HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

December 17, 2021

Arkema

Subject: December 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,

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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 0.19"/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 amplitude 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 0.52"/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 7 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 low noise floor. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. Overall acceleration is 6 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 8 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 9 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 at 0.15"/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. Non-rated.

D Hydrogenator Agitator 9002
Highest overall vibration is at 0.29"/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

M MIX BED WATER PUMP 191-07
The pump 2x and 5x RPM vibrations are dominant. Check the pump operational parameters and shaft alignment as time allows. **Rated a Class I Defect.**

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 4: ARK WK 2
Report Date: 20-Dec-21 07:22

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (17-Dec-21)			
	OVERALL LEVEL	1-20 KHz	
11	.060 In/Sec	.345 G-s	1200.0 RPM
21	.063 In/Sec	.415 G-s	
23	.191 In/Sec	.146 G-s	
71	.131 In/Sec	.808 G-s	
81	.175 In/Sec	.671 G-s	
83	.077 In/Sec	1.439 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (17-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.048 In/Sec	.014 G-s	45.00 RPM
03	.045 In/Sec	.033 G-s	
11	.073 In/Sec	.716 G-s	1400.0 RPM
12	.082 In/Sec	.681 G-s	
13	.150 In/Sec	.090 G-s	
21	.091 In/Sec	.317 G-s	
22	.147 In/Sec	.088 G-s	
23	.123 In/Sec	.782 G-s	
31	.073 In/Sec	.438 G-s	
32	.084 In/Sec	.435 G-s	
33	.044 In/Sec	.165 G-s	
41	.066 In/Sec	.473 G-s	
42	.079 In/Sec	.520 G-s	
51	.064 In/Sec	.255 G-s	375.0 RPM
53	.102 In/Sec	.233 G-s	
61	.053 In/Sec	.230 G-s	
71	.037 In/Sec	.264 G-s	45.00 RPM
81	.021 In/Sec	.138 G-s	
83	.054 In/Sec	.191 G-s	
57 - A/B Concentr Vac Pmp-var RPM (17-Dec-21)			
	OVERALL LEVEL	1-20 KHz	
11	.058 In/Sec	.393 G-s	900.0 RPM
12	.062 In/Sec	.319 G-s	
21	.066 In/Sec	.249 G-s	
23	.054 In/Sec	.189 G-s	
71	.135 In/Sec	.460 G-s	
81	.354 In/Sec	.956 G-s	
83	.093 In/Sec	.795 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (17-Dec-21)			
	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.274 G-s	1200.0 RPM
12	.038 In/Sec	.385 G-s	

	21	.045 In/Sec	.709 G-s	
	22	.039 In/Sec	.299 G-s	
	23	.047 In/Sec	1.005 G-s	
	71	.066 In/Sec	.329 G-s	
	72	.078 In/Sec	.392 G-s	
	81	.076 In/Sec	.475 G-s	
	82	.084 In/Sec	.802 G-s	
	83	.049 In/Sec	.663 G-s	

C-203 - C-203 Comp (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.041 In/Sec	1.308 G-s	3588.0 RPM
12	.061 In/Sec	1.963 G-s	
21	.067 In/Sec	2.612 G-s	
22	.074 In/Sec	2.756 G-s	
23	.052 In/Sec	2.116 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.031 In/Sec	.577 G-s	
72M	.038 In/Sec	1.290 G-s	
73M	.057 In/Sec	8.659 G-s	
81M	.056 In/Sec	2.873 G-s	
82M	.053 In/Sec	4.503 G-s	
71F	.068 In/Sec	2.107 G-s	
72F	.037 In/Sec	.781 G-s	
73F	.056 In/Sec	1.402 G-s	
81F	.032 In/Sec	1.116 G-s	
82F	.036 In/Sec	.882 G-s	

C-202 - C-202 Comp (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.073 In/Sec	.838 G-s	3588.0 RPM
12	.116 In/Sec	.693 G-s	
21	.068 In/Sec	.723 G-s	
22	.123 In/Sec	3.664 G-s	
23	.039 In/Sec	.389 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.038 In/Sec	1.778 G-s	
72M	.051 In/Sec	2.628 G-s	
73M	.074 In/Sec	5.437 G-s	
81M	.052 In/Sec	3.992 G-s	
82M	.048 In/Sec	1.422 G-s	
71F	.027 In/Sec	4.864 G-s	
72F	.061 In/Sec	.852 G-s	
73F	.088 In/Sec	5.681 G-s	
81F	.035 In/Sec	6.152 G-s	
82F	.052 In/Sec	1.081 G-s	

C-201 - C-201 Comp (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.154 In/Sec	4.493 G-s	3588.0 RPM
12	.045 In/Sec	.641 G-s	
21	.109 In/Sec	2.546 G-s	
22	.042 In/Sec	.072 G-s	
23	.095 In/Sec	2.893 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.041 In/Sec	1.905 G-s	
72M	.045 In/Sec	3.273 G-s	

73M	.070 In/Sec	1.943 G-s	
81M	.078 In/Sec	3.290 G-s	
82M	.056 In/Sec	5.024 G-s	
71F	.043 In/Sec	1.831 G-s	
72F	.042 In/Sec	1.078 G-s	
73F	.048 In/Sec	1.552 G-s	
81F	.037 In/Sec	7.221 G-s	
82F	.048 In/Sec	1.151 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.147 In/Sec	.734 G-s	1780.0 RPM
12	.104 In/Sec	.562 G-s	
13	.071 In/Sec	.400 G-s	
21	.153 In/Sec	1.015 G-s	
22	.079 In/Sec	.681 G-s	
23	.052 In/Sec	.498 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.160 In/Sec	7.964 G-s	
72F	.184 In/Sec	6.456 G-s	
73F	.143 In/Sec	3.893 G-s	
81F	.121 In/Sec	3.113 G-s	
82F	.264 In/Sec	5.021 G-s	
83F	.158 In/Sec	3.618 G-s	
71M	.090 In/Sec	7.786 G-s	
72M	.163 In/Sec	9.182 G-s	
73M	.124 In/Sec	6.408 G-s	
81M	.164 In/Sec	2.549 G-s	
82M	.257 In/Sec	1.359 G-s	
83M	.181 In/Sec	3.757 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.045 In/Sec	.076 G-s	506.3 RPM
12	.047 In/Sec	.128 G-s	
13	.086 In/Sec	.083 G-s	
21	.043 In/Sec	.065 G-s	
22	.061 In/Sec	.092 G-s	
23	.122 In/Sec	.063 G-s	
71	.117 In/Sec	.433 G-s	
72	.153 In/Sec	.344 G-s	
73	.093 In/Sec	.246 G-s	
81	.116 In/Sec	.124 G-s	
82	.152 In/Sec	.071 G-s	
83	.102 In/Sec	.083 G-s	

202-05 - NASH SEAL LIQUID PUMP-A (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.018 In/Sec	.065 G-s	1800.0 RPM
21	.012 In/Sec	.143 G-s	
23	.017 In/Sec	.070 G-s	
71	.024 In/Sec	.042 G-s	
72	.022 In/Sec	.028 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.082 In/Sec	.057 G-s	1185.0 RPM

21	.069 In/Sec	.113 G-s	
23	.052 In/Sec	.039 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.190 In/Sec	.506 G-s	
31L	.346 In/Sec	.503 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.267 In/Sec	.217 G-s	
51L	.240 In/Sec	.192 G-s	100.0 RPM
52	.288 In/Sec	.279 G-s	
52L	.256 In/Sec	.299 G-s	
53	.062 In/Sec	.210 G-s	
53L	.034 In/Sec	.211 G-s	
61	.167 In/Sec	.094 G-s	
61L	.176 In/Sec	.090 G-s	
81	.036 In/Sec	.036 G-s	
82	.034 In/Sec	.031 G-s	
83	.019 In/Sec	.034 G-s	

192-03 - Two Stage Water Pump A-WEST (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.058 In/Sec	.155 G-s	1765.0 RPM
21	.073 In/Sec	.347 G-s	
23	.046 In/Sec	.160 G-s	
71	.177 In/Sec	.330 G-s	
72	.071 In/Sec	.526 G-s	

191-07 - M MIX BED WATER PUMP 191-07 (17-Dec-21)

	OVERALL LEVEL	1-20 KHz	
11	.067 In/Sec	.119 G-s	3600.0 RPM
21	.051 In/Sec	.392 G-s	
23	.121 In/Sec	.553 G-s	
71	.309 In/Sec	.179 G-s	
72	.172 In/Sec	.161 G-s	

Clarification Of Vibration Units:

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