HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

October 18, 2021

Arkema

Subject: October week 2 service report

Critical equipment and monthly equipment with issues are discussed in this report.

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

Hi-Speed Industrial Service tests and inspects industrial machinery and equipment and makes recommendations concerning maintenance and repairs based on its experience in the field of industrial repair and maintenance. The information contained herein is provided as an opinion only, not as a guaranty or warranty of the matters discussed herein.

This completes our assessment of your equipment for this survey. Thank you for your business and don't hesitate to call if you have any comments or questions.

Sincerely,

David W. Shook
Senior Reliability Specialists
Hi-Speed Industrial Service
dshook@gohispeed.com

7030 Ryburn Drive
Millington, TN 38053
P. 901-873-5300
F. 901-873-5301

H2O2 Weekly Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1
The motor has the highest vibration amplitude of about 0.18"/second velocity peak overall in the outboard axial measurement. Vibration still consists of multiple low amplitude shaft speed harmonics with a dominant 4x RPM peak. **Rated a Class I Defect.**

Agitator, Hydrogenator C 7001-01
Data shows all vibrations are below 0.17"/second velocity peak overall. No immediate concern.

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.28"/sec peak velocity for the outboard pump bearing and is dominated by a 16 order vibration which we believe to be vane pass. We will continue to watch for changes. **Rated a Class I Defect.**

Flash Vacuum Pump 2130-1
Data shows all vibrations are under 0.1"/second velocity peak overall. No issues of note.

Air Compressor C-201
Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. We suspect this is impeller pass related. Overall acceleration is 6.1 g's RMS at 1 point. Synchronous 3x RPM and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Air Compressor C-202
Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. We suspect this is impeller pass related. Overall acceleration is 3.6 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Air Compressor C-203
Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. This month shows a large jump in the DE compressor axial overall acceleration but the waterfall spectrum up to 6 KHz doesn't see to show much difference, so the increase must be above that frequency. We suspect this is impeller pass related or possibly a gear mesh. Overall acceleration is 12.5 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class II Defect this week.**

Instrument Air Compressor
The male and female shaft vibrations still seem to show gear mesh and harmonics as well as a beat vibration occasionally. They continue to vary over time. Both shafts have between 4 and 8 g's RMS overall in the data. The dominant vibration appears to be the second gear mesh harmonic at near 2500 Hz. We are still watching this unit closely and will be going forward. **Rated a Class I Defect.**

Air Compressor NASH A 201-08A
Vibrations are still lower at 0.17"/sec velocity peak for the outboard vertical. The vibration spectrum is still dominated by a 20-order vibration, which is thought to be vane pass. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002
Highest overall vibration is at 0.29"/sec velocity peak for the gearbox output top horizontal. 2 dominant vibrations are sub-synchronous to motor speed at about 9 Hz and a 10.5 orders. There appears to be a resonance, and the amplitude changes over time, but does not seem to be periodic. The others are most likely the number of pinion teeth (14 teeth and the input gear mesh) and the first harmonic of gear mesh. Ensure all fasteners are at proper torque values and inspect support structures for any signs of stress cracks, broken welds, or metal fatigue. **Rated a Class I Defect now.**

H2O2 Monthly Route Equipment

M MIX BED WATER PUMP 191-07
The pump vane pass vibration (5x RPM) is up with a little 2x RPM also. Check the pump operational parameters and shaft alignment as time allows. **Rated a Class II Defect.**

H2O2 70% special pump check

STP BUILDING P105

First data shows a dominant vibration at 2x RPM in the motor shaft end horizontal at over 0.35”/second velocity peak in the time waveform. This usually is indicative of an alignment issue. Check all the fasteners, coupling and alignment. **Rated a Class II Defect since this a new installation.**

STP BUILDING P102 BELT DRIVE PISTON PUMP

No immediate issues.

Abbreviated Last Measurement Summary
****

Database: Arkema.rbm
Station: PEROXIDE
Route No. 4: ARK WK 2
Report Date: 22-Oct-21 07:35

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump	(18-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.058 In/Sec	.494 G-s	1200.0 RPM
21	.062 In/Sec	.499 G-s	
23	.176 In/Sec	.128 G-s	
71	.152 In/Sec	.992 G-s	
81	.170 In/Sec	.773 G-s	
83	.085 In/Sec	2.221 G-s	
7000-01 - AGITATOR,HYDROGENATOR C	(18-Oct-21)		
	OVERALL LEVEL	1-20 KHZ	
02	.045 In/Sec	.043 G-s	45.00 RPM
03	.056 In/Sec	.017 G-s	
11	.080 In/Sec	.780 G-s	1400.0 RPM
12	.085 In/Sec	.775 G-s	
13	.134 In/Sec	.295 G-s	
21	.092 In/Sec	.241 G-s	
22	.170 In/Sec	.521 G-s	
23	.157 In/Sec	.757 G-s	
31	.078 In/Sec	.440 G-s	
32	.084 In/Sec	.458 G-s	
33	.043 In/Sec	.184 G-s	
41	.064 In/Sec	.405 G-s	
42	.080 In/Sec	.572 G-s	
51	.077 In/Sec	.344 G-s	375.0 RPM
53	.071 In/Sec	.207 G-s	
61	.036 In/Sec	.205 G-s	
71	.053 In/Sec	.146 G-s	45.00 RPM

	81	.020 In/Sec	.165 G-s	
	83	.050 In/Sec	.234 G-s	
57	- A/B Concentr Vac Pmp-var RPM	(18-Oct-21)		
		OVERALL LEVEL	1-20 KHz	
	11	.102 In/Sec	.299 G-s	900.0 RPM
	12	.066 In/Sec	.518 G-s	
	21	.104 In/Sec	.266 G-s	
	23	.069 In/Sec	.148 G-s	
	71	.159 In/Sec	.738 G-s	
	81	.284 In/Sec	.687 G-s	
	83	.085 In/Sec	.882 G-s	
2130-1	- FLASH VAP VAC PUMP-var speed	(18-Oct-21)		
		OVERALL LEVEL	1-20 KHz	
	11	.040 In/Sec	.094 G-s	1200.0 RPM
	12	.033 In/Sec	.381 G-s	
	21	.041 In/Sec	.330 G-s	
	22	.044 In/Sec	.276 G-s	
	23	.059 In/Sec	.515 G-s	
	71	.065 In/Sec	.391 G-s	
	72	.073 In/Sec	.316 G-s	
	81	.082 In/Sec	.653 G-s	
	82	.072 In/Sec	.583 G-s	
	83	.040 In/Sec	.568 G-s	
C-203	- C-203 Comp	(18-Oct-21)		
		OVERALL LEVEL	1-20 KHz	
	11	.065 In/Sec	2.360 G-s	3588.0 RPM
	12	.028 In/Sec	.385 G-s	
	21	.037 In/Sec	1.272 G-s	
	22	.047 In/Sec	1.596 G-s	
	23	.026 In/Sec	.910 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.034 In/Sec	1.255 G-s	
	72M	.038 In/Sec	1.639 G-s	
	73M	.057 In/Sec	12.49 G-s	
	81M	.060 In/Sec	2.544 G-s	
	82M	.070 In/Sec	4.427 G-s	
	71F	.056 In/Sec	2.171 G-s	
	72F	.055 In/Sec	1.769 G-s	
	73F	.083 In/Sec	2.268 G-s	
	81F	.062 In/Sec	3.109 G-s	
	82F	.045 In/Sec	1.536 G-s	
C-202	- C-202 Comp	(18-Oct-21)		
		OVERALL LEVEL	1-20 KHz	
	11	.149 In/Sec	5.030 G-s	3588.0 RPM
	12	.114 In/Sec	1.923 G-s	
	21	.079 In/Sec	1.504 G-s	
	22	.088 In/Sec	1.629 G-s	
	23	.063 In/Sec	.330 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.040 In/Sec	2.245 G-s	
	72M	.054 In/Sec	1.752 G-s	
	73M	.079 In/Sec	.534 G-s	
	81M	.055 In/Sec	2.371 G-s	

82M	.062 In/Sec	2.516 G-s	
71F	.040 In/Sec	1.677 G-s	
72F	.064 In/Sec	1.763 G-s	
73F	.082 In/Sec	3.617 G-s	
81F	.038 In/Sec	2.792 G-s	
82F	.054 In/Sec	1.951 G-s	

C-201 - C-201 Comp (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.146 In/Sec	4.317 G-s	3588.0 RPM
12	.158 In/Sec	6.129 G-s	
21	.095 In/Sec	1.005 G-s	
22	.041 In/Sec	.485 G-s	
23	.059 In/Sec	1.484 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.047 In/Sec	1.762 G-s	
72M	.055 In/Sec	3.215 G-s	
73M	.077 In/Sec	1.779 G-s	
81M	.100 In/Sec	6.136 G-s	
82M	.061 In/Sec	4.333 G-s	
71F	.057 In/Sec	2.195 G-s	
72F	.047 In/Sec	.667 G-s	
73F	.039 In/Sec	1.023 G-s	
81F	.042 In/Sec	3.007 G-s	
82F	.052 In/Sec	1.327 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.137 In/Sec	.555 G-s	1780.0 RPM
12	.107 In/Sec	.732 G-s	
13	.065 In/Sec	.469 G-s	
21	.150 In/Sec	1.799 G-s	
22	.078 In/Sec	.543 G-s	
23	.056 In/Sec	.411 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.141 In/Sec	6.307 G-s	
72F	.184 In/Sec	6.873 G-s	
73F	.148 In/Sec	4.043 G-s	
81F	.132 In/Sec	2.688 G-s	
82F	.224 In/Sec	5.623 G-s	
83F	.179 In/Sec	4.156 G-s	
71M	.100 In/Sec	6.685 G-s	
72M	.149 In/Sec	6.651 G-s	
73M	.121 In/Sec	4.086 G-s	
81M	.203 In/Sec	6.347 G-s	
82M	.231 In/Sec	7.667 G-s	
83M	.205 In/Sec	3.222 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.059 In/Sec	.093 G-s	506.3 RPM
12	.061 In/Sec	.185 G-s	
13	.099 In/Sec	.123 G-s	
21	.053 In/Sec	.068 G-s	
22	.056 In/Sec	.151 G-s	
23	.101 In/Sec	.091 G-s	
71	.100 In/Sec	1.422 G-s	

72	.146 In/Sec	1.210 G-s	
73	.097 In/Sec	.173 G-s	
81	.124 In/Sec	.400 G-s	
82	.171 In/Sec	.275 G-s	
83	.085 In/Sec	.278 G-s	

202-05 - NASH SEAL LIQUID PUMP-A (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.020 In/Sec	.108 G-s	1800.0 RPM
21	.014 In/Sec	.179 G-s	
23	.033 In/Sec	.022 G-s	
71	.020 In/Sec	.042 G-s	
72	.014 In/Sec	.033 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.094 In/Sec	.036 G-s	1185.0 RPM
21	.087 In/Sec	.105 G-s	
23	.064 In/Sec	.030 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.178 In/Sec	.702 G-s	
31L	.188 In/Sec	.865 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.169 In/Sec	.180 G-s	
51L	.292 In/Sec	.177 G-s	100.0 RPM
52	.217 In/Sec	.273 G-s	
52L	.267 In/Sec	.279 G-s	
53	.052 In/Sec	.196 G-s	
53L	.029 In/Sec	.202 G-s	
61	.145 In/Sec	.149 G-s	
61L	.133 In/Sec	.195 G-s	
81	.035 In/Sec	.027 G-s	
82	.033 In/Sec	.030 G-s	
83	.026 In/Sec	.162 G-s	

9003-01 - D-HYDRO PRIMARY FILT FD PUMP (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.035 In/Sec	.419 G-s	1800.0 RPM
21	.048 In/Sec	.444 G-s	
23	.040 In/Sec	.630 G-s	
71	.106 In/Sec	.184 G-s	
72	.124 In/Sec	.222 G-s	

9003-02 - D-HYDRO RECYCLE PUMP (20-Sep-21)

	OVERALL LEVEL	1-20 KHz	
11	.039 In/Sec	.332 G-s	1800.0 RPM
21	.032 In/Sec	.871 G-s	
23	.030 In/Sec	.512 G-s	
71	.089 In/Sec	.190 G-s	
72	.114 In/Sec	.192 G-s	

9002-01 - D-HYDRO SPARE PUMP (20-Jun-19)

	OVERALL LEVEL	1-20 KHz	
11	.149 In/Sec	.192 G-s	1800.0 RPM
21	.138 In/Sec	.192 G-s	
23	.105 In/Sec	.192 G-s	
71	.084 In/Sec	.192 G-s	

	72	.125 In/Sec	.192 G-s	

9001-01 - D-HYDRO SECOND. FILT FD PUMP (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.052 In/Sec	.163 G-s	1800.0 RPM
21	.052 In/Sec	.357 G-s	
23	.034 In/Sec	.157 G-s	
71	.074 In/Sec	.333 G-s	
72	.066 In/Sec	.313 G-s	

192-03 - Two Stage Water Pump A-WEST (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.058 In/Sec	.225 G-s	1765.0 RPM
21	.086 In/Sec	.296 G-s	
23	.058 In/Sec	.296 G-s	
71	.158 In/Sec	.723 G-s	
72	.063 In/Sec	.853 G-s	

191-13 - STP BUILDING 70% P105 (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.164 In/Sec	.328 G-s	3600.0 RPM
21	.331 In/Sec	.209 G-s	
23	.046 In/Sec	.099 G-s	
71	.052 In/Sec	.785 G-s	
72	.082 In/Sec	.501 G-s	

191-07 - M MIX BED WATER PUMP 191-07 (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.091 In/Sec	.111 G-s	3600.0 RPM
21	.062 In/Sec	.702 G-s	
23	.107 In/Sec	1.040 G-s	
71	.373 In/Sec	.204 G-s	
72	.162 In/Sec	.174 G-s	

191-14 - STP BYILDING 70% P102 BELT DRIVE PISTON PUMP (18-Oct-21)

	OVERALL LEVEL	1-20 KHz	
11	.200 In/Sec	.159 G-s	3600.0 RPM
21	.226 In/Sec	.218 G-s	
23	.132 In/Sec	.054 G-s	
71	.268 In/Sec	.748 G-s	
72	.251 In/Sec	.702 G-s	

Clarification Of Vibration Units:

Acc	--> G-s	PK
Vel	--> In/Sec	PK