HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

August 25, 2021

Arkema

Subject: August 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,

David W. Shook
Senior Reliability Specialists
Hi-Speed Industrial Service
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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 0.2"/second velocity peak overall in the outboard axial measurement. Vibration still consists of multiple low amplitude shaft speed harmonics with a dominant 4x RPM component we suspect is impeller pass. **Rated a Class I Defect.**

Agitator, Hydrogenator C 7001-01
Data shows the highest vibration is in the motor inboard horizontal at 0.1"/second velocity peak overall which is dominated by low amplitude2x and 3x RPM peaks. No immediate concern.

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.33"/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 high 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. Overall acceleration is 5 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 low 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. Overall acceleration is 3 g's RMS at 1 point. **Rated a Class I Defect**.

Air Compressor C-203
Rotor bar vibrations are low for this motor's history and could indicate higher loading 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. Overall acceleration is 3.7 g's RMS at 1 point. **Rated a Class I Defect**.

Instrument Air Compressor
The male and female shaft vibrations still seem to show gear mesh and harmonics as well as a beat vibration occasionally. They continue to vary over time. Both shafts have between 4 and 8 g's RMS overall in the data. The dominant vibration appears to be the second gear mesh harmonic at near 2500 Hz. We are still watching this unit closely and will be going forward. **Rated a Class I Defect.**

Air Compressor NASH A 201-08A
Vibrations have risen to 0.24"/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 0.26"/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. There 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.**

Centac Compressor
The unit was not in operation during the survey.

<u>H2O2 Monthly Route Equipment</u>

530-03 North Cooling Tower South Pump
The unit motor has an increase in the shaft speed vibration at the top E-W measurement point. Impeller could have build up or wear. We will keep a close eye on the unit. **Rated a Class I Defect.**

2130-6 ABC Sec Filter Feed Pump North
I Made a note in my analyzer that there was a sound in the motor, but the overall data amplitudes did not compel me to report this unit during report generation on the August 6th service. I had been reporting the pump during earlier surveys. See the overalls attached in green below.

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2130-6     - ABC SEC FILT FEED PUMP-NORTH  (06-Aug-21)
                       OVERALL LEVEL     1-20 KHz
        11                .113 In/Sec       .199 G-s        1800.0 RPM
        21                .090 In/Sec       .522 G-s
        23                .055 In/Sec       .894 G-s
        71                .100 In/Sec       .745 G-s
        72                .097 In/Sec       .460 G-s
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7007-24 ABC Sec Filter Feed Pump South

The pump seems to be cavitating which is generating an elevated noise floor in the spectrum and seen as an increase in acceleration. Both pumps were operating during the survey. Check for proper operation. **Rated a Class I Defect.**

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                    Abbreviated Last Measurement Summary
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               Database:  Arkema.rbm
               Station:   PEROXIDE
               Route No.  5:  ARK WK 3
               Report Date:  25-Aug-21   12:48

MEASUREMENT POINT     OVERALL LEVEL       HFD / VHFD      MACHINE SPEED
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2130-1old  - C Concentrator Vacuum Pump    (25-Aug-21)
                       OVERALL LEVEL     1-20 KHz
        11                .068 In/Sec       .233 G-s        1200.0 RPM
        21                .071 In/Sec       .481 G-s
        23                .197 In/Sec       .159 G-s
        71                .148 In/Sec      1.014 G-s
        81                .159 In/Sec       .681 G-s
        83                .080 In/Sec      1.183 G-s

7000-01    - AGITATOR,HYDROGENATOR C       (25-Aug-21)
                       OVERALL LEVEL     1-20 KHZ
        02                .038 In/Sec       .019 G-s          45.00 RPM
        03                .047 In/Sec       .035 G-s
        11                .068 In/Sec       .640 G-s        1400.0 RPM
        12                .064 In/Sec       .662 G-s
        13                .098 In/Sec       .265 G-s
        21                .080 In/Sec       .207 G-s
        22                .105 In/Sec       .048 G-s
        23                .069 In/Sec       .569 G-s
        31                .073 In/Sec       .511 G-s
        32                .099 In/Sec       .479 G-s
        33                .055 In/Sec       .254 G-s
        41                .071 In/Sec       .524 G-s
        42                .074 In/Sec       .633 G-s
        51                .065 In/Sec       .295 G-s          375.0 RPM
        53                .089 In/Sec       .214 G-s
        61                .033 In/Sec       .225 G-s
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	71	.055 In/Sec	.253 G-s	45.00 RPM
	81	.022 In/Sec	.170 G-s	
	83	.049 In/Sec	.238 G-s	

57 - A/B Concentr Vac Pmp-var RPM (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.056 In/Sec	.217 G-s	900.0 RPM
12	.066 In/Sec	.297 G-s	
21	.073 In/Sec	.196 G-s	
23	.067 In/Sec	.280 G-s	
71	.127 In/Sec	.813 G-s	
81	.331 In/Sec	.872 G-s	
83	.081 In/Sec	1.051 G-s	

2130-1 - FLASH VAP VAC PUMP-var speed (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.055 In/Sec	.047 G-s	1200.0 RPM
12	.039 In/Sec	.344 G-s	
21	.040 In/Sec	.351 G-s	
22	.040 In/Sec	.401 G-s	
23	.056 In/Sec	.403 G-s	
71	.059 In/Sec	.376 G-s	
72	.075 In/Sec	.169 G-s	
81	.076 In/Sec	.238 G-s	
82	.070 In/Sec	.548 G-s	
83	.040 In/Sec	.524 G-s	

C-203 - C-203 Comp (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.032 In/Sec	.339 G-s	3588.0 RPM
12	.050 In/Sec	1.121 G-s	
21	.022 In/Sec	.515 G-s	
22	.038 In/Sec	1.568 G-s	
23	.037 In/Sec	1.380 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.031 In/Sec	1.134 G-s	
72M	.041 In/Sec	1.687 G-s	
73M	.062 In/Sec	.836 G-s	
81M	.039 In/Sec	3.578 G-s	
82M	.052 In/Sec	3.701 G-s	
71F	.043 In/Sec	1.733 G-s	
72F	.056 In/Sec	1.801 G-s	
73F	.062 In/Sec	1.104 G-s	
81F	.052 In/Sec	1.899 G-s	
82F	.048 In/Sec	1.826 G-s	

C-202 - C-202 Comp (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.052 In/Sec	1.039 G-s	3588.0 RPM
12	.109 In/Sec	.256 G-s	
21	.056 In/Sec	.288 G-s	
22	.068 In/Sec	.038 G-s	
23	.055 In/Sec	1.044 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.036 In/Sec	1.530 G-s	
72M	.035 In/Sec	1.036 G-s	
73M	.117 In/Sec	2.286 G-s	

81M	.040 In/Sec	1.572 G-s	
82M	.048 In/Sec	3.580 G-s	
71F	.035 In/Sec	1.942 G-s	
72F	.059 In/Sec	1.190 G-s	
73F	.048 In/Sec	1.928 G-s	
81F	.037 In/Sec	1.890 G-s	
82F	.045 In/Sec	1.344 G-s	

C-201 - C-201 Comp (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.104 In/Sec	2.161 G-s	3588.0 RPM
12	.149 In/Sec	5.306 G-s	
21	.087 In/Sec	.834 G-s	
22	.044 In/Sec	.862 G-s	
23	.055 In/Sec	.965 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.042 In/Sec	2.980 G-s	
72M	.044 In/Sec	2.314 G-s	
73M	.062 In/Sec	1.190 G-s	
81M	.067 In/Sec	8.239 G-s	
82M	.051 In/Sec	3.292 G-s	
71F	.056 In/Sec	2.109 G-s	
72F	.029 In/Sec	.393 G-s	
73F	.065 In/Sec	2.537 G-s	
81F	.059 In/Sec	2.225 G-s	
82F	.050 In/Sec	1.495 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.101 In/Sec	.775 G-s	1780.0 RPM
12	.103 In/Sec	1.010 G-s	
13	.061 In/Sec	.332 G-s	
21	.118 In/Sec	1.315 G-s	
22	.075 In/Sec	.802 G-s	
23	.055 In/Sec	.356 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.150 In/Sec	5.294 G-s	
72F	.168 In/Sec	6.025 G-s	
73F	.136 In/Sec	2.642 G-s	
81F	.119 In/Sec	2.550 G-s	
82F	.306 In/Sec	7.743 G-s	
83F	.212 In/Sec	5.952 G-s	
71M	.096 In/Sec	3.509 G-s	
72M	.130 In/Sec	5.065 G-s	
73M	.149 In/Sec	4.980 G-s	
81M	.178 In/Sec	3.047 G-s	
82M	.158 In/Sec	2.908 G-s	
83M	.169 In/Sec	5.196 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.066 In/Sec	.090 G-s	506.3 RPM
12	.070 In/Sec	.179 G-s	
13	.132 In/Sec	.121 G-s	
21	.066 In/Sec	.085 G-s	
22	.070 In/Sec	.083 G-s	
23	.110 In/Sec	.064 G-s	

	71	.135 In/Sec	.917 G-s	
	72	.219 In/Sec	.855 G-s	
	73	.171 In/Sec	.063 G-s	
	81	.135 In/Sec	.493 G-s	
	82	.235 In/Sec	.399 G-s	
	83	.141 In/Sec	.358 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.074 In/Sec	.088 G-s	1185.0 RPM
21	.083 In/Sec	.195 G-s	
23	.047 In/Sec	.102 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.233 In/Sec	.551 G-s	
31L	.206 In/Sec	.598 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.212 In/Sec	.271 G-s	
51L	.199 In/Sec	.263 G-s	100.0 RPM
52	.231 In/Sec	.193 G-s	
52L	.263 In/Sec	.200 G-s	
53	.103 In/Sec	.467 G-s	
53L	.027 In/Sec	.483 G-s	
61	.162 In/Sec	.117 G-s	
61L	.143 In/Sec	.115 G-s	
81	.033 In/Sec	.033 G-s	
82	.034 In/Sec	.037 G-s	
83	.028 In/Sec	.161 G-s	

530-01 - PUMP,N.COOLING TWR,NORTH (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.095 In/Sec	.037 G-s	1780.0 RPM
12	.130 In/Sec	.485 G-s	

530-03 - PUMP,N.COOLING TWR,SOUTH (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.125 In/Sec	.897 G-s	1780.0 RPM
12	.410 In/Sec	.426 G-s	

548-7 - IRON-FREE H2O BOOSTER PUMP (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.027 In/Sec	.263 G-s	1800.0 RPM
21	.028 In/Sec	.894 G-s	
23	.059 In/Sec	.224 G-s	
71	.033 In/Sec	.094 G-s	
72	.029 In/Sec	.122 G-s	

SCT-1 - SOUTH CT PUMP - EAST (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.039 In/Sec	.622 G-s	1800.0 RPM
21	.039 In/Sec	.766 G-s	
23	.051 In/Sec	.073 G-s	
71	.117 In/Sec	.661 G-s	
72	.076 In/Sec	.614 G-s	

SCT-2 - SOUTH CT PUMP - MID (25-Aug-21)

	OVERALL LEVEL	1-20 KHz	
11	.026 In/Sec	.743 G-s	1800.0 RPM

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        21               .035 In/Sec       .947 G-s
        23               .062 In/Sec       .356 G-s
        71               .089 In/Sec       .485 G-s
        72               .091 In/Sec       .456 G-s

 SCT-3      - SOUTH CT PUMP - WEST          (25-Aug-21)
                        OVERALL LEVEL     1-20 KHz
        11               .029 In/Sec       .558 G-s        1800.0 RPM
        21               .036 In/Sec       .593 G-s
        23               .052 In/Sec       .273 G-s
        71               .103 In/Sec       .290 G-s
        72               .095 In/Sec       .488 G-s

-------------------------------------------------------------------------------
   Clarification Of Vibration Units:
      Acc      -->  G-s      PK
      Vel      -->  In/Sec   PK                      Abbreviated Last Measurement
Summary
                     ************************************

               Database:  Arkema.rbm
               Station:   PEROXIDE
               Report Date:  25-Aug-21   12:49

 MEASUREMENT POINT     OVERALL LEVEL       HFD / VHFD      MACHINE SPEED
 -----------------     -------------       ----------      -------------

 2130-6     - ABC SEC FILT FEED PUMP-NORTH  (25-Aug-21)
                        OVERALL LEVEL     1-20 KHz
        11               .042 In/Sec       .761 G-s        1800.0 RPM
        21               .044 In/Sec       .588 G-s
        23               .063 In/Sec       .223 G-s
        71               .129 In/Sec       .418 G-s
        72               .112 In/Sec       .421 G-s

-------------------------------------------------------------------------------
   Clarification Of Vibration Units:
      Acc      -->  G-s      PK
      Vel      -->  In/Sec   PK                      Abbreviated Last Measurement
Summary
                     ************************************

               Database:  Arkema.rbm
               Station:   PEROXIDE
               Report Date:  25-Aug-21   12:49

 MEASUREMENT POINT     OVERALL LEVEL       HFD / VHFD      MACHINE SPEED
 -----------------     -------------       ----------      -------------

 7007-24    - ABC SEC. FILT FEED PMP-SOUTH  (25-Aug-21)
                        OVERALL LEVEL     1-20 KHz
        11               .039 In/Sec       .468 G-s        1800.0 RPM
        21               .041 In/Sec      1.483 G-s
        23               .038 In/Sec       .247 G-s
        71               .152 In/Sec      1.971 G-s
        72               .123 In/Sec      2.482 G-s
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Clarification Of Vibration Units:

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