HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

November 24, 2021

Arkema

Subject: November week 3 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,

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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 a slight drop in the 3x RPM vibration in the motor drive end vertical most likely due to slower speed. 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 0.3”/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. Overall acceleration is 5.4 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 have dropped but are slightly elevated for this motor’s history. Peak acceleration is about 8 g’s and peak velocity has dropped to below 0.1”/second overall for the motor drive end vertical. 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 5.5 g’s RMS at 1 point We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Air Compressor C-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 4.9 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 5 and 10 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 0.2"/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 0.25"/sec velocity peak for the gearbox input horizontal. 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 reportable equipment this week.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 5: ARK WK 3
Report Date: 24-Nov-21 14:09

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (24-Nov-21)			
	OVERALL LEVEL	1-20 KHz	
11	.062 In/Sec	.582 G-s	1200.0 RPM
21	.061 In/Sec	.491 G-s	
23	.176 In/Sec	.159 G-s	
71	.106 In/Sec	1.221 G-s	
81	.166 In/Sec	.842 G-s	
83	.076 In/Sec	1.304 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (24-Nov-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.050 In/Sec	.021 G-s	45.00 RPM
03	.043 In/Sec	.028 G-s	
11	.077 In/Sec	.709 G-s	1400.0 RPM
12	.081 In/Sec	.915 G-s	
13	.158 In/Sec	.220 G-s	
21	.086 In/Sec	.413 G-s	
22	.157 In/Sec	.093 G-s	
23	.131 In/Sec	1.199 G-s	
31	.074 In/Sec	.397 G-s	
32	.084 In/Sec	.460 G-s	
33	.039 In/Sec	.177 G-s	
41	.069 In/Sec	.515 G-s	
42	.075 In/Sec	.516 G-s	
51	.101 In/Sec	.297 G-s	375.0 RPM
53	.085 In/Sec	.197 G-s	
61	.044 In/Sec	.218 G-s	
71	.054 In/Sec	.322 G-s	45.00 RPM
81	.019 In/Sec	.166 G-s	
83	.053 In/Sec	.205 G-s	
57 - A/B Concentr Vac Pmp-var RPM (24-Nov-21)			
	OVERALL LEVEL	1-20 KHz	
11	.070 In/Sec	.375 G-s	900.0 RPM
12	.078 In/Sec	.303 G-s	
21	.089 In/Sec	.314 G-s	
23	.070 In/Sec	.247 G-s	
71	.134 In/Sec	.956 G-s	
81	.304 In/Sec	.937 G-s	
83	.052 In/Sec	.787 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (24-Nov-21)			
	OVERALL LEVEL	1-20 KHz	
11	.036 In/Sec	.204 G-s	1200.0 RPM
12	.031 In/Sec	.304 G-s	

21	.042 In/Sec	.302 G-s	
22	.041 In/Sec	.456 G-s	
23	.053 In/Sec	.381 G-s	
71	.075 In/Sec	.119 G-s	
72	.062 In/Sec	.506 G-s	
81	.072 In/Sec	.744 G-s	
82	.089 In/Sec	.518 G-s	
83	.040 In/Sec	.478 G-s	

C-203 - C-203 Comp (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.065 In/Sec	2.415 G-s	3588.0 RPM
12	.149 In/Sec	6.314 G-s	
21	.030 In/Sec	.936 G-s	
22	.068 In/Sec	2.407 G-s	
23	.021 In/Sec	.581 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.034 In/Sec	1.384 G-s	
72M	.051 In/Sec	1.922 G-s	
73M	.058 In/Sec	2.837 G-s	
81M	.057 In/Sec	4.913 G-s	
82M	.064 In/Sec	4.808 G-s	
71F	.053 In/Sec	1.724 G-s	
72F	.052 In/Sec	1.825 G-s	
73F	.086 In/Sec	4.858 G-s	
81F	.053 In/Sec	2.837 G-s	
82F	.055 In/Sec	2.422 G-s	

C-202 - C-202 Comp (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.204 In/Sec	8.757 G-s	3588.0 RPM
12	.118 In/Sec	.819 G-s	
21	.096 In/Sec	2.396 G-s	
22	.062 In/Sec	1.364 G-s	
23	.115 In/Sec	4.507 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.039 In/Sec	2.458 G-s	
72M	.043 In/Sec	.868 G-s	
73M	.073 In/Sec	1.514 G-s	
81M	.034 In/Sec	4.168 G-s	
82M	.055 In/Sec	1.650 G-s	
71F	.032 In/Sec	1.913 G-s	
72F	.059 In/Sec	1.846 G-s	
73F	.059 In/Sec	1.474 G-s	
81F	.035 In/Sec	5.489 G-s	
82F	.051 In/Sec	1.803 G-s	

C-201 - C-201 Comp (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.125 In/Sec	.725 G-s	3588.0 RPM
12	.063 In/Sec	.641 G-s	
21	.112 In/Sec	2.894 G-s	
22	.047 In/Sec	.640 G-s	
23	.064 In/Sec	1.416 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.046 In/Sec	2.071 G-s	
72M	.055 In/Sec	2.774 G-s	

73M	.082 In/Sec	1.795 G-s	
81M	.105 In/Sec	4.374 G-s	
82M	.066 In/Sec	4.001 G-s	
71F	.043 In/Sec	5.444 G-s	
72F	.046 In/Sec	.638 G-s	
73F	.044 In/Sec	1.782 G-s	
81F	.054 In/Sec	2.108 G-s	
82F	.067 In/Sec	2.104 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.134 In/Sec	.627 G-s	1780.0 RPM
12	.110 In/Sec	.755 G-s	
13	.085 In/Sec	.619 G-s	
21	.144 In/Sec	1.404 G-s	
22	.080 In/Sec	.714 G-s	
23	.051 In/Sec	.738 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.191 In/Sec	8.005 G-s	
72F	.125 In/Sec	6.454 G-s	
73F	.162 In/Sec	4.940 G-s	
81F	.127 In/Sec	2.474 G-s	
82F	.213 In/Sec	5.656 G-s	
83F	.145 In/Sec	2.022 G-s	
71M	.129 In/Sec	7.818 G-s	
72M	.180 In/Sec	7.157 G-s	
73M	.107 In/Sec	6.908 G-s	
81M	.187 In/Sec	6.917 G-s	
82M	.288 In/Sec	9.948 G-s	
83M	.232 In/Sec	6.004 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.059 In/Sec	.125 G-s	506.3 RPM
12	.068 In/Sec	.132 G-s	
13	.090 In/Sec	.123 G-s	
21	.056 In/Sec	.082 G-s	
22	.060 In/Sec	.133 G-s	
23	.093 In/Sec	.096 G-s	
71	.107 In/Sec	.927 G-s	
72	.160 In/Sec	.951 G-s	
73	.106 In/Sec	.068 G-s	
81	.114 In/Sec	.308 G-s	
82	.197 In/Sec	.278 G-s	
83	.113 In/Sec	.153 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.089 In/Sec	.018 G-s	1185.0 RPM
21	.082 In/Sec	.135 G-s	
23	.067 In/Sec	.051 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.240 In/Sec	.575 G-s	
31L	.243 In/Sec	.556 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.196 In/Sec	.190 G-s	
51L	.221 In/Sec	.189 G-s	100.0 RPM

52	.187 In/Sec	.283 G-s	
52L	.193 In/Sec	.282 G-s	
53	.087 In/Sec	.343 G-s	
53L	.026 In/Sec	.399 G-s	
61	.112 In/Sec	.130 G-s	
61L	.151 In/Sec	.139 G-s	
81	.034 In/Sec	.038 G-s	
82	.032 In/Sec	.030 G-s	
83	.019 In/Sec	.024 G-s	

530-01 - PUMP,N.COOLING TWR,NORTH (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.076 In/Sec	.290 G-s	1780.0 RPM
12	.143 In/Sec	.524 G-s	

530-03 - PUMP,N.COOLING TWR,SOUTH (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.102 In/Sec	.586 G-s	1780.0 RPM
12	.384 In/Sec	.455 G-s	

548-7 - IRON-FREE H2O BOOSTER PUMP (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.015 In/Sec	.306 G-s	1800.0 RPM
21	.018 In/Sec	.626 G-s	
23	.032 In/Sec	.287 G-s	
71	.044 In/Sec	.078 G-s	
72	.025 In/Sec	.134 G-s	

SCT-1 - SOUTH CT PUMP - EAST (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.022 In/Sec	.986 G-s	1800.0 RPM
21	.032 In/Sec	1.026 G-s	
23	.042 In/Sec	.253 G-s	
71	.084 In/Sec	.350 G-s	
72	.050 In/Sec	.379 G-s	

SCT-2 - SOUTH CT PUMP - MID (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.030 In/Sec	1.358 G-s	1800.0 RPM
21	.055 In/Sec	1.212 G-s	
23	.056 In/Sec	.446 G-s	
71	.104 In/Sec	.355 G-s	
72	.050 In/Sec	.287 G-s	

SCT-3 - SOUTH CT PUMP - WEST (24-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.104 In/Sec	.690 G-s	1800.0 RPM
21	.035 In/Sec	.226 G-s	
23	.045 In/Sec	.244 G-s	
71	.090 In/Sec	.267 G-s	
72	.080 In/Sec	.233 G-s	

Clarification Of Vibration Units:

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