HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

November 18, 2021

Arkema

Subject: November 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 0.21”/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.**

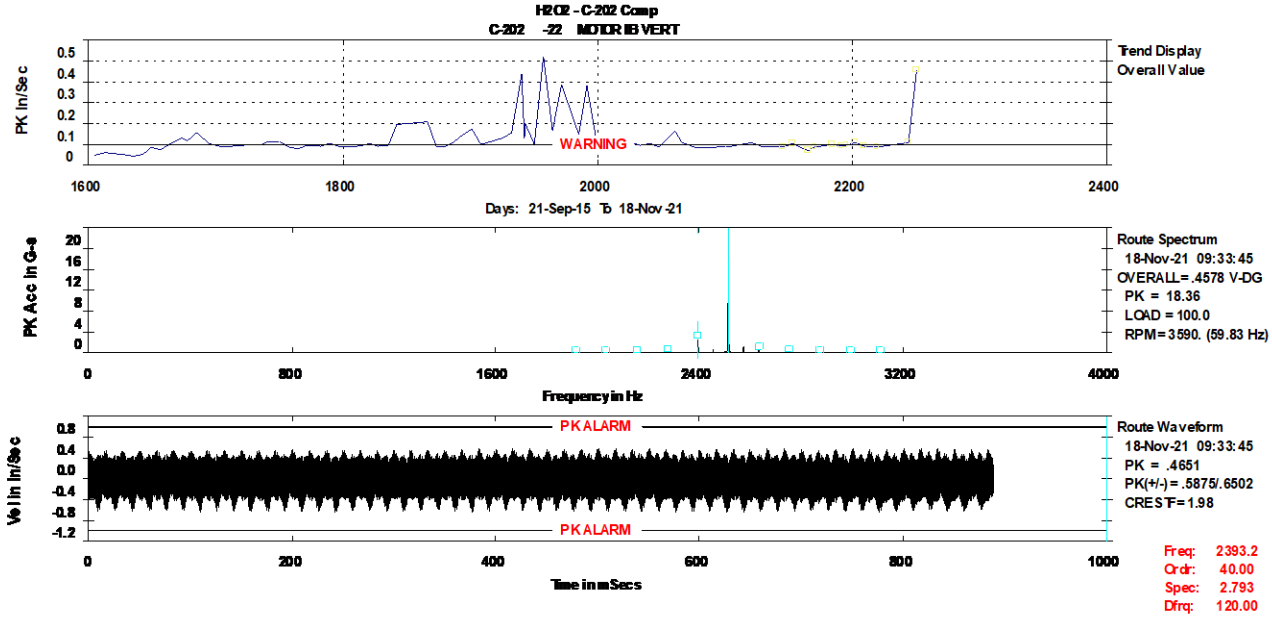
Agitator, Hydrogenator C 7001-01
Data shows a slight increase in a 3x RPM vibration in the motor drive end vertical. This usually indicates some misalignment. Adjust only as time allows. **Rated a Class I Defect.**

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.25”/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 4.7 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 extremely high for this motor’s history. Peak acceleration is about 18 g’s and peak velocity is approaching ½”/second overall for the motor drive end vertical. Vibration data indicates the motor has 42 bars in the rotor. 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 3.3 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 II 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 6.2 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 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 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. 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 RPM vibration is 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: 23-Nov-21 07:32

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump	(18-Nov-21)		
	OVERALL LEVEL	1-20 KHz	
11	.062 In/Sec	.635 G-s	1200.0 RPM
21	.064 In/Sec	.534 G-s	
23	.214 In/Sec	.142 G-s	
71	.149 In/Sec	.787 G-s	
81	.180 In/Sec	.666 G-s	
83	.081 In/Sec	1.718 G-s	
7000-01 - AGITATOR,HYDROGENATOR C	(18-Nov-21)		
	OVERALL LEVEL	1-20 KHZ	
02	.050 In/Sec	.035 G-s	45.00 RPM
03	.045 In/Sec	.021 G-s	
11	.078 In/Sec	.635 G-s	1400.0 RPM
12	.098 In/Sec	.799 G-s	
13	.146 In/Sec	.132 G-s	
21	.085 In/Sec	.315 G-s	
22	.177 In/Sec	.066 G-s	
23	.152 In/Sec	1.038 G-s	
31	.073 In/Sec	.397 G-s	

	32	.087 In/Sec	.511 G-s	
	33	.048 In/Sec	.239 G-s	
	41	.082 In/Sec	.627 G-s	
	42	.086 In/Sec	.708 G-s	
	51	.066 In/Sec	.325 G-s	375.0 RPM
	53	.074 In/Sec	.227 G-s	
	61	.033 In/Sec	.205 G-s	
	71	.056 In/Sec	.287 G-s	45.00 RPM
	81	.023 In/Sec	.168 G-s	
	83	.058 In/Sec	.229 G-s	

57 - A/B Concentr Vac Pmp-var RPM (18-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.094 In/Sec	.265 G-s	900.0 RPM
12	.070 In/Sec	.402 G-s	
21	.091 In/Sec	.188 G-s	
23	.054 In/Sec	.198 G-s	
71	.131 In/Sec	.399 G-s	
81	.249 In/Sec	.774 G-s	
83	.055 In/Sec	.687 G-s	

2130-1 - FLASH VAP VAC PUMP-var speed (18-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.055 In/Sec	.160 G-s	1200.0 RPM
12	.031 In/Sec	.287 G-s	
21	.044 In/Sec	.328 G-s	
22	.048 In/Sec	.179 G-s	
23	.057 In/Sec	.431 G-s	
71	.061 In/Sec	.244 G-s	
72	.068 In/Sec	.364 G-s	
81	.070 In/Sec	.695 G-s	
82	.087 In/Sec	.721 G-s	
83	.046 In/Sec	.662 G-s	

C-203 - C-203 Comp (18-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.048 In/Sec	1.761 G-s	3588.0 RPM
12	.031 In/Sec	.449 G-s	
21	.038 In/Sec	1.323 G-s	
22	.106 In/Sec	4.115 G-s	
23	.020 In/Sec	.406 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.049 In/Sec	4.101 G-s	
72M	.033 In/Sec	.740 G-s	
73M	.053 In/Sec	3.897 G-s	
81M	.059 In/Sec	1.580 G-s	
82M	.056 In/Sec	6.180 G-s	
71F	.046 In/Sec	1.996 G-s	
72F	.050 In/Sec	1.299 G-s	
73F	.079 In/Sec	3.737 G-s	
81F	.054 In/Sec	3.872 G-s	
82F	.050 In/Sec	1.722 G-s	

C-202 - C-202 Comp (18-Nov-21)

	OVERALL LEVEL	1-20 KHz	
11	.080 In/Sec	2.718 G-s	3588.0 RPM
12	.129 In/Sec	1.211 G-s	

21	.081 In/Sec	.972 G-s	
22	.458 In/Sec	17.91 G-s	
23	.097 In/Sec	3.807 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.033 In/Sec	.978 G-s	
72M	.039 In/Sec	.579 G-s	
73M	.079 In/Sec	1.934 G-s	
81M	.034 In/Sec	2.406 G-s	
82M	.066 In/Sec	1.979 G-s	
71F	.038 In/Sec	1.678 G-s	
72F	.057 In/Sec	1.272 G-s	
73F	.055 In/Sec	2.229 G-s	
81F	.045 In/Sec	3.331 G-s	
82F	.045 In/Sec	.885 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.119 In/Sec	3.251 G-s	3588.0 RPM
12	.087 In/Sec	3.647 G-s	
21	.097 In/Sec	1.546 G-s	
22	.043 In/Sec	.758 G-s	
23	.057 In/Sec	.904 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.048 In/Sec	2.423 G-s	
72M	.056 In/Sec	3.003 G-s	
73M	.084 In/Sec	2.245 G-s	
81M	.083 In/Sec	4.669 G-s	
82M	.059 In/Sec	2.964 G-s	
71F	.053 In/Sec	2.081 G-s	
72F	.073 In/Sec	2.398 G-s	
73F	.078 In/Sec	3.286 G-s	
81F	.067 In/Sec	2.805 G-s	
82F	.063 In/Sec	2.662 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.129 In/Sec	.527 G-s	1780.0 RPM
12	.108 In/Sec	.689 G-s	
13	.069 In/Sec	.331 G-s	
21	.161 In/Sec	.876 G-s	
22	.074 In/Sec	.644 G-s	
23	.087 In/Sec	.464 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.147 In/Sec	6.404 G-s	
72F	.139 In/Sec	6.630 G-s	
73F	.171 In/Sec	5.440 G-s	
81F	.137 In/Sec	2.102 G-s	
82F	.235 In/Sec	6.903 G-s	
83F	.178 In/Sec	3.356 G-s	
71M	.127 In/Sec	9.387 G-s	
72M	.146 In/Sec	7.044 G-s	
73M	.104 In/Sec	8.070 G-s	
81M	.207 In/Sec	6.907 G-s	
82M	.290 In/Sec	2.510 G-s	
83M	.178 In/Sec	1.269 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.063 In/Sec	.105 G-s	506.3 RPM
12	.061 In/Sec	.167 G-s	
13	.110 In/Sec	.105 G-s	
21	.058 In/Sec	.093 G-s	
22	.066 In/Sec	.138 G-s	
23	.094 In/Sec	.094 G-s	
71	.119 In/Sec	.998 G-s	
72	.176 In/Sec	1.131 G-s	
73	.096 In/Sec	.091 G-s	
81	.119 In/Sec	.395 G-s	
82	.204 In/Sec	.209 G-s	
83	.100 In/Sec	.201 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.016 In/Sec	.091 G-s	1800.0 RPM
21	.016 In/Sec	.250 G-s	
23	.018 In/Sec	.122 G-s	
71	.021 In/Sec	.047 G-s	
72	.013 In/Sec	.032 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.092 In/Sec	.033 G-s	1185.0 RPM
21	.070 In/Sec	.185 G-s	
23	.063 In/Sec	.035 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.179 In/Sec	.487 G-s	
31L	.114 In/Sec	.518 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.159 In/Sec	.185 G-s	
51L	.223 In/Sec	.197 G-s	100.0 RPM
52	.261 In/Sec	.244 G-s	
52L	.253 In/Sec	.242 G-s	
53	.081 In/Sec	.487 G-s	
53L	.032 In/Sec	.466 G-s	
61	.134 In/Sec	.113 G-s	
61L	.138 In/Sec	.112 G-s	
81	.033 In/Sec	.051 G-s	
82	.037 In/Sec	.028 G-s	
83	.024 In/Sec	.179 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	

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       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-Nov-21)
                    OVERALL LEVEL     1-20 KHz
       11               .058 In/Sec       .115 G-s        1765.0 RPM
       21               .072 In/Sec       .229 G-s
       23               .050 In/Sec       .388 G-s
       71               .144 In/Sec       .627 G-s
       72               .065 In/Sec       .632 G-s

191-13     - E MIXED BED WATER PMP 191-13  (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-Nov-21)
                    OVERALL LEVEL     1-20 KHz
       11               .084 In/Sec       .149 G-s        3600.0 RPM
       21               .065 In/Sec       .483 G-s
       23               .114 In/Sec       .368 G-s
       71               .338 In/Sec       .171 G-s
       72               .241 In/Sec       .205 G-s

191-14     - W MIX BED WATER PUMP 191-14   (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

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  Clarification Of Vibration Units:
     Acc      -->  G-s      PK
     Vel      -->  In/Sec   PK
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