HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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November 20, 2023

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The following is a summary of findings from the November 2023 WEEK 3 vibration survey at the H2O2 Plant that was performed on November 16, 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.

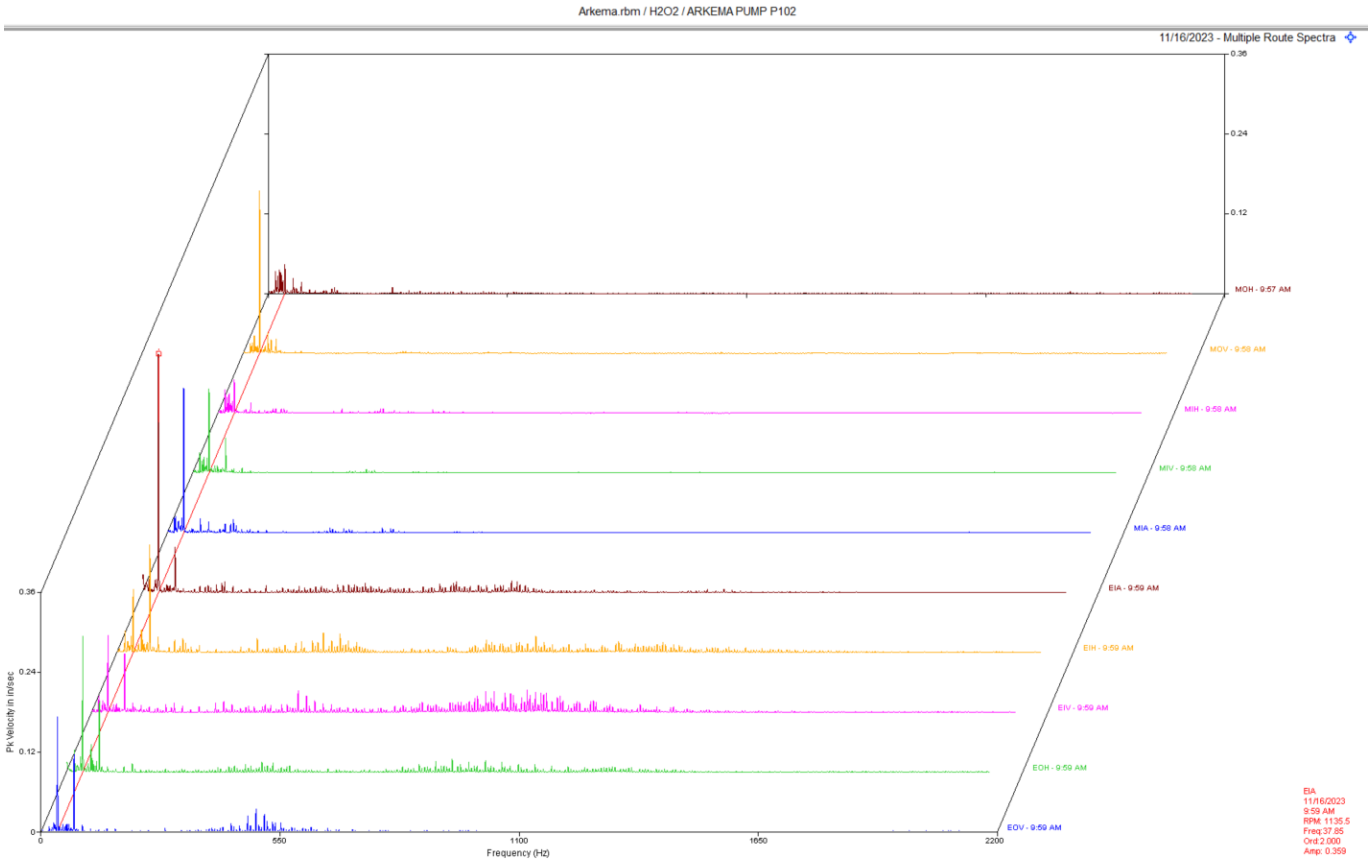
CLASS III; Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

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 3 H2O2 Plant

Pump 102 P102 CLASS I



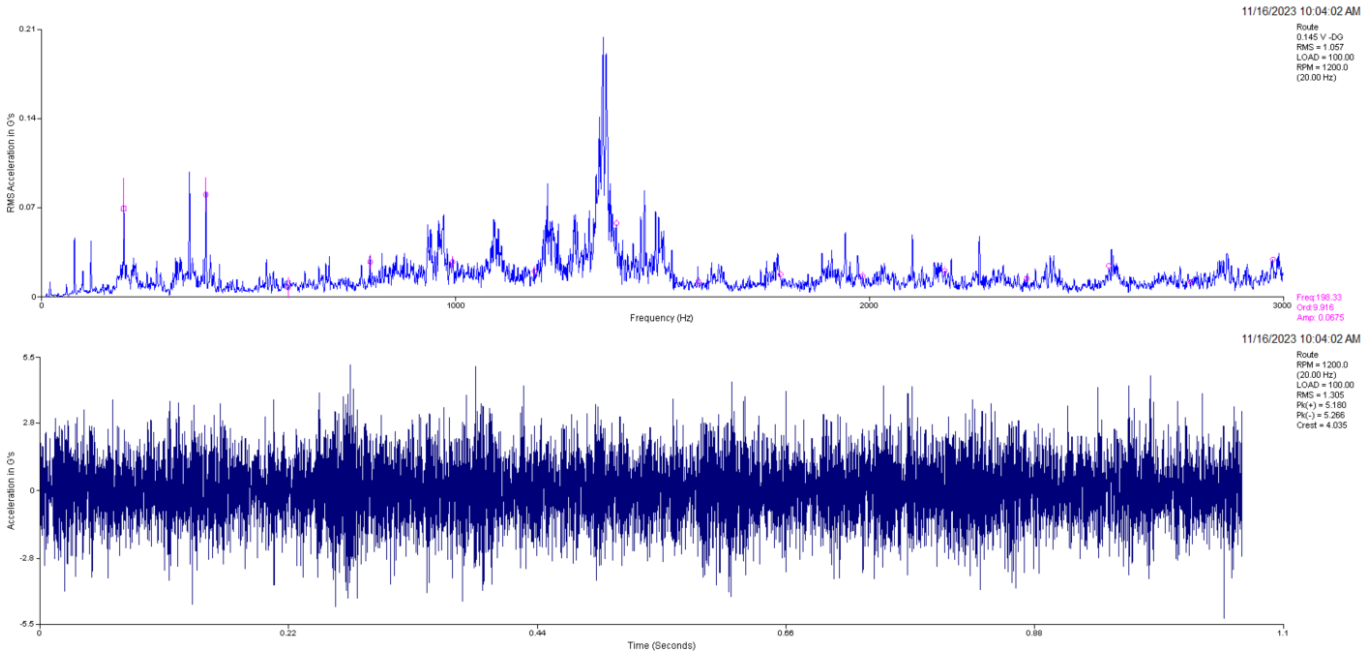
Observation:

Data above is a multipoint spectral waterfall. Pump data shows a 2 x rpm peak with multiple pump 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



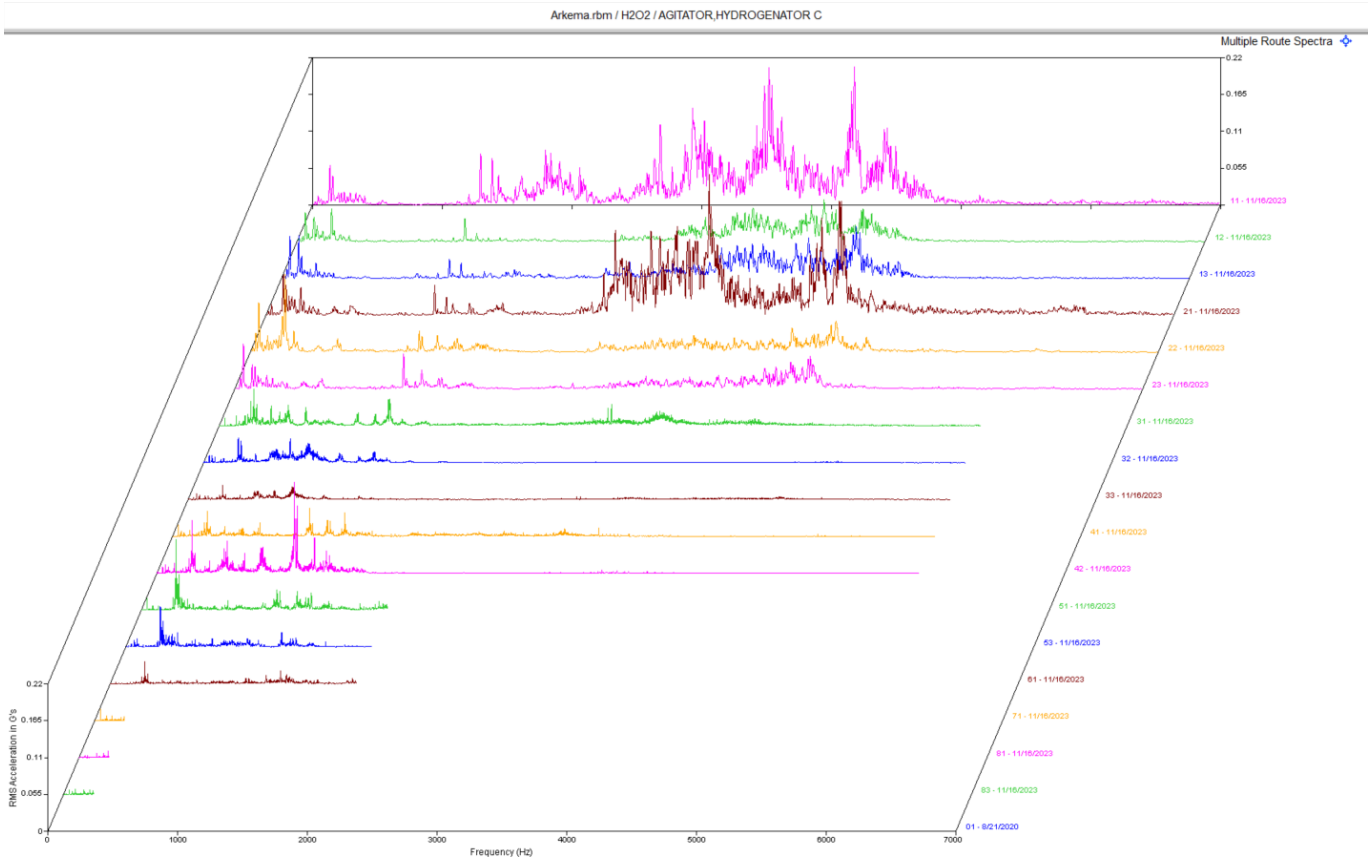
Observation:

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.

Recommendation:

The pump appears to have early to mid-stage bearing defects/wear. We are monitoring this issue closely.

Agitator, Hydrogenator C CLASS I



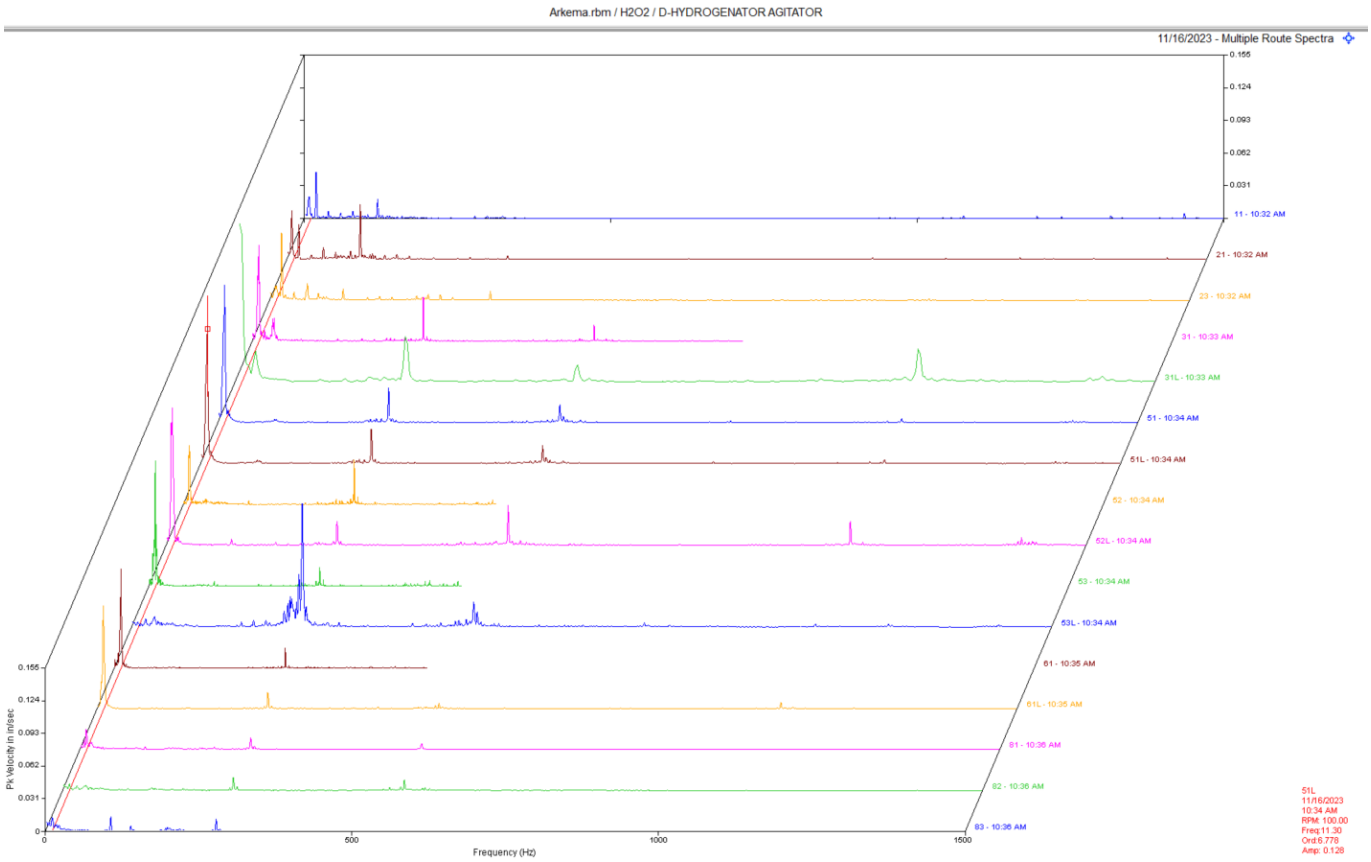
Observation:

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 I



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:

Data shows a decrease in amplitude throughout gear drive. This will be downgraded to a CLASS I defect. We still recommend to 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.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 3

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
P102	- ARKEMA PUMP P102	(16-Nov-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.097 In/Sec	.427 G-s
MOV		.269 In/Sec	.482 G-s
MIH		.091 In/Sec	.567 G-s
MIV		.161 In/Sec	.626 G-s
MIA		.244 In/Sec	.207 G-s
EIA		.409 In/Sec	.623 G-s
EIH		.262 In/Sec	3.483 G-s
EIV		.247 In/Sec	.699 G-s
EOH		.277 In/Sec	.324 G-s
EOV		.243 In/Sec	1.293 G-s
XSTORPMP	- X STORAGE PUMP	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.038 In/Sec	.374 G-s
21		.034 In/Sec	.463 G-s
23		.033 In/Sec	.182 G-s
71		.282 In/Sec	.197 G-s
72		.054 In/Sec	.102 G-s
YSTORPMP	- Y STORAGE PUMP	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.167 In/Sec	.885 G-s
21		.167 In/Sec	.652 G-s
23		.112 In/Sec	.225 G-s
71		.137 In/Sec	.193 G-s
72		.038 In/Sec	.075 G-s
2130-1old	- C Concentrator Vacuum Pump	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
11		.068 In/Sec	.504 G-s
21		.065 In/Sec	.561 G-s
23		.120 In/Sec	.217 G-s
71		.145 In/Sec	2.452 G-s
81		.182 In/Sec	.586 G-s
83		.160 In/Sec	.651 G-s
7000-01	- AGITATOR,HYDROGENATOR C	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHZ
02		.043 In/Sec	.017 G-s
03		.046 In/Sec	.012 G-s
11		.075 In/Sec	1.560 G-s
12		.090 In/Sec	.574 G-s
13		.113 In/Sec	.586 G-s
21		.079 In/Sec	1.429 G-s
22		.148 In/Sec	.458 G-s
23		.115 In/Sec	.304 G-s
31		.066 In/Sec	.366 G-s
32		.075 In/Sec	.108 G-s
33		.062 In/Sec	.106 G-s
41		.054 In/Sec	.220 G-s
42		.083 In/Sec	.432 G-s
51		.075 In/Sec	.240 G-s
53		.048 In/Sec	.108 G-s

	61	.025 In/Sec	.222 G-s
	71	.051 In/Sec	.196 G-s
	81	.027 In/Sec	.260 G-s
	83	.037 In/Sec	.372 G-s

57 - A/B Concentr Vac Pmp-var RPM (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.049 In/Sec	.380 G-s
12	.056 In/Sec	.093 G-s
21	.106 In/Sec	.450 G-s
23	.072 In/Sec	.134 G-s
71	.131 In/Sec	.672 G-s
81	.309 In/Sec	.702 G-s
83	.102 In/Sec	.530 G-s

2130-1 - FLASH VAP VAC PUMP-var speed (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.043 In/Sec	.379 G-s
12	.039 In/Sec	.254 G-s
21	.042 In/Sec	.382 G-s
22	.045 In/Sec	.249 G-s
23	.054 In/Sec	.235 G-s
71	.079 In/Sec	.995 G-s
72	.084 In/Sec	.493 G-s
81	.082 In/Sec	1.315 G-s
82	.078 In/Sec	1.008 G-s
83	.055 In/Sec	.466 G-s

C-203 - C-203 Comp (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.070 In/Sec	3.129 G-s
12	.025 In/Sec	.650 G-s
21	.052 In/Sec	2.100 G-s
22	.029 In/Sec	.203 G-s
23	.022 In/Sec	.191 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.071 In/Sec	4.319 G-s
72M	.068 In/Sec	.915 G-s
73M	.113 In/Sec	1.304 G-s
81M	.042 In/Sec	8.222 G-s
82M	.036 In/Sec	2.380 G-s
71F	.039 In/Sec	8.795 G-s
72F	.062 In/Sec	2.639 G-s
73F	.036 In/Sec	.827 G-s
81F	.048 In/Sec	12.15 G-s
82F	.057 In/Sec	2.662 G-s

C-202 - C-202 Comp (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.116 In/Sec	4.499 G-s
12	.151 In/Sec	.789 G-s
21	.076 In/Sec	1.000 G-s
22	.056 In/Sec	.328 G-s
23	.050 In/Sec	.290 G-s
	OVERALL LEVEL	1-20 KHZ
71M	.046 In/Sec	3.254 G-s
72M	.044 In/Sec	.957 G-s
73M	.086 In/Sec	1.089 G-s
81M	.053 In/Sec	6.965 G-s
82M	.056 In/Sec	.911 G-s
71F	.037 In/Sec	2.779 G-s
72F	.075 In/Sec	1.036 G-s
73F	.052 In/Sec	.678 G-s
81F	.042 In/Sec	4.835 G-s
82F	.061 In/Sec	1.273 G-s

C-201 - C-201 Comp (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.149 In/Sec	5.225 G-s
12	.059 In/Sec	1.768 G-s

21		.110 In/Sec	1.596 G-s
22		.034 In/Sec	.229 G-s
23		.061 In/Sec	.136 G-s
		OVERALL LEVEL	1-20 KHZ
71M		.061 In/Sec	3.255 G-s
72M		.046 In/Sec	.978 G-s
73M		.070 In/Sec	1.124 G-s
81M		.042 In/Sec	6.333 G-s
82M		.028 In/Sec	.937 G-s
71F		.040 In/Sec	5.412 G-s
72F		.059 In/Sec	1.264 G-s
73F		.037 In/Sec	1.250 G-s
81F		.038 In/Sec	5.846 G-s
82F		.059 In/Sec	1.467 G-s

201-08A - COMPRESSOR,NASH A 201-08A (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.053 In/Sec	.219 G-s
12	.051 In/Sec	.138 G-s
13	.122 In/Sec	.096 G-s

9002-10 - D-HYDROGENATOR AGITATOR (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.062 In/Sec	.200 G-s
21	.088 In/Sec	.207 G-s
23	.079 In/Sec	.056 G-s
	OVERALL LEVEL	1-20 KHZ
31	.166 In/Sec	.806 G-s
31L	.186 In/Sec	.740 G-s
	OVERALL LEVEL	1-20 KHz
51	.191 In/Sec	.350 G-s
51L	.191 In/Sec	.350 G-s
52	.119 In/Sec	.375 G-s
52L	.209 In/Sec	.563 G-s
53	.194 In/Sec	.150 G-s
53L	.190 In/Sec	.255 G-s
61	.153 In/Sec	.210 G-s
61L	.132 In/Sec	.210 G-s
81	.037 In/Sec	.029 G-s
82	.031 In/Sec	.013 G-s
83	.039 In/Sec	.012 G-s

NTC-SF - N CT-SOUTH FAN, N TWR (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
1	.322 In/Sec	.570 G-s
2	.228 In/Sec	.630 G-s
3	.242 In/Sec	.672 G-s
	OVERALL LEVEL	1-20 KHZ
4	.248 In/Sec	.393 G-s
5	.089 In/Sec	.0011 G-s
6	.254 In/Sec	.585 G-s

NCT - NF - N CT -NORTH FAN, N TWR (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
7	.319 In/Sec	.449 G-s
8	.207 In/Sec	.415 G-s
9	.245 In/Sec	.313 G-s
	OVERALL LEVEL	1-20 KHZ
10	.170 In/Sec	.327 G-s
11	.204 In/Sec	.292 G-s
12	.193 In/Sec	.392 G-s

530-01 - PUMP,N.COOLING TWR,NORTH (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.251 In/Sec	1.292 G-s
12	.164 In/Sec	.603 G-s

530-02 - PUMP,N.COOLING TWR,MIDDLE (16-Nov-23)

	OVERALL LEVEL	1-20 KHz
11	.120 In/Sec	1.240 G-s

	12	.178 In/Sec	1.374 G-s
548-7	- IRON-FREE H2O BOOSTER PUMP	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	11	.023 In/Sec	.867 G-s
	21	.029 In/Sec	.932 G-s
	23	.041 In/Sec	.675 G-s
	71	.026 In/Sec	.193 G-s
	72	.024 In/Sec	.292 G-s
STC-NF	- S CT - NORTH FAN, S TWR	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	1	.204 In/Sec	.407 G-s
	2	.171 In/Sec	.195 G-s
		OVERALL LEVEL	1-20 KHZ
	4	.124 In/Sec	.409 G-s
	5	.117 In/Sec	.522 G-s
STC-MF	- S CT - MID FAN, S TWR	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	1	.293 In/Sec	.511 G-s
	2	.234 In/Sec	.172 G-s
	3	.183 In/Sec	.120 G-s
		OVERALL LEVEL	1-20 KHZ
	4	.133 In/Sec	.311 G-s
	5	.095 In/Sec	.416 G-s
	6	.138 In/Sec	.505 G-s
STC-SF	- S CT - SOUTH FAN, S TWR	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	1	.200 In/Sec	.350 G-s
	2	.277 In/Sec	.212 G-s
	3	.220 In/Sec	.100 G-s
		OVERALL LEVEL	1-20 KHZ
	4	.152 In/Sec	.509 G-s
	5	.090 In/Sec	.492 G-s
	6	.365 In/Sec	.566 G-s
SCT-1	- SOUTH CT PUMP - EAST	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	11	.066 In/Sec	1.895 G-s
	21	.057 In/Sec	1.387 G-s
	23	.053 In/Sec	1.488 G-s
	71	.169 In/Sec	.768 G-s
	72	.092 In/Sec	1.430 G-s
SCT-2	- SOUTH CT PUMP - MID	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	11	.067 In/Sec	1.221 G-s
	21	.053 In/Sec	2.350 G-s
	23	.070 In/Sec	.853 G-s
	71	.075 In/Sec	.680 G-s
	72	.049 In/Sec	1.624 G-s
SCT-3	- SOUTH CT PUMP - WEST	(16-Nov-23)	
		OVERALL LEVEL	1-20 KHz
	11	.082 In/Sec	2.217 G-s
	21	.110 In/Sec	2.987 G-s
	23	.088 In/Sec	.837 G-s
	71	.168 In/Sec	.929 G-s
	72	.121 In/Sec	1.319 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

QualiTest® Diagnostics

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