HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

January 13, 2021

Arkema

Subject: December 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
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 0.19"/second velocity peak overall in the inboard 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 still shows a low amplitude2x and 3x RPM vibration in the motor drive end measurements. This usually indicates some misalignment. Adjust only as time allows. **Rated a Class I Defect.**

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.19"/sec peak velocity for the outboard pump bearing and is dominated by a possible 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. Overall acceleration is 4.8 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 elevated 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. Overall acceleration is 8.8 g's RMS at 1 point. 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. Overall acceleration is 6.0 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 3 and 7 g's RMS overall acceleration. 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. Some oil was noted on the unit base. **Rated a Class I Defect.**

Air Compressor NASH A 201-08A
Vibrations are at 0.15"/sec velocity peak for the inboard 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 0.26"/sec velocity peak for the gearbox output top N/S. Dominant vibrations are at about 10.5 Hx and 14 orders of the input speed. They appear to be a resonant, but the one of them 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. Perform periodic oil analysis on the gearbox for signs of internal wear. **Rated a Class I Defect.**

H2O2 Monthly Route Equipment

No immediate concerns at this time.

Abbreviated Last Measurement Summary

****

Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 1
Report Date: 13-Jan-22 07:23

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (10-Jan-22)			
	OVERALL LEVEL	1-20 KHz	
11	.056 In/Sec	.628 G-s	1200.0 RPM
21	.060 In/Sec	.560 G-s	
23	.192 In/Sec	.139 G-s	
71	.159 In/Sec	.895 G-s	
81	.171 In/Sec	.579 G-s	
83	.075 In/Sec	1.494 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (10-Jan-22)			
	OVERALL LEVEL	1-20 KHZ	
02	.050 In/Sec	.023 G-s	45.00 RPM
03	.055 In/Sec	.058 G-s	
11	.073 In/Sec	.735 G-s	1400.0 RPM
12	.075 In/Sec	.810 G-s	
13	.090 In/Sec	.154 G-s	
21	.094 In/Sec	.552 G-s	
22	.117 In/Sec	.417 G-s	
23	.099 In/Sec	.362 G-s	
31	.072 In/Sec	.443 G-s	
32	.075 In/Sec	.371 G-s	
33	.043 In/Sec	.194 G-s	
41	.072 In/Sec	.733 G-s	
42	.070 In/Sec	.654 G-s	
51	.065 In/Sec	.222 G-s	375.0 RPM
53	.081 In/Sec	.293 G-s	
61	.030 In/Sec	.207 G-s	
71	.039 In/Sec	.206 G-s	45.00 RPM
81	.025 In/Sec	.185 G-s	
83	.054 In/Sec	.227 G-s	
57 - A/B Concentr Vac Pmp-var RPM (10-Jan-22)			
	OVERALL LEVEL	1-20 KHz	
11	.069 In/Sec	.280 G-s	900.0 RPM
12	.067 In/Sec	.307 G-s	
21	.079 In/Sec	.317 G-s	
23	.057 In/Sec	.313 G-s	
71	.154 In/Sec	.770 G-s	
81	.191 In/Sec	.884 G-s	
83	.051 In/Sec	1.017 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (10-Jan-22)			
	OVERALL LEVEL	1-20 KHz	
11	.041 In/Sec	.115 G-s	1200.0 RPM
12	.035 In/Sec	.346 G-s	

21	.040 In/Sec	.693 G-s	
22	.045 In/Sec	.314 G-s	
23	.054 In/Sec	.199 G-s	
71	.070 In/Sec	.339 G-s	
72	.067 In/Sec	.497 G-s	
81	.077 In/Sec	.678 G-s	
82	.082 In/Sec	.951 G-s	
83	.041 In/Sec	.630 G-s	

2130-6 - ABC SEC FILT FEED PUMP-NORTH (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.038 In/Sec	.815 G-s	1800.0 RPM
21	.043 In/Sec	.506 G-s	
23	.060 In/Sec	.627 G-s	
71	.183 In/Sec	.872 G-s	
72	.119 In/Sec	.811 G-s	

9001-1 - EAST OXIDIZER FEED PUMP (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.029 In/Sec	.141 G-s	1800.0 RPM
21	.068 In/Sec	.319 G-s	
23	.056 In/Sec	.472 G-s	
71	.114 In/Sec	.531 G-s	
72	.142 In/Sec	.247 G-s	

9001-2 - MIDDLE OXIDIZER FEED PUMP (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.038 In/Sec	.413 G-s	1800.0 RPM
21	.041 In/Sec	.224 G-s	
23	.046 In/Sec	.111 G-s	
71	.076 In/Sec	.251 G-s	
72	.098 In/Sec	.187 G-s	

7016-11 - WEST OXIDIZER FEED PUMP (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.019 In/Sec	.371 G-s	1800.0 RPM
21	.021 In/Sec	.748 G-s	
23	.015 In/Sec	.210 G-s	
71	.084 In/Sec	.225 G-s	
72	.095 In/Sec	.598 G-s	

234-01 - CHILL WATER PUMP 234-01 (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.048 In/Sec	.683 G-s	1790.0 RPM
21	.043 In/Sec	.924 G-s	
23	.117 In/Sec		
71	.085 In/Sec	.466 G-s	
72	.097 In/Sec	.291 G-s	

C-203 - C-203 Comp (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.038 In/Sec	1.351 G-s	3588.0 RPM
12	.081 In/Sec	2.709 G-s	
21	.030 In/Sec	.980 G-s	
22	.049 In/Sec	1.312 G-s	
23	.020 In/Sec	.474 G-s	
	OVERALL LEVEL	1-20 KHZ	

71M	.039 In/Sec	1.783 G-s	
72M	.033 In/Sec	.673 G-s	
73M	.063 In/Sec	2.818 G-s	
81M	.075 In/Sec	3.391 G-s	
82M	.057 In/Sec	2.219 G-s	
71F	.041 In/Sec	1.679 G-s	
72F	.055 In/Sec	1.501 G-s	
73F	.114 In/Sec	5.941 G-s	
81F	.049 In/Sec	3.981 G-s	
82F	.054 In/Sec	2.138 G-s	

9000-02 - D HYDROGENATOR FD PUMP- EAST (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.043 In/Sec	.153 G-s	1800.0 RPM
21	.053 In/Sec	.827 G-s	
23	.037 In/Sec	.195 G-s	
71	.095 In/Sec	.546 G-s	
72	.096 In/Sec	.669 G-s	

236-04A - HYDROGNTOR PRECOOLER FD PUMP (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.039 In/Sec	.430 G-s	1800.0 RPM
21	.071 In/Sec	.791 G-s	
23	.046 In/Sec	.240 G-s	
71	.134 In/Sec	.231 G-s	
72	.071 In/Sec	.236 G-s	

C-202 - C-202 Comp (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.232 In/Sec	8.229 G-s	3588.0 RPM
12	.118 In/Sec	.586 G-s	
21	.071 In/Sec	.296 G-s	
22	.128 In/Sec	4.168 G-s	
23	.075 In/Sec	2.741 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.042 In/Sec	1.583 G-s	
72M	.046 In/Sec	.792 G-s	
73M	.086 In/Sec	2.703 G-s	
81M	.065 In/Sec	4.423 G-s	
82M	.067 In/Sec	8.881 G-s	
71F	.032 In/Sec	3.518 G-s	
72F	.061 In/Sec	1.973 G-s	
73F	.049 In/Sec	1.521 G-s	
81F	.037 In/Sec	4.459 G-s	
82F	.046 In/Sec	.886 G-s	

C-201 - C-201 Comp (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.108 In/Sec	1.975 G-s	3588.0 RPM
12	.088 In/Sec	1.440 G-s	
21	.088 In/Sec	.756 G-s	
22	.048 In/Sec	1.128 G-s	
23	.076 In/Sec	2.124 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.045 In/Sec	2.047 G-s	
72M	.052 In/Sec	3.485 G-s	
73M	.077 In/Sec	3.990 G-s	

81M	.106 In/Sec	4.809 G-s	
82M	.057 In/Sec	2.240 G-s	
71F	.038 In/Sec	1.473 G-s	
72F	.062 In/Sec	1.830 G-s	
73F	.033 In/Sec	.564 G-s	
81F	.048 In/Sec	4.966 G-s	
82F	.054 In/Sec	1.114 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.114 In/Sec	.604 G-s	1780.0 RPM
12	.114 In/Sec	1.020 G-s	
13	.081 In/Sec	.476 G-s	
21	.141 In/Sec	1.263 G-s	
22	.077 In/Sec	.749 G-s	
23	.044 In/Sec	.361 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.127 In/Sec	5.851 G-s	
72F	.165 In/Sec	6.262 G-s	
73F	.129 In/Sec	3.522 G-s	
81F	.148 In/Sec	1.776 G-s	
82F	.213 In/Sec	7.393 G-s	
83F	.191 In/Sec	6.440 G-s	
71M	.096 In/Sec	6.020 G-s	
72M	.137 In/Sec	5.511 G-s	
73M	.130 In/Sec	3.275 G-s	
81M	.167 In/Sec	6.225 G-s	
82M	.215 In/Sec	2.266 G-s	
83M	.170 In/Sec	2.577 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.052 In/Sec	.123 G-s	506.3 RPM
12	.063 In/Sec	.206 G-s	
13	.085 In/Sec	.073 G-s	
21	.044 In/Sec	.066 G-s	
22	.049 In/Sec	.134 G-s	
23	.122 In/Sec	.071 G-s	
71	.124 In/Sec	.172 G-s	
72	.149 In/Sec	.396 G-s	
73	.109 In/Sec	.150 G-s	
81	.120 In/Sec	.098 G-s	
82	.140 In/Sec	.107 G-s	
83	.097 In/Sec	.151 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (10-Jan-22)

	OVERALL LEVEL	1-20 KHz	
11	.088 In/Sec	.036 G-s	1185.0 RPM
21	.082 In/Sec	.130 G-s	
23	.058 In/Sec	.152 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.179 In/Sec	.680 G-s	
31L	.232 In/Sec	.658 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.258 In/Sec	.294 G-s	
51L	.218 In/Sec	.253 G-s	100.0 RPM
52	.265 In/Sec	.268 G-s	

52L	.253 In/Sec	.255 G-s
53	.072 In/Sec	.507 G-s
53L	.026 In/Sec	.521 G-s
61	.183 In/Sec	.115 G-s
61L	.158 In/Sec	.099 G-s
81	.033 In/Sec	.038 G-s
82	.033 In/Sec	.019 G-s
83	.018 In/Sec	.053 G-s

Clarification Of Vibration Units:

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