HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

November 12, 2021

Arkema

Subject: November week 1 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
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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 0.13"/second velocity peak overall. No immediate concern.

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.3"/sec peak velocity for the outboard pump bearing and is dominated by a 8 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 low noise floor. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. The dominant peak appears to be 37 orders of shaft speed and could be gear mesh. Overall acceleration is 5 g's RMS at 1 point. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

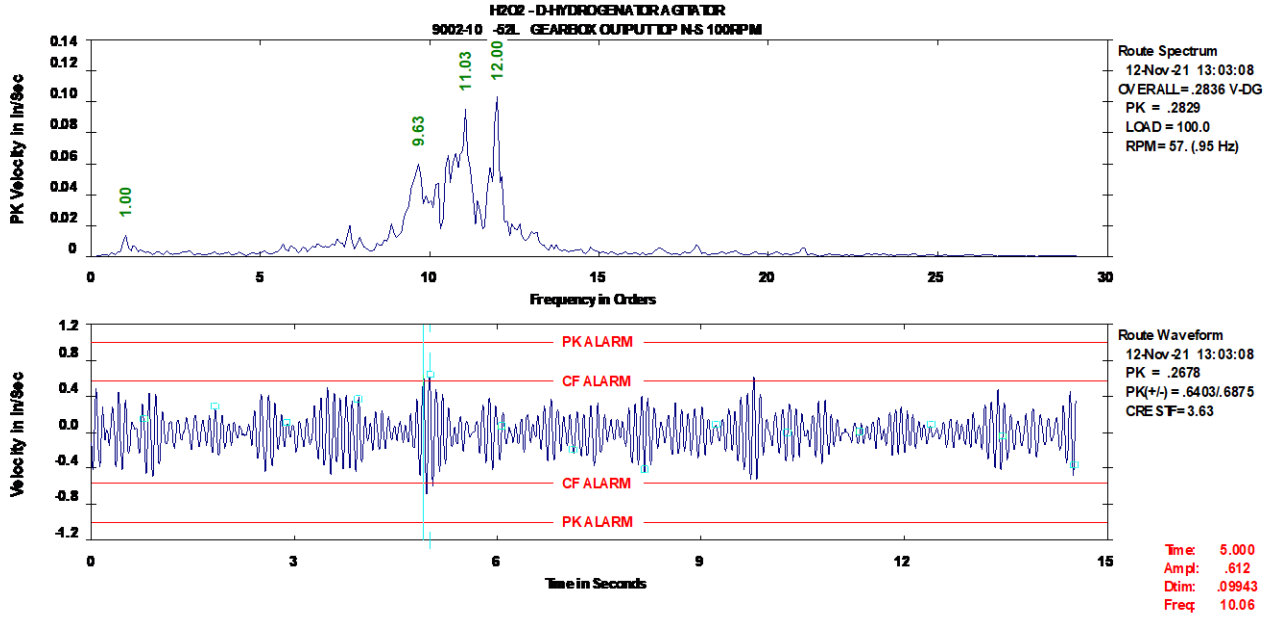
Air Compressor C-202
Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. Overall acceleration is 7 g's RMS at 1 point. A 3x RPM vibration peak and multiple low amplitude harmonics are evident throughout the spectrum. The dominant peak appears to be at 50 orders. 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 low noise floor. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. The dominant peak appears to be 37 orders of shaft speed and could be gear mesh. A 6.9X RPM vibration peak and multiple low amplitude harmonics are evident throughout the spectrum. Overall acceleration is 5 g's RMS at 1 point. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Instrument Air Compressor
The male and female shaft vibrations still seem to show gear mesh and lobe pass 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 acceleration. Harmonics of 4.3X and 6.9X input speed are evident in the data. The dominant vibration appears to be at near 2500 Hz and is a harmonic. 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 0.22"/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 0.28"/sec velocity peak for the gearbox output top horizontal. 3 dominant vibrations are at about 9.6, 11, and 12 orders of the output speed, which is about 57 RPM. They appear to be a resonant, but the one of them,(12X) could be a gear mesh. The time waveform shows they are most likely periodically beating (going into and out of phase). Ensure all fasteners are at proper torque values and inspect support structures for any signs of stress cracks, broken welds, or metal fatigue. Supporting data follows. **Rated a Class I Defect.**



H2O2 Monthly Route Equipment

No immediate concerns.

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                    Abbreviated Last Measurement Summary
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                Database:  Arkema.rbm
                Station:   PEROXIDE
                Route No.  3:  ARK WK 1
                Report Date:  15-Nov-21   07:29

MEASUREMENT POINT      OVERALL LEVEL       HFD / VHFD       MACHINE SPEED
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2130-1old  - C Concentrator Vacuum Pump     (12-Nov-21)
                       OVERALL LEVEL     1-20 KHz
        11               .063 In/Sec       .531 G-s        1200.0 RPM
        21               .061 In/Sec       .478 G-s
        23               .184 In/Sec       .167 G-s
        71               .134 In/Sec       .865 G-s
        81               .157 In/Sec       .739 G-s
        83               .076 In/Sec      1.552 G-s

7000-01    - AGITATOR,HYDROGENATOR C       (12-Nov-21)
                       OVERALL LEVEL     1-20 KHZ
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02	.046 In/Sec	.017 G-s	45.00 RPM
03	.047 In/Sec	.046 G-s	
11	.078 In/Sec	.681 G-s	1400.0 RPM
12	.082 In/Sec	.717 G-s	
13	.109 In/Sec	.253 G-s	
21	.098 In/Sec	.577 G-s	
22	.126 In/Sec	.239 G-s	
23	.110 In/Sec	.258 G-s	
31	.077 In/Sec	.373 G-s	
32	.076 In/Sec	.479 G-s	
33	.044 In/Sec	.272 G-s	
41	.076 In/Sec	.559 G-s	
42	.074 In/Sec	.603 G-s	
51	.062 In/Sec	.287 G-s	375.0 RPM
53	.070 In/Sec	.210 G-s	
61	.040 In/Sec	.289 G-s	
71	.056 In/Sec	.319 G-s	45.00 RPM
81	.025 In/Sec	.147 G-s	
83	.060 In/Sec	.228 G-s	

57 - A/B Concentr Vac Pmp-var RPM (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.068 In/Sec	.294 G-s	900.0 RPM
12	.066 In/Sec	.332 G-s	
21	.086 In/Sec	.245 G-s	
23	.064 In/Sec	.123 G-s	
71	.149 In/Sec	.805 G-s	
81	.304 In/Sec	.908 G-s	
83	.063 In/Sec	.915 G-s	

2130-1 - FLASH VAP VAC PUMP-var speed (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.418 G-s	1200.0 RPM
12	.036 In/Sec	.346 G-s	
21	.037 In/Sec	.762 G-s	
22	.043 In/Sec	.614 G-s	
23	.054 In/Sec	1.260 G-s	
71	.058 In/Sec	.373 G-s	
72	.066 In/Sec	.502 G-s	
81	.080 In/Sec	.573 G-s	
82	.079 In/Sec	.689 G-s	
83	.043 In/Sec	.538 G-s	

236-06 - HYDRO FD PUMP N 236-06 -2FLR (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.094 In/Sec	.072 G-s	3600.0 RPM
21	.104 In/Sec	.221 G-s	

236-26 - HYDRO FD PUMP S 236-26-2FLR (23-Aug-19)

	OVERALL LEVEL	1-20 KHz	
11	.103 In/Sec	.221 G-s	1800.0 RPM
21	.073 In/Sec	.221 G-s	
23	.103 In/Sec	.221 G-s	
* 71	.031 In/Sec	.221 G-s	
* 72	.031 In/Sec	.221 G-s	

7007-24 - ABC SEC. FILT FEED PMP-SOUTH (25-Aug-21)

		OVERALL LEVEL	1-20 KHz	
	11	.039 In/Sec	.468 G-s	1800.0 RPM
	21	.041 In/Sec	1.483 G-s	
	23	.038 In/Sec	.247 G-s	
	71	.152 In/Sec	1.971 G-s	
	72	.123 In/Sec	2.482 G-s	
2130-6	- ABC SEC FILT FEED PUMP-NORTH		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.039 In/Sec	.695 G-s	1800.0 RPM
	21	.052 In/Sec	.490 G-s	
	23	.050 In/Sec	.274 G-s	
	71	.201 In/Sec	.761 G-s	
	72	.121 In/Sec	.802 G-s	
9001-1	- EAST OXIDIZER FEED PUMP		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.038 In/Sec	.125 G-s	1800.0 RPM
	21	.063 In/Sec	.356 G-s	
	23	.045 In/Sec	.186 G-s	
	71	.119 In/Sec	.695 G-s	
	72	.098 In/Sec	.253 G-s	
9001-2	- MIDDLE OXIDIZER FEED PUMP		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.041 In/Sec	.645 G-s	1800.0 RPM
	21	.040 In/Sec	.295 G-s	
	23	.044 In/Sec	.191 G-s	
	71	.078 In/Sec	.232 G-s	
	72	.063 In/Sec	.244 G-s	
7016-11	- WEST OXIDIZER FEED PUMP		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.025 In/Sec	.377 G-s	1800.0 RPM
	21	.022 In/Sec	.601 G-s	
	23	.017 In/Sec	.253 G-s	
	71	.087 In/Sec	.548 G-s	
	72	.105 In/Sec	.864 G-s	
234-01	- CHILL WATER PUMP 234-01		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.042 In/Sec	.955 G-s	1790.0 RPM
	21	.041 In/Sec	1.295 G-s	
	23	.138 In/Sec		
	71	.078 In/Sec	.297 G-s	
	72	.097 In/Sec	.264 G-s	
C-203	- C-203 Comp		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.028 In/Sec	.859 G-s	3588.0 RPM
	12	.041 In/Sec	.882 G-s	
	21	.059 In/Sec	2.048 G-s	
	22	.125 In/Sec	5.092 G-s	
	23	.045 In/Sec	1.349 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.029 In/Sec	.530 G-s	
	72M	.046 In/Sec	1.605 G-s	

	73M	.054 In/Sec	4.372 G-s	
	81M	.055 In/Sec	3.413 G-s	
	82M	.063 In/Sec	4.995 G-s	
	71F	.046 In/Sec	1.573 G-s	
	72F	.049 In/Sec	1.146 G-s	
	73F	.103 In/Sec	4.893 G-s	
	81F	.044 In/Sec	1.280 G-s	
	82F	.049 In/Sec	2.144 G-s	

9000-02 - D HYDROGENATOR FD PUMP- EAST (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.035 In/Sec	.337 G-s	1800.0 RPM
21	.049 In/Sec	.390 G-s	
23	.034 In/Sec	.230 G-s	
71	.118 In/Sec	.443 G-s	
72	.088 In/Sec	.617 G-s	

9000-01 - D HYDROGENATOR FD PUMP- WEST (13-Sep-21)

	OVERALL LEVEL	1-20 KHz	
11	.061 In/Sec	.220 G-s	1800.0 RPM
21	.058 In/Sec	.182 G-s	
23	.034 In/Sec	.387 G-s	
71	.114 In/Sec	.500 G-s	
72	.127 In/Sec	.561 G-s	

236-04A - HYDROGNTOR PRECOOLER FD PUMP (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.037 In/Sec	.623 G-s	1800.0 RPM
21	.072 In/Sec	.488 G-s	
23	.038 In/Sec	.832 G-s	
71	.134 In/Sec	.259 G-s	
72	.068 In/Sec	.287 G-s	

C-202 - C-202 Comp (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.111 In/Sec	4.229 G-s	3588.0 RPM
12	.134 In/Sec	1.453 G-s	
21	.106 In/Sec	2.822 G-s	
22	.110 In/Sec	3.030 G-s	
23	.079 In/Sec	2.380 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.041 In/Sec	1.928 G-s	
72M	.046 In/Sec	1.408 G-s	
73M	.071 In/Sec	3.976 G-s	
81M	.039 In/Sec	6.919 G-s	
82M	.061 In/Sec	2.237 G-s	
71F	.030 In/Sec	3.170 G-s	
72F	.063 In/Sec	1.846 G-s	
73F	.075 In/Sec	2.903 G-s	
81F	.037 In/Sec	2.630 G-s	
82F	.044 In/Sec	.806 G-s	

C-201 - C-201 Comp (12-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.124 In/Sec	3.181 G-s	3588.0 RPM
12	.070 In/Sec	.727 G-s	
21	.099 In/Sec	.956 G-s	

	22	.047 In/Sec	.884 G-s	
	23	.092 In/Sec	2.960 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.056 In/Sec	2.781 G-s	
	72M	.051 In/Sec	2.597 G-s	
	73M	.073 In/Sec	1.600 G-s	
	81M	.100 In/Sec	4.939 G-s	
	82M	.059 In/Sec	2.916 G-s	
	71F	.039 In/Sec	3.016 G-s	
	72F	.061 In/Sec	1.899 G-s	
	73F	.055 In/Sec	2.097 G-s	
	81F	.048 In/Sec	4.680 G-s	
	82F	.064 In/Sec	1.872 G-s	
new AC	- INSTRUMENT AIR COMPRESSOR		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.146 In/Sec	.642 G-s	1780.0 RPM
	12	.109 In/Sec	.691 G-s	
	13	.075 In/Sec	.444 G-s	
	21	.137 In/Sec	1.327 G-s	
	22	.091 In/Sec	.256 G-s	
	23	.047 In/Sec	.473 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71F	.118 In/Sec	6.325 G-s	
	72F	.179 In/Sec	6.337 G-s	
	73F	.139 In/Sec	4.909 G-s	
	81F	.134 In/Sec	1.850 G-s	
	82F	.225 In/Sec	6.047 G-s	
	83F	.153 In/Sec	3.453 G-s	
	71M	.087 In/Sec	3.791 G-s	
	72M	.162 In/Sec	4.813 G-s	
	73M	.101 In/Sec	7.299 G-s	
	81M	.181 In/Sec	5.920 G-s	
	82M	.241 In/Sec	5.713 G-s	
	83M	.207 In/Sec	4.324 G-s	
201-08A	- COMPRESSOR,NASH A 201-08A		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.065 In/Sec	.101 G-s	506.3 RPM
	12	.069 In/Sec	.142 G-s	
	13	.104 In/Sec	.087 G-s	
	21	.056 In/Sec	.077 G-s	
	22	.067 In/Sec	.194 G-s	
	23	.102 In/Sec	.079 G-s	
	71	.116 In/Sec	.940 G-s	
	72	.167 In/Sec	.698 G-s	
	73	.090 In/Sec	.065 G-s	
	81	.120 In/Sec	.292 G-s	
	82	.215 In/Sec	.165 G-s	
	83	.113 In/Sec	.242 G-s	
9002-10	- D-HYDROGENATOR AGITATOR		(12-Nov-21)	
		OVERALL LEVEL	1-20 KHz	
	11	.081 In/Sec	.050 G-s	1185.0 RPM
	21	.066 In/Sec	.120 G-s	
	23	.059 In/Sec	.047 G-s	
		OVERALL LEVEL	1-20 KHZ	

31	.236 In/Sec	.537 G-s		
31L	.136 In/Sec	.638 G-s		
	OVERALL LEVEL	1-20 KHz		
51	.174 In/Sec	.126 G-s		
51L	.210 In/Sec	.133 G-s	100.0	RPM
52	.268 In/Sec	.236 G-s		
52L	.284 In/Sec	.235 G-s		
53	.081 In/Sec	.475 G-s		
53L	.037 In/Sec	.426 G-s		
61	.178 In/Sec	.120 G-s		
61L	.169 In/Sec	.119 G-s		
81	.034 In/Sec	.025 G-s		
82	.038 In/Sec	.020 G-s		
83	.027 In/Sec	.127 G-s		

234-19 - Trane Refrig Machine (NEW) (04-Mar-19)

	OVERALL LEVEL	1-20 KHz		
13	.028 In/Sec	.127 G-s	3600.0	RPM
11	.023 In/Sec	.127 G-s		
71	.016 In/Sec	.127 G-s		
81	.024 In/Sec	.127 G-s		

EP15 - CENTAC Compressor (06-Aug-21)

	OVERALL LEVEL	1-20 KHz		
11	.056 In/Sec	.153 G-s	3600.0	RPM
12	.079 In/Sec	.784 G-s		
13	.122 In/Sec	.206 G-s		
21	.109 In/Sec	.091 G-s		
22	.057 In/Sec	.591 G-s		
23	.055 In/Sec	.559 G-s		
* 901	.224 Mils		28171.	RPM
* 902	.171 Mils		40980.	RPM
* 903	.168 Mils		42931.	RPM

8001-1 - Electric Joy Compressor (05-Oct-15)

	OVERALL LEVEL			
11	.140 In/Sec		3600.0	RPM
13	.102 In/Sec			
21	.216 In/Sec			
981	.374 Mils		22856.	RPM
971	.487 Mils			
991	.356 Mils		31836.	RPM
932	1.561 Mils		3580.0	RPM

Clarification Of Vibration Units:

Acc	-->	G-s	PK
Vel	-->	In/Sec	PK
Dsp	-->	Mils	P-P

* - Indicates Data Has Date/Time Different From Machine Date/Time