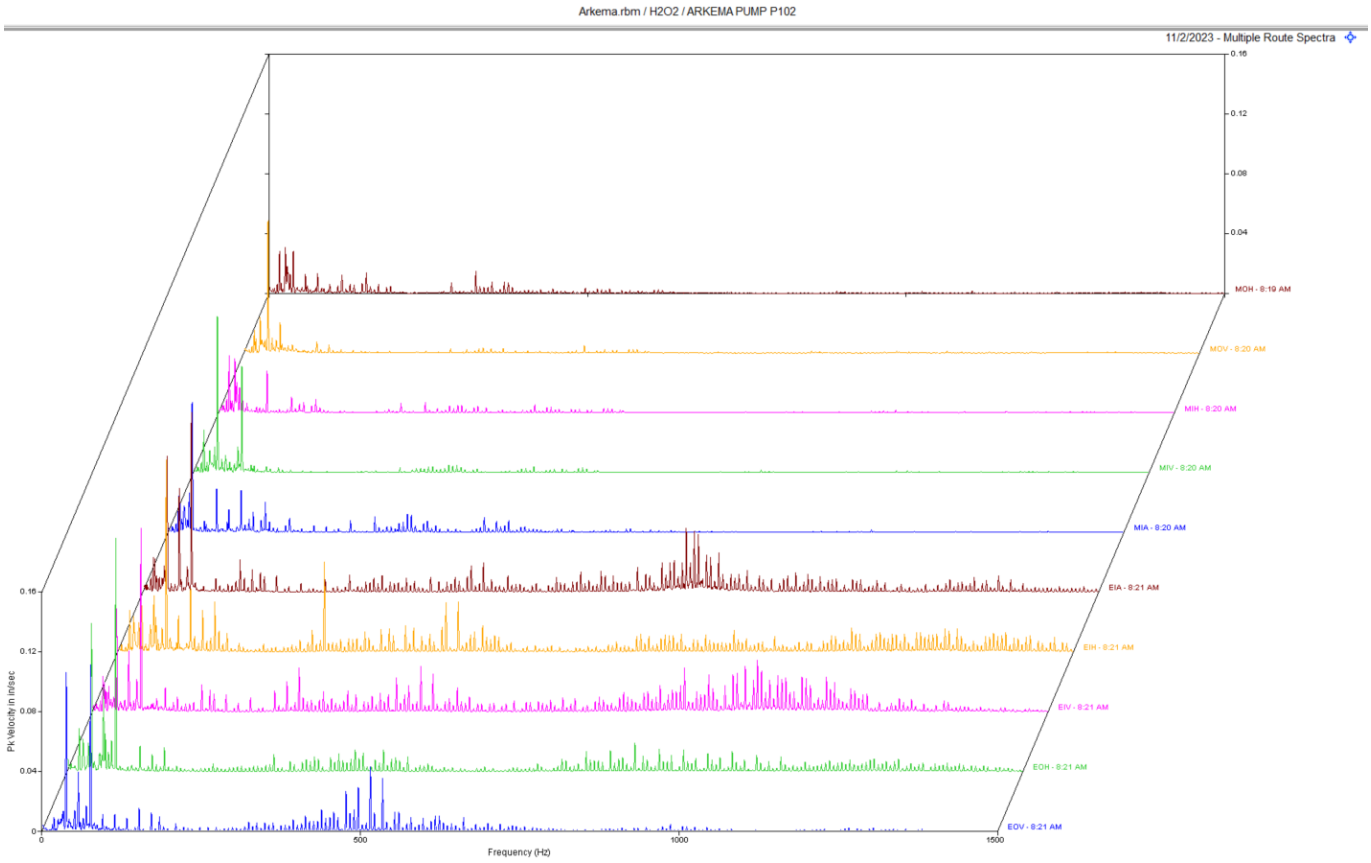
CLASS III; Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

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 2 H2O2 Plant

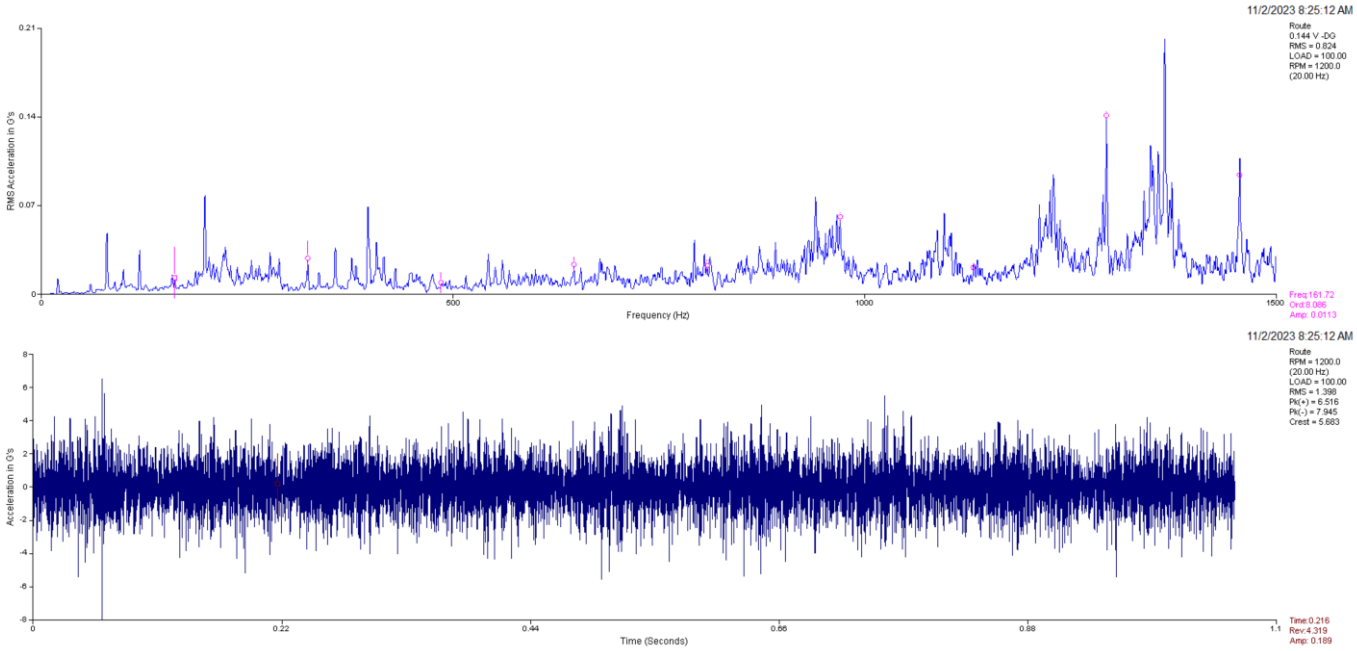
Pump 102 P102 CLASS I



Observation:
Data above is a multipoint spectral waterfall. Pump data (EIA-EOV) shows axial vibration with multiple rpm harmonics throughout the pump spectra.

Recommendation:
The pump appears to have possible internal wear beginning to occur. The higher vibration in the axial direction may indicate excessive axial clearances. We are monitoring this very closely.

C Concentrator Vacuum Pump CLASS I



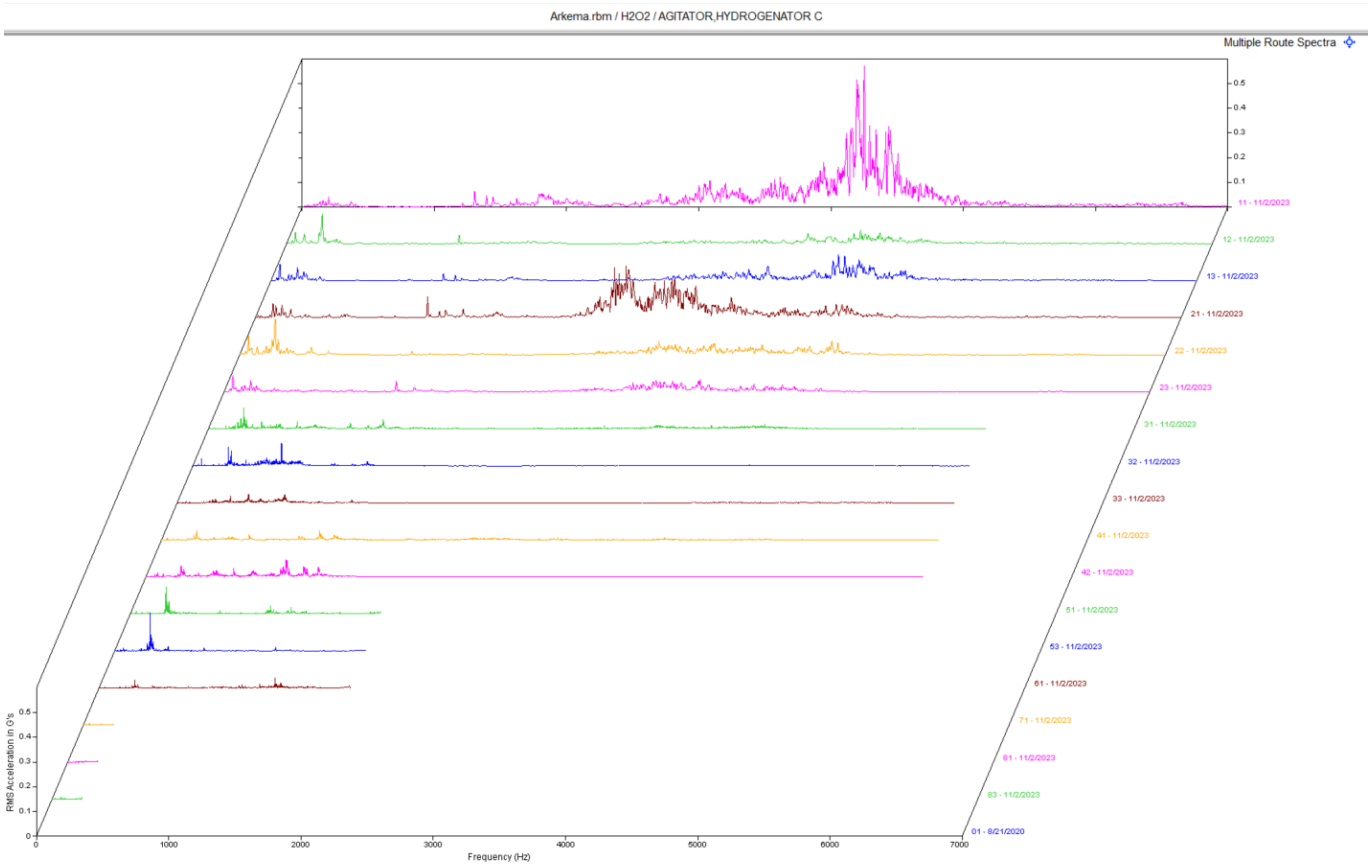
Observation:

Data above is the pump drive end horizontal. The small peaks in mid to high range of the spectrum are non-synchronous peaks and are very likely bearing defect frequencies but may be impeller related if pump has 8 vanes.

Recommendation:

The pump appears to have early to mid-stage bearing defects/wear and or impeller issues. We need to confirm the number of vanes on impeller. We are monitoring this issue closely.

Agitator, Hydrogenator C CLASS I



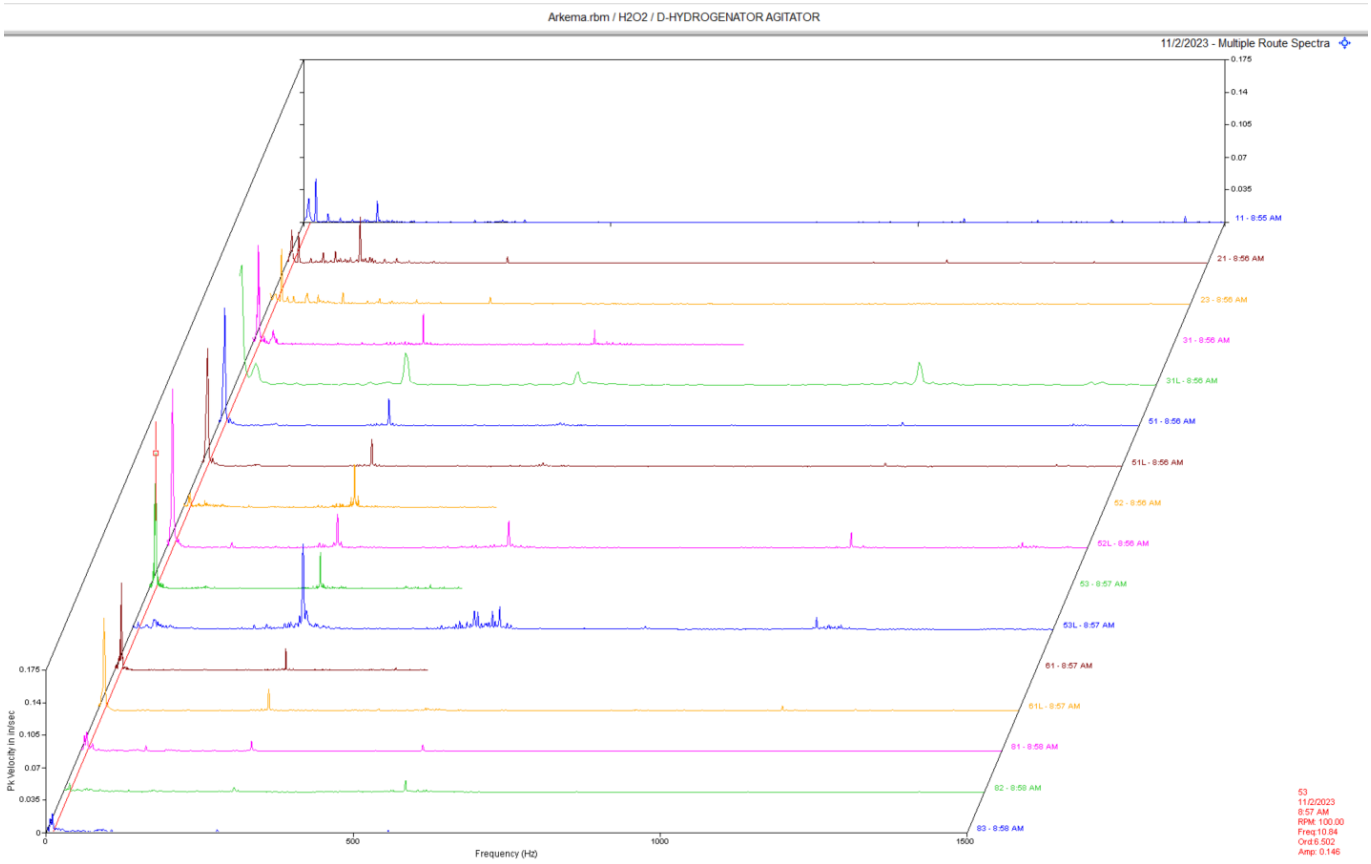
Observation:

Data above is a multipoint spectral waterfall. Data still shows some 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. This issue appears to be minor at this time and we are monitoring this closely.

D Hydrogenator Agitator CLASS II



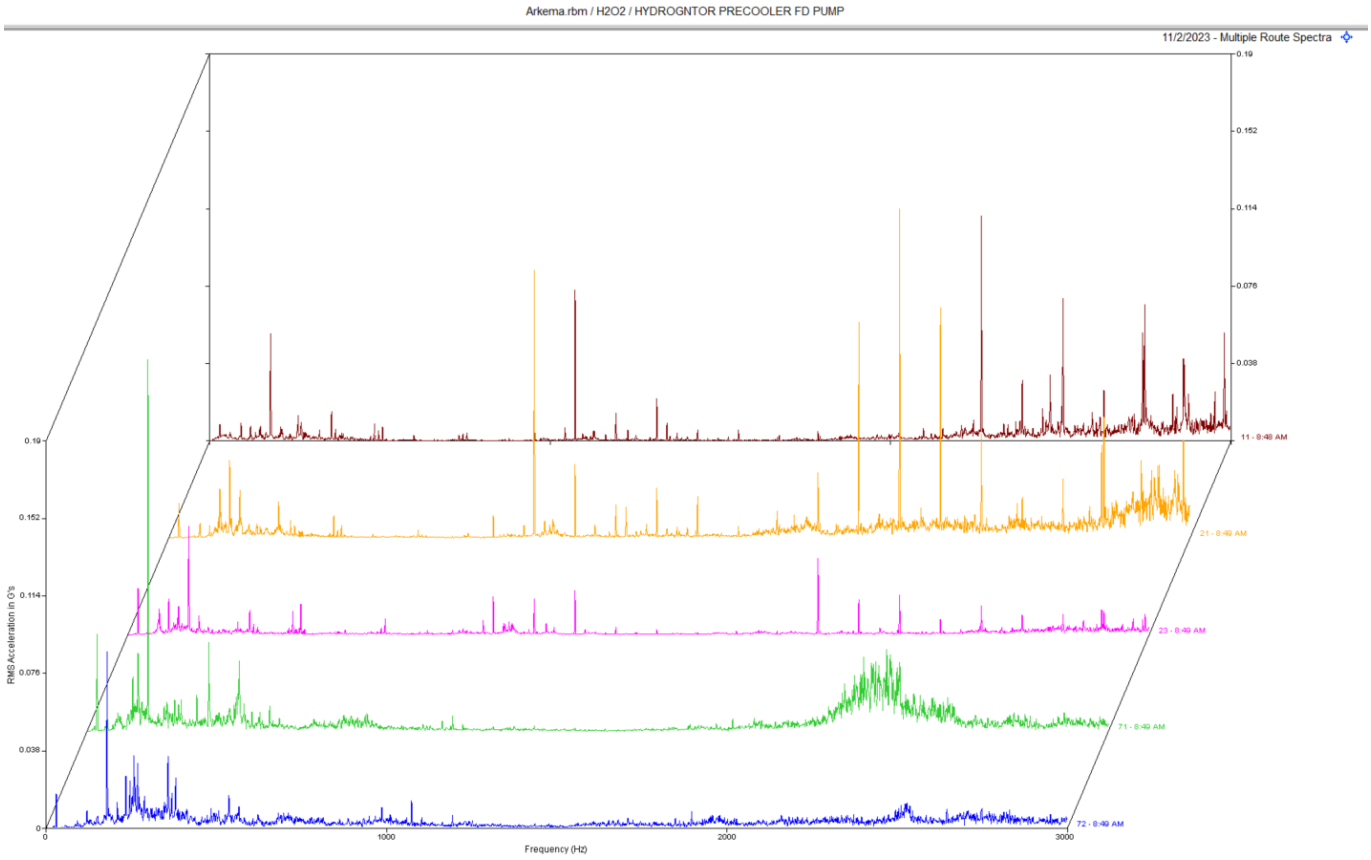
Observation:

Data above is a multi-point spectra of the motor and gear drive. 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. There is also some gear mesh harmonics on the output axial that have increased in amplitude.

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.

236-04A Hydrogenator Precooler Feed Pump CLASS II



Observation:
Motor data shows both electrical and mechanical defects according to the multi point spectra above.

Recommendation:
Data suggests issues with this motor. Motor should be replaced as time allows.

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
P102	- ARKEMA PUMP P102	(02-Nov-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.078 In/Sec	.343 G-s
MOV		.116 In/Sec	.467 G-s
MIH		.080 In/Sec	.554 G-s
MIV		.154 In/Sec	.461 G-s
MIA		.136 In/Sec	.190 G-s
EIA		.241 In/Sec	.401 G-s
EIH		.229 In/Sec	1.386 G-s
EIV		.241 In/Sec	1.227 G-s
EOH		.237 In/Sec	2.092 G-s
EOV		.206 In/Sec	.605 G-s
XSTORPMP	- X STORAGE PUMP	(02-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.046 In/Sec	.523 G-s
21		.047 In/Sec	.502 G-s
23		.039 In/Sec	.165 G-s
71		.107 In/Sec	.255 G-s
72		.041 In/Sec	.071 G-s
2130-1old	- C Concentrator Vacuum Pump	(02-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.061 In/Sec	.559 G-s
21		.094 In/Sec	.666 G-s
23		.194 In/Sec	.169 G-s
71		.144 In/Sec	1.793 G-s
81		.182 In/Sec	.766 G-s
83		.138 In/Sec	.544 G-s
7000-01	- AGITATOR,HYDROGENATOR C	(02-Nov-23)	
		OVERALL LEVEL	1-20 KHZ
02		.052 In/Sec	.028 G-s
03		.038 In/Sec	.025 G-s
11		.072 In/Sec	2.935 G-s
12		.112 In/Sec	.409 G-s
13		.118 In/Sec	.793 G-s
21		.085 In/Sec	1.118 G-s
22		.165 In/Sec	.534 G-s
23		.115 In/Sec	.402 G-s
31		.066 In/Sec	.390 G-s
32		.093 In/Sec	.108 G-s
33		.045 In/Sec	.087 G-s
41		.045 In/Sec	.288 G-s
42		.074 In/Sec	.336 G-s
51		.059 In/Sec	.172 G-s
53		.076 In/Sec	.062 G-s
61		.035 In/Sec	.196 G-s
71		.032 In/Sec	.184 G-s
81		.023 In/Sec	.180 G-s
83		.037 In/Sec	.287 G-s
57	- A/B Concentr Vac Pmp-var RPM	(02-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.049 In/Sec	.284 G-s

	12	.060 In/Sec	.162 G-s
	21	.068 In/Sec	.513 G-s
	23	.062 In/Sec	.158 G-s
	71	.134 In/Sec	.711 G-s
	81	.297 In/Sec	1.449 G-s
	83	.124 In/Sec	1.043 G-s

2130-1 - FLASH VAP VAC PUMP-var speed (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.048 In/Sec	.142 G-s
12	.041 In/Sec	.071 G-s
21	.062 In/Sec	1.674 G-s
22	.046 In/Sec	.192 G-s
23	.053 In/Sec	.235 G-s
71	.076 In/Sec	1.099 G-s
72	.079 In/Sec	.380 G-s
81	.089 In/Sec	1.534 G-s
82	.082 In/Sec	.508 G-s
83	.045 In/Sec	.406 G-s

236-06 - HYDRO FD PUMP N 236-06 -2FLR (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.106 In/Sec	.490 G-s
21	.083 In/Sec	.950 G-s

2130-6 - ABC SEC FILT FEED PUMP-NORTH (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.035 In/Sec	1.431 G-s
21	.050 In/Sec	1.311 G-s
23	.041 In/Sec	.862 G-s
71	.161 In/Sec	1.872 G-s
72	.111 In/Sec	2.066 G-s

9001-1 - EAST OXIDIZER FEED PUMP (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.028 In/Sec	.466 G-s
21	.043 In/Sec	.616 G-s
23	.064 In/Sec	.518 G-s
71	.083 In/Sec	1.092 G-s
72	.067 In/Sec	.969 G-s

9001-2 - MIDDLE OXIDIZER FEED PUMP (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.042 In/Sec	.662 G-s
21	.046 In/Sec	1.027 G-s
23	.064 In/Sec	1.185 G-s
71	.090 In/Sec	.465 G-s
72	.076 In/Sec	.718 G-s

7016-11 - WEST OXIDIZER FEED PUMP (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.037 In/Sec	.590 G-s
21	.022 In/Sec	.573 G-s
23	.028 In/Sec	.586 G-s
71	.094 In/Sec	.445 G-s
72	.076 In/Sec	1.285 G-s

234-01 - CHILL WATER PUMP 234-01 (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.076 In/Sec	1.466 G-s
21	.038 In/Sec	.593 G-s
23	.052 In/Sec	
71	.111 In/Sec	.559 G-s
72	.031 In/Sec	.652 G-s

C-203 - C-203 Comp (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.078 In/Sec	2.967 G-s
12	.033 In/Sec	.930 G-s
21	.048 In/Sec	2.134 G-s

	22	.020 In/Sec	.277 G-s
	23	.022 In/Sec	.208 G-s
		OVERALL LEVEL	1-20 KHZ
	71M	.088 In/Sec	4.592 G-s
	72M	.044 In/Sec	.958 G-s
	73M	.052 In/Sec	1.505 G-s
	81M	.059 In/Sec	13.69 G-s
	82M	.044 In/Sec	1.652 G-s
	71F	.050 In/Sec	3.351 G-s
	72F	.060 In/Sec	1.736 G-s
	73F	.038 In/Sec	1.013 G-s
	81F	.043 In/Sec	6.990 G-s
	82F	.041 In/Sec	1.491 G-s

9000-02 - D HYDROGENATOR FD PUMP- EAST (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.036 In/Sec	.602 G-s
21	.041 In/Sec	.541 G-s
23	.032 In/Sec	.803 G-s
71	.118 In/Sec	.974 G-s
72	.107 In/Sec	1.306 G-s

236-04A - HYDROGNTOR PRECOOLER FD PUMP (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.058 In/Sec	.737 G-s
21	.066 In/Sec	1.017 G-s
23	.080 In/Sec	1.951 G-s
71	.180 In/Sec	.683 G-s
72	.080 In/Sec	.534 G-s

C-202 - C-202 Comp (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.176 In/Sec	6.980 G-s
12	.161 In/Sec	2.792 G-s
21	.085 In/Sec	1.467 G-s
22	.054 In/Sec	.381 G-s
23	.046 In/Sec	.339 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.060 In/Sec	5.984 G-s
72M	.051 In/Sec	1.125 G-s
73M	.095 In/Sec	1.250 G-s
81M	.066 In/Sec	6.848 G-s
82M	.056 In/Sec	1.212 G-s
71F	.040 In/Sec	6.363 G-s
72F	.064 In/Sec	1.212 G-s
73F	.039 In/Sec	1.822 G-s
81F	.049 In/Sec	7.608 G-s
82F	.059 In/Sec	1.985 G-s

C-201 - C-201 Comp (02-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.158 In/Sec	5.723 G-s
12	.064 In/Sec	1.545 G-s
21	.092 In/Sec	1.496 G-s
22	.043 In/Sec	.434 G-s
23	.055 In/Sec	.236 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.088 In/Sec	4.806 G-s
72M	.047 In/Sec	1.457 G-s
73M	.074 In/Sec	1.273 G-s
81M	.069 In/Sec	16.88 G-s
82M	.036 In/Sec	1.374 G-s
71F	.040 In/Sec	5.853 G-s
72F	.067 In/Sec	1.902 G-s
73F	.049 In/Sec	1.564 G-s
81F	.048 In/Sec	8.035 G-s
82F	.068 In/Sec	1.741 G-s

201-08A - COMPRESSOR,NASH A 201-08A (02-Nov-23)

	OVERALL LEVEL	1-20 KHz

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            11                        .052 In/Sec        .111 G-s
            12                        .066 In/Sec        .086 G-s
            13                        .098 In/Sec        .107 G-s

      9002-10    - D-HYDROGENATOR AGITATOR        (02-Nov-23)
                                    OVERALL LEVEL     1-20 KHz
            11                        .069 In/Sec        .310 G-s
            21                        .082 In/Sec        .177 G-s
            23                        .074 In/Sec        .063 G-s
                                    OVERALL LEVEL     1-20 KHZ
            31                        .174 In/Sec        .616 G-s
            31L                       .158 In/Sec        .657 G-s
                                    OVERALL LEVEL     1-20 KHz
            51                        .176 In/Sec        .241 G-s
            51L                       .176 In/Sec        .241 G-s
            52                        .075 In/Sec        .278 G-s
            52L                       .231 In/Sec        .545 G-s
            53                        .274 In/Sec        .066 G-s
            53L                       .141 In/Sec        .277 G-s
            61                        .148 In/Sec        .230 G-s
            61L                       .136 In/Sec        .230 G-s
            81                        .042 In/Sec        .051 G-s
            82                        .029 In/Sec        .017 G-s
            83                        .038 In/Sec       .0095 G-s

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   Clarification Of Vibration Units:
      Acc       -->  G-s       PK
      Vel       -->  In/Sec    PK
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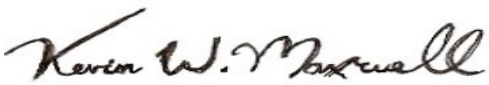
As always, it has been a pleasure to serve Arkema. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



ISO Certified Vibration Analyst, Category III

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