HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

September 24, 2021

Arkema

Subject: September 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 0.19"/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 0.138"/second velocity peak overall. No immediate concern.

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.27"/sec peak velocity for the outboard pump bearing and is dominated by a 16 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 wide noise floor. We suspect this is impeller pass related. Overall acceleration is 6.6 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. 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. We suspect this is impeller pass related. Overall acceleration is 5.9 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. 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 wide noise floor. We suspect this is impeller pass related. Overall acceleration is 6.4 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Instrument Air Compressor
The unit pad was still covered with an extremely slippery oily slimy mixture that prevented safe data collection.

Air Compressor NASH A 201-08A
Vibrations are still lower at 0.19"/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 0.27"/sec velocity peak for the gearbox output top horizontal. 2 dominant vibrations are sub-synchronous to motor speed at about 9 Hz and a 10.5 orders. peak and harmonic. 6.4There appears to be a resonance, and the amplitude changes over time, but does not seem to be periodic. The others are most likely the number of pinion teeth (14 teeth and the input gear mesh) and the first harmonic of gear mesh. Ensure all fasteners are at proper torque values and inspect support structures for any signs of stress cracks, broken welds, or metal fatigue. **Rated a Class I Defect now.**

H2O2 Monthly Route Equipment

North Cooling Tower South Vertical Pump 530-03
Pump vibrations show a 1xand a sub-synchronous vibration with the overall velocity at 0.32"/second velocity peak. Check unit fasteners and flow as time allows. **Rated a Class I Defect.**

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 5: ARK WK 3
Report Date: 24-Sep-21 12:37

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (24-Sep-21)			
	OVERALL LEVEL	1-20 KHz	
11	.058 In/Sec	.533 G-s	1200.0 RPM
21	.058 In/Sec	.468 G-s	
23	.188 In/Sec	.124 G-s	
71	.141 In/Sec	.955 G-s	
81	.152 In/Sec	.571 G-s	
83	.071 In/Sec	1.608 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (24-Sep-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.039 In/Sec	.040 G-s	45.00 RPM
03	.057 In/Sec	.058 G-s	
11	.083 In/Sec	.611 G-s	1400.0 RPM
12	.076 In/Sec	.735 G-s	
13	.135 In/Sec	.277 G-s	
21	.090 In/Sec	.345 G-s	
22	.138 In/Sec	.227 G-s	
23	.107 In/Sec	.850 G-s	
31	.073 In/Sec	.414 G-s	
32	.084 In/Sec	.573 G-s	
33	.044 In/Sec	.219 G-s	
41	.069 In/Sec	.429 G-s	
42	.080 In/Sec	.682 G-s	
51	.071 In/Sec	.375 G-s	375.0 RPM
53	.072 In/Sec	.209 G-s	
61	.038 In/Sec	.103 G-s	
71	.048 In/Sec	.257 G-s	45.00 RPM
81	.021 In/Sec	.164 G-s	
83	.051 In/Sec	.195 G-s	
57 - A/B Concentr Vac Pmp-var RPM (24-Sep-21)			
	OVERALL LEVEL	1-20 KHz	
11	.064 In/Sec	.343 G-s	900.0 RPM
12	.062 In/Sec	.281 G-s	
21	.104 In/Sec	.247 G-s	
23	.068 In/Sec	.157 G-s	
71	.140 In/Sec	.585 G-s	
81	.267 In/Sec	1.027 G-s	
83	.079 In/Sec	.713 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (24-Sep-21)			
	OVERALL LEVEL	1-20 KHz	
11	.064 In/Sec	.086 G-s	1200.0 RPM
12	.035 In/Sec	.241 G-s	
21	.041 In/Sec	.334 G-s	

	22	.044 In/Sec	.764 G-s	
	23	.050 In/Sec	.480 G-s	
	71	.057 In/Sec	.465 G-s	
	72	.072 In/Sec	.541 G-s	
	81	.088 In/Sec	.138 G-s	
	82	.081 In/Sec	.920 G-s	
	83	.041 In/Sec	.588 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.031 In/Sec	.916 G-s	3588.0 RPM
12	.099 In/Sec	3.597 G-s	
21	.080 In/Sec	3.313 G-s	
22	.028 In/Sec	.283 G-s	
23	.058 In/Sec	2.280 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.051 In/Sec	3.572 G-s	
72M	.042 In/Sec	2.390 G-s	
73M	.057 In/Sec	4.684 G-s	
81M	.053 In/Sec	2.807 G-s	
82M	.065 In/Sec	5.910 G-s	
71F	.045 In/Sec	2.873 G-s	
72F	.052 In/Sec	1.664 G-s	
73F	.082 In/Sec	6.410 G-s	
81F	.053 In/Sec	2.901 G-s	
82F	.046 In/Sec	1.688 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.120 In/Sec	4.535 G-s	3588.0 RPM
12	.129 In/Sec	.762 G-s	
21	.072 In/Sec	1.155 G-s	
22	.096 In/Sec	2.570 G-s	
23	.064 In/Sec	1.895 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.034 In/Sec	1.471 G-s	
72M	.060 In/Sec	2.292 G-s	
73M	.075 In/Sec	2.332 G-s	
81M	.046 In/Sec	2.635 G-s	
82M	.055 In/Sec	5.990 G-s	
71F	.045 In/Sec	1.785 G-s	
72F	.058 In/Sec	1.656 G-s	
73F	.043 In/Sec	1.184 G-s	
81F	.034 In/Sec	.927 G-s	
82F	.047 In/Sec	.950 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.142 In/Sec	4.479 G-s	3588.0 RPM
12	.088 In/Sec	1.698 G-s	
21	.096 In/Sec	1.824 G-s	
22	.044 In/Sec	.037 G-s	
23	.048 In/Sec	.329 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.054 In/Sec	3.088 G-s	
72M	.053 In/Sec	3.186 G-s	
73M	.073 In/Sec	1.697 G-s	

81M	.087 In/Sec	6.159 G-s	
82M	.063 In/Sec	3.357 G-s	
71F	.047 In/Sec	2.949 G-s	
72F	.056 In/Sec	1.650 G-s	
73F	.041 In/Sec	1.413 G-s	
81F	.044 In/Sec	6.601 G-s	
82F	.041 In/Sec	.894 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (13-Sep-21)

	OVERALL LEVEL	1-20 KHz	
* 11	.121 In/Sec	.825 G-s	1780.0 RPM
* 12	.097 In/Sec	.679 G-s	
* 13	.059 In/Sec	.434 G-s	
* 21	.142 In/Sec	1.558 G-s	
* 22	.074 In/Sec	.868 G-s	
* 23	.049 In/Sec	.414 G-s	
	OVERALL LEVEL	1-20 KHZ	
* 71F	.117 In/Sec	7.788 G-s	
* 72F	.128 In/Sec	4.174 G-s	
* 73F	.282 In/Sec	2.483 G-s	
* 81F	.315 In/Sec	11.28 G-s	
* 82F	.311 In/Sec	13.15 G-s	
* 83F	.143 In/Sec	3.039 G-s	
71M	.115 In/Sec	6.427 G-s	
72M	.125 In/Sec	4.128 G-s	
73M	.108 In/Sec	5.032 G-s	
81M	.142 In/Sec	3.660 G-s	
82M	.189 In/Sec	3.068 G-s	
83M	.182 In/Sec	3.277 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.063 In/Sec	.120 G-s	506.3 RPM
12	.064 In/Sec	.229 G-s	
13	.130 In/Sec	.102 G-s	
21	.072 In/Sec	.070 G-s	
22	.072 In/Sec	.137 G-s	
23	.120 In/Sec	.111 G-s	
71	.121 In/Sec	1.197 G-s	
72	.175 In/Sec	.981 G-s	
73	.101 In/Sec	.250 G-s	
81	.127 In/Sec	.258 G-s	
82	.187 In/Sec	.301 G-s	
83	.115 In/Sec	.105 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.094 In/Sec	.031 G-s	1185.0 RPM
21	.062 In/Sec	.132 G-s	
23	.043 In/Sec	.049 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.199 In/Sec	.904 G-s	
31L	.177 In/Sec	.872 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.158 In/Sec	.365 G-s	
51L	.170 In/Sec	.293 G-s	100.0 RPM
52	.238 In/Sec	.276 G-s	

52L	.274 In/Sec	.264 G-s	
53	.072 In/Sec	.399 G-s	
53L	.024 In/Sec	.383 G-s	
61	.147 In/Sec	.118 G-s	
61L	.163 In/Sec	.111 G-s	
81	.035 In/Sec	.037 G-s	
82	.037 In/Sec	.016 G-s	
83	.027 In/Sec	.212 G-s	

NTC-SF - N CT-SOUTH FAN, N TWR (30-Aug-21)

	OVERALL LEVEL	1-20 KHz	
1	.367 In/Sec	.531 G-s	1780.0 RPM
2	.194 In/Sec	.415 G-s	
3	.221 In/Sec	.461 G-s	
	OVERALL LEVEL	1-20 KHZ	
4	.222 In/Sec	.423 G-s	
5	.0049 In/Sec	.0012 G-s	
6	.276 In/Sec	.414 G-s	
6L	.303 In/Sec	.386 G-s	

NCT - NF - N CT -NORTH FAN, N TWR (30-Aug-21)

	OVERALL LEVEL	1-20 KHz	
7	.247 In/Sec	.506 G-s	1780.0 RPM
8	.138 In/Sec	.410 G-s	
9	.136 In/Sec	.334 G-s	
	OVERALL LEVEL	1-20 KHZ	
10	.139 In/Sec	.335 G-s	
11	.136 In/Sec	.299 G-s	
12	.142 In/Sec	.383 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.162 In/Sec	.386 G-s	1780.0 RPM
12	.145 In/Sec	.449 G-s	

530-02 - PUMP,N.COOLING TWR,MIDDLE (22-Jun-21)

	OVERALL LEVEL	1-20 KHz	
11	.127 In/Sec	.376 G-s	1780.0 RPM
12	.163 In/Sec	.527 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.124 In/Sec	.547 G-s	1780.0 RPM
12	.319 In/Sec	.453 G-s	

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

	OVERALL LEVEL	1-20 KHz	
11	.020 In/Sec	.484 G-s	1800.0 RPM
21	.020 In/Sec	.704 G-s	
23	.031 In/Sec	.246 G-s	
71	.034 In/Sec	.112 G-s	
72	.026 In/Sec	.134 G-s	

STC-NF - S CT - NORTH FAN, S TWR (30-Aug-21)

	OVERALL LEVEL	1-20 KHz	
1	.289 In/Sec	.599 G-s	1780.0 RPM
2	.220 In/Sec	.399 G-s	

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       3                .259 In/Sec       .160 G-s
                      OVERALL LEVEL     1-20 KHz
       4                .130 In/Sec       .342 G-s
       5                .135 In/Sec       .472 G-s
     * 6                .175 In/Sec       .472 G-s

STC-MF     - S CT - MID FAN, S TWR         (30-Aug-21)
                      OVERALL LEVEL     1-20 KHz
       1                .264 In/Sec       .378 G-s        1780.0 RPM
     * 2                .240 In/Sec       .084 G-s
       3                .116 In/Sec       .102 G-s
                      OVERALL LEVEL     1-20 KHz
       4                .084 In/Sec       .264 G-s
       5                .123 In/Sec       .426 G-s
       6                .090 In/Sec       .493 G-s

STC-SF     - S CT - SOUTH FAN, S TWR       (30-Aug-21)
                      OVERALL LEVEL     1-20 KHz
       1                .193 In/Sec       .377 G-s        1780.0 RPM
       2                .254 In/Sec       .212 G-s
       3                .330 In/Sec       .097 G-s
                      OVERALL LEVEL     1-20 KHz
       4                .173 In/Sec       .495 G-s
       5                .104 In/Sec       .544 G-s
       6                .221 In/Sec       .640 G-s

SCT-1      - SOUTH CT PUMP - EAST          (24-Sep-21)
                      OVERALL LEVEL     1-20 KHz
       11               .029 In/Sec      1.555 G-s        1800.0 RPM
       21               .029 In/Sec      1.058 G-s
       23               .042 In/Sec       .261 G-s
       71               .118 In/Sec       .487 G-s
       72               .067 In/Sec       .568 G-s

SCT-2      - SOUTH CT PUMP - MID           (24-Sep-21)
                      OVERALL LEVEL     1-20 KHz
       11               .036 In/Sec       .278 G-s        1800.0 RPM
       21               .040 In/Sec      1.616 G-s
       23               .050 In/Sec       .216 G-s
       71               .068 In/Sec       .354 G-s
       72               .054 In/Sec       .414 G-s

SCT-3      - SOUTH CT PUMP - WEST          (24-Sep-21)
                      OVERALL LEVEL     1-20 KHz
       11               .022 In/Sec       .898 G-s        1800.0 RPM
       21               .041 In/Sec       .293 G-s
       23               .055 In/Sec       .298 G-s
       71               .093 In/Sec       .419 G-s
       72               .078 In/Sec       .352 G-s

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

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